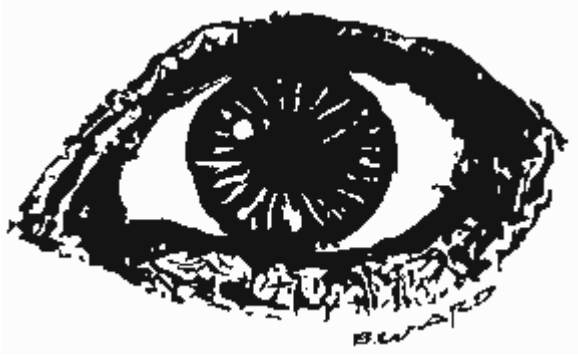

RESIDENT/FELLOW
RESEARCH DAY

May 18, 2007

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
9:30 AM – 5:00 PM

RESIDENT/FELLOW RESEARCH DAY

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IOWA CITY, IOWA

RESIDENT/FELLOW RESEARCH DAY - 2007

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Jacinthe Rouleau, M.D.

OCULOPLASTIC SURGERY
Adel H. Alsuhaibani, M.D.
Adam G. de la Garza, M.D.

PEDIATRIC OPHTHALMOLOGY
Suma Shankar, M.D., Ph.D.

VITREORETINAL DISEASE
Jeffrey J. Fuller, M.D.
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Vinit B. Mahajan, M.D., Ph.D.
Michael D. Radosevich, M.D., Ph.D.

RESEARCH FELLOWS
Bing Jiang, Ph.D.
Shaival Shah

RESIDENT/FELLOW RESEARCH DAY - 2007

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Jordan M. Graff, M.D.
Susannah V. Quisling, M.D.
Christopher C. Robinson, M.D.
Avinash P. Tantri, M.D.

SECOND-YEAR RESIDENTS

Jason C. Friedrichs, M.D.
Edward H. Hu, M.D.
Yian Jin Jones, M.D.
Andrew C. G. Steffensmeier, M.D.
Paula Wynn, M.D.

FIRST-YEAR RESIDENTS

Parley D. Fillmore M.D., Ph.D.
Arpitha Muthialu, M.D.
Matthew P. Rauen, M.D.
Parisa Taravati, M.D.
Erynn Bo Yang, M.D.

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OPHTHALMOLOGY RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Friday, May 18, 2007

OPHTHALMOLOGY RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Friday, May 18, 2007

1:45 **Matt Rauen,** K.M. Goins, sponsor....13.
Impact of previous cataract surgery in donor corneas used for endothelial keratoplasty: Is there support for a two-hit-hypothesis?

2:00 **Jacinthe Rouleau,** R. Kardon, sponsor....14.
Retina Nerve Fiber Structure Versus Visual Field Function In Patients with Ischemic Optic Neuropathy (AION): A test of a linear model

2:15 **Adel Alsuhaibani**....15.
Management of Uveal Melanoma in Saudi Arabia: A 22-Year Experience

2:30 **Scott Piette,** M.D. Abramoff, E. Greenlee, W.L.M. Alward, Y.H. Kwon, sponsors....16.
Comparison of Computer Aided Planimetry Between Simultaneous and Non-Simultaneous Stereo Optic Disc Photographs

2:45 Break
Refreshments served near the entrance to the Braley Auditorium, 01136 PFP

3:00 **Dwight Silvera,** K.M. Goins, sponsors....17.
Comparison of Visual Outcomes, OR Efficiency, and Complication Rates of Eye Bank Pre-cut Donor Tissue versus Intraoperatively Cut Tissue for DSEK: 6 Month Results

3:15 **Jeffrey Fuller,** S. Russell, sponsor....18.
Vitreal Penetration of Oral Moxifloxacin in Humans

3:30 **Paula Wynn,** R. Kardon, sponsors....19.
The Effect of Refractive Error on OCT Retinal Nerve Fiber Layer Sector Analysis

3:45 Faculty Vote on Presentations
Blodi Conference Room 11131 PFP

ADJOURN

OPHTHALMOLOGY RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS

Friday, May 18, 2007

Presented Previously
(excused from presenting)

James G. Howard, S.R. Russell, G.S. Hageman, sponsors .....20.
Vitreous Sample Analysis after Bevacizumab (Avastin) Injection

Manuscripts submitted for publication
(excused from presenting)

Jordan Graff, T.A. Oetting, A.G. Lee, sponsors .....21.
The Rise of the Ophthalmic Knowledge Assessment Program (OKAP) Examination

Yian Jin Jones, K.M. Goins, N.A. Syed**,**sponsors .....22.
A comparison of the Femtosecond Laser (Intralase) versus Manual Microkeratome (Moria ALTK) in Dissection of Donor Tissue for Posterior Lamellar Keratoplasty. Initial Studies in Eye Bank Eye

Christopher Robinson, K.M. Goins, W.L.M. Alward, E. Greenlee, Y.H. Kwon, sponsors.....23.
Evaluation of Changes in Intraocular Pressure and Incidence of Glaucoma Following Endothelial Keratoplasty

Published manuscripts
(excused from presenting)

Robert Dinn, Drs. Greenlee, Alward and Kwon, sponsors.....24.
Concordance of Diurnal Intraocular Pressure between Fellow Eyes in Primary Open-Angle Glaucoma , Published in *Ophthalmology* 2007;114(5):915-920

Avinash Tantri, Thomas A. Oetting, sponsor .....25.
Anesthesia Monitoring by Registered Nurses During Cataract Surgery: Assessment of Need for Intraoperative Anesthesia Consultation, Published in *J Cataract Refract Surg*. 2006 Jul;32(7):1115-8.

Susannah Quisling (Longmuir), MD, Stacy Sjoberg, Bridget Zimmerman, Kenneth Goins, John Sutphin
Comparison of Pentacam and Orbscan IIz (OIIz) on Posterior Curvature Topography Measurements in Keratoconus Eyes.
Published in *Ophthalmology*. 2006;113(9):1629-32.

Educational Benefit of Stereo Movies of Ophthalmic Surgery for Residents and Medical Students

Jason Friedrichs, M.D., M.S.
Sponsors: Michael D. Abramoff, M.D., Ph.D.; Andrew G. Lee, M.D.

Purpose: Understanding the three dimensional (3-D) nature of ocular pathology and of ophthalmic surgery is essential for training in ophthalmology for residents and medical students. Ophthalmologists almost exclusively use stereo-slitlamps, -fundoscopes, -angiograms, and –surgical microscopes. Nevertheless, during training, students and residents are only rarely exposed to 3-D viewing. This makes it much more difficult to understand the three-dimensional relationships of structures such as the optic nerve head in glaucoma, ocular tumors, cataract, cornea, macular edema, retinal detachments, thickened and thinned retina, retinal scars and retinal blood vessels. It also steepens the learning curve for ophthalmic surgery, because in almost all surgery, depth of vision is required. This is especially the case for the surgical procedures commonly performed by residents, including cataract surgery, strabismus surgery and glaucoma surgery. The reasons for this lack of exposure are mostly due to technological limitations: because of the nature of optics, additional sets of binocular oculars on any diagnostic imaging device such as a surgical microscope means substantially less light is available for the primary set of oculars that is used by the clinician - leading to unacceptable darkening of the image. In addition, recording and viewing of stereo movies has until recently been both prohibitively difficult because of the synchronization required between two cameras and the low contrast by stereo cameras. This is not withstanding the fact that almost all ophthalmic images are acquired in stereo format – so far there has just not been a way to conveniently view these images in a group. New digital stereo acquisition and display technology that have recently become available hold the promise to improve this situation. Though it may be expected that viewing stereo movies of surgical procedures may better prepare residents for wet-lab and real surgical procedures, and that viewing of stereo images of diverse pathology may help medical students and residents better understand those pathologies, no evidence is currently available in the literature.

Methods: We purchased two stereo viewing technologies. The first uses LCD shutter glasses with a projector using flicker-free stereo video projection (DephthQ, Lightspeed Inc.). The second uses virtual goggles (TD Vision 3D Visor) to enable students and residents to view stereo images of ocular pathology, angiography and stereo movies of surgical procedures. We propose to then evaluate the effect of the addition of stereo viewing to the education of students and residents. Medical students and residents will be interviewed about the effect of 3-D viewing on education and training. After each lecture, a questionnaire will be completed. The questionnaire includes 5 statements about the perception and understanding of the three dimensional nature of the images viewed. After each statement, the learner will indicate her or his level of agreement by means of a 5-point Likert scale, with possible responses ranging from "completely agree" to "completely disagree. The surveys will be analyzed using standard statistical methods to determine if a statistically significant difference exists between the two stereo and standard viewing methods.

Results: To be determined.

Support: Residents and Fellows Research Program

Immunohistochemistry of Ocular Adnexal Vascular Lesions - Distinguishing Lymphatic versus Blood Vessel Origins Using LYVE-1, D2-40 and Podoplanin

Shalini Johnson, M.D.
Sponsors: Robert F. Mullins, Ph.D.; Jeffrey A. Nerad, M.D.; Nasreen A. Syed, M.D.

Support: Residents and Fellows Research Program

Purpose: To use specific immunohistochemical markers to characterize various vascular malformations and benign vascular neoplasms of the ocular adnexa. Although these lesions typically have distinct clinical and morphologic features, at times there is overlap. It has been proposed that these lesions are not distinct clinical entities but rather a part of a continuum. Our purpose is to use recently discovered lymphatic endothelium specific antibodies LYVE-1, D2-40 and podoplanin as well as general vascular endothelial markers to develop an immunohistochemical profile that may be useful in understanding the nature and classification of these vascular lesions.

Methods: Vascular lesions that have been archived in the F. C. Blodi Ocular Pathology laboratory between the years 1996 to 2006 with the histopathologic diagnoses of cavernous hemangioma (n=19), capillary hemangioma (n=15), orbital varix (n=7), pyogenic granuloma (n=7) and lymphangioma (n=16, of which 9 blocks were from the same case) were used in this study. Immunohistochemistry was performed on formalin-fixed, deparaffinized tissues using the avidin-biotin complex peroxidase method. The antibodies used in this study include the lymphatic endothelial specific antibodies LYVE-1(lymphatic vessel endothelial hyaluronan receptor), D2-40 and podoplanin and the panendothelial vascular markers UEA-1 (Ulex Europaeus Agglutinin I), CD31and CD34.

Results: The results show that lymphangioma had variable expression of LYVE-1 and podoplanin, consistent expression of D2-40 and consistent or fairly consistent expression of vascular markers UEA-1, CD31 and CD34. Neither cavernous hemangioma nor venous malformations showed expression of LYVE-1 or D2-40. Cavernous hemangioma also did not generally label with podoplanin antibodies while venous malformations showed variable podoplanin expression. Cavernous hemangioma had variable expression of UEA-1 and fairly consistent expression of CD31 and CD34. Venous malformation had consistent expression of UEA-1, CD31 and CD34. Neither capillary hemangioma nor pyogenic granuloma displayed expression of LYVE-1 or D2-40 and both lesions also either consistently or fairly consistently lacked podoplanin expression as well. In contrast to the lymphatic markers, both capillary hemangioma and pyogenic granuloma showed consistent expression of UEA-1, CD31 and CD34.

Conclusions: These immunohistochemical profiles are consistent with the histologic and morphologic differences found between blood vessel versus lymphatic vessel lesions suggesting that these lesions are actually distinct clinical entities with unique origins.

Author Disclosure Block: S. Johnson, None; **R.F. Mullins**, None; **J.A. Nerad**, None; **N.A. Syed**, None.

Validity of a Novel Web-Based Vision Screening Tool

Shaival Shah
James Torner, Ph.D.
Sponsor: Richard Olson, M.D.

Purpose: Vision screening has become a major public health issue in the United States. It is estimated that only 1 in 5 school children in the US receive a vision screening. Amblyopia is the leading cause of monocular blindness in adults aged 20-70. Early recognition and referral are crucial, especially during infancy and childhood, to prevent permanent vision loss. The Internet is still a relatively untapped resource for vision screening, and holds the potential for widespread, free testing. The purpose of this study was to demonstrate the validity of a novel web-based vision screening tool.

Methods: In this prospective study, we enrolled a combined total of 204 patients and accompanying siblings between ages 3-12 who presented to the pediatric ophthalmology clinic of the University of Iowa. Each study subject's vision was tested twice in a randomized fashion: once using the web-based vision screening tool administered by the parent, and once using the EVA (electronic visual acuity tester) protocol administered by a trained orthoptist. Frequency data as well as sensitivity, specificity values were computed with SAS v. 9.0.

Results: At a specificity of 91.3%, the web-based vision screening tool achieved a sensitivity of 71.4%.

Conclusion: This is the first study to show that web-based vision screening is possible. It is free, accessible, user-friendly, and able to incorporate patient education. It is valid when used in a controlled environment. Future testing and development should occur in a variety of settings.

*This test is available at www.lazyeyetest.org/test

Lessons Learned from Prism Adaptation Non-Responders

Andrew C.G. Steffensmeier, M.D.
Sponsor: Richard J. Olson, M.D.

Background: Following multiple small reports of improved surgical outcomes using preoperative prisms (prism adaptation), the Prism Adaptations Study Research Group concluded in a multi-center, prospective, randomized trial that prism adaptation did result in improved outcomes when surgical correction was directed towards the larger deviation measured following prism adaptation. Several groups have subsequently published data in favor of prism adaptation. To date, no known large series has been published to characterize patients who did not respond to prism adaptation.

Purpose: To evaluate patients treated preoperatively by prism adaptation who did not respond to prism adaptation to identify risk factors for non-response.

Methods: Retrospective chart review will be utilized to identify characteristics common to non-responders.

Preliminary Results: The following results are reported from the records of patients with acquired esotropia who were treated with prism adaptation at the University Of Iowa Department Of Ophthalmology. Of 509 patients listed as prism adapted, 260, 160 were non-responders. Of these, 98 (61%) had deviations greater than 8 prism diopters at either near or distance postoperatively. 16 (10% of total non-responders) had re-operations. Overall, 254(49.9%) of the 509 patients undergoing prism adaptation had postoperative deviations of greater than 8 prism diopters, and 8.8% of them had secondary surgery to correct the remaining deviation.

Conclusion: The preliminary findings show unexpectedly poor outcomes, with lower success than those originally reported in the Prism Adaptation Study. This may reflect inclusion of patients not originally eligible for the Prism Adaptation Study.

Future plans include detailed analysis of the charts of non-responders with attention to variables including age; gender; initial deviation; course of adaptation; surgical correction made; post operative deviation, fusion testing, visual acuity; and secondary surgeries; and concurrent medical and ophthalmic findings.

Genetic and Phenotypic Heterogeneity in Leber Congenital Amaurosis

Suma P. Shankar, M.D., Ph.D.
Richard J. Olson, M.D.; William E. Scott, M.D.; Jeaneen L. Andorf, B.A.; Ronald V. Keech, M.D.; Edwin M. Stone M.D., Ph.D.

Purpose: Leber Congenital Amaurosis (LCA) is a heterogenous group of inherited disorders typically characterized by poor vision from birth, nystagmus, normal fundus appearance and non-recordable or severely reduced electroretinograph (ERG).[1-2] Clinical variability of LCA has been well described with fundus features varying from essentially normal appearance to macular coloboma-like lesions, bone spicule–like pigmentation, pigmentary clumping, fundus flecks, chorioretinal atrophy and attenuated retinal vessels. Other ocular and systemic abnormalities, including neurological, developmental and renal disorders have also been described. In the past few years, discovery of nine different genes causing LCA has provided the opportunity to molecularly diagnose and classify LCA based on the gene-causing disease.[3-5] Phase I gene therapy for treating LCA caused by RPE65 in humans has been approved in the past year. Determining the gene causing LCA in a patient and characterizing the specific clinical features is important both for providing better care and in identifying the ones that can be potentially treated by gene therapy. The purpose of this study was to identify disease-causing genes in LCA patients seen at the University of Iowa and study the genotype-phenotype correlation.

Methods: Thirty-eight patients with the clinical diagnosis of LCA were screened for disease-causing mutations with a combination of single strand conformational polymorphism analysis (SSCP), a multiplexed allele-specific ligation assay (SNPlex), and bidirectional DNA sequencing. Clinical records, fundus photographs and OCT (when available) were analyzed. The phenotypes of patients with known molecular diagnosis were studied to identify gene-specific clinical features.

Results: Disease-causing mutations were identified in eighteen patients involving six different LCA genes: AIPL1, CEP290, CRB1, CRX, GUCY2D and RPE65. The clinical features among these patients showed great variability with VA from 20/60 to NLP, fundus appearance from normal to bone-spicule pigmentation, Coat's like exudative response, periarteriolar preservation of RPE, non-specific peripheral and macular pigmentary changes and yellow or white retinal deposits or flecks. Systemic associations included developmental delay, nephrolithiasis, seizures and hypotonia. We identified some clinical findings that were gene-specific. Keratoconus was found in a patient with GUCY2D, and in patients with CRB1 mutations, preserved para-arteriolar retinal pigment epithelium (PPRPE) and Coat's like response was found.

Conclusions: Although there is significant overlap in the phenotype of LCA caused by different genes, there are certain clinical features that are gene-specific. Screening of a larger number of patients is required to further delineate these gene-specific clinical features.

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Lumpers or splitters? The role of molecular diagnosis in Leber congenital amaurosis. Ophthalmic Genet. 2006 Dec;27(4):113-5.
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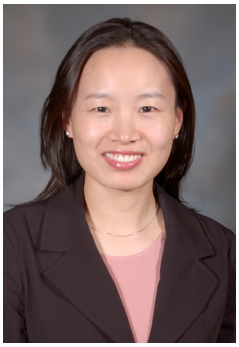
Identifying candidate glaucoma-related genes in patients with thin corneas

E. Bo Yang, M.D.
Sponsors: Wallace L.M. Alward, M.D.; John H. Fingert M.D.; Ph.D.



Purpose: To identify potential genes responsible for the thin cornea phenotype, which has been associated with a higher risk of developing glaucoma and for glaucomatous damage progression.

Method: Since 2004, the Glaucoma Service has tested central corneal thickness (CCT) in 2172 patients. CCT was measured using ultrasound pachymetry. The patient database was reviewed and analyzed for CCT characteristics and identification of patients with thin corneas.

Results: The mean CCT of all eyes examined was 550.4 μm ± 52.11 μm (SD). Of the 2172 patients with CCT measurements, 145 patients with CCT of ≤ 470 μm in either eye were identified. Forty-nine patients were excluded from this study because of congenital glaucoma (11), corneal pathology (31) in the eye with thin cornea, and inaccessibility for further testing (3). The remaining 100 patients were eligible for the study.

Conclusion: The 100 patients and their first-degree blood-relatives will be contacted for testing (pachymetry and intraocular pressure), At the same time a blood sample will be obtained. Study of the family pedigrees will hopefully reveal the inheritance pattern, and DNA analysis may identify the genes responsible for the thin cornea phenotype.

Genetic studies of central corneal thickness as a glaucoma risk factor

Bing Jiang, M.D.
Markus H. Kuehn, Ph.D.
Sponsors: Young H. Kwon, M.D,; Michael G. Anderson, Ph.D.

Purpose: The Ocular Hypertension Treatment Study (OHTS) demonstrated central corneal thickness (CCT) to be a powerful predictor for the development of glaucomatous damage. Eyes with a CCT of 555 microns or less had a threefold greater risk of developing glaucoma than those who had a CCT of more than 588 microns. However, two main questions remain unresolved. First, is CCT a genetically determined independent risk factor for glaucoma? Secondly, does the thickness of the cornea influence IOP measurements, i.e. are apparent differences in glaucoma progression between patients with thick or thin corneas the result of underestimation of IOP in individuals with thin corneas? In order to address these questions, it would be highly desirable to have at hand an experimental system where experimental conclusions could be based on manipulation, as well as association. The purpose of these experiments is to develop mouse models with differing CCT values and to begin utilizing genetic approaches to address their potential relationships to glaucoma.

Methods: CCT was determined in several strains of inbred mice using a Corneo-Gage Plus pachymeter. In addition, CCT was measured directly through morphometric analysis of corneal cryosections. Data were analyzed to reveal potential CCT differences with respect to strain, sex, and age of the animal.

Results: Pachymeter CCT measurements correlated well to those obtained from corneal sections (R^2 =0.998). The CCT within each strain of mice was tightly constrained and there were statistically significant differences between different strains (range: 85.5 to 113.3 microns). There does not appear to be a sex related difference.

Conclusion: Our study demonstrates that mice can be used to study the effects of CCT variations. These data suggest that CCT is genetically determined and that tractable differences exist in existing inbred mouse strains. In our ongoing experiments, we aim to utilize these strains to identify specific genes regulating CCT through genetic analyses, evaluate the degree to which CCT affects IOP measurements in mice, and evaluate whether these CCT-regulating loci will also serve as enhancers or suppressors of glaucoma severity in mouse models of glaucoma.

A New Definition of Optic Nerve Hypoplasia Based on Optical Coherence Tomography (OCT)

Reid A. Longmuir, M.D.
Sponsor: Randy H. Kardon M.D., Ph.D.

Purpose: To propose a new method of quantifying and categorizing the degree of optic nerve hypoplasia based on optic disc area, retinal nerve fiber layer thickness, and visual field sensitivity.

Methods: 26 patients (43 eyes) were identified with a diagnosis of optic nerve hypoplasia based on the clinical and photographic appearance of the optic nerve in the neuro-ophthalmology clinic at the University of Iowa. 74 normal eyes and 43 eyes judged clinically to have hypoplastic nerves had perimetry (Humphrey and/or Goldmann visual fields), optic nerve photographs, OCT of the retinal nerve fiber layer thickness (fast RNFL scan) and optic disc area (fast disc scan). Abnormal HVF was defined as at least 2 adjacent points at less than 5% probability or an absolute mean deviation at the 5% level or worse. Abnormal GVF was defined as a focal deficit at >10 degrees in one isopter or >5 degrees for multiple isopters, or evidence of generalized constriction. Abnormal RNFL was defined as total RNFL or single quadrant at the 5th percentile or less, or a single clock hour at the 1st percentile or less.

Results: Based on OCT optic disc area alone, 35/43 eyes (81%) were smaller than the lower 5th percentile of normal (<1.73 mm2). Based on a combination of either sectoral or average RNFL thinning *and* small disc area, 31/43 eyes (72%) were abnormal; of these, 25/31 (81%) also had an abnormal visual field. Only one of the 43 eyes was normal on all three modalities

Conclusions: Optic nerve hypoplasia should be considered as a spectrum of pathology ranging from mild (small nerve with normal retinal nerve fiber layer thickness and normal visual field) to severe (small disc area with abnormally thin retinal nerve fiber layer *and* visual field loss). The degree of pathology in a given eye can be best estimated by knowing the area of the scleral opening, the retinal nerve fiber layer thickness (assumed to be proportional to axon number) and the visual field sensitivity.

Research at The University of Iowa Department of Ophthalmology and Visual Sciences
is supported in part by an unrestricted grant from Research to Prevent Blindness

Stability of vision, refraction, astigmatism, and endothelial cell density (ECD) at 1 year after Deep Lamellar Endothelial Keratoplasty (DLEK)

Parley D. Fillmore, M.D., Ph.D.
Sponsor: Kenneth M. Goins, M.D.

Purpose: To report the 1 year results of a large, prospective series of DLEK patients.

Methods: 91 DLEK procedures were performed in 86 eyes, divided into three study groups: large incision 9 mm DLEK [n=7], small incision 5-8 mm DLEK [n=75], and penetrating keratoplasty conversion [n=9]. Best corrected visual acuity (BCVA), topographic astigmatism, and ECD were evaluated prospectively.

Results: At 12 months, 61% eyes achieved 20/40 or better BCVA. Average ECD was 2066±558 cells/mm^2 with a 9 mm incision size and 1590±568 cells/mm^2 with smaller incisions.

Conclusion: DLEK provides good BCVA (≥20/40) for the majority of patients at 1 year. ECD is greater at 1 year with larger (9mm) incisions. ECD was similar in eyes with DLEK alone or with a combined procedure.

Research at The University of Iowa Department of Ophthalmology and Visual Sciences is supported in part by an unrestricted grant from Research to Prevent Blindness

Outcomes Following Descemet's Stripping Endothelial Keratoplasty

Parisa Taravati, M.D.
Sponsor: Kenneth Goins, M.D.

Purpose: To determine the best-corrected visual acuity and corneal endothelial cell counts 1 month, 3 months, 6 months, and 12 months following Descemet's Stripping Endothelial Keratoplasty (DSEK). The incidence of post-operative pupillary block, lenticule dislocation, and secondary procedures was also examined.

Methods: A retrospective review of 23 eyes of 21 patients who underwent either DSEK or combined phacoemulsification and DSEK between August of 2005 and August of 2006 at the University of Iowa was performed. Baseline data included age, best-corrected visual acuity, and diagnosis. Outcome measures were recorded at 1, 3, 6, and 12 months post-operatively.

Results: The mean age at surgery was 68 ($\pm$ 12) years. Pre-operatively, the mean best-corrected visual acuity was 0.6 logMAR (range 0.2-1.3 logMAR), and the mean donor endothelial cell count was 2985 $\pm$ 301 cells/mm^2. Of the 23 eyes, 16 had Fuchs' endothelial dystrophy, 5 had pseudophakic bullous keratopathy (PBK), 1 had bullous keratopathy, and 1 had both Fuchs' and PBK. Thirteen eyes underwent DSEK only, 9 underwent combined phacoemulsification and DSEK, and 1 underwent DSEK and Ahmed shunt revision. The incidence of post-operative pupillary block was 35%. One patient developed aqueous misdirection requiring pars plana vitrectomy and peripheral iridectomy. The incidence of lenticule dislocation was 17%, all requiring lenticule repositioning. The incidence of graft failure was 13%, requiring repeat DSEK. Mean post-operative visual acuity was 0.6 logMAR (range 0-2.3) at 1 month, 0.3 logMAR (range 0.1-1.0) at 3 months, and 0.2 logMAR (range 0-0.6) at 6 months. Endothelial cell counts were not measured in all patients, but mean post-operative endothelial cell counts were 2020 $\pm$ 904 cells/mm^2 at 1 month (n=8), 1992 $\pm$ 861 cells/mm^2 at 3 months (n=9), and 1944 $\pm$ 395 cells/mm^2 at 6 months (n=9). The 12-month data has not been included since some patients have not yet had 12-month follow-up.

Conclusions: DSEK offers good visual rehabilitation for patients with Fuchs' endothelial dystrophy and/or bullous keratopathy. However, there is a high rate of post-operative pupillary block. Outcomes from all patients who underwent DSEK at the University of Iowa between August of 2005 and July of 2007 will eventually be obtained.

Research at The University of Iowa Department of Ophthalmology and Visual Sciences is supported in part by an unrestricted grant from Research to Prevent Blindness

Endotine Forehead Device Effect on Brow Lift over Time

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Sponsor: Jeffrey A. Nerad, M.D.

Background: The Endotine Forehead 3.5 (Coapt Systems, Palo Alto, Calif.) has recently become more popular for use of endoscopic brow lift for many reasons. The implantable bioabsorbable fixation device has many benefits including ease of use, the ability to adjust intraoperatively or postoperatively, fewer side effects with less to no pain, parasthesias, alopecia as seen with the open coronal technique, and multipoint fixation to prevent regression of elevation. One hesitation in the use of endotine forehead device for brow lift is the questionable maximum amount of brow lift achievable and amount of postoperative brow descent over time compared to the traditional open coronal technique.

Only one previous study on Endotine Forehead device on brow lift has been done studying the effects in 21 patients with average follow-up time of 14.6 weeks.[2] Average elevations of 4.2-4.8 mm compared to pre-operatively were obtained. The study was merely a comparison of pre-operative brow height vs. post-operative brow height with no comparison post-operatively over time. The study concluded that the Endotine Forehead device provides significant and reproducible brow elevation with no significant adverse effects.

Purpose: The purpose of this study is to prospectively study the effects of Endotine Forehead Device in brow lift over 1 year time period.

Methods: Endoscopic brow lift using the Endotine device second-generation polymer of 82/18 L-lactide/glycolide will be performed on 50 consecutive patients. Patients with connective tissue diseases, on chronic steroids or immunosuppressives, or any condition that would alter the normal healing process will be excluded. Preoperative and postoperative standardized photographs will be taken in the Frankfort horizontal plane and two measurements will be compared: midpupil to superior brow and lateral canthus to superior brow, over a 1 year time interval: immediate, 1 week, 1 month, 3 months, 6 months, and 12 months post-operatively.

Results: To be collected in the near future.

Conclusion: We hope to show that the Endotine Forehead device provides significant and reproducible brow elevation, and although there may be as reported some brow descent post-operatively that the other benefits including of ease of use, the ability to adjust intraoperatively or postoperatively, and fewer side effects outweigh the amount of brow descent, and therefore it serves as a clinically significant option in brow lift.

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The role of contact lens solution types as a substrate in the viability of *Fusarium* spp. : Potential implications in contact lens related fungal keratitis

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Sponsor: Christine Sindt, O.D., F.A.O.O.

Purpose: To determine the role of contact lens solution types as a substrate in the viability of *Fusarium* spp. We propose that it is the unique composition of the Bausch and Lomb RENU with MoistureLoc which may inadvertently provide a suitable substrate for Fusarium sustainability and potential proliferation. Given the high porosity of currently popular non-silcone hydrogel contact lenses, we propose that the preservative alexidine may become sequestered within the contact lens and thus rendering its antimicrobial properties ineffective.

Methods: In vitro microbiological study to assess the viability of *Fusarium* spp. known to cause contact lens-associated fungal keratitis in various contact solutions. Utilizing previously established standardized protocols of fungal innoculation, culture and analysis of growth, various combinations of contact lens solutions with and without standardized pre-treatment with various contact lens types will be assessed for their ability to sustain/promote *Fusarium* growth.

Results: Pending

Conclusions: Pending

Impact of previous cataract surgery in donor corneas used for endothelial keratoplasty: Is there support for a two-hit-hypothesis?

Matthew Rauen, M.D.
sponsor: Kenneth Goins, M.D.

Purpose: Endothelial keratoplasty offers many advantages over traditional penetrating keratoplasty and utilization of this procedure continues to increase. As surgical techniques continue to evolve, preservation of endothelial cells is of utmost importance. In fact, endothelial cell loss rates as high as 50% in the first year have been observed. The donor, host, and perioperative conditions that impact endothelial cell loss over time have not totally been elucidated.

Phacoemulsification surgery, especially when involving hard brunescent cataracts, has been associated with both immediate endothelial cell loss and a sustained rate of cell loss even 2 years after surgery. These findings suggest a long lasting effect on endothelial cell biology after phacoemulsification.

The goal of this study is to assess if previous cataract surgery in the donor cornea impacts rate of endothelial cell loss over time in patients after endothelial keratoplasty. Demand for corneal tissue will increase as the popularity of EK increases. Increasing demand combined with an aging population may lead to tissue shortages and force expansions of the donor base. A better understanding of cornea donor-related factors will lead to more optimal EK outcomes.

Methods: A retrospective chart review will be performed on patients who have undergone DLEK and DSEK at the University of Iowa. Using the Iowa Lions Eye Bank database, donor corneas with past history significant for same eye cataract surgery will be identified. The rate of endothelial cell loss in this group will be compared to patients whose donor tissue had no previous intraocular surgery.

Results: To be determined.

Conclusion: To be determined.

Retinal Nerve Fiber Structure versus Visual Field Function in Patients With Ischemic Optic Neuropathy (AION): A Test of a Linear Model

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

Purpose: To test a linear model relating the regional loss in retinal nerve fiber (RNFL) thickness to the corresponding regional loss in sensitivity with data from patients with previous anterior ischemic optic neuropathy (AION).

Design: Case-control study.

Participants: 24 individuals with AION and 20 with normal vision were tested. The time since the AION attack ranged from 5.2 months to over 20.3 years (median of 2.95 years).

Methods: Eyes were tested with standard automated perimetry (SAP) and with optical coherence tomography (OCT), RNFL thickness scans. The average RNFL thickness of the inferior and superior disc sectors was plotted against the average total deviations (linear units) of the corresponding superior and inferior arcuate field regions and a linear model fitted. According to the model, the RNFL thickness $R = s_o T + b$, where T is the relative SAP sensitivity loss (on a linear scale, e.g. for -3dB, T=0.5), s_o is the RNFL thickness attributable to axons in the healthy/normal state (T=1.0) and b is the residual RNFL measured when all sensitivity and axons are lost.

Main Outcome Measures: OCT RNFL thickness and SAP sensitivity.

Results: The data from the AION patients resembled the data from glaucoma patients previously tested and were described by the linear model. For patients with SAP losses greater than -10 dB in the arcuate region, the RNFL thickness provided an estimate of residual RNFL thickness, b. The median value of b (45.5 mm) was similar to the value for patients with glaucoma. It varied among individuals (range: 30.4 to 63.3 mm) showing a very weak correlation with patient's age (r^2=0.09) and the time since the AION episode (r^2=0.07), but an excellent correlation (r^2=0.88; $p<0.01$) with the value of s_o, estimated from the unaffected eyes.

Conclusion: The relationship between a structure (OCT RNFL thickness) and function (SAP sensitivity loss) is the same for patients with AION and glaucoma and can be approximated by a simple linear model. This model predicts that a severe loss in function will leave a residual RNFL thickness, which varies among individuals.

Management of Uveal Melanoma in Saudi Arabia: A 22-Year Experience

Adel Alsuhaibani, M.D.

Objective: To report our experience with the diagnosis and management of uveal melanoma in patients from Saudi Arabia, a predominant Arab country.

Design: Retrospective, noncomparative, interventional, case series.

Participants: All patients diagnosed with uveal melanoma at King Khaled Eye Specialist Hospital (KKESH), Riyadh, Saudi Arabia from June 1983 to July 2005.

Methods: A medical record review of clinical history, imaging studies, surgical procedures and treatment outcome was performed.

Main Outcome Measures: Demographic, presenting symptoms and signs, treatment rendered and complications of uveal melanoma.

Results: Among the 60 patients (37.males, 23 females) with uveal melanoma (average age 51 years; range 12 to 80 years), 43 (72%) were Saudi Arabian and the rest 17 (28%) patients were from neighboring Arab countries. Decreased vision was the main presenting complaint of 47 (78%) patients followed by pain in 12 (20%) patients; the duration being 6 months or more in 24 (40%) of the patients. The apical height of tumor was 5 mm or more in 50 (83%) of the eyes and the largest basal dimension was more than 15 mm in 24 (40%) of the eyes. Primary enucleation was performed for 47 (73%) eyes; episcleral radiation plaque therapy for 6 (10%) eyes, exenteration in 3 (5%) orbits, endoresection of uveal melanoma in 2 (3%) eyes and 3 patients refused any treatment. Adjunct external beam radiation therapy was performed in 6 (10%) orbits. Histopathological diagnosis was available for 49 (82%) of the operated eyes; 31(63%) eyes had spindle cell and the rest 18 (37%) eyes had epithelioid or mixed cell types. Evidence of extraocular tumor extension was found in 14 eyes. And 7 (12%) patients developed metastasis after the initial diagnosis of uveal melanoma. Follow-up information was available in 57 (95%) patients of which 26 (46%) had follow-up for 2 or more years.

Conclusion: Less than 3 cases of uveal melanoma per year from a major eye care referral center in the Middle East confirms previous observations that uveal melanoma primarily effects Caucasian population. Further studies may be required to estimate the true incidence of uveal melanoma in an Arab population. Early diagnosis and treatment may be necessary to improve the outcome in most cases of uveal melanoma.

Comparison of Computer Aided Planimetry Between Simultaneous and Non-Simultaneous Stereo Optic Disc Photographs

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Sponsors: Michael D. Abramoff, Emily Greenlee, Wallace L.M. Alward, Young H. Kwon

Purpose: Planimetry of stereo color photographs of the optic disc is an essential component of the evaluation of glaucoma. We wanted to determine whether the method of acquiring stereo photographs, namely simultaneous and non-simultaneous stereo imaging has an effect on the evaluation of the images by experts, by comparing expert reading linear cup to disc ratios and comparing robustness of readings of multiple images taken with the same camera and with different cameras.

Methods: 264 optic disc stereo images (left + right) were obtained from 44 eyes of 44 patients with open-angle glaucoma by imaging them three times sequentially, realigned and refocused each times, with both the Nidek 3DX simultaneous stereo camera and a manually operated standard Zeiss 30° sequential stereo camera, so there were 6 stereo images per eye. Computer aided planimetry was performed on each stereo image in random order by three masked independent glaucoma experts to segment the image into cup, rim and background. The three planimetries for each image were combined into one majority vote planimetry image. Linear Cup to Disc ratio (lcdr) was computed by dividing the area of the cup by the area of the disc. Overall mean lcdr was calculated for per patient per camera, and compared between cameras by Tukey corrected t-test. Robustness was estimated by comparing variance of the three sequential images from the same camera and different cameras.

Results: Mean lcdr for Nidek was 0.64 (95% CI, 0.64-0.69) and 0.64 for Zeiss (95% CI, 0.59-0.69).

Conclusion: Mean linear cup to disc ratio as evaluated by three glaucoma experts was the same with simultaneous and sequential manual stereo imaging. Variance of three experts' planimetry between sequential images taken with either camera was the same.

Comparison of Visual Outcomes, OR Efficiency, and Complication Rates of Eye Bank Pre-cut Donor Tissue versus Intraoperatively Cut Tissue for DSEK – 6 Month Results

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Purpose: Compare the visual outcomes, OR efficiency and rates of complications among consecutive patients who underwent DSEK at UIHC with donor tissue cut in the OR versus pre-cut tissue from the Iowa Lions Eye Bank.

Methods: A chart review was performed on 56 patients, Recipient's age, donor's age, initial donor endothelial cell count, and pachymetry of donor lenticule were recorded. Primary outcome measures included visual acuity (VA) and endothelial cell counts (ECC) at 6 months post-op, OR times, and rates of complications including primary graft failure. T-tests were used to compare groups.

Results: Group A (26 patients) received donor tissue cut in the OR and Group B (30 patients) received pre-cut tissue from the eye bank. There was no difference in the age of recipients (p=0.836), age of donors (p=0.511), or initial ECC (p=0.24) between groups. There was a trend towards thinner discs cut by the eye bank (p=0.075). VA at 3 months was 20/59 in Group A and 20/37 in Group B (p=0.009). However, at 6 months there was no statistically significant difference between the VA of Group A (20/42) and Group B (20/32) (p=0.18). Operating times were 21 minutes shorter in Group B (p=0.0009). At 3 months ECC there was no difference between groups (p=0.863) with 30.0% cell loss in Group A and 31.1% in Group B. Also, at the 6 month point, ECC had only slightly declined in both groups with Group A having an endothelial cell loss of 31.8% compared to 34.8% in Group B (p=0.53). The rate of primary graft failure was 11.54% in Group A but only 3.33% in Group B.

6 month Results:

Endothelial Cell Counts (ECC) following DSAEK

	Initial ECC	ECC @ 3M	% loss @ 3M	ECC @ 6M	% loss @ 6 M
Group A (OR-cut)	3034.231	2125.308	**30.0%**	2069.60	**31.8%**
Group B (Pre-cut)	3134.633	2160.50	**31.1%**	2044.89	**34.8%**
	p = 0.24	p = 0.863		p = 0.53	

Visual Acuity Results Following DSAEK

	VA @ 3M	VA @ 6M
Group A (OR-cut)	20/59	20/42
Group B (Pre-cut)	20/37	20/32
	p = 0.009	p = 0.18

Conclusion: Eye Bank prepared tissue for DSEK is associated with shorter OR times, reduced rate of primary graft failure and a trend towards better visual acuity. There was no difference in the endothelial cell loss between groups at 6 months. Despite the limitations of a consecutive series (i.e. learning curve), it appears that there are no detrimental results with regards to visual acuity, endothelial cell counts and complication rates when pre-cut donor lenticules are used. Further long-term studies are needed to fully answer the question of safety as well as other questions regarding the ideal thickness of the pre-cut donor lenticule.

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Vitreal Penetration of Oral Moxifloxacin in Humans

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McGregor Lott, M.D.; Dennis Marcus, M.D.
Sponsor: Stephen Russell, M.D.

Purpose: To investigate the penetration of moxifloxacin (Avelox, Schering-Plough), a fourth-generation fluoroquinolone, into the vitreous humor after oral administration.

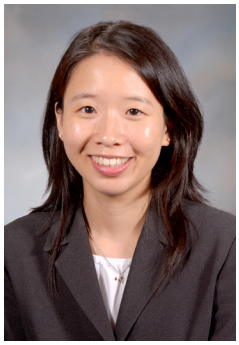
Methods: A prospective, non-randomized clinical trial in which 32 consecutive patients (age 27 - 83, mean 62.4 ± 11.8 years) scheduled for elective pars plana vitrectomy were assigned to one of four dosing groups: Control (n = 3), which received no medication; Single-dose (n = 11), which received one 400 mg oral dose of moxifloxacin 3 hours before surgery; 2-dose (n = 8), which received one 400 mg dose approximately 14 hours before surgery and a second 400 mg dose 3 hours before surgery; and 5-dose (n = 10), which received one 400 mg dose on each of the 4 days preceding surgery and a fifth dose 3 hours before surgery. Demographic data, including gender, race, surgical indication, diabetic status, phakic status, and history of prior vitrectomy, were collected and did not differ significantly between groups. Undiluted vitreous samples were obtained from all 32 patients and analyzed using high-performance liquid chromatography.

Results: Intravitreal moxifloxacin concentrations (mean ± SD) were as follows: Control, below quantifiable levels; Single-dose, 572.091 ± 238.85 ng/µL; 2-dose, 1561.25 ± 340.40 ng/µL; 5-dose, 1200.40 ± 645.13 ng/µL. Concentration differences between the Single-dose and 5-dose groups ($p = 0.007$) and between the Single-dose and 2-dose groups ($p = 0.0001$) were statistically significant. Concentration differences between the 2-dose and 5-dose groups ($p = 0.17$) were not statistically significant.

Conclusions: Orally-administered moxifloxacin achieves significant levels in the non-inflamed human vitreous. Administering 2 or 5 doses of oral moxifloxacin prior to surgery leads to similar intravitreal concentrations and is superior to single-dose administration, though all 3 groups attained levels exceeding the minimum inhibitory concentrations of many bacteria implicated in postoperative endophthalmitis (including *S. epidermidis*). Multiple daily doses of oral moxifloxacin may serve as a useful adjunct in its treatment.

The Effect of Refractive Error on OCT Retinal Nerve Fiber Layer Sector Analysis

Paula Wynn M.D.
Sponsor: Randy H. Kardon M.D. Ph.D.



Problem: The variation in the sector location at which the major arcuate bundles of RNFL come together to enter the nerve can cause false positive results on the Stratus probability plots. In high myopes, the maximum peaks of the superior and inferior arcuate bundles seem to be displaced toward the maculo-papillary sector. Consequently, the peaks in the TSNIT plot are spread further apart. In the case of high hyperopes, the opposite occurs, and the peaks are closer together. This is easily seen if one looks at the reference TSNIT plot for normative data in the print-outs. This effect can cause one to either under or over-estimate the clock hour sector probability of being abnormal compared to the normal TSNIT configuration. Notably, the Zeiss normative database excluded eyes with greater than 5 diopters of myopia or hyperopia and the variation in the shape of the retinal nerve fiber layer (RNFL) profile is further evident by the large confidence bands about the mean RNFL profile.

Purpose: We would like to identify features that help identify normal eyes as being normal and not falsely abnormal in cases where the RFNL regional sector thickness is outside normal (yellow, 5^{th} percentile, or red 1^{st} percentile sectors on the report form). The location of the peak RNFL thickness for the superior and inferior arcuate bundles will be studied as a function of refractive error to understand how common this occurs and at what range of refractive errors, or whether it is a continuous function of refractive error. We would also like to determine which clock hour sectors are the most common ones to be classified as falsely positive and if it may be attributable to peak-shifts. Finally, we will study the angular location of the major arterial arcade as it exits the disc border to determine the association with the location of the RNFL arcuate bundle.

Methods: We will review the Stratus RFNL analyses for 86 normal subjects (normal visual fields and normal exams) conducted at the University of Iowa Department of Ophthalmology and patients with a normal exam in one eye (disease may be in the other eye or in the retina) and generate a frequency distribution curve for the arcuate peak-to-peak distances measured on the TSNIT plot derived from the fast RNFL circular scan. Peak-to-peak distances will then be plotted against refractive error to evaluate if there is any quantitative relationship between the two variables. In addition, we will analyze which clock hour sectors are the most commonly classified as falsely positive based on 5% and 1% probability coding.

Results/Conclusion: Pending.

Vitreous Sample Analysis after Bevacizumab (Avastin) Injection

James G. Howard, M.D.
Stephen R. Russell, M.D,; Gregory S. Hageman, Ph.D., sponsors

Purpose: Bevacizumab (Avastin) is a humanized murine monoclonal antibody that binds all VEGF-A isoforms. It is FDA approved for the treatment of metastatic colorectal cancer and is widely used as an off label intravitreal agent to treat neovascular age-related macular degeneration (AMD). The pharmacokinetics of bevacizumab following intravitreal injection are not well understood. Whether bevacizumab remains intact or is cleaved into smaller bioactive fragments that are more easily diffusible is not known. A pharmacologic derivative of bevicizumab, ranibizumab (Lucentis) is a VEGF inhibitor that was developed to treat neovascular AMD and is in the final stages of the FDA approval process. Prior studies of retinal permeability suggest that ranibizumab (48 kD) effectively penetrates the retina whereas larger molecules such as HER2 (148 kD) exhibit much poorer penetration. We hypothesize that cleavage of bevacizumab (149 kD) to its Fab fragment enhances its clinical efficacy and can be demonstrated within six weeks of injection.

Methods: Six pseudophakic patients who have been treated with bevacizumab (Avastin) for the first time within the previous six weeks and who are in need of an additional intravitreal injection will undergo a vitreous tap of 0.1 cc at the same time as injection. The samples will be subjected to Western blot analysis to determine whether the bevacizumab molecule has remained intact or if it has been proteolyzed into smaller fragments.

Results and conclusions are pending.

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The Rise of the Ophthalmic Knowledge Assessment Program (OKAP) Examination

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Sponsors: Thomas A. Oetting, M.D.; Andrew G. Lee, M.D. TA

Purpose: The Ophthalmic Knowledge Assessment Program (OKAP) examination is an in-training educational assessment tool administered by the Clinical Education portion of the American Academy of Ophthalmology (AAO). The test is intended to be a self-assessment tool designed to prepare residents for the post-residency written qualifying examination (WQE). In recent years, some ophthalmology fellowship applications have requested resident OKAP examination scores as part of their evaluation process. The goals of this study are to 1) analyze the OKAP examination data as compared with faculty evaluations of resident knowledge and performance, 2) evaluate the current preparation methods for the OKAP examination employed in training programs around the country and 3) address the potential issues surrounding the application of the OKAP as a measure of resident competency.

Methods: A retrospective analysis was performed of the percentile rank on OKAP examination score of for 20 ophthalmology resident physicians over 4 years at a major university-based training facility in the United States. The percentile rank was compared to the average of all rotation summative evaluations awarded to these same residents by supervising faculty blinded to the OKAP score results. Data regarding preparation for the OKAP examination was also obtained from a cross-sectional, anonymous survey administered to twenty-two chief residents in ophthalmology at a chief resident training retreat.

Results: There was no correlation between OKAP examination results and blinded faculty scoring of either resident overall performance ($r = .11$). Regarding formal OKAP review, 50.0% of chief residents surveyed responded that their program provided external, professional OKAP review courses for their residents. Including organized in-house review courses, 88.9% of programs set aside educational time for formal OKAP preparation.

Conclusions: Though there is no correlation between OKAP examination scores and blinded faculty scoring of resident knowledge, a large majority of residency programs spend a great deal of time, money, and effort in formal preparation for the OKAP examination. Caution and additional study are warranted before applying the self-assessment, preparatory OKAP examination as an external competency tool for employment or fellowship selection.

Manuscript submitted for publication

A Comparison of the Femtosecond Laser (IntraLase®) Versus Manual Microkeratome (Moria ALTK®) in Dissection of the Donor in Endothelial Keratoplasty: Initial Study in Eye Bank Eyes

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John E. Sutphin, M.D,; Robert Mullins, Ph.D. and Jessica M. Skeie, M.S.
Sponsor: Kenneth Mark Goins, M.D.

Purpose: To determine the safety and efficacy of femtosecond laser (IntraLase®) and manual microkeratome (Moria ALTK®) in creating pre-cut endothelial keratoplasty donor tissue.

Methods: Sixteen corneoscleral buttons from 8 donors were evaluated within 2 days of the death of the donor. The mean donor age was 72 years and mean death to preservation time was 11 hours. Eight eyes underwent deep lamellar keratectomy using the femtosecond laser (IntraLase® - firing rate 30 kHz, lamellar cut energy 7.4 μJ, side cut energy 5.5 μJ, spot size 10 μM, diameter 9.0 mm, depth 400 μm, spiral pattern), while the other 8 eyes were cut using the Moria ALTK® microkeratome (350-micron head). Ultrasonic pachymetry and endothelial cell density (ECD) were performed before and after keratectomy. The residual stromal bed was examined with electron microscopy to determine the smoothness of the surface. Cell viability was assessed using a transferase dUTP nick end labeling (TUNEL) assay.

Results: The mean preoperative pachymetry was similar in the microkeratome group and femtosecond laser group (CP=0.239). The microkeratome group obtained a consistently deeper keratectomy of 446 ± 25 versus 400 ± 41 μm in laser group (p=0.023). Similarly, residual stromal bed was thinner in microkeratome group (115 ± 28.5 vs. 177 ± 42 microns), (P=0.005). There was no statistically significant difference in the ECD between the two groups preoperatively or at forty-eight hours after keratectomy. Comparing to the preoperative state, there was a 1% and 4% reduction of ECD in the microkeratome and femtosecond laser groups, respectively. The scanning electron microscopy of the stromal surface consistently showed a smoother contour in the manual microkeratome group. TUNEL assays indicate no significant endothelial cell loss in either the microkeratome group or the femtosecond laser group.

Conclusions: The femtosecond laser is as effective as microkeratome in creating pre-cut endothelial keratoplasty donor tissue with good endothelial cell stability. The femtosecond laser depth is closer to its target and therefore with programming change could be more useful for cutting the buttons to an appropriate thickness. The less smooth stromal surface created by this particular model of femtosecond laser (30 Khz) may improve disc adherence, which continues to be a problem in endothelial keratoplasty.

Manuscript submitted for publication

Evaluation of Changes in Intraocular Pressure and Incidence of Glaucoma Following Endothelial Keratoplasty

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Purpose: To report the changes in intraocular pressure (IOP) and incidence of new or worsened ocular hypertension (OHTN) or glaucoma following endothelial keratoplasty. Secondary measures included BSCVA and central corneal pachymetry (CCT).

Methods: A retrospective, consecutive review of all patients undergoing DLEK and DSEK between 12/03 and 9/05, with a minimum of 3 months of postoperative follow-up was done. Baseline data included age, gender, BSCVA, preoperative IOP, preoperative CCT, preoperative diagnosis of OHTN or glaucoma, preoperative IOP medication regimen and preoperative glaucoma surgical history. IOP and other clinical outcome measures were collected at 1, 3, 6 and approximately 12 months postoperatively. All IOP measurements were collected with a Tono-pen. The development or worsening of OHTN or glaucoma was defined as the need for medical or surgical intervention for the treatment of elevated IOP.

Results: 57 eyes of 57 consecutive patients were evaluated with a mean age of 70.0±10.4 years. 34 (59.6%) were female and the average follow-up time was 8.0±4.0 months with a range of 3 to 16 months. Preoperatively, the mean BSCVA was 0.70±0.47 LogMAR (20/100), mean IOP was 15.7±4.0 mmHg, and mean CCT was 736.1±113.7µm. 13 (23%) of patients carried a diagnosis of OHTN or glaucoma: 9 required preoperative glaucoma medication and 6 had prior filtering surgery. There were 39 endothelial keratoplasties (38 DLEK, 1 DSEK) and 18 combined phacoemulsification cataract surgery with IOL and DLEK. The mean IOP difference from preoperative measurements was -0.6±5.1 mmHg at 1 month, 1.9±6.6 mmHg at 3 months, 1.2±7.5 mmHg at 6 months and -0.3±5.3 mmHg at 1 year. The mean CCT was 573.8±124.1 µm, 559.9±122.4 µm, 578.0±115.0 µm, and 587.4±143.0 µm at 1, 3, 6 and 12 months. The mean BSCVA was 0.55±0.29 LogMAR (20/70) at 1 month, 0.41±0.22 LogMAR (20/50) at 3 months, 0.34±0.19 LogMAR (20/44) at 6 months and 0.29±0.15 LogMAR (20/40) at 12 months. 16 (28%) patients developed or worsened pre-existing OHTN or glaucoma at the time of last followup; 7 out of 13 patients with a pre-existing diagnosis worsened and 9 out of 44 patients without a pre-existing diagnosis required treatment. Only 12 (23%) patients required an increased number of glaucoma medications from baseline or surgical intervention at the time of last follow-up.

Conclusions: Although endothelial keratoplasty results in a minimal change in IOP there is a moderate risk of the development of OHTN or glaucoma and worsening of pre-existing disease. This risk appears to be lower than the published risk for penetrating keratoplasty.

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Concordance of Diurnal Intraocular Pressure between Fellow Eyes in Primary Open-Angle Glaucoma

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Purpose: To study the concordance of diurnal intraocular pressure (IOP) between fellow eyes in primary open-angle glaucoma (POAG).

Design: Retrospective chart review.

Participants: Ninety-three POAG patients.

Methods: Patients who met the definition of POAG and underwent diurnal curve measurement were included. Subjects were excluded if there was a history of surgery, trauma, ocular vascular disease, incomplete diurnal curve, or asymmetric ocular medication use. Patients on symmetric ocular medication were included and analyzed separately. Goldmann applanation tonometry was performed at 10 AM, 1 PM, 4 PM, 7 PM, 10 PM, and 7 AM (the next day). The following statistical analyses were performed: (1) average Pearson correlation coefficient (*r*) from individual correlations of right and left eye IOP over the 6 time points for each subject; (2) linear mixed model analysis for repeated measures, with eye (right and left) and time as the within-subject fixed effects, and (3) absolute difference in change in IOP between fellow eyes over each time interval and probability that the difference was within 2 or 3 mmHg.

Main Outcome Measure: The concordance of the IOP between fellow eyes as measured by absolute difference in change in IOP between fellow eyes and probability of the difference being within 2 or 3 mmHg.

Results: Thirty-seven patients were untreated and 56 were treated on symmetric IOP-lowering medications. The diurnal curves of fellow eyes exhibited parallel profiles according to the linear mixed model. The average difference in the change of IOP between fellow eyes over given time intervals ranged from 1.6 to 2.0 mmHg. The estimated probability that the absolute change in IOP between fellow eyes was within 2 mmHg was 68% to 90%, and within 3 mmHg was 78% to 95% for all time intervals.

Conclusion: The diurnal variation of IOP in POAG is largely concordant between fellow eyes. For any given time interval, the fellow eye IOPs may fluctuate asymmetrically a minority of the time. Clinicians who utilize the uniocular trial should be aware of the limit of the IOP concordance.

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Anesthesia Monitoring by Registered Nurses During Cataract Surgery: Assessment of Need for Intraoperative Anesthesia Consultation

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Purpose: The purpose of this study is to assess the frequency and risk factors for intraoperative anesthesia consultation when performing cataract surgery monitored by registered nurses.

Setting: Iowa City Veterans Affairs Medical Center, Iowa City, Iowa.

Methods: Retrospective review of 270 cataract surgeries performed under local anesthesia from April 1, 2002 to April 1, 2003.

Results: The ASA (American Society of Anesthesiologists) classification of each patient was determined: 1 patient was classified as ASA 1. 150 patients were classified as ASA 2. 119 patients were classified as ASA 3. Anesthesiology was consulted 24 times. 19 consultations involved patients who were ASA 3, while 5 consultations involved patients who were ASA 2 ($p < 0.001$). In most cases, (23/24) anesthesia provided a consultation (e.g. increase oxygen flow rate, clarification of EKG, start IV, equipment repair) and left to allow the nurses to continue to monitor the patient. In only 1 case, (ASA 3) the anesthesia service converted the case to monitored anesthesia care and relieved the nurse to monitor the patient.

Conclusions: In our study, monitoring of routine cataract surgery by registered nurses is associated with a low rate of intraoperative anesthesia consultation. Most consultations resulted in little intervention. ASA classification appears predictive of need for intraoperative anesthesia consultation.

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