

**RESIDENT/FELLOW
RESEARCH DAY**

May 23, 2008

**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
9:00 AM – 5:00 PM**

RESIDENT/FELLOW RESEARCH DAY - 2008

DEPARTMENT OF OPHTHALMOLOGY

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James C. Folk, M.D.	Milan Sonka, Ph.D.
Gregory S. Hageman, Ph.D.	Edwin M. Stone, M.D., Ph.D.
Kenneth M. Goins, M.D.	Michael Wall, M.D.
A. Tim Johnson, M.D., Ph.D.	Thomas A. Weingeist, Ph.D., M.D.
Randy H. Kardon, M.D., Ph.D.	Mark E. Wilkinson, O.D.
Andrew G. Lee, M.D.	

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Terry A. Braun, Ph.D.	Richard J. Olson, M.D.
Karen M. Gehrs, M.D.	Christine W. Sindt, O.D.
Young H. Kwon, M.D., Ph.D.	Peter Soliz, Ph.D.

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Michael D. Abramoff, M.D., Ph.D.	Brian R. Kirschling, O.D.
Michael G. Anderson, Ph.D.	Todd E. Scheetz, Ph.D.
John H. Fingert, M.D., Ph.D.	Nasreen A. Syed, M.D.
Emily C. Greenlee, M.D.	

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Edward S. Perkins, M.D., Ph.D.
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John E. Sutphin, M.D.
H. Stanley Thompson, M.D.

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

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Michael Johnson, M.D.

Colin Scott, M.D.

Nathan Troy Tagg, M.D.

OCULOPLASTIC SURGERY

Adam G. de la Garza, M.D.

PEDIATRIC OPHTHALMOLOGY

Susannah Longmuir, M.D.

VITREORETINAL DISEASE

Jordan Graff, M.D.

Vinit B. Mahajan, M.D., Ph.D.

Narendra Patel, M.D.

Michael D. Radosevich, M.D., Ph.D.

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RESIDENTS

THIRD-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.

SECOND-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.

FIRST-YEAR RESIDENTS

Alex Cohen, M.D.
Nandini Gandhi, M.D.
Leslie Pham, M.D.
A. Brock Roller, M.D.
Lucas Wendel, M.D.

ORTHOPTICS – TRAINING

Tracey Coussens, Second Year
Anna deMelo, Second Year
Amy Ellis, First Year
Amy Gilbertson, First Year

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Department of Ophthalmology and Visual Sciences
Resident and Fellow Research Program
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**OPHTHALMOLOGY RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS**

Friday, May 23, 2008

<i>Time</i>		<i>Page</i>
8:45	Breakfast Refreshments served at the entrance to the Braley Auditorium, 01136 PFP	
9:00	Arpitha Muthialu , J.A. Nerad, sponsor 1. Endotine forehead device effect on brow lift over time	1.
9:15	Adam de la Garza , J.A. Nerad, sponsor 2. Adenoid cystic carcinoma of the lacrimal gland	2.
9:30	Paula Wynn , R. Kardon, sponsor 3. Effect of refractive error on optical coherence tomography (OCT) retinal nerve fiber layer sector analysis	3.
9:45	N. Troy Tagg , R. Kardon, sponsor 4. Retinal nerve fiber structure versus visual field function 15 years after recovery of optic neuritis	4.
10:00	Michael C. Johnson , R. Kardon, sponsor 5. Use of optical coherence tomography (OCT) in distinguishing papilledema from pseudopapilledema	5.
10:15	Nandini Gandhi , K.M. Goins, sponsor 6. Comparison of the 60 kHz femtosecond laser (IntraLase®) versus manual microkeratome in the dissection of donor tissue for endothelial keratoplasty (EK)	6.
10:30	Break Refreshments, served in the Blodi Conference Room, 11131 PFP	
11:00	Parisa Taravati , K.M. Goins, sponsor 7. Outcomes following Descemet’s stripping automated endothelial keratoplasty (DSAEK)	7.
11:15	Alex Cohen , K.M. Goins, M.D. Wagoner, sponsors 8. Penetrating keratoplasty (PKP) versus deep anterior lamellar keratoplasty (DALK) for the treatment of keratoconus (KC)	8.
11:30	Lucas Wendel , K.M. Goins, M.D. Wagoner, sponsors 9. Endothelial cell survival after Descemet’s stripping automated endothelial keratoplasty (DSAEK), comparing the pull-through and forceps delivery techniques	9.
11:45	Anna Kitmann , K.M. Goins, M.D. Wagoner, sponsors 10. Penetrating keratoplasty (PKP) for treatment of acanthamoeba keratitis	10.
12:00	Buffet Lunch Melrose Conference Rooms 1, 2, 51000 & 51005 Fifth Floor PFP	

**OPHTHALMOLOGY RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS**

Friday, May 23, 2008

- 1:15 **Colin Scott**, M. Wall, sponsor 11.
Diagnosis and grading of papilledema in patients with raised
intracranial pressure using optical coherence tomography (OCT)
compared to clinical expert assessment using a modified Frisen scale
- 1:30 **Reid Longmuir**, M. Wall, W.L. Alward, Y.H. Kwon, sponsors 12.
Visual field improvement in glaucoma subjects from the
variability in perimetry (VIP) Study
- 1:45 **Susannah Longmuir**, W.E. Scott, R. J. Olson, W. Pfeiffer, sponsors 13.
Seven-year results from a volunteer-led photoscreening
program of preschool children screened in Iowa using the MTI
Photoscreener
- 2:00 **Tracey Coussens**, P. Kutschke, sponsor 14.
Relationship of peak cycloplegia and iris reactivity using one
drop cyclogyl in hyperopic children
- 2:15 **Anna de Melo**, P. Kutschke, sponsor 15.
Recovery of visual acuity after recurrence of amblyopia
- 2:30 Break**
Refreshments, served in the Blodi Conference Room, 11131 PFP
- 3:00 **Andrew Steffensmeier**, T. A. Oetting, sponsor 16.
Intraocular pressure measurement following YAG capsulotomy
does not affect patient care
- 3:15 **Jason Friedrichs**, M.D. Abramoff, A.G. Lee, sponsors 17.
Educational benefit of stereo movies of ophthalmic surgery for
residents and medical students
- 3:30 **Bo Yang**, M.D. Abramoff, sponsor 18.
Comparing resident and fellow optic disc cup and rim
segmentation from stereo photographs using computer-aided
planimetry
- 3:45 **Vinit Mahajan**, S. Russell, E. Stone, sponsors 19.
A new macular dystrophy with pigment spots, cystic spaces
and hemorrhage
- 4:00 **A. Brock Roller**, J.C. Folk, sponsor 20.
Effect of vitrectomy on the progression of age-related macular
degeneration
- 4:15 Faculty Vote on Presentations**
Blodi Conference Room 11131 PFP

ADJOURN

**OPHTHALMOLOGY RESIDENT/FELLOW RESEARCH DAY
SCHEDULE OF EVENTS**

Friday, May 23, 2008

Excused from Presentation: Presenting in 2009

Jordan Graff

Narendra Patel

Leslie Pham

Michael Radosevich

Excused from Presentation: Manuscripts Submitted

Ed Hu, C. Sindt, sponsor

The role of contact lens solution types as a substrate in the viability of *Fusarium* species: Potential implications in contact lens related fungal keratitis (Awarded the 2007 P.J. Leinfelder Research Day Award)

Parley Fillmore, K.M. Goins, sponsor

Visual acuity, refractive error and endothelial cell density 6 and 12 months after deep lamellar endothelial keratoplasty (DLEK)

Mathew Rauen, K.M. Goins, sponsor

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

Excused from Presenting: Manuscript Published

Yian Jin Jones, K.M. Goins, sponsor

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. *Cornea* 2008;27:88-93.

RESIDENT/FELLOW RESEARCH DAY - 2008

Endotine Forehead device effect on brow lift over time

Arpitha Muthialu, M.D.

Sponsor: Jeffrey A. Nerad, M.D.



Background: The Endotine Forehead 3.5 (Coapt Systems, Palo Alto, Calif.) has recently become more popular for use in endoscopic brow lifts for many reasons. The implantable bioabsorbable fixation device is designed to provide multipoint distributed tension for fixation during brow lift in a rapid manner. The multiple benefits include ease of use, the ability to adjust intraoperatively, fewer side effects with less pain, paresthesia, and alopecia as seen with the open coronal technique. Hesitation exists over the ultimate longevity of elevation, as compared with the coronal brow lift, largely considered to be the gold standard to which other methods are compared.

Purpose: The purpose of this study was to evaluate early results in a series of endoscopic brow lift cases using the Endotine Forehead device and to determine if there is any brow descent over a 6 month follow up period.

Methods: A retrospective review was done on 20 patients who underwent endoscopic brow lift using the Endotine Forehead device (original version polylactide homopolymer and 3.5 mm tines) between October 2005 and October 2007 at the University of Iowa under the supervision of two oculoplastic surgeons. Preoperative and postoperative standardized photographs were taken in the Frankfort horizontal plane. Two measurements, midpupil to superior brow and lateral canthus to superior brow, were compared from the preoperative period to the 1 week-1 month postoperative period and the 4-6 month postoperative period.

Results: Twenty patients were evaluated with at least 4-6 months of postoperative follow up. The mean age was 61 +/- 22 years of age and all patients had visual functional deficits from brow ptosis. One week-1 month postoperatively, the mean percent increase compared to preoperatively for midpupil to superior brow was 28.5% and lateral canthus to superior brow was 18.8%. Four-six months postoperatively, the mean percent increase compared to preoperatively for midpupil to superior brow was 18.9% and lateral canthus to superior brow was 9.7%. The amount of brow descent from immediate postoperatively to 4-6 month postoperatively for midpupil to superior brow was 34% and lateral canthus to superior brow was 48%. There was one report of mild subcutaneous discomfort at the edge of the endotine platform and no reports of device extrusion, device removal, numbness, paresthesia, or alopecia.

Conclusions: The Endotine Forehead device provides significant brow elevation with minimal adverse events; however, there is significant brow descent (34-48% decrease) just over the 6-month postoperative period seen in our study patients. Further long-term studies are needed to determine the pattern of descent over time and if and when the end of the curve is a plateau. Based on the amount of descent over time, immediate postoperative goal brow height may need to be adjusted, or intraoperative changes, such as additional fixation methods, are needed to enhance the longevity of the brow lift effect.

Adenoid cystic carcinoma of the lacrimal gland

Adam de la Garza, M.D.

Sponsor: Jeffrey A. Nerad, M.D.



Purpose: To review the clinical characteristics and outcomes of 30 patients with sinoorbital adenoid cystic carcinoma treated at a tertiary care academic medical center.

Methods: A retrospective case series of 30 patients with adenoid cystic carcinoma of the orbit and/or sinus treated at a single institution between 1963 and 2007.

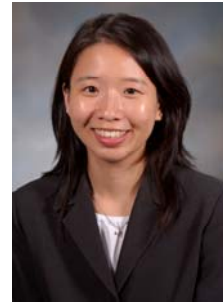
Results: The study included 14 men and 16 women. The mean age at diagnosis was 54.6 years. The median follow-up time was 67 months (range: 8 to 299 months). Treatment modalities included exenteration with radiation therapy (XRT), exenteration alone, local resection with XRT, and local resection without XRT. The majority (21) of patients underwent radical resection, and 17 patients received radiation therapy. Twelve patients developed distant metastases, with the most common site being to the lung. In spite of aggressive local therapy, the majority died from the disease.

Conclusions: Adenoid cystic carcinoma continues to be a deadly disease with a high rate of distant metastasis and a low rate of survival. The optimum regimen of local therapy remains unclear.

Effect of refractive error on optical coherence tomography (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 locations at which the major arcuate bundles of the retinal nerve fiber layer (RNFL) come together to enter the nerve can cause false positive results on the Stratus probability plots when compared to the “normal” profile. The wide variation in the entry angle of the arcuate RNFL bundles is evident in the large confidence bands about the mean RNFL profile. In the case of myopes, the maximum RNFL thickness of the superior and inferior arcuate bundles appears to be displaced toward the maculo-papillary sector and the peaks in the TSNIT plot are spread more apart. The opposite appears to occur in hyperopes. This effect can cause one to either under or overestimate the probability of abnormality compared to the normal TSNIT configuration and on the sector probability plots.

Purpose: We will examine the variation in the locations of the peak RNFL thicknesses for the superior and inferior arcuate bundles (and their angle of entry into the optic nerve) in normal subjects and determine if there is a correlation to refractive error. In addition, we will determine the incidence of false positive results on the Stratus probability plots in normal subjects and determine which clock hour sectors are most commonly classified as falsely positive.

Methods: We will review the Stratus RNFL analyses for normal subjects (normal visual fields and exams) and patients with a normal exam in one eye (disease may be in the other eye or in the retina) conducted at the University of Iowa Hospitals and Clinics (UIHC) Department of Ophthalmology. We will tabulate the frequency distribution for the arcuate peak-to-peak distances measured on the TSNIT plot derived from the fast RNFL circular scan. Peak-to-peak distances will 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.

RESIDENT/FELLOW RESEARCH DAY - 2008

Retinal Nerve Fiber Structure versus Visual Field Function 15 Years After Recovery of Optic Neuritis

N. Troy Tagg, M.D.

Sponsors: Susan Anderson B.S., Donald C. Hood, Ph.D. and Randy H. Kardon, M.D., Ph.D. for the Optic Neuritis Study Group



Purpose: To elucidate the relationship between retinal nerve fiber layer (RNFL) thickness as measured by optical coherence tomography (OCT) and loss in visual function as measured by static automated perimetry (SAP) in patients with recovered optic neuritis. Inter-eye differences between OCT and SAP measurements were compared for affected and unaffected eyes.

Design: Case series.

Participants: A cohort of 120 patients from the optic neuritis treatment trial (ONTT). All data are from the 15 year follow-up time point and are compared to a group of normal subjects (n=86) from our institution.

Methods: Affected and fellow eyes were tested with both SAP and OCT. SAP threshold data were arranged into sectors corresponding to nerve fiber layer bundles (maculopapillary, inferior arcuate, and superior arcuate,) according to the model proposed by Garway-Heath. OCT peripapillary retinal nerve fiber layer scans were similarly divided into the corresponding nerve fiber layer bundles. Average RNFL thicknesses (microns) and average threshold loss (dB deviation from normal) were calculated for each sector. OCT and SAP data were correlated in each sector. Inter-eye differences for each variable were tested using standard statistical analysis techniques. Results were compared to our published data relating structure and function in anterior ischemic optic neuropathy (AION) and glaucoma for which a linear model has been shown to apply.

Main Outcome Measures: Optical coherence tomography RNFL thickness and SAP sensitivity.

Results: When compared with the fellow eye, affected eyes showed a significant inter-eye difference in threshold visual loss. The affected eye also showed a significantly *lower* RNFL thickness when compared with the fellow eye. There was no significant correlation between degree of threshold loss and degree of RNFL loss in affected eyes. These data do not fit well to a linear model of structure/function previously reported in patients with AION and glaucoma.

Conclusions: Fifteen years after optic neuritis, affected eyes showed significantly thinner RNFL thickness and significantly more visual field loss. There was poor correlation between degree of structural damage and the amount of functional threshold loss in affected eyes. A previously reported linear model of structure/function correlation for AION and glaucoma does not apply to patients with recovered optic neuritis.

Supported by a cooperative agreement from the National Eye Institute, National Institutes of Health, U10 EY09435

Use of optical coherence tomography (OCT) in distinguishing papilledema from pseudopapilledema

Michael C. Johnson, M.D.

Sponsors: Randy H. Kardon, M.D., Ph.D., Andrew G. Lee, M.D. and Michael Wall, M.D.



Purpose: The distinction between low grade papilledema and pseudopapilledema can be challenging based on clinical examination alone. Retinal nerve fiber layer (RNFL) thickness analysis by optical coherence tomography (OCT) has been used to aid in this distinction with variable results. We attempt to use RNFL thickness along with other OCT data to assist in the determination.

Methods: A retrospective review of digital optic disc photographs from patients with disc swelling seen in a neuro-ophthalmology clinic from January 2004 to July 2007 was conducted. Photographs demonstrating Stage 1 disc swelling by Frisén criteria without obvious disc drusen were used. Ten photographs in each of 3 categories of disc swelling were selected for initial evaluation. The categories and inclusion criteria were: 1. Papilledema (opening pressure ≥ 23 cmH₂O, normal MR imaging, resolution of disc swelling with serial photographs); 2. Pseudopapilledema with buried drusen (echography demonstrating buried drusen not seen clinically, no symptoms of increased intracranial pressure {ICP}, no change in disc appearance with follow-up) and 3. Pseudopapilledema without drusen (echography negative for buried drusen, no symptoms of increased ICP or opening pressure < 20 cmH₂O, no change in disc appearance over 1 year). Three masked neuro-ophthalmologists attempted categorizing the disc swelling based on monocular photographs alone. OCT data was analyzed from the fast RNFL thickness (3.4), fast RNFL map and fast optic disc protocols.

Results: All 3 neuro-ophthalmologists were in agreement and correctly categorized the photographs in 2 of 30 cases. A significant difference was observed when comparing RNFL thickness between the 3 categories ($P < 0.05$), and between the individual categories papilledema and pseudopapilledema without buried drusen ($P < 0.05$). Comparison using retinal thickness was also significant. No significant difference was found in mean optic disc size between categories.

Conclusion: Low grade papilledema and pseudopapilledema cannot be distinguished reliably by experienced observers using photographs alone. Initial results demonstrate OCT's ability to differentiate papilledema from pseudopapilledema without buried drusen on a group basis. No parameter could be found to distinguish between categories on an individual case basis using the OCT.

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Comparison of the 60 kHz femtosecond laser (IntraLase[®]) versus manual microkeratome (Moria ALTK[®]) in the dissection of donor tissue for endothelial keratoplasty (EK)

Nandini Gandhi, M.D.

Sponsors: Kenneth Mark Goins, M.D. and Robert F. Mullins, Ph.D.



Background: A large percentage of penetrating keratoplasties in the United States are performed for conditions in which corneal pathology is confined to the endothelium. The advent of endothelial keratoplasty has made it possible selectively to transplant the corneal endothelium, allowing for more optimal refractive outcomes and shorter recovery times. Endothelial keratoplasty donor tissue can be cut using a manual microkeratome or a femtosecond laser. A comparison study of endothelial tissue cut using a manual microkeratome (Moria ALTK[®]) and a 30 kHz femtosecond laser (IntraLase[®]) showed that the two were equally effective and safe in cutting endothelial tissue. However, the 30 kHz laser produces a rougher stromal surface than the Moria; this may enable good disc adherence but may also reduce optical quality.¹ The 60 kHz femtosecond laser, with closer spot size separation and lower energy levels, may be able to create a smoother surface that has still has good disc adherence.

Purpose: To compare the tissue characteristics of endothelial keratoplasty tissue cut with the 60 kHz femtosecond laser (IntraLase[®]) and the manual microkeratome (Moria ALTK[®]).

Methods: Ten corneal buttons from five donors will be evaluated. Five corneas will undergo deep lamellar keratectomy with the 60 kHz femtosecond IntraLase[®] laser and five will be cut with the Moria. Pachymetry and endothelial cell density will be performed before and after the dissection. Scanning electron microscopy will be performed to evaluate the structure of the endothelial lenticule. Finally, dUTP nick end labeling (TUNEL) assays will be performed to assess endothelial cell viability.

Results: Data is being collected currently; results are pending.

¹ Jin Jones Y, Goins KM, Sutphin J, Mullins R, Skeie J. (2008) Comparison of the Femtosecond Laser (IntraLase) versus Manual Microkeratome (Moria ALTK) in Dissection of the Donor in Endothelial Keratoplasty. *Cornea*. 27(1): 88-93.

Outcomes following Descemet's stripping endothelial keratoplasty (DSEK)

Parisa Taravati, M.D.

Sponsor: Kenneth M. Goins, M.D.



Purpose: To determine the best-corrected visual acuity (BCVA) and corneal endothelial cell density (ECD) 1, 3, 6 and 12 months following Descemet's stripping endothelial keratoplasty (DSEK). The incidence of postoperative pupillary block, lenticule dislocation, and secondary procedures was also examined.

Methods: A retrospective review was done of 97 eyes (89 patients) that underwent DSEK between August 2005 and November 2006 at the University of Iowa. Baseline data included age, BCVA, and diagnosis. Outcome measures were recorded at 1, 3, 6, and 12 months postoperatively. ECD was measured predominantly using non-contact specular microscopy, when permitted by corneal clarity.

Results: The mean age at surgery was 71 ± 11 years. Preoperatively, the mean BCVA was $0.7 \log\text{MAR} \pm 0.6 \log\text{MAR}$, and the mean donor ECD was $3007 \pm 299 \text{ cells/mm}^2$. Of the 97 eyes, 64 had Fuchs' endothelial dystrophy, 24 had pseudophakic bullous keratopathy, 1 had bullous keratopathy, 6 had failed penetrating keratoplasty grafts, 1 had a failed DSEK graft, and 1 had Fuchs' endothelial dystrophy with anterior stromal fibrosis. Fifty-four eyes underwent DSEK only, 37 underwent combined phacoemulsification and DSEK, 3 underwent DSEK and anterior vitrectomy, 1 underwent DSEK and synechiolysis, 1 underwent DSEK and superficial keratectomy, and 1 underwent DSEK and Ahmed shunt revision. The incidence of postoperative pupillary block was 20%. One patient developed aqueous misdirection requiring pars plana vitrectomy and peripheral iridectomy. The incidence of lenticule dislocation was 25%, all requiring lenticule repositioning and air tamponade. The incidence of iatrogenic graft failure was 3% and allograft rejection 1%, all requiring repeat DSEK. Mean postoperative BCVA was $0.5 \log\text{MAR} \pm 0.5 \log\text{MAR}$ (n=93) at 1 month, $0.3 \log\text{MAR} \pm 0.3 \log\text{MAR}$ (n=82) at 3 months, $0.3 \log\text{MAR} \pm 0.3 \log\text{MAR}$ (n=76) at 6 months, and $0.3 \log\text{MAR} \pm 0.4 \log\text{MAR}$ (n=53) at 12 months. The mean postoperative ECD was $1973 \pm 648 \text{ cells/mm}^2$ (n=29) at 1 month, 2083 ± 601 (n=41) cells/mm^2 at 3 months, $1939 \pm 539 \text{ cells/mm}^2$ (n=20) at 6 months, and $1575 \text{ cells/mm}^2 \pm 624 \text{ cells/mm}^2$ (n=29) at 12 months.

Conclusions: DSEK provides rapid visual rehabilitation and excellent BCVA in patients with endothelial dysfunction. Despite leaving just enough air in the anterior segment to cover the disc edges, there was a high rate of postoperative pupillary block and lenticule dislocation in this series. These findings confirm the necessity of multiple postoperative examinations immediately after DSEK in order to diagnose and treat complications.

RESIDENT/FELLOW RESEARCH DAY - 2008

Penetrating keratoplasty (PKP) versus deep anterior lamellar keratoplasty (DALK) for the treatment of keratoconus (KC)

Alex Cohen, M.D.

Sponsors: Kenneth M. Goins, M.D. and Michael D. Wagoner, M.D.



Purpose: The goal of this study was to compare the outcomes of penetrating keratoplasty (PKP) and deep anterior lamellar keratoplasty (DALK) in the treatment of keratoconus (KC).

Design: Retrospective, nonrandomized, comparative case series.

Participants: Forty-seven patients who underwent either PKP (36 eyes, 36 patients) or DALK (11 eyes, 11 patients) between January 1, 2000 and December 31, 2006 at the University of Iowa Hospitals and Clinics were included in the study.

Main Outcome Measures: Best-corrected visual acuity (BCVA), refractive results, keratometry, and complications

Results: Among 36 patients who were treated with PKP, the mean age was 37 years (range 17 to 78) and the mean follow up was 44 months (range 13 to 74). Among 11 patients treated with DALK, the mean age was 44 years (range 26 to 58) and the mean follow up was 24 months (range 6 to 41). There were no statistically significant differences between PKP and DALK with respect to final BCVA, spherical or cylindrical refraction, and keratometry. Final BCVA of 20/40 or better was obtained in 30 (83.3%) eyes after PKP and 9 (82%) eyes after DALK ($P = 1.0$). Final visual acuity of 20/25 or better was obtained in 27 (75.0%) eyes after PKP compared to 5 (45.5%) eyes after DALK ($P = 0.13$). Final visual acuity of 20/20 or better was obtained in 20 (55.6%) eyes after PKP compared to 3 (27.3%) eyes after DALK ($P = 0.16$). Complications that occurred after PKP included endothelial rejection episodes (14 eyes), wound dehiscence (7 eyes), endophthalmitis (1 eye), and bacterial keratitis (1 eye). Complications that occurred after DALK included interface scar (4 eyes) and wound dehiscence (3 eyes).

Conclusion: Treatment of keratoconus with PKP or DALK is associated with similar visual outcomes and complication rates. While DALK offers the benefit of elimination of the risk of immune-mediated endothelial rejection, PKP provides a higher percentage of patients with final BCVA of 20/25 or better.

Endothelial cell survival after Descemet's stripping automated endothelial keratoplasty (DSAEK), comparing the pull-through and forceps delivery techniques

Lucas Wendel, M.D.

Sponsors: Kenneth M. Goins, M.D. and Michael D. Wagoner, M.D.



Purpose: To compare the suture pull-through and forceps delivery techniques used in Descemet's stripping automated endothelial keratoplasty (DSAEK).

Methods: A retrospective chart review of 49 eyes from 48 patients who underwent DSAEK between December of 2005 and April of 2007 at the University of Iowa was performed. Outcome measures included best spectacle-corrected visual acuity (BSCVA), central corneal thickness, final endothelial cell density (ECD), and change in ECD. All cases included had at least 12 months of postoperative follow up.

Results: There was no significant difference between the groups, in terms of preoperative BSCVA, donor tissue characteristics, or length of follow up. Twelve months postoperatively, the mean BSCVA in the forceps delivered group was 0.27 logMAR (range 0.0-1.0 logMAR) and 0.19 logMAR (range 0.0-0.3 logMAR) in the suture pull-through group. The mean central corneal thickness was 627 ± 53 μm in the forceps delivered group and 604 ± 32 μm in the suture pull-through group. The ECD averaged 1403 ± 667 cells/ mm^2 and 1299 ± 823 cells/ mm^2 in the forceps delivered and suture pull-through groups, respectively. The mean change in ECD was 1562 ± 655 cells/ mm^2 (-52.7%) in the forceps delivered group and 1594 ± 924 cells/ mm^2 (-55.1%) in the suture pull-through group. None of these outcomes showed a statistically significant difference.

Conclusions: The suture pull-through and forceps delivery method of performing DSAEK offer comparable outcomes in regards to best-corrected visual acuity, pachymetry, and ECD. However, the number of cases compared in this study is relatively few and more cases are needed to make a more meaningful comparison.

Penetrating Keratoplasty (PKP) for treatment of acanthamoeba keratitis

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Sponsors: Kenneth M. Goins, M.D. and Michael D. Wagoner, M.D.



Purpose: Acanthamoeba is a rare and serious corneal infection that cannot always be successfully treated with medical therapy alone. There is limited and contradictory literature on the outcome of surgical intervention with penetrating keratoplasty (PKP) in medically unresponsive cases or for subsequent visual rehabilitation. The purpose of this study was to evaluate the outcomes of therapeutic PKP and optical PKP for management of medically unresponsive cases or post-keratitis visual disability, respectively.

Methods: All cases of therapeutic and optical PKP performed for Acanthamoeba keratitis between January 1, 1980 and December 31, 2006 were retrospectively reviewed. Inclusion criteria included histopathologic confirmation of acanthamoeba organisms and at least 6 months of postoperative follow up.

Results: Fifty-one PKPs were performed in 31 eyes of 30 patients. This included treatment of 22 eyes with therapeutic PKP and 9 eyes with optical PKP. Of the 22 eyes treated with therapeutic PKP, multiples PKPs (range 2 to 6) were required in 12 (55%) eyes. A microbiological cure was achieved in 22 (100%) eyes. After a mean follow up of 33 months (range 6 to 114), a clear graft was present in 15 (68%) eyes with a mean visual acuity of 20/52. There were 11 (50%) eyes with a final visual acuity of 20/40 or better and 7 (31.8%) eyes with vision that were 20/200 or worse. Of the 9 eyes treated with optical PKP, only 1 (11.1%) eye required a repeat PKP. After a mean follow up of 94 months (range 15 to 200), a clear graft was present in 9 (100%) eyes with a mean visual acuity of 20/30. There were 8 (72.7%) eyes with a final visual acuity of 20/40 or better, and no eyes that were 20/200 or worse.

Conclusion: Therapeutic PKP can be successful in achieving a medical cure in most cases of acanthamoeba keratitis, although multiple PKP may be required and the visual prognosis is guarded. Optical PKP performed after resolution of active keratitis is associated with an excellent prognosis for both graft survival and visual outcome.

Diagnosis and grading of papilledema in patients with raised intracranial pressure using optical coherence tomography (OCT) compared to clinical expert assessment using a modified Frisén scale

Colin Scott, M.D.

Sponsors: Randy H. Kardon, M.D., Ph.D., Andrew G. Lee, M.D. and Michael Wall, M.D.



Introduction: Papilledema has traditionally been measured using the Frisén scale, which is subjective, has inter-observer variability and is limited by a finite integer scale. Optical coherence tomography (OCT) could provide an objective, more quantitative, continuous metric for monitoring optic nerve changes with treatment.

Methods: Twenty-eight patients with papilledema were obtained from 2004 to 2008 and digital disc photographs of either the right or left eye were selected for review, if they also had OCT of the peripapillary retinal nerve fiber layer (RNFL) and total retinal thickness (TRT) of both eyes and OCT scans were of sufficient quality to be used in the study. Digital disc photos were randomized and graded by 3 masked expert reviewers using the Frisén Scale from 0 to 5. Spearman correlations of the disc RNFL and TRT average thickness compared to the Frisén grade of the photographs were performed.

Results: There was a statistically significant correlation between OCT RNFL average thickness and clinical expert assessment of photographs ($r=0.70$) with a higher correlation between photographs and average TRT ($r=0.76$). OCT RNFL thickness and TRT compared to 1 reviewer ranking disc edema from 1 to 28 using the modified Frisén scale showed a higher correlation compared to integer grading with ranked order vs. RNFL ($r=0.83$) and was greatest with ranked order vs. TRT ($r=0.89$).

Conclusion: OCT and clinical grading of optic nerve photographs using the modified Frisén scale are highly correlated and provide useful measures for grading papilledema. OCT provides a useful adjunct as a quantitative tool for the evaluation and monitoring the extent of papilledema.

RESIDENT/FELLOW RESEARCH DAY - 2008

Visual field improvement in glaucoma subjects from the variability in perimetry (VIP) study

Reid Longmuir, M.D.

Sponsors: Michael Wall, M.D., Wallace L.M. Alward, M.D.
and Young H. Kwon, M.D.



Purpose: To determine if improvement in visual field performance is common among glaucoma patients in the variability in perimetry (VIP) study.

Methods: All subjects were recruited from the glaucoma clinic at University of Iowa Hospitals and Clinics (UIHC). Enrollment criteria included the presence of optic disc changes with abnormal automated perimetry results. The patients could have primary, secondary, or normal tension glaucoma. Exclusion criteria included cataract with vision less than 20/30, pupils smaller than 2.5 mm, younger than age 19 years, or current pregnancy. Subjects underwent baseline visual field testing using the SITA-Size III, Size V full threshold, motion detection perimetry, and matrix perimetry. Included subjects performed these tests twice at baseline in one eye only, and the results averaged. Subsequent tests were performed every six months on the same eye, for a total of ten visits. Those subjects with eight or more tests are included. Mean deviation results from each test were used to create a regression line for the total number of tests performed, and the slope was used to determine if the subject's visual field test had improved, worsened, or remained stable over time.

Results: Sixty-seven patients were included in the analysis. Of these subjects, 20/67 (30%) showed measurable improvement of the mean deviation on the Size III test and 20/67 (30%) improved on the Size V test. 14/67 (21%) improved on both tests. Of these patients, five underwent surgery during the study period. Three underwent trabeculectomy with mitomycin C, one had cataract surgery, and one had both (trabeculectomy first, then cataract surgery). This latter patient worsened after trabeculectomy, and then improved after the cataract surgery.

Conclusions: Although improvement in visual field is often felt to be related to a "learning curve," the possibility of subtle visual field improvement related to control and/or treatment of glaucoma has never been fully addressed. Visual field improvement is common in the VIP study, showing that patients can show improvement in their visual field testing even while under care for glaucoma. Conventional wisdom holds that optic nerve function cannot improve, but this data may suggest otherwise. Other explanations for visual field improvement may include testing artifact, removal of media opacity in some (usually cataract) or improvement in acuity due to refraction. Future aims should include studying the intraocular pressure trend during the study period.

RESIDENT/FELLOW RESEARCH DAY - 2008

Seven-year results from a volunteer-led photoscreening program of preschool children screened in Iowa using the MTI photoscreener

Susannah Longmuir, M.D.

Sponsors: Alejandro Leon, M.D., Richard J. Olson, M.D.,
Wanda Pfeiffer, OC (C), COMT and William E. Scott, M.D.



Purpose: Photoscreening has been found to be an effective method of screening for amblyopic risk factors, including anisometropia, high hyperopia, high myopia, high astigmatism, strabismus and media opacities in children. While the rate of follow up in Tennessee, Rhode Island, New Hampshire and Taiwan was reported to exceed 70%, in the same report, 10 states including Iowa had follow up rates of less than 40%. Since that time, the Iowa KidSight Photoscreening program has developed a more aggressive follow up program. We set out to determine the effectiveness of the Iowa Photoscreening program over a 7-year period and report the improved follow up rates.

Methods: This retrospective study analyzed results of the Iowa volunteer-led photoscreening program using the MTI photoscreener (Riviera Beach, FL) from May 1, 2000 to April 30, 2007. Referral rate, followup rate, and positive predictive value were obtained.

Results: 90,329 children were screened by the Iowa Volunteer-led Photoscreening program from May 2000- April 2007. Target age for screening was 6 months to 48 months. The mean age of screening was 3.38 years. Four percent of tested children failed their vision screening: 22.8% for anisometropia, 24.5% for astigmatism, 3.4% for high myopia, 32.1% for high hyperopia, 0.7% for media opacity, 14.1% for strabismus, and 2.4% for other causes, such as iris colobomas, ptosis or anisocoria. Of all referred children, 31% were examined by ophthalmologists and 69% by optometrists. The overall positive predictive value of the MTI photoscreener was 95.2%. The retake rate or non-readable rate was 4.62%. Between the years of 2000 and 2003, the follow up rate ranged from 36.1% to 53.71%. However, in 2004 when a full-time follow up coordinator was hired, the follow up rate improved to 89.28%.

Conclusion: Photoscreening continues to be an important tool in vision screening nationwide. Follow up for the State of Iowa has been as low as 36.1 %, but has now improved to 89.2%, after adding a full-time followup coordinator to the Iowa KidSight program.

Relationship of peak cycloplegia and iris reactivity using one drop cyclogyl in hyperopic children

Tracey Coussens, Second Year Orthoptics Student
Sponsor: Pamela Kutschke, CO



Purpose: This study was conducted to determine if one drop of Cyclogyl 1% will provide adequate cycloplegia. In addition, the correlation between pupil reactivity and cycloplegia was investigated.

Participants: Thirty children ages 4-12 with a refractive error of 2-6 diopters of hyperopia were enrolled in the study. Participants could not have more than 3 diopter of astigmatism or have any interocular pathology. Visual acuity needed to be 20/40 or better on HOTV or Snellen letters.

Methods: Cycloplegia was measured using a series of auto refractor readings, 10 minutes apart for one hour. Pupil reactivity was observed using a penlight and recorded as either reactive or non-reactive to light.

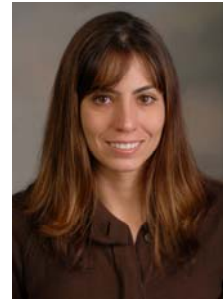
Results: Analysis in process.

Support: No funds were received for this project.

Recovery of visual acuity after recurrence of amblyopia

Anna de Melo, Second Year Orthoptics Student

Sponsors: Pamela Kutschke, CO, Melissa Madsen, CO,
Richard J. Olson, M.D. and Wanda Pfeifer OC(C), COMT



Purpose: To determine if the visual acuity of patients that have recurrence of amblyopia can be recovered to the previous level once the treatment is reinstated.

Design: Retrospective, population-based, case series

Participants: One-hundred and seventeen patients who underwent occlusion treatment and showed recurrence of amblyopia with reduction of therapy were selected

Methods: A retrospective chart review was performed of all patients treated with occlusion therapy for strabismic and/or anisometric amblyopia at our institution over a 30-year period. Of the 597 patients studied, 117 met inclusion criteria. A recurrence of amblyopia was defined as a reduction of ≥ 2 logMAR levels of visual acuity or reversal of fixation pattern. The final visual acuity of the 117 patients was analyzed after the treatment was restarted.

Results and Conclusion: Analysis in process

Support: No funds were received for this project

RESIDENT/FELLOW RESEARCH DAY - 2008

Intraocular pressure measurement following YAG capsulotomy does not affect patient care

Andrew Steffensmeier, M.D.

Sponsors: Anne Beals, R.N., Constance Grignon, M.D. and Thomas A. Oetting, M.D.



Purpose: To evaluate the rate of intervention based on intraocular pressure (IOP) measurement following Nd:YAG posterior capsulotomy in patients treated prophylactically with brimonidine 2% tartate.

Setting: Department of Ophthalmology, Veterans Administration Medical Center, Des Moines, Iowa, USA. All procedures performed by senior-year ophthalmology residents.

Methods: Eighty-two consecutive cases of Nd:YAG posterior capsulotomy over the course of 21 months were reviewed. Factors recorded included IOP before and one hour after capsulotomy, amount of energy delivered, existence of history of glaucoma or ocular hypertension, existence of other ocular diagnoses and need for intervention for IOP elevation. The protocol used in the clinic during this study period included administration of brimonidine tartate 0.2% prior to capsulotomy, IOP measurement by Goldman applanation at patient check-in prior to administration of brimonidine, and IOP measurement at one hour following the procedure.

Results: The records were reviewed from the 82 Nd:YAG capsulotomy procedures that were performed during the study period. The 82 procedures involved eyes from 79 different patients. Six of the procedures were excluded, as the patients died and their records were not available. Eleven of these procedures were excluded from the study group due to insufficient records (i.e., without a record of the pre- or postoperative pressure). However, in none of the excluded patients was there any indication of elevated IOP or additional intervention. The mean change in IOP in the study group was a drop of 3 mm Hg. The change in IOP ranged from a decrease of 10 mm Hg to an increase of 8 mm Hg. The maximum IOP measured following the YAG procedure was 23 mm Hg. Interestingly, none of the patients with a known history of glaucoma or ocular hypertension showed an increase in IOP following the YAG procedure. No patient required further intervention for an IOP elevation following posterior capsulotomy.

Conclusion: In our study of a VA population, there were no interventions needed for IOP increases following Nd:YAG posterior capsulotomy in patients who received prophylactic brimonidine. Based on our data, it does not seem necessary to measure the IOP following the Nd:YAG capsulotomy procedure in patients with posterior chamber lenses. Eliminating this additional exam step will reduce patient inconvenience, reduce the risk of corneal abrasion or other harm from the additional measurement, and will save the VA the additional resources required to provide the measurement.

Educational benefit of stereo movies of ophthalmic surgery for residents and medical students



Jason Friedrichs, M.D.

Sponsors: Michael D. Abramoff, M.D., Ph.D. and 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. That is, 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 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 notwithstanding 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 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 (DepthQ, 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 five 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.

Comparing resident and fellow optic disc cup and rim segmentation from stereo photographs using computer-aided planimetry

Bo Yang, M.D.

Sponsors: Michael D. Abramoff, M.D., Ph.D., Wallace L.M. Alward, M.D., Yian Jin Jones, M.D. and Young H. Kwon, M.D.



Purpose: Optic disc segmentation into cup and rim for diagnosis of glaucoma is subjective and requires pattern recognition and experience. Learning may be more effective if the residents' or glaucoma fellows' assessment can be compared objectively, accurately, and instantaneously to a reference standard. Longitudinal assessment of the trainees' progress would also be informative. We have developed an online tool (*Truthseeker*, <http://webscreen.opth.uowa.edu/disc>) to objectively compare residents' and fellows' computer-aided planimetry with an expert's evaluation of cup and rim on digitized stereo optic disc images. Here, we evaluate and compare the performance of residents or fellows according to training level using this tool.

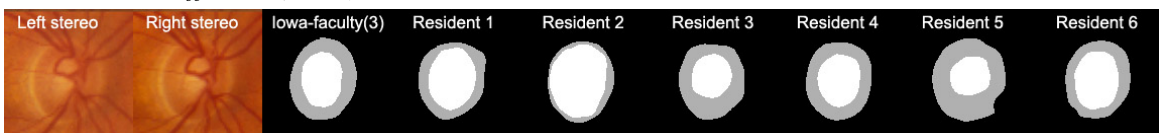
Methods: Six ophthalmology residents and 3 fellows performed online planimetry by delineating disc and cup margin on 57 pairs of stereo photographs of 57 eyes from 57 patients with suspected or open-angle glaucoma with varying severity (example in figure below). A reference standard (RS) was previously created for this dataset by having 3 glaucoma faculty evaluate these images.¹ The fellows' and residents' planimetry were compared to the RS in two ways: linear cup-to-disc ratio ($l_{cdr} = \sqrt{N_c / (N_r + N_c)}$) and accuracy (number of pixels assigned correctly/total number of pixels).

Results: The correlation of 3 first-year residents with the reference standard was 0.58 (95% CI, 0.38-0.73), 0.72 (0.57-0.83), and 0.77 (0.64-0.86); of second year residents 0.45 (0.22-0.64), 0.66 (0.48-0.79), and 0.75 (0.61-0.85); and of the 3 glaucoma fellows 0.73 (0.58-0.83), 0.81 (0.70-0.88), and 0.86 (0.74-0.93), respectively. The accuracy of correctly assigning each pixel to the right structure (rim, cup, or background) for the first-year residents was 0.90, 0.91, 0.93; of the second years 0.92, 0.92, 0.94; and of the fellows 0.95, 0.95, and 0.96, respectively.

Conclusion: The *Truthseeker* can be used as a testing tool to evaluate trainee performance on the evaluation of optic disc assessment. In this preliminary study, the glaucoma fellows as a group performed better than residents on stereoscopic optic disc images. The glaucoma fellows also produced more consistent results, whereas, the residents produced more varying results. We are currently extending this study to include a larger number of residents at multiple ophthalmology residency programs.

No commercial relationships for any of the authors

1. Abramoff et al. (2007) *IOVS* 48:1665-73.



A new macular dystrophy with pigment spots, cystic spaces and hemorrhage

Vinit Mahajan, M.D.

Sponsors: Stephen R. Russell, M.D. and Edwin M. Stone, M.D., Ph.D.



Introduction: A 24-year-old female with bilateral moderate central visual loss was found to have peculiar intra-retinal pigment spots, cystic spaces, and hemorrhage within the macula. The family history suggested the presence of an inherited macular dystrophy.

Methods: Extended family members of the proband underwent dilated fundus examination, optical coherence tomography, and, in selected cases, fluorescein angiography and electroretinography.

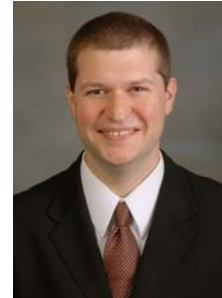
Results: Seventeen family members, representing three generations and ranging in age from 5 to 63 years, were clinically examined. Visual acuities ranged from 20/25 to 20/200. Amblyopia and strabismus were frequently present in affected individuals. Consistent with an autosomal dominant pattern of inheritance, seven family members had multiple central macular cystic spaces and flat, round, densely pigmented spots within the retina. There were right angle vessels and telangiectasias in the central macula. Two subjects showed evidence of active retinal hemorrhage and leakage on fluorescein angiography, which was responsive to either focal laser or a single injection of bevacizumab. In those cases examined, the multifocal electroretinography revealed a diminished foveal response.

Conclusions: Spotted cystic hemorrhagic macular dystrophy appears to represent a new autosomal dominant retinal dystrophy. Since these patients are at risk for choroidal neovascularization, identification of the responsible gene may provide insight into the mechanisms of pathologic neovascularization.

Effect of vitrectomy on the progression of age-related macular degeneration

A. Brock Roller, M.D.

Sponsors: Culver H. Boldt, M.D. and James C. Folk, M.D.



Purpose: There is increasing evidence that retinal and choroidal ischemia may play a central and fundamental role in the development and progression of age-related macular degeneration (AMD). Vitrectomy is known to improve oxygenation to the inner retina by means of increased oxygen diffusion and increased circulation of fluid from well-perfused areas. We hypothesize that vitrectomy may reduce the long-term progression of AMD, perhaps by improving retinal oxygenation. This hypothesis will be addressed by reviewing disease progression in patients who have a diagnosis of AMD and have also had vitrectomy surgery in one eye only, leaving the fellow eye as a control.

Methods: This study is designed as a retrospective chart review. An initial database search was conducted to identify all available University of Iowa Hospitals and Clinics (UIHC) patients who have a diagnosis of AMD and who have had vitrectomy surgery in the past 10 years. This resulted in 298 potential subjects. Patients were excluded if they had confounding retinal disease, such as retinal detachment, proliferative diabetic retinopathy or moderate to severe nonproliferative diabetic retinopathy, angioid streaks, high myopia, vascular occlusions or extensive posterior scarring prior to vitrectomy. Screening has so far resulted in 24 patients, all of whom had undergone vitrectomy for epiretinal membrane, macular hole, or cataract complications. Of these, 17 have follow up of greater than two years since vitrectomy. The database search will be expanded to include patients dating as far back as possible. Sequential fundus photographs of post-vitrectomy and virgin fellow eyes will be evaluated in a blinded fashion by two separate investigators to grade progression of AMD. Primary endpoints for progression are to include central geographic atrophy, development of choroidal neovascularization, and doubling of the visual angle. Secondary endpoints will include noncentral geographic atrophy, pigmentary changes, and increase in number and size of macular drusen. The resulting data from postsurgical and control fellow eyes will be analyzed to determine if vitrectomy is associated with reduce disease progression.

Results/Conclusions: Pending.

