

**RESIDENT / FELLOW
RESEARCH DAY**

**Department of Ophthalmology
and Visual Sciences**

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**Roy J. and Lucille A. Carver
College of Medicine**

University of Iowa Hospitals & Clinics

Iowa City, Iowa



Posters

Melrose Conference Center, 5th Floor, Pomerantz Family Pavilion

Thursday, April 19, 2012, 4:00-7:00 PM

Papers

Braley Auditorium, 01136 Lower Level, Pomerantz Family Pavilion

Friday, April 20, 2012, 8:00 AM-4:20 PM

RESIDENT/FELLOW RESEARCH DAY - 2012

DEPARTMENT OF OPHTHALMOLOGY AND VISUAL SCIENCES

PROFESSOR AND HEAD

Keith D. Carter, M.D.

PROFESSORS

Wallace L. M. Alward, M.D.	Patricia A. Kirby, M.D.
Nikolai O. Artemyev, Ph.D.	Young H. Kwon, M.D., Ph.D.
H. Culver Boldt, M.D.	Thomas A. Oetting, M.D.
Keith D. Carter, M.D.	Stephen R. Russell, M.D.
Thomas L. Casavant, Ph.D.	Val C. Sheffield, M.D., Ph.D.
James C. Folk, M.D.	Milan Sonka, Ph.D.
Kenneth M. Goins, M.D.	Edwin M. Stone, M.D., Ph.D.
A. Tim Johnson, M.D., Ph.D.	Michael D. Wagoner, M.D., Ph.D.
Chris A. Johnson, Ph.D.	Michael Wall, M.D.
Randy H. Kardon, M.D., Ph.D.	Mark E. Wilkinson, O.D.

ASSOCIATE PROFESSORS

Michael D. Abramoff, M.D., Ph.D.	Scott A. Larson, M.D.
Richard C. Allen, M.D., Ph.D.	Robert F. Mullins, Ph.D.
Michael G. Anderson, M.D.	Richard J. Olson, M.D.
Terry A. Braun, Ph.D.	Todd E. Scheetz, Ph.D.
Arlene V. Drack, M.D.	Christine W. Sindt, O.D.
John H. Fingert, M.D., Ph.D.	Nasreen A. Syed, M.D.

ASSISTANT PROFESSORS

Anna S. Kitzmann, M.D.	Khadija S. Shahid, O.D.
Brian R. Kirschling, O.D.	Seongjin Seo, Ph.D.
Markus H. Kuehn, Ph.D.	Elliott H. Sohn, M.D.
Beth R. Kutzbach, M.D.	Steven F. Stasheff, M.D., Ph.D.
Reid A. Longmuir, M.D.	Stewart Thompson, Ph.D.
Susannah Q. Longmuir, M.D.	Matthew J. Thurtell, M.D.
Vinit B. Mahajan, M.D., Ph.D.	Budd A. Tucker, Ph.D.

ORTHOPTISTS

Tara Bragg, C.O.
Amy Ellis, C.O.
Wanda L. Pfeifer, OC(C), C.O.M.T.

FACULTY RESEARCH ADVISOR/PROGRAM DIRECTOR

Michael D. Wagoner, M.D., Ph.D.

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PROFESSORS EMERITUS

Sohan S. Hayreh, M.D., Ph.D., D.Sc.
G. Frank Judisch, M.D.
Karl C. Ossoinig, M.D.
Edward S. Perkins, M.D., Ph.D.
William E. Scott, M.D.
John E. Sutphin, M.D.
H. Stanley Thompson, M.D.
Thomas A. Weingeist, Ph.D., M.D.

VISITING PROFESSOR

William J. Kimberling, Ph.D.

ADJUNCT FACULTY

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Neil N. Silbermann, M.D., Clinical

ADJUNCT ASSOCIATE PROFESSOR

Constance Grignon, M.D., Clinical
Peter Soliz, Ph.D.

ADJUNCT CLINICAL ASSISTANT PROFESSOR

Christopher F. Blodi, M.D.
Elizabeth Ann Brown, M.D.
Puwat Charukamnoetkanok, M.D.
Emily C. Greenlee, M.D.
Christopher L. Haupt, M.D.
Linda J. Lehman, M.D.
Lyse S. Strnad, M.D.
Andrew C. Steffensmeier, M.D.
Steven H. Wolken M.D.

ADJUNCT CLINICAL INSTRUCTOR

David S. Dwyer, M.D.
John F. Stamler, M.D., Ph.D.

ASSISTANT TO THE CHAIR

Larry W. McGranahan, C.H.E.

RESIDENT/FELLOW RESEARCH DAY - 2012

FELLOWS

CORNEA

Gina M. Rogers, M.D.

GLAUCOMA

Brian Tienor M.D.

NEURO-OPHTHALMOLOGY

Alethia H. Pantazis, M.D.

OCULOPLASTIC SURGERY

Rachel A. Sobel, M.D.

PEDIATRIC OPHTHALMOLOGY

Jeffrey T. Lynch, M.P.H., M.D.

VITREORETINAL DISEASE

Benjamin Bakall, M.D., Ph.D.
Matthew A. Cunningham, M.D.
Andrew S. Davis, M.D.
A. Brock Roller, M.D.
Paul S. Tluczek, M.D.

RESIDENT/FELLOW RESEARCH DAY - 2012

RESIDENTS

THIRD-YEAR RESIDENTS

Priya Gupta, M.D.
Esther S. Hong, M.D.
Shaival S. Shah, M.D.
Matthew S. Ward, M.D.
Christopher E. Watts, M.D.

SECOND-YEAR RESIDENTS

Meredith A. Baker, M.D.
John J. Brinkley, M.D.
John J. Chen, M.D., Ph.D.
Amy C. Maltry, M.D.
Jordan J. Rixen, M.D.

FIRST-YEAR RESIDENTS

Elizabeth H. Gauger, M.D.
Pavlina S. Kemp, M.D.
Angela R. McAllister, M.D.
Justin M. Risma, M.D.
Matthew C. Weed, M.D.

ORTHOPTICS – TRAINING

Grant Casey, B.S., Second Year
Micaela Johnson, B.S.E., First Year
Cheyanne Lester, B.A., First Year

OTHER PRESENTERS

Dina Ahram, B.S.	Christopher Kirkpatrick, B.S.
Umme Salma Bengali, B.S.	Brandon Menke, B.S.
Frederick Blodi, B.S.	Hannah Rowell, B.S.
Erin Burnight, Ph.D.	Desi Schoo, B.A.
Mark Christopher, M.S.	Jessica Skeie, Ph.D.
Tryphena L. Cuffy, B.S.	Scott Whitmore, B.S.
Adam Hedberg-Buenz, B.A.	Ralph Hazelwood, B.S.
Qiao Hu, M.S.	

GUEST FACULTY

3rd Annual Distinguished Ophthalmic Educator

J. Douglas Cameron, MD, MBA, is Professor of Ophthalmology and Laboratory Medicine and Pathology at the University of Minnesota, a Professor Emeritus of Ophthalmology at the Mayo Clinic School of Medicine, Director Emeritus of Vision of Ophthalmic Pathology at the Armed Forces Institute of Pathology (AFIP).



A native of Minnesota, he completed his Bachelor of Arts degree at St. Olaf College, Northfield, MN. He went on to obtain his degree in medicine from Northwestern University Medical School, Chicago. He followed this with an Internship at Montefiore Hospital and Medical Center in New York City and a clinical residency in Ophthalmology at the Scheie Eye Institute at the University of Pennsylvania in Philadelphia, Philadelphia. He then did a fellowship in Ophthalmic Pathology at the Ophthalmic Branch of the AFIP in Washington DC.

Dr Cameron has held several prestigious academic appointments since the completion of his ophthalmic training. He initially joined the faculty at the University of Minnesota in Ophthalmology and Laboratory Medicine and Pathology, where he completed a residency in Anatomic Pathology and experienced a meteoric rise through the academic ranks to full Professor and administrative ranks to Chief of Ophthalmology at Hennepin County Medical Center, Director of the Ophthalmic Pathology Laboratory, and Chief of Laboratory Medicine. In 1999, he was appointed as a Professor of Ophthalmology at the Mayo Clinic School of Medicine. In 2009, he was appointed as the Chief of Division of Ophthalmic Pathology in the Department of Neuropathology, at the AFIP. Due to unfortunate closing of this iconic institution in 2011 while he was at the zenith of his academic and administration contributions, he returned to the University of Minnesota where he resumed his previous appointment as a Professor of Ophthalmology and Laboratory Medicine and Pathology.

Dr. Cameron has received many awards and honors. He has been a recipient of a Heed Ophthalmic Fellowship and the Honor Award of the American Academy of Ophthalmology. He was awarded the Business Excellence Award for Lifelong Learning by the University of St Thomas Graduate School of Business. He was twice recognized as the Teacher of the Year by the ophthalmology residents at both the University of Minnesota and the Mayo Clinic. Most recently, he was awarded the *2012 Zimmerman Medal* by the American Association of Ophthalmic Oncologists and Pathologists for outstanding contributions to the field of ophthalmic pathology.

Dr. Cameron is an accomplished academic ophthalmologist. Renowned for his prowess as a lecturer, he has given hundreds of invited presentation at national and international symposia. He has been the featured instructor at the ophthalmic pathology section of the annual basic science courses at Harvard Medical School (Lancaster Course) since 1991, the University of Texas at Houston since 1995, and the King Khaled Eye Specialist Hospital since 1998. He is the author of numerous landmark scientific publications, including one book on Trachoma Control in India (circa 1965), 21 textbook chapters, and 101 peer-reviewed journal articles.

The 3rd Annual Leinfelder Society Alumni Representative

Andrew Doan, MD, PhD is an Assistant Professor of Surgery at Loma Linda University and at the Uniformed Services University School of the Health Sciences. He practices comprehensive ophthalmology and eye pathology at Eye Associates of Southern California in Temecula, CA.



Born in Saigon, Vietnam and raised in Oregon, he earned a Bachelor of Arts degree in Biology from Reed College. He completed his MD and PhD degrees at The Johns Hopkins University School of Medicine. He then completed an internal medicine internship and an ophthalmology residency at the University of Iowa. While he was an ophthalmology resident at Iowa, he began archiving the Morning Rounds presentations and assembling a data base of interesting clinical cases, a process that ultimately evolved into the establishment of the highly successful and legendary web site, Eyerounds.org. Prior to graduation from the program he received the prestigious Leinfelder Award for best resident research day presentation. After leaving Iowa, he completed a fellowship in eye pathology at the Jules Stein Eye Institute at the University of California, Los Angeles.

In addition to maintaining his very busy comprehensive ophthalmology practice, Dr. Doan volunteers as a clinical provided at the Temecula-Murrieta Rescue Mission. He served for 10 years as a volunteer administrator for www.studentdoctor.net, a non-profit organization promoting the education of pre-doctoral students. He is currently the Chair for the Young Ophthalmologists Committee of the American Academy of Ophthalmology and has served as a committee member of the OPHTHPAC/ Congressional Advocacy Committee and the Ophthalmic Mutual Insurance Company.

Dr. Doan has received numerous honors. He is an inductee of the Society of Heed Fellows and a previous winner of the Meyer Teaching Award. He is a recipient of the American Academy of Ophthalmology Achievement Award and a US Navy FAP for Ophthalmology. He was the recipient of many scholarships and awards during his undergraduate and medical training, including an NIH Grant for Underrepresented Minorities, a Johns Hopkins University Scientist Training Award, and a Heed Ophthalmic Fellowship.

Dr. Doan is an accomplished academic ophthalmologist. He is the Managing Editor of the Journal of Academic Ophthalmology and the Deputy Editor-in-Chief of the Ophthalmic News & Education Network. He is a board member of MissionForVisionUSA.org, a Non-Profit Organization dedicated to the advancement of ocular research. He is the author of numerous landmark original scientific publications.

The 4th Annual Distinguished Alumni Society Representative

John W. Kitchens, MD is a vitreoretinal surgeon with the Retina Associates of Kentucky, Lexington, Kentucky.



Dr. Kitchens received a Bachelor of Science degree from the University of Evansville and Doctor of Medicine from the Indiana University School of Medicine. He completed his internship at Indiana University, his ophthalmology residency at the University of Iowa, and his vitreoretinal fellowship at the University of Miami/Bascom Palmer Eye Institute (BPEI). Prior to his current position, he served as the director of the trauma service at BPEI.

In addition to maintaining his very busy medical and surgical retina practice, Dr. Kitchens is currently the President of the Kentucky Academy of Eye Physicians and Surgeons. He just recently completed a term as the chair of the important On-line Community Advisory Committee of the American Academy of Ophthalmology (AAO). He is one of 8 founding members of the Vitreous-Buckle Society and one of 6 founding members of the Iowa Wings Tasting Society.

Dr. Kitchens has received numerous honors. He has been named to "Best Doctors in America" and "America's Top Ophthalmologists". He won first place in the Bloomberg Resident Cataract Video Competition sponsored by the American College of Eye Surgeons in 2003. He is the 3-time winner of the prestigious Rhett Butler award for the best surgical video at the annual meeting of the American Retina Surgical Society.

Dr. Kitchens is an accomplished academic ophthalmologist. He is currently an editor for the Medrounds and has previously served as the retina section editor for Ophthalmology Web and co-editor of Grand Rounds for the Ophthalmology Times. He is an investigator for multiple clinical trials on age-related macular degeneration, diabetic retinopathy, retinal vascular occlusive disease, ocular histoplasmosis syndrome and visual rehabilitation, and is a renowned authority on innovative surgical instrumentation and techniques. He has participated extensively as a speaker at meetings of the AAO and vitreoretinal subspecialty societies. He has been featured on the Discovery Channel's Mystery Diagnosis television program and the Learning Channel's "Diagnosis X". He is author of numerous landmark original scientific publications.

**The University of Iowa
Department of Ophthalmology and Visual Sciences
Resident and Fellow Research Program
would like to recognize**

The William C. and Dorotha Gaedke Charitable Trust

**for their continued support of
resident and fellow research**

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



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April 19-20, 2012

Department of Ophthalmology
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Roy J. and Lucille A. Carver
College of Medicine

University of Iowa
Hospitals and Clinics

Iowa City, Iowa

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

Thursday, April 19, 4:00 – 7:00 pm

Scientific Posters

Melrose Conference Center, Rooms 1 and 2
Pomerantz Family Pavilion, 5th Floor

Poster Number 1

Efemp1^{R345W} Causes Abnormal Retinal and Behavioral Responses to Light

Frederick Blodi, B.S., GRADUATE RESEARCH VOLUNTEER

Primary Supervisor: Stewart Thompson, Ph.D.

Additional Supervisor: Steven F. Stasheff, M.D., Ph.D.

Poster Number 2

Utilizing the LYST^{bg-J} Mutation to Identify Genetic Pathways of Exfoliation Syndrome and Circadian Intraocular Pressure

Tryphena L. Cuffy, B.S., GRADUATE STUDENT, INTERDISCIPLINARY GRADUATE PROGRAM IN GENETICS

Primary Supervisor: Michael Anderson, Ph.D.

Poster Number 3

Development of Pupillary Adrenergic Supersensitivity after Pharmacologic Induction of Oculosympathetic Defect

Christopher Kirkpatrick, B.S., OPHTHALMOLOGY RESIDENT-TO-BE

Primary Supervisor: Randy H. Kardon, M.D., Ph.D.

Poster Number 4

Enhanced Progenitor Cell Integration and Differentiation Following Transplantation on to PLGA Polymer Construct

Brandon Menke, B.S., DORIS DUKE FELLOW

Primary Supervisor: Budd A. Tucker, Ph.D.

Poster Number 5

Vitrectomy using Limbus-Based Trocar-Cannulas in Combined Anterior-Posterior Segment Disease

Hannah Rowell, B.S., MEDICAL STUDENT

Primary Supervisor: Vinit B. Mahajan, M.D., Ph.D.

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

Thursday, April 19, 4:00 – 7:00 pm

Poster Number 6

**Choriocapillaris Vascular Changes in Human Eyes with the High Risk
Complement Factor H Allele**

Desi Schoo, B.A., DORIS DUKE FELLOW

Primary Supervisor: Robert F. Mullins, Ph.D.

Poster Number 7

**Extracellular Superoxide Dismutase (SOD3) Regulates Oxidative Stress in the
Vitreous and Inner Retina**

Jessica Skeie, Ph.D., POSTDOCTORAL RESEARCH SCHOLAR

Primary Supervisor: Vinit B. Mahajan, M.D., Ph.D.

Poster Number 8

**Alternative Splicing and Differential Gene Expression in Human RPE/Choroid
Associated With a Genetic Risk Factor for Age-related Macular Degeneration**

Scott Whitmore, B.S., GRADUATE STUDENT, CENTER FOR BIOINFORMATICS AND COMPUTATIONAL
BIOLOGY

Primary Supervisor: Robert F. Mullins, Ph.D.

Additional Supervisor: Todd Scheetz, Ph.D.

Poster Number 9

LCA Gene Therapy In Somatic-Cell-Derived Induced Pluripotent Stem Cells

Erin Burnight, Ph.D., POSTDOCTORAL RESEARCH SCHOLAR

Primary Supervisor: Budd A. Tucker, Ph.D.

Winner of the Leinfelder Award for Best Basic Scientist Performance

Poster Number 10

**Identification and Characterization of Gene Responsible for Cavitory Optic Disk
Anomalies**

Ralph Hazelwood, B.S., GRADUATE STUDENT

Primary Supervisor: John Fingert, M.D., Ph.D.

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

Thursday, April 19, 4:00 – 7:00 pm

Poster Number 11

Investigation of Gene-Expression Patterns in Familial Angle-Closure Glaucoma in the Basset Hound

Dina Ahram, B.S., GRADUATE STUDENT, INTERDISCIPLINARY PROGRAM

Primary Supervisor: Markus Kuehn, Ph.D.

Poster Number 12

Vision Machine Approach for the Detection of Vessel Bifurcations in Fundus Images.

Qiao Hu, M.S., GRADUATE STUDENT, ELECTRICAL AND COMPUTER ENGINEERING

Primary Supervisor: Michael D. Abramoff, M.D., Ph.D.

Poster Number 13

Pixel Classification of Iris Transillumination Defects

Umme Salma Bengali, B.S., GRADUATE STUDENT, BIOMEDICAL ENGINEERING

Primary Supervisor: Michael D. Abramoff, M.D., Ph.D.

Additional Supervisor: W.L.M. Alward, M.D.

Poster Number 14

Validation Of Tablet-based Evaluation Of Color Fundus Images

Mark Christopher, M.S., GRADUATE STUDENT, BIOMEDICAL ENGINEERING

Primary Supervisor: Michael D. Abramoff, M.D., Ph.D.

Additional Supervisor: Todd Scheetz, Ph.D.

Poster Number 15

Evaluation of IFIS Utilizing a Novel Handheld Pupilometry Device

Christopher Watts, M.D., OPHTHALMOLOGY RESIDENT

Primary Supervisor: Randy H. Kardon M.D., Ph.D.

Additional Supervisor: Thomas A. Oetting, M.D.

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

Friday, April 20, 2012, 8:00 AM - 4:20 PM

12:00 – 1:15	Buffet Luncheon Melrose Conference Center, 5 th Floor, PFP
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1:15 – 2:40	Scientific Papers, Session III Braley Auditorium Moderator: Andrew Doan, M.D., Ph.D.
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1:15	Introduction of Moderator	
1:20	John J. (Joey) Brinkley , Randy H. Kardon 9 Correlation of Optic Disc Morphology and Nerve Fiber Layer Thickness <i>via</i> Cirrus HD-OCT in Patients with Nonarteritic Anterior Ischemic Optic Neuropathy	
1:40	Jordan J. Rixen , Kenneth M. Goins..... 10 Treatment of Anirida with Boston Type I Keratoprosthesis	
2:00	A. Brock Roller , James C. Folk..... 11 Addition of Photodynamic Therapy for the Treatment of Neovascular Age-Related Macular Degeneration Refractory to Anti-VEGF Agents	
2:20	Alethia H. Pantazis , Randy H. Kardon 12 One Disease, Two Brothers, Multiple Reasons for Vision Loss	

2:40 – 3:00	Afternoon Break
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3:00 – 4:20	Scientific Papers, Session IV Braley Auditorium Moderator: J. Douglas Cameron, M.D., M.B.A.
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3:00	Brian Tienor , Young H. Kwon 13 Optic Disc Size in Glaucoma Patients with High Myopia	
3:20	Andrew Davis , Vinit B. Mahajan 14 Intravitreal Bevacizumab for Peripapillary Choroidal Neovascular Membranes	
3:40	Benjamin Bakall , Edwin M. Stone 15 Mutation Analysis in a Large Cohort of Individuals with Usher Syndrome	
4:00	John J. Chen , Michael D. Abramoff..... 16 Variability in Measurements of Diabetic Macular Edema in SD-OCT Using a 3D Segmentation Algorithm	

RESIDENT / FELLOW RESEARCH DAY - 2012

Morning Session, Paper 1

The Respectacle Project

Jeffrey T. Lynch, M.P.H., M.D.

Primary Supervisor: Richard J. Olson, M.D.



Background/Purpose: To determine the effectiveness of an innovative online eyeglass recycling model in the setting of international ophthalmic mission work.

Methods: Eyecare providers with two international ophthalmic/optometric mission groups [Humanity First (Guatemala) and World Harvest Mission (Kenya)] were asked to provide Respectacle with photographs and prescriptions of individuals in need of eyeglasses that they were not able to provide with their usual stock of used eyeglasses. The Respectacle database was searched for adequate matches, which were then mailed to the international sites.

Results: Pending

Conclusion: Pending

Financial Disclosure: Presenter is CEO and Founder of Respectacle, a 501(c)3 non-profit organization. Presenter does not benefit financially from the services provided by Respectacle, Inc.

*Winner of the
Kolder Memorial Humanitarian
Award*

RESIDENT / FELLOW RESEARCH DAY - 2012

Morning Session, Paper 2

Outcomes of Treatment of Fungal Keratitis at the University of Iowa Hospitals and Clinics: A Ten-Year Retrospective Analysis

Gina M. Rogers, M.D.

Primary Supervisor: Michael D. Wagoner, M.D., Ph.D.

Additional Supervisors: Anna S. Kitzmann, M.D.; Kenneth M. Goins, M.D.



Background/Purpose: To evaluate the outcomes of medical and surgical management of fungal keratitis at the University of Iowa Hospitals and Clinics.

Methods: A retrospective chart review was performed of all culture or histology- positive cases fungal keratitis that presented between 1 July 2001 and 30 June 2011. Inclusion criteria included sufficient follow-up to document successful or unsuccessful microbiological cure. The main outcome measure was a microbiological cure with either medical therapy alone or with a therapeutic keratoplasty. The secondary outcome measures were the requirement for subsequent optical keratoplasty and the final visual outcome.

Results: Seventy three eyes met the inclusion criteria. A microbiological cure was achieved in 72 (98.6%) eyes, including 41 (100%) eyes treated with medical therapy alone and 31 (96.7%) of 32 eyes treated with therapeutic keratoplasty. The need for surgical intervention correlated with increasing patient age ($P = .02$), previous anterior segment surgery ($P = .01$) or bacterial keratitis ($P = .02$), and the initial infiltrate depth ($P = .001$). Among the 41 eyes that achieved a medical microbiological cure, 3 (7.3%) underwent an optical PKP for central corneal scarring. After a mean follow-up of 20.1 months (range, 14-28 months), all three grafts remained clear. Among 32 eyes that required therapeutic keratoplasties, 13 (40.6%) underwent a subsequent optical keratoplasty (12 PKP; 1 DSAEK) for failed grafts. After a mean follow-up of 24.6 months (range, 3-84 months), 8 of these grafts remained clear. Among the 5 failed grafts, 4 were successfully treated with repeat keratoplasty (3 Boston K-pro 1; 1 PKP). In the medical cure group, the final median BSCVA after all interventions was 20/30, with 27 (65.9%) eyes that were 20/40 or better. Only 7 (17.1%) eyes were worse than 20/200. In the therapeutic keratoplasty group, the final median BSCVA after all interventions was 20/40, with 16 (50.0%) eyes that were 20/40 or better. Only 6 (18.8%) eyes were worse than 20/200. The visual differences between the 2 groups were not statistically significant.

Conclusion: A high microbiological cure rate can be achieved in eyes with fungal keratitis, although therapeutic keratoplasty is often required to achieve this objective.

Financial Disclosure: The authors have no financial disclosures.

*Winner of the
Leinfelder Award for Best Fellow Performance*

RESIDENT / FELLOW RESEARCH DAY - 2012

Morning Session, Paper 3

A Retrospective Case-Control Study of Safety and Complications of Sulcus-Placed MA50 Intraocular Lenses

Pavlina S. Kemp, M.D.

Primary Supervisor: Thomas A. Oetting, M.D.



Background/Purpose: To describe the safety and long-term outcomes of sulcus placement of the MA50 intraocular lens (IOL).

Methods: Patients who underwent cataract extraction surgery with an MA50 IOL placed in the sulcus at the University of Iowa between 1997 and 2012 were identified. Demographic information, pre-operative examination findings and measurements, intra-operative complications, and long-term post-operative complications will be recorded. Data gathered will include post-operative refraction data to calculate A-constant for MA50 in the sulcus. Long-term post-operative data will look to identify rates of IOL decentration, pigment dispersion syndrome, the need for McCannel sutures, lens exchange, pars plana vitrectomy or glaucoma intervention.

Results: Pending

Conclusion: Pending

Financial Disclosure: The authors have no financial disclosures.

Morning Session, Paper 4

Outcomes of Treatment of Pseudomonas Keratitis at the University of Iowa Hospitals and Clinics: A Five-Year Retrospective Analysis

Matthew C. Weed, M.D.

Primary Supervisor: Michael D. Wagoner, M.D., Ph.D.

Additional Supervisors: Gina M. Rogers, M.D.; Anna S. Kitzmann, M.D.; Kenneth M. Goins, M.D.



Background/Purpose: To evaluate outcomes of treatment of Pseudomonas keratitis at the University of Iowa Hospitals and Clinics.

Methods: A retrospective chart review was performed of all cases of culture-positive *Pseudomonas aeruginosa* keratitis that presented to the Cornea Service between 1 July 2006 and 30 July 2011. Inclusion criteria were a pre-infectious visual acuity of $\geq 20/40$ or an infiltrate involving the visual axis. Cases of polymicrobial keratitis were excluded. The main outcome measure was the visual outcome with or without therapeutic keratoplasty (TKP) for the acute microbial process and optical keratoplasty (OKP) for post-microbial keratitis scarring.

Results: Thirteen eyes met the inclusion criteria. The mean patient age was 38.7 years (range, 14 to 75). Eleven (84.6%) cases were associated with soft contact lens wear, including 9 that involved extended wear. At the time of initial presentation, the median BSCVA was CF (range, 20/50-HM), the mean abscess size was 19.7 mm² (range, 2.3-64.0 mm²), and a hypopyon was present in 10 (76.9%) eyes. A microbiological cure was achieved in 12 (92.3%) eyes with medical therapy alone and in 1 (7.7%) eyes with a TKP. Seven (58.3%) medically-treated eyes had a BSCVA that was less than 20/40 and 5 (41.6%) were worse than 20/200, of which 3 were treated with OKP. The presence of a hypopyon was significantly correlated with a visual outcome of $< 20/40$ after initial medical therapy ($P = .03$), whereas patient age ($P = .26$), CL wear ($P = .12$), initial visual acuity ($P = .51$), and infiltrate size ($P = .10$) were not. All 4 grafts (1 TKP; 3 OKP) remained clear after a mean follow-up of 37.5 months (range, 16-49 months) with a median visual acuity of 20/22.5 (range, 20/20 to 20/30). The final median BSCVA for all eyes was 20/30, with 9 (64.3%) eyes that were 20/40 or better. Two (14.3%) eyes were worse than 20/200.

Conclusion: The majority of eyes with Pseudomonas keratitis in the visual axis can achieve a good final visual outcome although surgical intervention during the acute and convalescent phase with TKP and OKP, respectively, is often required to achieve this objective.

Financial Disclosure: The authors have no financial disclosures.

RESIDENT / FELLOW RESEARCH DAY - 2012

Morning Session, Paper 5

Retinal Vessel Width Measurement at Branching Points and Murray's Law

Angela McAllister, M.D.

Primary Supervisor: Michael D. Abramoff, M.D., Ph.D.



Background/Purpose: To use an accurate, generalizable and automatic tool to measure retinal vessel width specifically at parent-child branching points to study Murray's law in retinal vessel trees and ultimately, use this as a biomarker to improve detection of retinal and systemic disease.

Methods: To account for problems associated with automated measurement of retinal vessel branch points, we developed a new algorithm to better approximate vessel width using electric lines of force. In this study, the algorithm was then compared with two expert observers who labeled 100 artery branchings and 100 vein branchings from 50 fundus images from 50 normal subjects. Each observer was instructed to annotate three measurements on each of the three branches for each selected branch point. Using a dataset of 544 retinal images was used from the population cohort Tromso study in Norway, another expert observer labeled the center of parent-child branch points. A total of 4607 branch points were matched, 1703 arteries and 2904 veins. Manual measurements were done on tablet-based color fundus image evaluation system.

Results: The algorithm was found to be 98.5% accurate in measuring branch points. A linear regression was performed to see if the parent-daughter branch point relationship conformed to Murray's Law relating the radii of daughter branches to the parent branch. Approximately two thirds of the arterial branch points obeyed Murray's Law and one third did not.

Conclusion: This is the first evidence that retinal arteries do not all obey Murray's Law different other vessel branching systems in the body. This could have important implications in improving detection of retinal and systemic disease processes.

Financial Disclosure: Patent by Abramoff and Xu

Morning Session, Paper 6

Diaton Transpalpebral Tonometry In Patients with Glaucoma And Glaucoma Drainage Devices—A Preliminary Study For Its Use In Keratoprosthesis Patients

Justin M. Risma, M.D.

Primary Supervisor: Young H. Kwon, M.D., Ph.D.

Additional Supervisors: Wallace L.M. Alward, M.D.; John H. Fingert, M.D., Ph.D.



Background/Purpose: Glaucoma is one of the most common and debilitating complications of Boston keratoprosthesis (K-Pro) surgery. Many patients require the placement of a glaucoma drainage device (GDD). The diagnosis and management of glaucoma in K-Pro patients is particularly challenging because there is no reliable method to measure intraocular pressure (IOP).

Most experts currently rely on digital palpation to estimate IOP in patients with K-Pros. However, this method lacks objectivity and evidence of accuracy. The Diaton tonometer estimates IOP through transpalpebral scleral indentation and therefore may be a reasonable alternative in K-Pro patients. It has shown fair reliability in normal patients who have normal IOP, but it has not been validated in other settings.

The purpose of this study is to determine whether the Diaton tonometer can reasonably detect high IOP in patients with glaucoma and GDDs. If reliable in these circumstances, it may be useful in the diagnosis and management of glaucoma in K-pro patients.

Methods: We will prospectively compare Diaton tonometry with Goldmann applanation tonometry in adult glaucoma patients with and without GDDs. Measurements will be recorded independently. In patients with GDDs, we will use the Diaton both over and away from the area with the GDD

Results: Pending

Conclusion: Pending

Financial Disclosure: The authors have no financial disclosures.

Morning Session, Paper 7

The Effect of Pars Plana Vitrectomy in Patients with Glaucoma

Elizabeth H. Gauger, M.D.

Primary Supervisor: Vinit B. Mahajan, M.D., Ph.D.

Additional Supervisor: Young H. Kwon, M.D., Ph.D.



Background/Purpose: To determine whether pars plana vitrectomy (PPV) has an effect on intraocular pressure in patients with pre-existing primary open angle glaucoma (POAG).

PPV alters the fluid dynamics of the posterior chamber, which may influence intraocular pressure (IOP). Removal of specific vitreous substructures also alters the molecular composition of tissues overlying the ciliary body, where intraocular fluid is generated. Although some surgical procedures, such as cataract surgery, can reduce IOP, other procedures like penetrating keratoplasty, may elevate IOP. The effect of vitrectomy on IOP is controversial, and it has not been studied in the setting of POAG. Understanding the effect of PPV on IOP is especially important in the management of patients with coexisting glaucoma and vitreoretinal disease.

Methods: Study design was a retrospective chart review of patients who underwent vitrectomy at the University of Iowa with the coexistent diagnosis of glaucoma.

Potential study patients who underwent vitrectomy at the University of Iowa will be identified by three different initial queries: 1) a review of billing codes for vitrectomy at the between years 2005 and 2010, a review of medical record diagnosis codes, and a review the Mahajan vitrectomy surgery database. These patient lists will then be cross-referenced to databases to identify patients with a concurrent glaucoma diagnosis. Inclusion criteria are: diagnosis of POAG, preoperative IOP (averaged over previous three readings), and postoperative IOP data for 6-12 months. Exclusion criteria include: patients undergoing a scleral buckling procedure or with glaucoma diagnosis other than POAG. Other data will include phakic status, ocular comorbidities, diabetic status, current glaucoma therapy, and previous glaucoma surgeries. Worsening glaucoma will be determined by increasing IOP and escalation of glaucoma therapy as indicated by an increase in medication or the need for further glaucoma surgical procedures. A case control group will be vitrectomy patients without glaucoma.

Results: A literature review identified several published studies on vitrectomy and IOP. There is no clear trend regarding the effects of PPV on IOP, and no study on POAG. Institutional Review Board approval was obtained. Over 3000 vitrectomy patients were identified from database queries. Cross-referencing glaucoma diagnosis is ongoing.

Conclusion: Understanding the effect of PPV on IOP may be important in the management of patients with coexisting glaucoma and vitreoretinal disease.

Financial Disclosure: The authors have no financial disclosures.

Morning Session, Paper 8

Timing of Intraocular Blood Breakdown

Amanda C. Maltry, M.D.

Primary Supervisor: Nasreen A. Syed, M.D.



Background/Purpose: To determine the natural history of blood breakdown in various ocular tissues following injury. The presence of hemosiderin in post-mortem eye tissues has been proposed as a potential method of estimating time interval since development of the hemorrhage. This is of particular interest in cases of non-accidental trauma in children in which retinal and optic nerve sheath hemorrhages are well-documented findings.

Methods: Gross and histopathologic examination was performed on 49 eyes enucleated after traumatic injury with ocular hemorrhage where the exact timing of the injury was known. The presence of hemosiderin was assessed with Perl's Prussian blue stain performed at two separate levels of archived tissue. Two investigators independently reviewed and recorded the presence or absence of hemosiderin in each ocular tissue type for each tissue section.

Results: Hemosiderin was identified in 42 of 49 eyes. The time from eye injury to enucleation ranged from 0 to 64 days. Hemosiderin was detected as early as 4 days after the injury. Of 8 eyes enucleated within 4 days of injury, 3 (38%) were positive for hemosiderin. 14 of 21 eyes (66%) enucleated within 7 days, and all eyes enucleated between 8 and 64 days were positive.

Conclusion: Hemosiderin can be identified in human ocular tissues as early as 4 days after hemorrhage and was present in all eyes after 8 days. Therefore, only a minimum duration of time from injury can be determined. The presence of hemosiderin suggests that the injury occurred 4 or more days prior to death or enucleation. In cases of post-mortem eye examination, the interval since onset of the hemorrhage may not be more specifically identified.

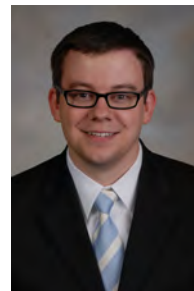
Financial Disclosure: The authors have no financial disclosures.

Afternoon Session, Paper 1

Correlation of Optic Disc Morphology and Nerve Fiber Layer Thickness *via* Cirrus HD-OCT in Patients with Nonarteritic Anterior Ischemic Optic Neuropathy

John J. “Joey” Brinkley, M.D.

Primary Supervisor: Randy H. Kardon, M.D., Ph.D.



Background/Purpose: To compare several measures of optic disc morphology *via* Cirrus HD-OCT with residual nerve fiber layer thickness in patients with NAION.

Methods: Retrospective review of patients diagnosed with NAION by the neuro-ophthalmology service at University of Iowa Hospitals and Clinics and analyzed *via* Cirrus HD-OCT from February 2008 to present day. Primary outcome measure is correlation of optic disc size and residual nerve fiber layer thickness following resolution of optic disc edema in NAION group. Secondary analysis to focus on comparison of optic disc morphology between NAION and control groups, and residual nerve fiber layer thickness following corticosteroid therapy vs. untreated patients in the NAION group.

Results: Pending

Conclusion: Pending

Financial Disclosure: The authors have no financial disclosures.

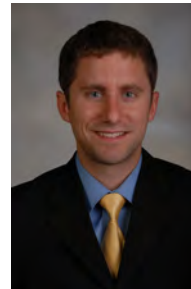
Afternoon Session, Paper 2

Treatment of Aniridia with Boston Type I Keratoprosthesis

Jordan J. Rixen, M.D.

Primary Supervisor: Kenneth M. Goins, M.D.

Additional Supervisors: Gina M. Rogers, M.D.; Anna Kitzmann, M.D.;
Michael D. Wagoner, M.D., Ph.D.



Background/Purpose: To report the outcomes of Boston keratoprosthesis (K-pro) type I implantation for congenital aniridia.

Methods: A retrospective review was performed of the medical records of every patient with congenital aniridia who underwent Boston K-pro type I implantation at the University of Iowa Hospitals and Clinics from January 1, 2009 through December 31, 2011. The main outcome measures were visual acuity, graft retention, and postoperative complications.

Results: A total of 7 eyes (7 patients) met the inclusion criteria. The mean patient age was 52 years (range, 12 to 85 years). The preoperative visual acuity was CF in 6 eyes and HM in 1 eye. In addition to the K-pro procedure, glaucoma shunts were performed on 4 eyes and a shunt revision was done for 1 of 2 previously shunted eyes. Intraocular lens removal was performed in 2 of 4 pseudophakic eyes, no IOL was implanted in 2 aphakic eyes, and a lensectomy was performed on the only phakic eye. Three eyes had a vitrectomy. After a median follow-up period of 12 months (range, 3 to 18 months), the median BSCVA was 20/160 (range, 20/100 to CF). This included 2 (28.6%) eyes that were 20/100 and 5 (71.4%) eyes that were better than 20/400. Compared to the preoperative BSCVA, the final vision was improved in 6 (85.7%) eyes and worse in 1 (14.3%) eye. The eye with worsened vision had initially improved from CF to 20/300, but worsened to HM following a hemorrhagic stroke and development of a large visual field defect with loss of the central visual field. The K-pro graft was retained in all 7 (100%) eyes. The most common complication was formation of a retroprosthetic membrane in 3 (42.9%) eyes, none of which required either a YAG capsulotomy or vitrectomy. One (14.3%) eyes developed a wound dehiscence that required surgical repair. There were no cases of microbial keratitis, sterile corneal ulceration, progression of glaucomatous optic atrophy, or vitreoretinal complications.

Conclusion: The Boston K-pro type 1 is a viable option for the visual rehabilitation of eyes with congenital aniridia.

Financial Disclosure: The authors have no financial disclosures.

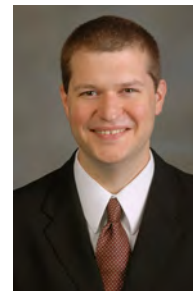
Afternoon Session, Paper 3

Addition of Photodynamic Therapy for the Treatment of Neovascular Age-Related Macular Degeneration Refractory to Anti-VEGF Agents

A. Brock Roller, M.D.

Primary Supervisor: James C. Folk, M.D.

Additional Supervisor: Elliott H. Sohn, M.D.



Background/Purpose: To examine the outcomes of combination anti-VEGF and photodynamic therapy (PDT) for the treatment of neovascular AMD refractory to anti-VEGF monotherapy.

Methods: Retrospective interventional study of patients treated with anti-VEGF monotherapy for neovascular AMD with persistent sub/intra-retinal fluid after at least 3 anti-VEGF injections in the 7 months prior to combination treatment. Main outcome measures were visual acuity and central retinal thickness at 1 or 2, 3, and 6 months. Secondary outcome measures were change in number of fluid-free visits and interval between treatments in 7 months prior and 6 months after combination therapy.

Results: Twenty-six eyes in 26 patients met the entrance criteria. Statistically significant improvements in logMAR visual acuities were present at one ($p=.01$) and 3 months ($p=.01$). Significant decreases in central subfield retinal thickness on optical coherence tomography, (OCT), were seen at one ($p=4 \times 10^{-5}$), 3 ($p=3 \times 10^{-4}$) and 6 months ($p=4 \times 10^{-5}$) as compared to pre-combination treatment OCTs. The percentage of patient visits with no subretinal fluid increased from 0.5% to 44% after the initiation of combination therapy ($p=8 \times 10^{-6}$). The interval between treatments increased from once every 1.6 months in the 7 months prior to combination treatment to once every 2.7 months in the 6 months after, ($p=.002$). No ocular complications attributable to PDT were seen.

Conclusion: Rescue therapy with the combination of anti-VEGF and PDT in eyes which have failed anti-VEGF monotherapy resulted in a mean improvement in vision, a decreased central subfield retinal thickness, and an increase in fluid free intervals.

Financial Disclosure: The authors have no financial disclosures.

Afternoon Session, Paper 4

One Disease, Two Brothers, Multiple Reasons for Vision Loss

Alethia H. Pantazis, M.D.

Primary Supervisor: Randy H. Kardon, M.D., Ph.D.



Background/Purpose: To present two cases of Hunter syndrome with evidence for vision loss from scleral, retinal, optic nerve and corneal deposition of mucopolysaccharides not seen in normal individuals.

Methods: Comparison of normal OCT, ERG, ECHO and GVF over time with that of two brothers diagnosed with Hunter syndrome (one who received enzyme replacement therapy).

Results: Progressive vision loss was seen with worsening visual field defects resulting from deposits of presumed mucopolysaccharide in, sclera, optic nerve, retina and cornea. These findings are not seen in normal individuals.

Conclusion: Vision loss related to Hunter syndrome is multifactorial and although enzyme replacement therapy has many advantages it does not appear to halt vision loss.

Financial Disclosure: The authors have no financial disclosures.

Afternoon Session, Paper 5

Optic Disc Size in Glaucoma Patients with High Myopia

Brian Tienor, M.D.

Primary Supervisor: Michael D. Abràmoff, M.D., Ph.D.

Additional Supervisor: Chris A. Johnson, Ph.D.



Background/Purpose: To determine if optic disc size is a risk factor for glaucoma severity or progression among open-angle glaucoma patients with high myopia.

Methods: In a retrospective observational case series, 40 eyes (40 patients) with open-angle glaucoma and high myopia (myopic refraction of more than -6.00 diopters) were evaluated. All patients had undergone visual field (VF) testing (24-2 SITA-Standard, Humphrey Field Analyzer) and Cirrus HD-OCT measuring retinal nerve fiber layer (RNFL) thickness and optic disc area. Patients were separated into Group A with optic disc area $<1.81 \text{ mm}^2$, and Group B with optic disc area $>1.81 \text{ mm}^2$. Data including VF mean deviation (MD), pattern standard deviation (PSD), RNFL thickness, number of incisional surgeries, number of laser procedures, number of prescribed glaucoma medications, peak intraocular pressure (IOP), and occurrence of disc hemorrhage were compared between the two groups.

Results: Pending

Conclusion: Pending

Financial Disclosure: The authors have no financial disclosures.

Afternoon Session, Paper 6

Intravitreal Bevacizumab for Peripapillary Choroidal Neovascular Membranes

Andrew Davis, M.D.

Primary Supervisor: Vinit B. Majahan, M.D., Ph.D.



Background/Purpose: To determine the response of peripapillary choroidal neovascularization (CNV) to intravitreal injection of Bevacizumab.

Methods: Retrospective case series. A chart review was conducted to identify patients with peripapillary CNV that received only Bevacizumab treatment. The demographic data, visual acuities, complications, number of injections and remission periods were reviewed. Recurrent subretinal or intraretinal fluid on spectral domain OCT was the indication for reinjection.

Results: Twenty eyes from 19 patients met the inclusion criteria. Average patient age was 70.6 years (range 26-94). Etiologies of PCNV included 12 eyes with AMD, 6 eyes with presumed ocular histoplasmosis, 1 eye with traumatic choroidal rupture, and 1 eye with idiopathic PCNV. The follow-up averaged 13.5 months (range 6-32 months). An average of 5.6 total injections (range 2-14) were performed. Complete resolution of fluid on OCT was achieved in 17 of 20 eyes (85%) after an average of 2.4 (range 1-5) intravitreal injections. Five of 17 eyes developed recurrent fluid on OCT at an average of 8.3 months following the last injection (range 4.5-15). Recurrent cases included 4 eyes with AMD and 1 eye with POHS. Fluid did not resolve completely in 3 of 20 eyes (15%). Six of 8 non-AMD cases remained dry after treatment throughout follow-up. Pre-injection visual acuity averaged 20/40 (range of 20/20-20/100). Post-injection visually acuity averaged 20/30 (range 20/15-20/60). There were no adverse events related to treatment.

Conclusion: Bevacizumab is effective for peripapillary CNV with good visual outcomes, but requires careful monitoring for recurrences.

Financial Disclosure: The authors have no financial disclosures.

Afternoon Session, Paper 7

Mutation Analysis in a Large Cohort of Individuals with Usher Syndrome

Benjamin Bakall, M.D., Ph.D.

Primary Supervisor: Ed Stone, M.D., Ph.D.

Additional Supervisors: Heather T. Daggett, Rebecca M. Johnston, Peter M. Brzeskiewicz, William Kimberling, Ph.D.



Background/Purpose: Usher syndrome is the most common cause of combined deaf-blindness. Mutations in Usher syndrome genes are also responsible for a significant fraction of nonsyndromic deafness and nonsyndromic retinitis pigmentosa. Identification of disease-causing genetic variants in patients with Usher syndrome is important to strengthen the clinical diagnosis, improve the accuracy of genetic counseling and facilitate selection of individuals for future clinical trials. There are currently nine genes and two additional genetic loci associated with Usher syndrome, and strategies for effectively and cost-efficiently screening for causative variants in these genes are still in evolution.

Methods: One or more of three different genotyping methods were used to screen the genomic DNA of 1269 patients with the clinical diagnosis of Usher syndrome. Specifically, 454 were screened using the SNPlex platform, 773 with TaqMan OpenArray and 765 with Fluidigm. The mutations included in each of the screening panels were selected on the basis of their previously observed frequencies, their molecular compatibility with each of the screening methods, and their absence from a cohort of 100 ethnically matched normal individuals. Forty-seven different variants were included in the SNPlex assay, 30 in the TaqMan OpenArray assay and 45 in the Fluidigm assay. These variants were distributed among six genes: MYO7A, CDH23, PCDH15, USH1C, USH2A, and USH3A. All variants identified by the screening panels were confirmed with Sanger sequencing.

Results: The SNPlex assay correctly identified one or more mutations in 33% of the patients evaluated using that platform, OpenArray identified variants in 30%, and Fluidigm identified variants in 32%. There was a much higher rate of false positive results for SNPlex (21.2%) compared to OpenArray (12.8%) and Fluidigm (11.6%). For all methods combined, one or more disease-causing variants were identified in 423 of the 1269 patients (33.3%).

Conclusions: All three screening methods performed well for detecting known disease-causing variants although the SNPlex platform had a higher false positive rate than the other two. For a genetically heterogeneous disease like Usher syndrome, high-throughput screening of common disease-causing variants is faster and more cost-effective than Sanger sequencing for the initial phase of a comprehensive mutation screening strategy. Although Sanger sequencing is still required for identification of rarer alleles, it can be limited to a single gene (a nine-fold reduction of work) when a patient's first allele is identified using an allele-specific method.

Financial Disclosure: The authors have no financial disclosures.

Afternoon Session, Paper 8

Variability in Measurements of Diabetic Macular Edema in SD-OCT Using a 3D Segmentation Algorithm

John J. Chen, M.D., Ph.D.

Primary Supervisor: Michael D. Abramoff, M.D., Ph.D.

Additional Supervisors: Kyungmoo Lee, Ph.D.; Meindert Niemeijer, Ph.D.; Milan Sonka, Ph.D.; Elliott H. Sohn, M.D.



Background/Purpose: To evaluate the intra-session repeatability of retinal thickness measurements in patients with diabetic macular edema (DME) using our standard 3D graph search based multilayer OCT segmentation automated algorithm to measure the overall thickness of the central macula.

Methods: 30 eyes from 29 patients diagnosed with clinically significant DME were included and underwent serial macular-centered spectral domain optical coherence (SD-OCT) scans (Heidelberg Spectralis). The central 5.8x4.7mm² area was segmented into 4 surfaces and the average thickness between the internal limiting membrane, external limiting membrane, inner/outer segment (IS/OS) junction, and the outer surface of the retinal pigment epithelium (RPE) were determined using our standard 3D graph search approach*[1]. The variability between paired scans was analyzed and compared with the central macular thickness obtained from the Heidelberg Spectralis software.

Results: The coefficient of repeatability and variation for macular thickness using the Iowa algorithm was 6.19 μm (0.89%) for full thickness retina, 2.56 μm (2.42%) for external limiting membrane to the outer RPE, and 2.52 μm (3.27%) for IS/OS junction to the outer RPE. The coefficient of repeatability and variation of the central macular thickness using the Heidelberg software was 9.84 μm (1.17%). The average thickness of the macula was 340.5 μm using the Iowa algorithm, while the central macular thickness measured by the Heidelberg software was 375.4 μm .

Conclusions: The reproducibility of retinal thickness measurements of the average thickness of the macula in patients with diabetic macular edema is improved by using a graph search multilayer algorithm that incorporates the full 3D information available in SD-OCT. Robust quantification of macular edema allows this to be used as an objective image based secondary endpoint for macular edema treatments, possibly in combination with quantification of External Limiting Membrane disruption.

Financial Disclosure: Patents by Abramoff and Sonka. This work was supported in part by the National Institutes of Health grants R01 EY018853, R01 EY019112, and R01 EB004640.

[1] Kyungmoo Lee, Meindert Niemeijer, Mona K. Garvin, Young H. Kwon, Milan Sonka, and Michael D. Abramoff, Segmentation of the Optic Disc in 3-D OCT Scans of the Optic Nerve Head, IEEE Transactions on Medical Imaging, vol. 29, no. 1, January 2010, 159-168.

*Winner of the
Leinfelder Award for Best Resident Performance*