Kansas EyeCon 2017

May 12 & 13, 2017
The Venue
4800 W 135th St., Ste. 108
Leawood, KS 66209

Sponsored by the University of Kansas Department of Ophthalmology and the Lemoine Alumni Society
DEPARTMENT OF OPHTHALMOLOGY
SCHOOL OF MEDICINE CLINICAL FACULTY

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3901 Rainbow Blvd., 1011 Miller, Kansas City, KS
Appointments: 913-588-6688

kumed.com/kueye

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Cornea & Anterior Segment

Thomas J. Whittaker, JD, MD
Vice Chair, Residency Dir., Neuro-Ophthalmology

C. Scott Atkinson, MD
Pediatric Ophthalmology

Miranda Bishara, MD
Cornea/Refractive/Cataracts

Dirck DeKeyser, OD
Optometrist

Donald Fletcher, MD
Low Vision

William Godfrey, MD
Uveitis

Paul Munden, MD
Glaucoma & Anterior Segment

David Silverman, MD, JD
Comprehensive

Ajay Singh, MD
Retina & Vitreous

Jason Sokol, MD
Oculofacial Plastic & Orbital Surg.

Matthew Twardowski, O.D.
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Reid Mollman, MD

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EDUCATING TOMORROW’S GENERATION ~ CARING FOR TODAY’S
Kansas EyeCon 2017

We wish to acknowledge and sincerely thank these organizations for exhibiting at this conference:

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Program Overview - This conference is intended to provide ophthalmologists with an educational forum to learn about new developments in the profession and their application to patient care. Covering a cross-section of all sub-specialties, physicians can expect to walk away having heard evidence-based presentations.

Target Audience - This program is designed to meet the needs of practicing ophthalmologists.

Learning Objectives - Upon completion of the educational activity, participants should be able to:

Glucoma and Anterior Segment Session
1. Analyze the efficiency of placement by residents following phacoemulsification;
2. Discuss the outcomes following placement of the trabecular micro-bypass stent;
3. Describe how intraocular silicone oil or viscoelastic can alter the fluid dynamics of an Ahmed valve;
4. Recognize the importance of priming Ahmed valves and the impact it can have on the acute pressure vs. flow characteristics of the device;
5. Describe the limitations of MIGS (Minimally Invasive Glaucoma Surgery);
6. Relate the reported efficacy and limitations of the gel microstent in the treatment of open angle glaucoma;
7. List other LIGS (Less Invasive Glaucoma Surgery) under investigation;
8. Identify issues with patient compliance/adherence with topical glaucoma medications;
9. Recognize new methods of drug delivery and associated pharmaceutical strategies;
10. Distinguish the pathologic changes in Graves Orbitopathy, which lead to increased intraocular pressure;
11. Describe the surgical management of Graves Orbitopathy and how intraocular pressure is affected by such management;
12. Explain the laser optical requirements and parameters for the SMILE procedure;
13. Recognize the small incision lenticule extraction procedure, patient selection and postoperative management;
14. Describe the risks and benefits of various approaches to surgical management of malignant lesions of the medial canthus;
15. Explain current practice patterns of ASOPRS members regarding malignant lesions of the medial canthus;
16. Evaluate the efficacy of Medpor nonporous barrier sheet as a substitute for supramid in orbital fracture repairs;
17. Recognize EVO6 breaks disulfide bonds in the crystalline lens and thereby softens the lens;
18. Show Disulfide bonding is implicated as a causative factor in reduction of accommodative amplitude;
19. Review common presenting symptoms of orbital mucormycosis;
20. Demonstrate importance of early diagnosis and treatment of orbital mucormycosis;
21. Review orbital and eyelid anatomy;
22. Compare anatomic dissection series to accepted normal anatomy;
23. Recognize and deal with encroachments on an ophthalmologist’s rights to life, liberty and the pursuit of happiness.

Refractive and Cataract Session
24. Provide case reports and analysis of successful toric implantation in patients with pellucid marginal degeneration;
25. Provide an overview of pellucid marginal degeneration and different treatment options currently available;
26. Identify the disadvantages of new femtosecond technologies in cataract surgery;
27. Interpret techniques for complex cataract surgery in setting of zonular issues and techniques for lens fixation in these settings;
28. Establish management of anterior capsular tear (Argentine flag sign, Brian Little rescue technique);
29. Explain techniques to deal with loose zonules during cataract surgery (CTR’s, Capsule retractors, Ahmed segments);
30. Determine IOL placement in the absence of proper capsular support. (John Hart dual needle iris suture technique, IOL lasso, Hoffman pockets);
31. Distinguish the indications for corneal crosslinking with the new FDA approved procedure;
32. Recognize the importance of epithelial closure to avoid complications with crosslinking;
33. Investigate the efficacy of topical NSAIDs after cataract surgery in prevention of post-operative cystoid macular edema.

Retina Session
34. Recognize the common forms of pediatric uveitis and the main treatment options used for these conditions;
35. Interpret the implications of data from DRCR protocol S and T in management of diabetic retinopathy and diabetic macular edema;
36. Identify the role of new intraocular lens fixation techniques in cases of inadequate capsular support;
37. Recognize common presentations, diagnostic techniques and management of primary vitreous-retinal lymphoma;
38. Define current management strategies of retinal detachments;

Method of Participation
Statements of credit will be awarded based on the participant’s attendance and will be available upon completion of an online evaluation/claimed credit form available at akhcinc.formstack.com/forms/kseyecon. Alternatively, a statement of credit will be awarded based on the participant’s attendance and submission of the activity evaluation form. A statement of credit will be available upon completion of an evaluation/claimed credit form that should be turned in at the end of the meeting. If you have questions about this CME activity, please contact AKH Inc. at dcotterman@akhcme.com.

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<td>Ivan Batlle, MD</td>
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<td>John Doane, MD</td>
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<td>Michael Gilbert, MD</td>
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<td>Robert Null, MD</td>
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<td>Anjulie Quick, MD</td>
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<td>Steven Safran, MD</td>
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<td>Michael Stiles, MD</td>
<td>Speaker/Consultant/Contracted Research</td>
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<td>Andrew Symons, MD</td>
<td>Stock Research Funding</td>
<td>Commonwealth Serum Laboratories; Psivida Corp. Novartis Pharmaceuticals Corp.</td>
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<td>Merryl Terry, MD</td>
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# Lemoine Distinguished Alumni Lecturers

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<th>LECTURER</th>
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<th>DATE</th>
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<tr>
<td>Timothy W. Olsen, MD</td>
<td>Rock Chalk Retina Talk: 100 year KU</td>
<td>5/9/2014</td>
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<td>KU SOM MD ‘89</td>
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<td>Luther L. Fry, MD</td>
<td>Standard Cataract Surgery: Tips &amp; Tricks Learned after 40,000+ Cases</td>
<td>5/8/2015</td>
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<td>KU SOM MD ‘67</td>
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<tr>
<td>John D. Hunkeler, MD</td>
<td>Continuous Education</td>
<td>4/8/2016</td>
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<td>KU SOM MD ‘67</td>
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<td>KU Eye Residency ‘73</td>
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<tr>
<td>William A. Godfrey, MD</td>
<td>Quality of Life for Ophthalmology: A Perspective</td>
<td>5/12/2017</td>
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<td>KU SOM MD ‘65</td>
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<td>KU Eye Residency ‘71</td>
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Alumni Speakers

John Doane, MD
MD: 1990; Residency: 1995

Eric Fry, MD
MD: 2003; Residency: 2007

John D. Hunkeler, MD
MD: 1967; Residency: 1973

Michael Stiles, MD
MD: 1985; Residency: 1989
AGENDA
Kansas EyeCon  
May 12 - 13, 2017

Friday, May 12, 2017

12:00 p.m.  Registration and lunch with exhibitors

1:00 p.m.  Welcome: Miranda Bishara, MD

*Glaucoma and Anterior Segment Session*

1:05 p.m.  Josh Jones, MD, Resident results with placement of the I-stent at KC Resident Surgical Experience and Initial Results using Trabecular Micro-Bypass Stents at the KCVA

1:15 p.m.  Reid Mollman, MD, Pressure and Flow Characteristics of Ocular Viscoelastic and Silicone Oil Through Glaucoma Drainage Devices

1:25 p.m.  Michael Stiles, MD, Less Invasive Glaucoma Surgery (LIGS): When Minimally Invasive Glaucoma Surgery (MIGS) are not Enough

1:50 p.m.  Paul Munden, MD, Drug Delivery in Glaucoma: Beyond Compliance

2:15 p.m.  Robert Null, MD, Effects of Orbital Decompression on Intraocular Pressure in Graves Orbitopathy

2:25 p.m.  John Doane, MD, Small Incision Lenticule Extraction (SMILE) – What you Need to Know

2:50 p.m.  Luke Dolezal, MD, Malignant Lesions of the Medial Canthus: Current Surgical Practices of ASOPRS Member

3:00 p.m.  *Break*

3:30 p.m.  Merryl Terry, MD, Early Experience with Medpor Nonporous Barrier Sheet in Orbital Fracture Repair

3:40 p.m.  John Hunkeler, MD, EVO6 Ophthalmic Solution - A Topical Treatment for Presbyopia

4:05 p.m.  Michael Gilbert, MD, Presentation and Treatment Outcomes of Orbital Mucormycosis

4:15 p.m.  Jason Sokol, MD, A Multi-Focal Cadaveric Study of the Orbital Anatomy Related to Oculofacial Plastic and Orbital Surgery

4:40 p.m.  Introduction of Dr. Godfrey: John Sutphin, MD

4:45 p.m.  William Godfrey, MD, Lemoine Distinguished Alumnus Lecturer, Quality of Life for Ophthalmology: A Perspective

5:15 p.m.  Session Adjourns

*Onsite reception immediately following*
Kansas EyeCon
May 12 – 13, 2017

Saturday, May 13, 2017

7:30 a.m. Breakfast with exhibitors
8:00 a.m. Welcome – Miranda Bishara, MD

Refractive and Cataract Session

8:05 a.m. Anjulie Quick, MD, Toric Intraocular Implantation in Patient with Pellucid Marginal Degeneration
8:15 a.m. Steven Safran, MD, Cataract Surgery and Lens Exchange Pearls for the Zonular in the Setting of Zonular Compromise: A Step-Wise Approach; Dysphotopsia: A Better Understanding
9:15 a.m. Eric Fry, MD, Cataract Surgery: The Good, the Bad and the Ugly
9:40 a.m. Daniel Durrie, MD, Corneal Crosslinking for Corneal Ectasia
10:05 a.m. Derek Horkey, MD, Effect of Topical NSAIDs on the Prevention of Post-Operative Cystoid Macular Edema after Cataract Surgery: A Retrospective Review
10:15 a.m. Break

Retina Session

10:35 a.m. Robert Null, MD (presenting on behalf of Dr. Jonathan Manhard), Treatment Modalities in Pediatric Uveitis
10:45 a.m. Andrew Symons, MD, MOC Review of Recent Advances in Retina
11:10 a.m. Ravi Singh, MD, Retinal Lymphoma
11:35 a.m. Ivan Batlle, MD, Retinal Detachments: Update
12:00 p.m. John Sutphin, MD, Luther and Ardis Fry Professor and Chairman, Closing Remarks: Future of KU Eye
12:15 p.m. Session Adjourns

University of Kansas Department of Ophthalmology
and The Lemoine Alumni Society
ABSTRACTS
Resident Surgical Experiences and Initial Results using Trabecular Micro-Bypass Stents at a VA Medical Center

Joshua Jones, MD, Resident, Class of 2018
Primary Supervisor: William Bray, MD

Purpose: To evaluate the safety and efficacy of iStent trabecular micro-bypass stent implantation following phacoemulsification in patients with primary open-angle glaucoma by senior ophthalmology residents at a VA Medical Center.

Design: Case series by retrospective chart review from October 2016 to May 2017 where we reviewed 11 charts of patients treated for primary open angle glaucoma using a trabecular micro-bypass stent performed by senior ophthalmology residents. Patients meeting criteria for inclusion had a history of primary open angle glaucoma managed with one or more intraocular pressure (IOP) lowering drops without previous incisional glaucoma surgery. A total of 11 patients and 13 eyes, met our criteria for inclusion.

Methods: Preoperative and postoperative evaluations were performed within 1 month of surgery as well as 1 day, 1 week, 1 month, 3 months, 6 months, and 12 months postoperatively. Evaluations included IOP measurements, topical ocular hypotensive medication use, cup/disc ratio, best corrected visual acuity, complications, and adverse events.

Patients: Among the 11 patients included, 10 were male and 1 was female, with an average age of 73.6 years. All patients had been previously diagnosed with mild to severe primary open angle glaucoma and were receiving treatment with 1-3 IOP lowering medications. Two patients, three eyes, had received previous treatment with selective laser trabeculoplasty. Each eye was implanted with one trabecular micro-bypass stent.

Conclusions: Trabecular micro-bypass stent implantation following phacoemulsification can be safely and efficiently performed by a senior ophthalmology resident. A longer follow-up period is needed to determine if the patients sustained a reduction in IOP and medication use following surgery.
The purpose of this project was to evaluate how intraocular viscoelastic or silicone oil can alter the fluid dynamics of an Ahmed valve. This was done by creating a laboratory setup to simulate intraocular conditions that the Ahmed valve would experience when subjected to silicone oil or ocular viscoelastic. The system included a microfluidics pump used to simulate aqueous production by the ciliary body, which was then connected to an Ahmed valve with an inline pressure transducer and data acquisition system. Initial runs of the system were done without viscoelastic or silicone oil, in order to calibrate the baseline pressure vs flow operating curve of the Ahmed valve. Then, multiple runs were carried out after exposing the Ahmed valve to viscoelastic or silicone oil independently.

The primary finding of this experiment was that either viscoelastic or silicone oil can both substantially increase the measured pressure at a given flow rate, and that the pressure returns to baseline after the viscoelastic or silicone oil is cleared from the system. Also, during the calibration runs without silicone oil or viscoelastic, it was noted that lack of priming an Ahmed valve can raise the measured pressure of the system by a considerable amount, which illustrates the importance of priming the valve prior to implantation.
Filtration Surgery: Indications and Improvements

MICHAEL C. STILES
VOLUNTEER FACULTY, KU EYE

Indications
- Advanced Glaucoma Intervention Study (AGIS) and Collaborative Initial Treatment Glaucoma Study (CITGS)
- Alternatives
  - Medical Therapy Alternative
  - Impact of Clear-Corneal and Small Incision Cataract Surgery
  - Minimally Invasive Glaucoma Surgery (MIGS)
  - Tubes

Improvements: reducing risks
- Preventing subjective vision loss
- Bleb Morphology: Preventing bleb dysesthesia and infection
- Current Research for Alternative Filtration Surgery Options

Case For Early Filter
- 55 yo M referred for “optic nerve evaluation.” Went in for routine check and realized blurred vision OD. (7/18/2002)
- VA: CF 20/40
- IOP OD: 20 mmHg
- TA: 37/23
- CCT: 498/483 microns
- Open angle, no XFS, no trauma, no steroid use
- Given Xalatan OU and Cosopt OD
- Tab with MMC OD (9/10/2002)
- BCVA: 20/50 and 20/20

Filtration Surgery in Glaucoma: Collaborative Initial Treatment Glaucoma Study (CITGS)
- Initial medicine vs. surgery:
  - Achieved VF stability equally well on average as long as aggressive target IOP’s (about 30% reduction) were achieved.
  - Advanced disease on initial diagnosis fared better with initial surgery.

Filtration Surgery in Advanced Glaucoma
Advanced Glaucoma Intervention Study (AGIS)
- AGIS supports Chandler’s and Grant’s original observation in the 1960’s:
  - “Eyes with advanced cupping...require pressures below the average population.”
Decline in Filtration Surgery

Medical Therapy

Pros:
- Well accepted by patients
- Rare vision-threatening side effects

Cons:
- Possible systemic side effects
- Compliance
- About ½ require more than one medication

Why not earlier filtration surgery?
- Hypotony
- Maculopathy
- Choroidal hemorrhage
- Bleb-related complications
- Dysthesia
- Infection

Complications and Vision Loss

Trab vs Tube Study (TVT)
- Complications requiring reoperation or causing loss of vision over 5 years:
  - Trabeculectomy 20%
  - Tube shunt 22%
Minimally Invasive Glaucoma Surgery (MIGS)

- Clear corneal, small-incision phaco
- Effective in angle closure
- Effective in open angle with higher pre-op IOP (up to 22.5% in OHTS)
- More modest effect in normotensive range
- ECP (EndoCyloPhotocoagulation)
- Trabectome
- One iStent

Minimally Invasive Glaucoma Surgery (MIGS)

- Clear corneal, small-incision phaco
- ECP (EndoCyloPhotocoagulation)
- Trabectome
- One iStent

Minimally Invasive Glaucoma Surgery (MIGS)

- Clear corneal, small-incision phaco
- ECP (EndoCyloPhotocoagulation)
- Trabectome
- One iStent

Minimally Invasive Glaucoma Surgery (MIGS)

- Clear corneal, small-incision phaco
- ECP (EndoCyloPhotocoagulation)
- Trabectome
- One iStent (limited FDA approval)

Canaloplasty

Alternative to Meds/Filtering Surg?

- Pros
  - No significant hypotony
  - Limited bleb at most
- Cons
  - Challenging learning curve
  - IOP Reduction (20-35%) in POAG (mid-teens)
  - More dramatic reduction in XFGl
  - One iStent

Case For Early Filter

- What about OS?
  - No HVF loss and normal OCT
  - No change on meds and repeat SLT X 3
  - Recent OCT
  - IOP of 24-30+ No VS cataract
  - Phaco/Trabectome?
  - Trab with MMC OS
Filtration Surgery: Current/Future Role?

- Current trends:
  - Less trabeculectomies in phakic eyes
  - Increasing acceptance of MIGS/CP
  - Accelerates cataract formation
  - More complications with post-trab phaco
  - Potential axial length/corneal topography changes with low IOP
    (refractive surprises more likely with subsequent phaco)
  - Can jeopardize filtration with subsequent phaco

Case for Phaco/Trabeculectomy with MMC

- 78 yo M referred for possible glaucoma and cataract surgery on Combigan and Lumigan. Progressive VF loss despite IOP in the low to mid-teens.
- VA: 20/40 (20/150) 20/30 (20/80)
- Ta: 23/19 (dilated) CCT: 510/492
- Open angles
- Phaco/trab/MMC OD 7/2014, OS being scheduled
- Phaco/MIGS
- Phaco/CP

Limitations of MIGS and Canaloplasty

- Ab-interno procedures require clear cornea
- Assume open angle (except Phaco and ECP)
- Pseudohypertrophic CACI
- NVGl, Traumatic
- LOW target IOP’s not typically obtained
- Assume well-functioning outflow “downstream”

What about Tubes? Trab. vs. Tube Study (TVT) 5 year results

- 212 patients, prospective randomized, multicenter trial
- Prior trab. or cataract surgery
- Compared
  - Trab with MMC (.4mg, 4min.)
  - Baerveldt 350 tube

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<tr>
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*Gedde et. al. AJ O 2012;135:789-803
What about Tubes?

Trab. vs. Tube Study (TVT)

- Tubes Concerns:
  - Diplopia (9.9%)
  - Corneal endothelium long term?
  - Reoperation rate
    - Trab: 29% (tube placement)
    - Tube: 9% (2nd tube or cyclodestruction)

Trabeculectomy:
Still the “Gold Standard”

- Improvements must:
  - Reduce rate of hypotony
  - Reduce rate of infection
  - Avoid anterior, focal, and cystic blebs

Treating Hypotony: Avoiding Permanent Maculopathy

- Timing: preferably within 6 weeks
  - Especially young, high myopes
- IOP needs to be transiently elevated significantly
- Suture repair of flap
  - Open repair (Palmberg)
  - Closed repair
    - Direct flap tightening (9-0 nylon, hVNS needle)
    - Bleb compression sutures

Moorfields Safer Surgery System
Peng Khaw, MD, PhD

- Goal: diffuse and posterior blebs
  - Fomix-based conj. flap
  - Small ostomy/flap ratio (low flow)
  - Posterior flap (posteriorly directed)
  - Large MMC treatment area
  - Diffuse bleb
  - Avoid “ring of steel”
Current Trend in Mitomycin-C Use: Injection

- Originally used post-op for bleb needlings
- Now increasingly used pre-op or intra-op

Rationale: diffuse spread of MMC more likely to yield more diffuse blebs (less long term failure and small, high, and cystic blebs)

Mitomycin-C Use: Injection

- Lim and Colleagues: Paper Presentation AGS Meeting 2014
- Retrospective 3 year data comparing MMC Injection vs. Sponge
  - Injection group
    - Lower IOP
    - Lower post-op med use
    - Less tense and vascular blebs
    - Similar complication rate

Mitosol

- Commercial Preparation, FDA-approved for use in glaucoma surgery
  - Pros
    - Consistent dose, potency with room temperature storage
    - Closed transfer system
    - Can now use MMC in FDA trials
  - Cons
    - Cost

ExPRESS Glaucoma Mini-shunt

- Failed as a full-thickness, small conj. incision procedure
- Converted to use under a scleral flap
  - Pros
    - Predictable outflow size
    - Less tissue removal
    - More secure AC
    - Less early hypotony?
  - Cons
  - Expense

ExPRESS Glaucoma Mini-shunt vs. Trabeculectomy

- Randomized, prospective, multi-center trial, 2 yr. follow-up
- Similar IOP control
- Quicker visual recovery to baseline in ExPRESS (1mo. vs. 3 mos.)
- Less early IOP variability and less complications in ExPRESS
  - AC Shallowing with Choroidals
- Surgically-treated cataract
ExPRESS Glaucoma Mini-shunt

- Other Studies: ExPress vs. Trab
- Quick acuity recovery
- No significant difference in complications or IOP control?
- Not cost-effective?
- ExPRESS
  - Titration of post-op filtration
  - Needle revisions more challenging

Avoiding Hypotony: Ongoing Battle

- Patient Variability
  - Nearly impossible to predict immediate post-op flow or effect of cutting/removing each flap suture
  - Scleral thickness/rigidity
  - Consistent flap/ostomy ratio
  - Aqueous flow rate/outflow ratio
  - Healing rates

Filtration Surgery: Future Options?

- AqueSys® Xen Implant
  - Ab-interno
- InnFocus Microshunt
  - Ab-externo

AqueSys® Materials and Methods

Materials
- Permanent, collagen derived, gelatin implant
  - Implant is soft & flexible when hydrated
  - Material and design mitigate traditional implant issues
    - Absence of Migration
    - Tissue conforming
    - Non-inflammatory

Methods
- Pre-loaded, disposable, "IOL-Like" Inserter
  - Straightforward and adoptable
  - With or without cataract surgery/gonio
  - Removable and/or repeatable

AqueSys® Mechanism of Action

Ab-Interno Sub-Conjunctival Drainage
- Surgical "Gold Standard" IOP reduction delivered minimally invasively
- Clinically proven outflow pathway
- Bypasses all potential outflow obstructions
- Conjunctival sparing: alternative surgical options are not compromised
- Single implant delivers desired effectiveness
- International studies demonstrated safety & efficacy
  - Early, moderate, & refractory glaucoma patients

Xen Implant Insertion
AqueSys Initial Clinical Results

<table>
<thead>
<tr>
<th>Refractory Population</th>
<th>12M (n=23)</th>
<th>18M (n=11)</th>
<th>24M (n=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean IOP mmHg</strong></td>
<td>13.9</td>
<td>12.8</td>
<td>13.2</td>
</tr>
<tr>
<td><strong>Std. Dev.</strong></td>
<td>3.0</td>
<td>3.4</td>
<td>3.7</td>
</tr>
<tr>
<td><strong>Median Meds % Reduction</strong></td>
<td>-71%</td>
<td>-65%</td>
<td>-62%</td>
</tr>
<tr>
<td><strong>% IOP reduction from Best Rx</strong></td>
<td>25%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Median Post of Meds</strong></td>
<td>1.1</td>
<td>1.0</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Mean Pre op IOP = 22.9 mmHg
Median Pre op Meds = 3.1

% IOP reduction from Best Rx:
- 25%
- 30%
- 30%

Median Post of Meds:
- 1.1
- 1.0
- 1.2

Mean Meds % Reduction:
- -71%
- -65%
- -62%

% IOP reduction from Best Rx:
- 25%
- 30%
- 30%

% <21 mmHg and/or -20%
100% 100% 100%

% <18 mmHg and/or -20%
100% 100% 100%

% <16 mmHg and/or -30%
96% 91% 91%

AqueSys U.S. Clinical Study

- FDA has approved the clinical study in the U.S.
- Enrollment now closed for refractory glaucoma subjects
  - Failed previous glaucoma surgery
  - Failed max. meds and LTP
  - 15 sites throughout the U.S. enrolled subjects
  - Each site was required to enroll a minimum of 5 subjects

The Lessons Learned for Glaucoma Drainage Devices:

- Keeping a small lumen tubular device with no reservoir open in the subconj/subTenons space can be accomplished by:
  - Use of an antiproliferative drug to stop the initial insult from surgery - MMC
  - Use of a very inert biomaterial to construct the device that minimizes the long-term foreign body reaction - SIBS
InnFocus Microshunt (IMS) U.S. Clinical Study

- FDA has approved the clinical study in the U.S.
- Enrollment now closed for primary surgical patients with uncontrolled POAG on MTMT with or w/o history of LTP
- Randomized, prospective, multi-center trial comparing IMS with MMC to Trabeculectomy with MMC

Small Implant Filtration Surgery Potential

Pros:
- Controlled and relatively consistent outflow
- Simpler post-op care
- Encourages a diffuse and more posterior bleb, less leak issues potentially
- No diplopia
- Little real estate used

Cons:
- Still subject to episcleral fibrosis
- Bleb still produced
- Cost

Filtration Surgery: Indications and Improvements

- Trabeculectomy remains a vital tool in glaucoma management
- Low targets possible
- Versatile
- Reduces med-dependence the most reliably (in addition to tubes)
- Role has declined over the last 2 decades
- More effective meds
- Repeatable LTP
- Small Incision Clear-Cornea Phaco (Angle Closure)
- MIGS and CP
- TVT Study

Technology that reduces hypotony and bleb-related risks, yet maintains filtration surgery efficacy, will dramatically increase its acceptance earlier in the glaucoma treatment armamentarium
Filtration Surgery: Indications and Improvements

Thank You

Questions/Comments??
Topical eye medications are effective at lowering intraocular pressure and treating patients with glaucoma conditions. However non-adherence to a prescribed drop regimen can limit the effectiveness of glaucoma treatment and place the patient at risk of progression and vision loss.

Nonadherence is multi-factorial and includes factors related to the topical drug, patient beliefs and behavior and physician influence.

Drug related barriers
Side effects
Ocular irritation,
Discomfort
Blurred vision
Hyperemia
Cost burden, especially for the uninsured

Patient beliefs and behaviors barriers
Asymptomatic disease until late
No improvement with treatment
Negative, not positive, reinforcement
Physical limitations
Complex regimen

Physician behavior barrier
React to nonadherence if issue raised by patient
Skeptical that physician influence can change behavior
Idealists actively engaging patients to encourage adherence
Patient education
Reinforce awareness of risk of blindness
Techniques for medicine administration

Nonadherence is associated with an increased risk of glaucoma progression!

Sustained Release Drug Delivery has the potential to obviate many issues related to nonadherence and offers the promise of disrupting our current glaucoma treatment paradigms. Currently no FDA approved SSDD systems clinically available for glaucoma.

Sustained Release
Drug + delivery system + ocular location
Drug
PGA

Delivery systems
Bi-compatible, biodegradable polymers
PLGA, PLA, Chitosan
Micro/nanoparticle
Erodible
Bulk erosion
Surface erosion
Non-erodible

Ocular location
Fornix
Helios Ring
Punctal plug
Mati Evolute
Intracanalicular
OTX-TP
Subconjunctival
pSivida
Nanoliposomes
Anterior chamber
Bimatoprost SR
Envisia ENV515
Glaukos iDose
Vitreous cavity
Icon Bioscience Verisome

Challenges for Sustained Release Drug Delivery
Pharmacologic
Clinical
Financial

References:


Effects of Orbital Decompression on Intraocular Pressure in Graves Orbitopathy

Robert Null, MD, Resident Class of 2017
Primary Supervisor: Jason Sokol, MD

Abstract: Graves orbitopathy is a common disease which lead to visual impairment through a variety of mechanisms, including diplopia, exposure keratopathy, and compressive optic neuropathy. Another mechanism of vision loss, less heavily emphasized historically, is glaucomatous damage to the optic nerve, associated with elevated intraocular pressure often seen in Graves’ orbitopathy. Surgical management of thyroid eye disease, involving orbital decompression by opening the medial or lateral orbital walls or orbital floor, offers the theoretic potential to relive external pressure on the globe, reducing intraocular pressure (IOP) and sparing the eye glaucomatous vision loss. In a retrospective chart review, patients with a diagnosis of thyroid eye disease who underwent any form of orbital decompression by a single surgeon were examined. Overall IOP lowering effect was calculated in all cases as a group, as well as by specific type of decompressive surgery (balanced vs floor/medial wall vs deep lateral wall, both in the immediate post-operative and long term (>6 weeks) periods. IOP trends in patients with both type 1 and type 2 Graves’ disease were also examined.
Small Incision Lenticule Extraction (SMILE) – What you Need to Know

John Doane, MD
Volunteer Faculty, KU Eye

I. Small Incision Lenticule Extraction

   A. Lamellar Corneal Surgery
   B. Development of SMILE
   C. Patient Selection for SMILE
   D. Potential Benefits of SMILE vs LASIK
      1. Faster recovery of post-op dry eye
      2. Quicker reinnervation of corneal nerves

E. Surgical Technique of SMILE

   1. Lenticule or refractive cut
   2. Lenticule side cut
   3. Cap cut
   4. Side Cut

F. Refractive Outcomes of SMILE

   1. Ex-US outcomes
   2. FDA trial results

G. Complications of SMILE

   1. Epithelial abrasions
   2. Incision tears
   3. Retained lenticule fragments

H. Enhancement of SMILE

   1. PRK
   2. LASIK
   3. Repeat SMILE
Small Incision Lenticule Extraction (SMILE)

Original article
Joshua Harvey, Hideki Fukuoka, MD, PhD, Natalie Afshari, MD FACS

Contributed by:
Brad H. Feldman, M.D., and Hideki Fukuoka, MD, PhD

All contributors:
Hideki Fukuoka, MD, PhD

Assigned editor:
Hideki Fukuoka, MD, PhD

Review:
Assigned status Up to Date by Hideki Fukuoka, MD, PhD, Joshua Harvey, Natalie Afshari, MD on April 30, 2015.

Introduction: Small incision lenticule extraction (SMILE) is a relatively new refractive procedure designed to treat a multitude of refractive errors such as myopia, hyperopia, presbyopia, and astigmatism. The procedure involves using a femtosecond laser to create a corneal lenticule which is extracted whole through a small incision without the use of an excimer laser. It is reported to achieve effects similar to laser-assisted in situ keratomileusis (LASIK) with excellent post-operative outcomes.

Background/Overview: Starting in 2007, an intrastromal lenticule method was reintroduced as an alternative to LASIK called Femtosecond Lenticule Extraction (FLEx) intended for patients with extreme myopia. After improvements to scan modes and energy parameters, improved visual recovery times were noted, with refractive results similar to LASIK. Following the implementation of FLEx, a procedure called small incision lenticule extraction (SMILE) was developed, involving a small 2-3 mm incision used to allow for extraction of the whole corneal lenticule without the need to create a flap.

While still in its early stages of proclivity amongst surgeons, SMILE is noted for achieving similar effects as LASIK but with some possible benefits such as faster recovery of post-op dry eye, reinnervation of corneal nerves, and a potential biomechanical advantage. The commencement of this procedure began in September 2011 and is established in various locations such as Europe, China and India. The clinical trial in the USA began in June 2012 and has been expanded by the US FDA after initial signs of success in a small sample of patients. To date, 255 patients have been treated at five centers in the USA. Outside of the USA, there are 150 centers in a total of 38 countries that perform the procedure.

Surgical Technique & History of Procedure: During the SMILE procedure, the patient is raised to the contact glass of the femtosecond laser and suction ports are activated to keep the patient’s eye fixated in the correct position while the lenticule is created. The lower interface of the intrastromal lenticule is created first (using an out-to-in direction with the laser to maximize the time without blurring the patient’s central vision), followed by the upper interface of the lenticule (using an in-to-out direction), known as the cap, and finally a 2–3 mm tunnel incision (usually supero-temporal) that links the cap interface to the corneal surface. To avoid any undesirable effects in the cornea such as haziness, the two interfaces (lower and upper) are created from the endothelial side of the cornea to the epithelial side. The patient is then moved to the surgical microscope for the lenticule separation and extraction part of the procedure. The layers of the lenticule are outlined and the lenticule is removed from the cornea using a pair of retinal micro-forceps, or can be extracted directly from within the pocket with the latest versions of the lenticule stripper, one of many instruments being developed for the SMILE procedure specifically.
When planning the treatment, the following parameters can be selected by the surgeon: cap thickness, cap diameter, cap side cut angle, refractive correction, lenticule diameter (optical zone), lenticule side cut angle, and the minimum lenticule thickness (so that the lower lenticule interface can be easily differentiated from the upper interface).

**Outcomes:** The efficacy and safety of SMILE at the time of its introduction had yet to be established, but studies have since elaborated on these aspects. In a group consisting of 88 eyes, Ang et al. (2014) found that 95.5% of the eyes were within ±1.00 D of the attempted correction and 78.4% were within ±0.50 D of the attempted correction. Additionally it was found that uncorrected visual distance acuity (UDVA) of 20/40 or better was seen in 100% of eyes at 3 month post-op and 76.5% were 20/20 or better, up to 12 months post-op.\[4\] Continuing, it was determined that there was no significant difference between the efficacy, predictability, or safety between low myopia eyes and eyes of -5.00 D or greater, highlighting the large span of cases that this procedure has the potential to improve. Because the incision is so minimal, the possibility of another treatment after SMILE is possible due to the cornea being left mostly intact. Another possibility being examined is the use of the lenticule for re-implantation after being cryopreserved, which has been successfully performed in rabbits.\[5\][6]

**Complications:** Complications arising during the SMILE procedure have been reported very infrequently, supporting the reported safety and predictability of the procedure. Studies using SMILE found epithelial abrasions, small tears at the incision, and perforated caps in few cases, however, none of these patients had late visual symptoms.\[7\] The loss of suction during the femtosecond laser portion of the procedure is one of the primary complications with SMILE, and seems to be a difficult topic to define care that applies to most or all cases. While noted to be very infrequent, one study showed the majority of cases in which suction loss occurred were able to be reapplied in the same setting (81.8%).\[8\]

![Table 1 Visual and refractive outcomes after SMILE](image)

The rest of the suction loss cases were aborted, though, it should be noted that for all cases involving suction-loss, there remained a significant number of patients that attained UDVA within attempted correction. Because a small incision (2-3 mm) is used in place of an entire flap, corneal...
nerve severance is minimal in comparison to LASIK. This coincides with the decreased occurrence of post-operative dry eye and studies have indeed shown an increase in nerve reinnervation after treatment. In a study by Xu et al. comparing dry eye parameters between SMILE and LASIK, all parameters were found to be worse in the early postoperative period for both groups, however the SMILE group showed better scores in tear break up time, the McMonnies score, and Schirmer’s test.[18] These findings by Xu et al. coincide with similar results from a study by Denoyer et al.,[15] which found high rates of dry eye symptoms for both procedures reported one month after surgery, but at 6 months after surgery, 80% of SMILE patients finished using any eye drops in contrast to only 57% of the patients in the LASIK group who did the same.

Conclusions: The SMILE procedure, while still in its early stages, seems to be a promising alternative to LASIK in some cases. Given its flapless technique and results that appear to be similar to LASIK, it may offer the same correctional abilities with the potential benefits of faster recovery of post-op dry eye, quicker reinnervation of corneal nerves, and biomechanical advantages. After clinical trials are completed for SMILE and pending its approval, this procedure may be an upcoming option for some patients, due to its minimally invasive technique and promising outcomes.

References
Malignant Lesions of the Medial Canthus: Current Surgical Practices of ASOPRS Members

Introduction

-**Surgical treatment:** methods to ensure complete resection include frozen-section analysis, wide margins, and Mohs micrographic resection techniques
- Mohs demonstrates highest cure rates for epithelial malignancies involving the medial canthus
- Despite these effective tissue-preserving surgical methods, surgery for medial lesions often requires removal of the lacrimal apparatus
- **Lacrimal dysfunction** may cause epiphora, exposure keratitis, episcleritis, discharge, irritation, and/or pain which may have a significant impact on quality of life for the patient

Methods

-**Given the diversity of surgical practices employed by surgeons in treating malignant lesions involving the medial canthus, we sought to determine current trends**
- 10 question web-based survey sent to current American Society of Ophthalmic Plastic and Reconstructive Surgeons (ASOPRS) members via email database
- 700 emails sent, 157 responses recorded (22.4%)

Results

- Most of the respondents currently practice in the United States (85%), with the regions most highly represented including the Midwest (22%), Northeast (17%), and Southeast (16%)
- Only 27% agree to wait 3-5 years to repair the lacrimal system after excision of malignant medial canthal lesion
- Regional variation: Midwest surgeons almost 3 times more likely to agree than those from Southeast (44% vs. 16%)
Results

- Timing of reconstruction evenly split between immediately (30%), 1 year (30%), and 2-3 years (27%), with fewer waiting 5 years (11%) or over 6 years (3%)
- Surgeons who believe other specialties reconstruct within one year were almost 3 times more likely to disagree with recommendations

Results

- 23% have seen a case of lesion recurrence into the nasal passageway and / or adjacent sinus through the lacrimal system after lesion excision
- These surgeons were twice as likely to agree with recommendations to wait 3-5 years for reconstruction

Discussion

- If the punctum and / or canaliculus is involved during a lesion excision, 75% reconstruct with a stent at the time of initial repair
- Of those that do not reconstruct immediately, most wait either one year (39%) or 2-3 years (41%)
- If reconstruction involves performing a DCR or cDCR with Jones tube placement, most wait 1 year (43%) or 2-3 years (30%)

Discussion

- No clear consensus on management
- Most do not agree to wait 3-5 years for reconstruction
- Practice may be shaped by previous experiences, region of training/practice, beliefs about standard of practice

Discussion

- Although not asked, surgeons may modify treatment plan based on factors, including tumor type and extent of spread
- Timing of follow up may be modified based on timing of reconstruction to identify recurrences early

References

1. RCS, ORHIR, EYLIDS, AND LACRIMAL SYSTEM - 2015 world Edition
Experience with Medpor Nonporous Barrier Sheet in Orbital Fracture Repair

Merryl J. Terry, MD, Resident, Class of 2019
Primary Supervisor: Jason Sokol, MD

Introduction: To evaluate the efficacy of the Medpor nonporous barrier sheet as a substitute for SupraFOIL in orbital fracture repairs.

Methods: A prospective case series using the Stryker 0.4mm thick Medpor nonporous barrier sheet in all patients presenting with orbital fractures over the age of 18 years from December 2014 to June 2015. Patient age, type of fracture, etiology of injury, presence of pre-operative restriction and diplopia, and post-op diplopia were recorded. Orbital floor fractures were repaired using a transconjunctival approach and medial wall fractures were repaired using an external medial canthal incision without fixation of the implant. Combined floor and medial wall fractures were repaired using the "wraparound" repair with the implant. Institutional review board approval was obtained for patients older than 18 years of age. Patients were followed for 6 months. Scanning electron microscopy (SEM) was then used to compare the thickness, smoothness, and porosity of the Medpor nonporous barrier and SupraFOIL implants. Beam deflection testing was also performed to compare the biomechanical properties of each implant.

Results: 47 patients underwent repair of orbital fractures with the Medpor nonporous barrier sheet. Average age was 43.3 years (range 18-84). 27 of 47 patients (57.4%) were males and 20 (42.6%) were females. The most common cause of injuries were: Assault (38.3%), MVA (14.9%), falls (25.5%), and sports-related (10.5%). 20 of 47 patients (42.6%) had isolated orbital floor and 2 patients (4.3%) had isolated medial wall fractures. 15 patients (31.9%) had combined floor and medial wall fractures involving the inferomedial orbital strut. 28 patients (59.6%) had pre-operative diplopia. Timing of surgery was between 3 and 55 days, with the median of 11.5 days. 5 of 47 patients (10.6%) had residual diplopia at their 1 week post-operative visit, each had resolved at 2 months post-op. No diplopia was reported at the 6 month post-operative visit. Electron microscopy showed that the 0.4mm Medpor nonporous barrier implant was thinner (0.33mm) than expected and thinner than 0.4mm SupraFOIL (0.38mm). SEM also showed that the surface of the Medpor nonporous barrier was smooth and nonporous. Beam deflection testing showed that for small forces (< 100 mN) the two materials behaved nearly identically, but at higher forces the nonporous Medpor implant was weaker.

Conclusion: The discontinued manufacturing of the SupraFOIL implant has led to the need for an alternative nonporous and non-metal implant for orbital fractures. Based on outcomes such as resolution of diplopia, the use of Medpor nonporous barrier sheet implant for orbital fracture repair is an effective alternative; there were no complications and no residual diplopia or restriction in our case series. We did find, however, that "0.4mm" Medpor nonporous barrier is thinner (0.33mm) than SupraFOIL implant (0.38mm). The Medpor nonporous barrier was also weaker when compared to SupraFOIL at higher forces >100 mN. This may require thicker implants (~0.5-0.6 mm) for combined orbital floor and medial wall fractures where the orbital strut is involved.

References:
Animal studies have shown that the aging crystalline lens becomes less flexible and is associated with a significant increase in disulfide bonds within the lens. Dihydrolipoic acid has been shown to reduce disulfide bonds and soften the aging animal lens. To facilitate corneal penetration of a topical drop for treatment of presbyopia, a pro-drug was formed: Lipoic Acid Choline Ester (EV06). Pre-clinical formulation of EV06 eye drops, plus toxicity evaluation, set the stage for an FDA-sanctioned Phase I/II clinical trial.

The Phase I/II randomized, multicenter, clinical trial was a double masked study of EV06 vs. Placebo. Presbyopes age 45-55 were enrolled in the 90-day bilateral eye study which revealed essentially no toxicity issues. Study follow-up and compliance were excellent. The mean change in best corrected distance corrected near vision (ETDRS measured) was just over one Snellen line of increase, EV06 vs. Placebo. Additional data will be presented.

In conclusion, Lipoic Acid Choline Ester eye drops were found to be safe and effective in the clinical study. Further study will be necessary to bring EV06 forward toward FDA approval.
Mucormycosis is a devastating fungal infection that most commonly affects immunocompromised patients. Orbital involvement with this infection is a dangerous finding that can portend rapid intracranial extension. Due to its aggressive course and high morbidity and mortality, early diagnosis and treatment of orbital Mucormycosis is critical. We examined the most common presenting symptoms of orbital Mucormycosis in a retrospective case series, as well as the rates of morbidity and mortality in relation to the chosen treatment course.
A Multi-Focal Cadaveric Study of the Orbital Anatomy Related to Oculofacial Plastic and Orbital Surgery

Jason Sokol, MD
Associate Professor, KU Eye

Aim:
The goals of this descriptive study are to look at four components of orbital anatomy: the inferior tarsal muscle, levator palpebrae superioris (LPS) aponeurosis, infraorbital canal (IC), and the ethmoidal foramina 24-12-6mm rule. Specifically, the inferior tarsal muscle study's objective is to classify the presence or absence of the inferior tarsal muscle. The LPS study aims to measure the length of the LPS aponeurosis, identify its attachment point, and locate the muscle-aponeurosis junction (MAJ). The infraorbital canal study evaluates the infraorbital canal location and measurements along the orbital floor in the plane of the anterior zygomatic arch. The ethmoidal foramina study is to verify the literature stating that the distances between the medial margin of the orbit to the anterior ethmoid foramen, from it to the posterior ethmoid foramen and from it to the optic canal are 24mm, 12mm & 6 mm. All four study components tried to see whether there were any variability in regards to gender and age.

Methods:
Inferior Tarsal Muscle: Forty-six lower eyelids of formalin-fixed cadavers were examined. Gross anatomical examination of muscle fibers was used to identify and classify variation. We devised a tripartite classification scheme consisting of absence (0), presence with few small fibers (defined as muscle fibers ≤ 1cm; 1) and presence with more numerous large fibers (defined as muscle fibers > 1cm; 2).

LPS: Forty-four upper eyelids from formalin embalmed adult cadavers were examined. Through a supraorbital approach, orbicularis oculi, orbital fat, and orbital fascia were removed and the LPS exposed. Presence or absences of a fatpad superior to the LPS and attachment to the orbital septum or superior tarsal muscle were noted. Measurements of the upper eyelid from medial to lateral canthus were taken. Eyelid midpoint was used as the landmark to measure the MAJ start point and its aponeurotic extension.

Infraorbital Canal (IC): 56 orbital floors were examined from formalin-fixed cadavers. Thorough dissection and removal of all the structures within the orbit were removed until the periosteum was clearly visualized. The periosteum of the floor of the orbit was removed to reveal the IC along with the infraorbital nerve and artery. Measurements were then taken, all at the plane of the most anterior portion of the zygomatic arch, using a micrometer (mm) of the length from the lateral wall of the orbit to the lateral wall of the infraorbital canal. Then the width of the IC was taken from lateral to medial wall of the IC, and the medial wall of the IC to the medial wall of the orbit.

Ethmoidal Foramina: 46 orbital floors were examined from formalin-fixed cadavers. The orbital contents were removed to reveal the anterior lacrimal crest (ALC), anterior ethmoidal foramen (AEF), posterior ethmoidal foramina (PEF), and optic canal (OC). A plastic probe was placed along the medial border of the orbit beginning posteriorly in the optic canal and extending anteriorly past the anterior lacrimal crest. The probe was then marked with three lines corresponding with the locations of the anterior lacrimal crest, anterior ethmoidal foramen, and the posterior ethmoidal foramen. A micrometer was then used to measure the distance between successive marks and between the most posterior mark and the end of the probe.
**Results:**
The inferior tarsal muscle study found 26 out of 46 lower eyelids to reveal the presence of gross muscle fibers upon examination (56.52%). The LPS study found the average of the levator aponeurosis length and MAJ to be 10.63mm and 13.98mm respectively. It also revealed that aponeurosis attachment to the orbital septum (63.8%) exceeded attachment to the superior tarsus plate (36.2%). The IC study found that the average length from the lateral of the orbit to the lateral portion of the IC was 20.81mm, the canal width average of 3.65mm, and from the medial wall of the IC to the medial wall of the orbit average length of 17.6mm. The ethmoidal foramina study resulted with average length distances of the 24-12-6 rule with ALC - AEF: 20.68 mm, AEF - PEF: 14.32 mm, PEF - OC: 7.59 mm, and ALC - OC: 42.59 mm.

**Conclusion:**
These findings greatly impact the realm of oculofacial plastic and orbital anatomy. Specifically, oculofacial plastic procedures that involve the upper and lower eyelid, along with the floor and medial wall of the orbital can gain insight on important landmarks and lengths that could help reduce surgical complication and/or risks in the future.
A departure from usual Albert Lemoine Lecture that of Presenting Research or Clinical Material but a contemplative, personal view of the forces of our lives, profession, and our society and how these are forcing change in the quality of life for our profession.

- Increasing pressures to restrict our life, liberty, and pursuit of happiness.
- How to increase awareness
- Limit effects
- Emphasize appreciation of the blessings we have
Toric Intraocular Implantation in Patient with Pellucid Marginal Degeneration

Julie Quick, MD, Resident Class of 2017
Primary Supervisor: Miranda Bishara, MD

Pellucid Marginal Degeneration (PMD) is a rare, progressive peripheral corneal ectasia characterized by inferior thinning and irregular astigmatism. Recent case reports show good results with implantation of toric intraocular lens (IOL).¹ We present a case of a 69-year-old male with topographically stable PMD who underwent phacoemulsification and toric IOL placement. There was significant improvement in his vision and reduction of astigmatism suggesting toric IOL is a safe and effective surgical procedure in patients with stable PMD.

Cataract surgery often needs to be performed on patients who have compromised zonules. The cause of the problem may be related to an underlying condition such as pseudoexfoliation syndrome or retinitis pigmentosa or may relate to previous trauma or surgery. This talk will discuss the associations to be aware of and will help individuals learn to recognize the preoperative signs of zonular deficiency on exam. It will then discuss the various intraoperative surgical techniques to deal with cataract removal and IOL placement in the zonular compromised patient using a step wise approach to deal with various degrees of zonular deficiency.

Dysphotopsias continue to be a perplexing problem that has been largely poorly understood. This talk will attempt to help clarify the different types of dysphotopsias, their underlying causes and create a better understanding for treatment. Positive dysphotopsia (halos, starbursts, glare, flickering etc.) etiologies will be considered first with rationale and methods for treatment. Negative dysphotopsia (a dark geometric arc in the temporal visual field) will then be overviewed with a focus on new theories that help explain the phenomenon and create a better understanding of what interventions may be effective and why.

IOL exchange in the setting of the compromised capsular bag:

The indication and incidence of intraocular lens exchange is increasing and indications include refractive errors, dysphotopsia, dislocation, damaged implants, and Uveitis, Glaucoma, Hyphema (UGH) syndrome. This talk will discuss various capsular bag structural problems that may be encountered during lens exchange surgery and demonstrate various surgical techniques to deal with these issues. These will include rhexis modification, capsular bag stabilization, IOL segmentation within the bag, haptic extrication and demonstrate some methods of IOL support which may be required in certain situations.
Cataract Surgery: The Good, the Bad and the Ugly!

Eric Fry, MD
Volunteer Faculty KU Eye

The lecture will be divided into three parts. The 1st part will be cases that had complications, such as posterior capsular rupture or suprachoridal hemorrhage that could have been handled better and one case of capsule distension during hydro-dissection, which resulted in a posterior capsular blow out. The second case is a case of suprachoridal hemorrhage and the multiple ways to deal with the problem.

The second part of the lecture is dealing with anterior capsular tears such as Argentine Flag sign, and zonular dehiscence during cataract surgery. I will discuss strategies to deal with the Argentine Flag once it occurs and techniques to minimize the occurrence during surgery. I will discuss use of capsular retractors, CTRs and Ahmed segments to successfully complete cataract surgery in the presence of zonular instability or compromise.

The third part of the lecture I will discuss placement of the IOL without capsular support. The John Hart Double Needle technique for iris fixated IOLs, and sutured IOLs using Gore-Tex suture (off label) and Hoffman pockets.
CORNEAL CROSS-LINKING
IMPLEMENTATION IN US CLINICAL PRACTICE

Daniel S. Durrie, MD
Volunteer Faculty, KU Eye
Overland Park, KS USA

U.S. CROSSLINKING APPROVAL
RIBOFLAVIN

• April 15, 2016 Approval granted to Avedro, Inc for corneal collagen crosslinking with:
  • Photrexa® Viscous
    • Riboflavin S'-phosphate 0.146%/20% dextran
    • Used for riboflavin loading and during UV exposure
  • Photrexa®
    • Riboflavin S'-phosphate 0.146%
    • Used for corneal swelling after loading phase
  • Corneas <400 um

U.S. CROSSLINKING APPROVAL
PROCEDURE

• 9 mm epithelium removal
• Photrexa Viscous q2' X 30'
  • Check riboflavin uptake
• Ultrasound pachymetry <400 um
  • Instill 2 gtt of Photrex every 5-10 seconds until ≥400 um
• 30 minutes UV exposure
  • Avedro XXL system
    • 365 nm UV, 3mW/cm²
    • Continue Photrexa Viscous q2'

U.S. CROSSLINKING APPROVAL
U.S. CLINICAL TRIAL OUTCOMES

• Approval based on 2 randomized, controlled 12 month clinical trials
• Primary Efficacy Criteria
  • Mean change in Kmax of ≥1D between treatment and control group

U.S. CROSSLINKING APPROVAL
U.S. Clinical Trial Outcomes: Kmax
U.S. CROSSLINKING APPROVAL
U.S. CLINICAL TRIAL OUTCOMES

- Safety assessed in 512 eyes undergoing crosslinking
- Most common ocular adverse reactions:
  - Corneal opacity (haze), punctate keratitis, corneal striae, corneal epithelium defect, eye pain, reduced visual acuity, and blurred vision.

![Example of how haze can present over time on Scheimpflug imaging](image)

PROCEDURE CONSIDERATIONS

- Where the procedure will be performed
- Equipment needed:
  - Photrexa® and Photrexa Viscous®
  - Pre- & Post-op medications
  - KXL System
  - Lid Speculum
  - Epithelial Removal
- Division of labor: aspects that trained personnel can perform
- Scheduling considerations

![CXL Treatment Flow](image)

CXL TREATMENT FLOW: HOW MUCH PHYSICIAN TIME?

<table>
<thead>
<tr>
<th>Treatment Step</th>
<th>Ophthalmologist</th>
<th>Trained Personnel</th>
<th>Time Spent</th>
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<tr>
<td>Position patient &amp; apply topical anesthetics</td>
<td>✓</td>
<td>✓</td>
<td>Under 5 minutes</td>
</tr>
<tr>
<td>Insert lid speculum</td>
<td>✓</td>
<td></td>
<td>A few seconds</td>
</tr>
<tr>
<td>Remove epithelium</td>
<td>✓</td>
<td>✓</td>
<td>Under 5 minutes</td>
</tr>
<tr>
<td>Apply riboflavin</td>
<td>✓</td>
<td></td>
<td>30 minutes</td>
</tr>
<tr>
<td>Confirm treatment parameters and initiate treatment</td>
<td>✓</td>
<td></td>
<td>A few seconds</td>
</tr>
<tr>
<td>Monitor patient during irradiation</td>
<td>✓</td>
<td></td>
<td>30 minutes</td>
</tr>
</tbody>
</table>

BUILDING A "CXL CENTER OF EXCELLENCE"

What would be needed in your practice to create a keratoconus center of excellence?

REFERRAL RELATIONSHIPS

- Incorporating routine screenings
- Early diagnosis and referral
- Referral Network Education:
  - Many KC patients are currently being followed by Optometry
  - Communicate with referral network to inform them of new, FDA approved treatment option
  - Ongoing patient management - patients will still need regular contact lens evaluation
PATIENT SELECTION/TREATMENT CRITERIA

**Photrexa Viscous®** (riboflavin 5'-phosphate in 20% dextran ophthalmic solution) 0.146% and **Photrexa®** (riboflavin 5'-phosphate ophthalmic solution) 0.146% photoenhancers indicated for use with the KXL System in corneal collagen cross-linking for the treatment of progressive keratoconus.

**Diagnosis and Monitoring of Progression**
- Advanced diagnostic equipment
- Placido Topographer
- Scheimpflug Tomographer
- Analyze front and back surface of cornea
- Anterior Segment OCT
- Detailed cross-section of cornea

**Criteria for Treatment**
- Definition of progression
- Minimal corneal thickness

**Pediatric Use**
- The safety and effectiveness of corneal collagen cross-linking has not been established in pediatric patients below the age of 14.

**Geriatric Use**
- No subjects enrolled in the clinical studies were 65 years of age or older.

**Pregnancy & Lactation**
- Safety has not been evaluated. Cross-linking should not be performed on pregnant women. Refer to full Prescribing Information.

USE IN SPECIFIC POPULATIONS

POST-OPERATIVE MANAGEMENT

**Referral Network Education is critical**
- for managing patient expectations and ensuring appropriate future referrals

**Post-operative Care**
- Post-operative regimen
- Expected outcomes
- Definition of Success
- Contact Lens Refitting

PATIENT EDUCATION

**Setting expectations:**
- Conventional CXL is not refractive surgery
- Goal is to limit progression
- Contact lenses and/or spectacles still required

**The most common ocular treatment-emergent adverse events (TEAEs) in any CXL-treated eye were corneal opacity (haze), punctate keratitis, corneal striae, corneal epithelium defect, eye pain, reduced visual acuity, and blurred vision**
PATIENT COUNSELING

- Patients should be advised not to rub their eyes for the first five days after their procedure.
- Patients may be sensitive to light and have a foreign body sensation. Patients should be advised that there may be discomfort in the treated eye and that sunglasses may help with light sensitivity.
- If patients experience severe pain in the eye or any sudden decrease in their vision, they should be advised to contact their physician immediately.
- If the bandage contact lens that was placed on the patient’s eye on the day of treatment falls out or becomes dislodged, the patient should be advised not to replace it and to contact their physician immediately.

BUILDING A “CXL CENTER OF EXCELLENCE”

1. Internal doctor and staff education first
2. Notify your patients that CXL is approved
3. Decide who will do the procedures
4. Decide where you will do the procedures
5. Set patient expectations carefully
6. Go to your outside network after you have you have mastered patient selection, treatment and post op follow-up

COSTS FOR THE PROCEDURE

- Equipment: $85,000
- Riboflavin: $500 per syringe
- In cases where pachymetry is below 400 microns after 30 minutes of drops, you will need to use both syringes or $1000
- 1.5 hours of surgery center or office time
- Follow up needs
- Future vision correction needs?
- Durrie Vision charges: $5000 per eye inclusive of pre-op and post-op care

REIMBURSEMENT FOR CROSS-LINKING IN THE US

- A shift to third-party commercial coverage

QUESTIONS TO CONSIDER

- Is keratoconus an ‘elective’ orphan disease?
- Is CXL a medically necessary procedure?
- Does CXL have significant, demonstrated clinical benefits?
- Is it something you’d expect insurance to cover?

Shift to Third Party Coverage is already happening

- Without early detection and intervention: keratoconus may lead to one or more corneal transplants ($13k to $27k ea. overall cost)
- Patients and practices have already started filing insurance on their own. And some payers have begun to cover, but coverage and payment rates are inconsistent
- Many patients are delaying Cross-linking treatment due to financial concerns and lack of coverage.
- If a patient is indicated for CXL, and they delay treatment, they put their vision at risk.

WHAT DO PAYERS THINK OF CXL?

Note: Lives shown above are commercial only.

COST TO THE KC PATIENT

Annual Out of Pocket costs for KC treatment exceeds $5,000 for 8.2% (46% spent more than $1,000 each year; 2.4% spend more than $10,000 annually.)

Lifetime Out of Pocket costs is in excess of $10,000 for 31.5%. More than half of survey responders have already spent more than $5,000 OOP.

HOW THEY MAKE IT WORK – GOFUNDME.COM

EXAMPLE OF HOW ARE PAYMENTS DETERMINED

<table>
<thead>
<tr>
<th>Code</th>
<th>Examples of how payment is determined</th>
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<tr>
<td>0402T</td>
<td>Collagen cross-linking of cornea.</td>
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<tr>
<td></td>
<td>• Payers may reimburse procedures at a percentage of submitted charge</td>
</tr>
<tr>
<td></td>
<td>• &quot;Submitted&quot; charge vs &quot;Allowed&quot; charge</td>
</tr>
<tr>
<td></td>
<td>• Practice responsibility to set the charge</td>
</tr>
<tr>
<td></td>
<td>• Additional reference materials can be found at Avedro.com/ARCH</td>
</tr>
<tr>
<td>J3490</td>
<td>Unclassified drug</td>
</tr>
<tr>
<td></td>
<td>• Commercial payers establish their own reimbursement methodologies for physician-administered drugs, including:</td>
</tr>
<tr>
<td></td>
<td>• Submit invoice with claim.</td>
</tr>
<tr>
<td></td>
<td>• Payment based on a percentage of Wholesale Acquisition Cost (WAC), published by third-party price reporting warehouses.</td>
</tr>
</tbody>
</table>

In this example, payments with CPT code and J code are not bundled.

AVEDRO IS LAUNCHING REIMBURSEMENT SUPPORT.

• Hotline for Reimb Support Questions – May 25
• Appeals Support – June 25
• Advocate for positive coverage policies for patient
• Work with societies to influence process with payers

Patient Assistance Program

• Free of charge drug for uninsured patients.
• Patients must meet financial eligibility criteria.

Prescription Assistance Program

• Patients who are denied coverage.
• Patient: Out-of-Pocket costs for drug are limited.
• Federal healthcare programs are excluded.

Thank you!
Effect of Topical NSAIDs on the Prevention of Post-Operative Cystoid Macular Edema after Cataract Surgery: A Retrospective Review

Derek Horkey, MD, Resident, Class of 2017
Primary Supervisors: Drs. Miranda Bishara and Paul Munden

Purpose: To investigate whether the use of topical NSAIDs following cataract surgery has any effect on the rate of developing cystoid macular edema after uncomplicated cataract surgery.

Methods: All patients undergoing cataract surgery in the year 2016 by two surgeons were reviewed to look for cases of postoperative cystoid macular edema. One surgeon only uses post-operative topical steroids following cataract surgery while the other surgeon uses topical steroids, NSAIDs, and antibiotics.

Results: While rates of cystoid macular edema following cataract surgery are low in general there was not a statistically significant difference in the rate of post-operative cystoid macular edema between the patients of the two surgeons.

Conclusion: While topical NSAIDs have had a long standing use in the treatment of patients following cataract surgery, their use may not be necessary in uncomplicated cataract surgery. More investigation should be done to find out if there is a subset of patients that would benefit. Decreasing the use of this medication can decrease the financial burden on our patients.
Treatment Modalities in Pediatric Uveitis

Jonathan Manhard, MD, Resident Class of 2019
Primary Supervisor: Erin Stahl, MD
KU EyeCon 2017

Educational objective
Appreciate the common forms of pediatric uveitis, and the main treatment options used for these conditions

Pediatric uveitis classification
- Infectious
  - Numerous causes (e.g. toxoplasmosis, lyme disease, syphilis, TB, toxocariasis, viruses)
- Noninfectious
  - Most commonly JIA associated uveitis and pars planitis
- Masquerade syndromes

JIA-associated uveitis
- Usually presents as chronic anterior uveitis, preceded by arthritis
- Biphasic course (peaks at age 4-5 and 13-14)
- Ocular complications
  - Cataract, secondary glaucoma, synechiae, band keratopathy

Mainstay therapy: corticosteroids
- Topical, peribulbar, intravitreal, systemic
- Intravitreal implants: dexamethasone (ozurdex) and fluocinolone (retisert)
- Significant side effects with prolonged use (ocular & systemic)

Corticosteroid sparing immunomodulatory therapy
- Should be discussed at time of diagnosis

Classic immunomodulatory agents

<table>
<thead>
<tr>
<th>Antimetabolites</th>
<th>T-cell inhibitors</th>
<th>Alkylating agents</th>
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</thead>
<tbody>
<tr>
<td>Methotrexate (Trexal)</td>
<td>Cyclosporine</td>
<td>Chlorambucil</td>
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<tr>
<td>Azathioprine (Imuran)</td>
<td>Tacrolimus</td>
<td>Cyclophosphamide</td>
</tr>
<tr>
<td>Mycophenolate (Cellcept)</td>
<td>Sirolimus</td>
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</tbody>
</table>
**Biologics**

- Infliximab (Remicade)
- Adalimumab (Humira)
- Golimumab (Simponi)
- Etanercept (Enbrel)
- Rituximab (Rituxan)

**The stepladder approach to non-infectious uveitis**

- **Anterior inflammation**
  - Start with aggressive topical corticosteroids & cycloplegia
  - If >0.5 cell remains at 3 months, add local corticosteroid injections
  - Can consider systemic steroids (ideally <3 month duration)
  - Monitor IOP
- **Intermediate/Posterior Inflammation**
  - Start with local corticosteroid injections
  - May add systemic steroids if inadequate response

**Next steps**

- If taper leads to recurrence, add NSAIDs (e.g. naproxen or tolmentin)
- If insufficient response, consider early initiation of immunomodulatory therapy

**Immunomodulatory therapy**

- Methotrexate
  - Generally first choice due to safety/efficacy profile
  - Oral or subcutaneous injection weekly
  - folic acid supplementation/leukovorin
  - Sufficient monotherapy in ¾ of JIA
  - May take up to 3 months to show effect
- Other classic therapy can be substituted or added
  - If control has not been achieved at 6 months
  - Azathioprine, mycophenolate mofetil, or cyclosporine

**Biologic response modifying agents**

- TNF-alpha inhibitors (infliximab & adalimumab)
  - May be used as monotherapy or with classic IMT
  - Adalimumab often tried prior to infliximab
  - 1st line for Behcet’s, 2nd line for JIA after MTX
  - Considered at 3 months for inadequate control
  - Potential 2nd line agent for posterior or panuveitis

**Major biologic trials**

- **SYCAMORE trial**
  - Adalimumab + MTX vs Placebo + MTX for JIA refractory to MTX monotherapy
  - Results expected in 2018
  - Interim data support use of adalimumab in treatment of JIA & uveitis
- **ADJUVITE trial**
  - Adalimumab vs placebo on reducing intraocular inflammation after 2 months of treatment
End of the line – other new biologics

- For those refractory to anti-TNF alpha tx
  - Rituximab
  - Daclizumab
  - Tocilizumab
  - Abatacept

Descending the steps

- Ideal tapering regimens remain unclear
- CMH research
- Multidisciplinary clinic with pediatric rheumatology and ophthalmology

Questions?

jmanhard@kumc.edu

Sources

MOC Review of Recent Advances in Retina

Andrew Symons, MBBS, PhD, FRANZCO

Diabetic retinopathy – protocols T & S

I. Results of DRCR protocol S
II. Discussion of use of VEGF inhibitors vs pan retinal photocoagulation
III. Results of DRCR protocol T

AMD – AREDS2 and CATT 5 year results

I. Indications for dietary supplementation in age-related macular degeneration
II. CATT 5 year results: vision, retinal thickness and geographic atrophy

Novel intraocular lens techniques

I. Technique of scleral tunnel fixation of intraocular lenses
II. Technique of goretex suture scleral fixation of Bausch and Lomb Akreos lens
III. Comparison of anterior chamber intraocular lens fixation, iris suture fixation and recent scleral fixation methods

ROP – AP-ROP and anti-VEGFs

I. Identification and treatment of aggressive posterior retinopathy of prematurity
II. Indications for use of VEGF inhibitors in ROP
III. Summary of the literature on potential developmental risks of VEGF inhibitors in ROP

Genetic disease

I. Identification of patients who would potentially benefit from genetic therapy: Leber's congenital amaurosis, choroideremia
II. Summary of genetic treatments
Primary Vitreo-Retinal Lymphoma

Ravi Singh, MD
Volunteer Faculty, KU Eye

Primary Vitreo-Retinal Lymphoma (PVRL) is a rare malignancy that affects the vitreous, retina, uveal tissue and optic nerve. The central nervous system is involved at some stage in over 80% cases. PVRL can masquerade as intermediate uveitis and may present with varying degree of symptoms. Diagnosis can be made with cytokine analysis of ocular fluids along with cytology, immunohistochemistry and flow cytometry of vitreous specimens.

Goal of treatment is eradication of intraocular disease and prevention/treatment of CNS lymphoma. Treatment strategies used include globe irradiation, intravitreal chemotherapy, and systemic chemotherapy. Even with aggressive treatment, the disease has a poor prognosis.
Retina Detachments: Update

Ivan Batlle, MD
Volunteer Faculty, KU Eye

Retinal detachment surgery has remained essentially unchanged for the last ten years. However, instrumentation has advanced. Smaller gauge vitrectomy instruments have made surgery sutureless and faster. Surgical results have improved to 90% -95% success with one or more surgeries. Superior detachment without inferior peripheral disease can be treated with pneumatic retinopexy with good success rate. Timing of the surgery has also changed. Studies have shown that post-operative visual acuity is associated with preoperative vision rather than the duration of the detachment. The status of the macula, on or off, was not predictive of post-operative vision.

Lattice degeneration and atrophic holes are treated when symptomatic. There is no consensus in the literature regarding the need to treat asymptomatic peripheral lesions on a contralateral eye. However, one must carefully evaluate the other eye as there is a higher incidence of detachments in fellow eyes.
KU MD and Residency Alumni Directory
<table>
<thead>
<tr>
<th>Name</th>
<th>MD Class</th>
<th>Residency Class</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wayne Anliker MD</td>
<td>1997</td>
<td></td>
<td>Emporia, KS</td>
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<tr>
<td>Thomas Ashley MD</td>
<td>1984</td>
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<td>Topeka, KS</td>
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<tr>
<td>Adam AufderHeide MD</td>
<td></td>
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<td>Mission, KS</td>
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<td>Douglas B. Babel MD</td>
<td>1992</td>
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<td>Hasan Bahrani MD</td>
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<tr>
<td>Richard Barr MD</td>
<td>1957</td>
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<tr>
<td>Donald E. Beahm MD</td>
<td>1971</td>
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<td>William R. Beck MD</td>
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<td>Deloris W. Bell MD</td>
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<td>Ravi B. Berger MD</td>
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<td>Cleveland, OH</td>
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<td>Ann Bidwell MD</td>
<td>1980</td>
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<td>Round Lake, IL</td>
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<td>Miranda Bishara MD</td>
<td></td>
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<td>Thomas C. Black MD</td>
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<td>Audrey Blacklock MD</td>
<td>2006</td>
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<td>Jeffrey A. Boomer MD</td>
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<td>Michelle Boyce MD</td>
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<td>Emily Broxterman MD</td>
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<td>Michael Brusco MD</td>
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<td>Trey M. Butler MD</td>
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<tr>
<td>Anita Campbell MD</td>
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<td>William Campbell MD</td>
<td>1965</td>
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<td>Thomas P. Campbell MD</td>
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<td>1986</td>
<td>Wheat Ridge, CO</td>
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<td>Patrick K. Canon MD</td>
<td></td>
<td>2001</td>
<td>Colorado Springs, CO</td>
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<td>Timothy Cavanaugh MD</td>
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<td>1986</td>
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<tr>
<td>Mary Champion MD</td>
<td></td>
<td>2015</td>
<td>Phoenix, AZ</td>
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<tr>
<td>Ryan Christensen MD</td>
<td>2004</td>
<td>2008</td>
<td>Shawnee Mission, KS</td>
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<tr>
<td>Amy Ciccio MD</td>
<td>2002</td>
<td>2006</td>
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<tr>
<td>Justin T. Cohen MD</td>
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<tr>
<td>Sam N. Cohlmia, MD</td>
<td>1993</td>
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<tr>
<td>Brian E. Conner MD</td>
<td></td>
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<td>Salina, KS</td>
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</table>
Terry A. Cox MD
MD Class: 1975
Residency Class: 1979
Columbia, SC

Charles H. Cozean MD
MD Class: 1962
Residency Class: 1966
Cape Girardeau, MO

Valerie Crandall MD
Residency Class: 1982
Ft. Myers, FL

Terrence Curran MD
MD Class: 1972
Residency Class: 1977
Prairie Village, KS

Mohammad Dastjerdi MD
Residency Class: 2013
Newark, NJ

Sujote David MD
MD Class: 1991
Residency Class: 1994
Kansas City, KS

Brandon Davis MD
Residency Class: 2007
New Orleans, LA

John Doane MD
MD Class: 1990
Residency Class: 1995
Leawood, KS

Luke Dolezal MD
Residency Class: 2018
Prairie Village, KS

Thomas G. Duckett MD
MD Class: 1967
Broomfield, CA

KU MD and Residency Alumni

Alina Dumitrescu MD
Residency Class: 2015
Iowa City, IA

David S. Dyer MD
MD Class: 1989
Overland Park, KS

Richard J. Eggleston MD
Residency Class: 1974
Clarkston, WA

Mark D. Emig MD
MD Class: 1988
Residency Class: 1993
Omaha, NE

Nicholas Engelbrecht MD
MD Class: 1996
St. Louis, MO

Sujote David MD
MD Class: 1991
Residency Class: 1994
Kansas City, KS

Brandon Davis MD
Residency Class: 2007
New Orleans, LA

John Doane MD
MD Class: 1990
Residency Class: 1995
Leawood, KS

Luke Dolezal MD
Residency Class: 2018
Prairie Village, KS

Thomas G. Duckett MD
MD Class: 1967
Broomfield, CA

KU MD and Residency Alumni

Kenneth J. Frank MD
MD Class: 1992
Ottawa, KS

Eric L. Fry MD
MD Class: 2003
Residency Class: 2007
Garden City, KS

Luther L. Fry MD
MD Class: 1967
Garden City, KS

Scott Fudemberg MD
Residency Class: 2007
Philadelphia, PA

Valerie Garden MD
Fellow: 2000
Santa Rosa, CA

Amy Gemperli MD
MD Class: 1992
Residency Class: 1996
Kansas City, MO

Darrell E. Genstler MD
Residency Class: 1981
Albany, OR

James A. Gessler MD
MD Class: 1974
Springfield, MO

Michael Gilbert, MD
Residency Class: 2019
Prairie Village, KS

Erin Gilliland MD
MD Class: 1999
St. Joseph, MO
KU MD and Residency Alumni

William A. Godfrey MD
MD Class: 1965
Residency Class: 1971
Prairie Village, KS

Robert T. Goetzinger MD
MD Class: 1971
Residency Class: 1976
Riverdale, GA

Andre J. Golina MD
Residency Class: 1979
West Palm Beach, FL

Charles E. Graham MD
Residency Class: 1993
Las Vegas, NV

R. Bruce Grene MD
MD Class: 1978
Wichita, KS

Hasan Hakim MD
Residency Class: 1997
Dearborn, MI

James R. Hardin MD
Residency Class: 1997
Salisbury, NC

David Hardten, MD
MD Class: 1987
Minneapolis, MN

Toby Hartong MD
Residency Class: 1982
Leawood, KS

James D. Haug MD
MD Class: 1981
Residency Class: 1985
Atchinson, KS

K. Dwight Hendricks MD
Residency Class: 1983
Kansas City, KS

James A. Hiatt MD
MD Class: 1999
Residency Class: 2003
Mesa, AZ

Derek Horkey MD
Residency Class: 2017
Prairie Village, KS

Alan Hromas MD
Residency Class: 2014
Wichita, KS

Ana G. Huaman MD
MD Class: 1984
Residency Class: 1996
Albuquerque, NM

Quentin C. Huerter MD
MD Class: 1959
Residency Class: 1969
Leawood, KS

Denise A. Hug MD
MD Class: 1996
Kansas City, MO

John D. Hunkeler MD
MD Class: 1967
Residency Class: 1973
Overland Park, KS

Joel Hunter MD
Fellow: 2010
Orlando, FL

Richard L. Irwin MD
MD Class: 1975
Residency Class: 1980
Putnam, CT

Srinivas Iyengar MD
Residency Class: 2008
Encinitas, CA

Randolph Jackson MD
Residency Class: 2004
Kansas City, KS

Russell Jayne MD
Fellow: 1997
Las Vegas, NV

Andrew J. Jefferson MD
Residency Class: 1986
Leawood, KS

Faisal Jehan MD
MD Class: 1998
Residency Class: 2003
Fontana, CA

Cindi Kalin Johnson MD
Residency Class: 1994
Leavenworth, KS

Josh Jones MD
Residency Class: 2018
Prairie Village, KS

Raymond E. Kandt MD
Residency Class: 1967
Prairie Village, KS

Neda Karimi MD
MD Class: 2001
Residency Class: 2005
Santa Monica, CA

Rickey D. Kellerman MD
MD Class: 1978
Wichita, KS
KU MD and Residency Alumni

Daniel M. King  MD  MD Class: 1974  Residency Class: 1982  Red Bluff, CA

David A. Kingrey MD  MD Class: 1994  Wichita, KS

Jess Koons MD  MD Class: 1957  Liberal, KS

Ernest Kovarik MD  Residency Class: 1969  Shawnee Mission, KS

Randall J. Kresie MD  MD Class: 1984  Residency Class: 1988  Topeka, KS

Kartik Kumar MD  Residency Class: 2011  Houston, TX

Leila Kump MD  Residency Class: 2010  Gaithersburg, MD

Bradley R. Kwapiszeski MD  MD Class: 1991  Shawnee Mission, KS

Brian A. LaGreca MD  Residency Class: 1992  Billings, MT

Dale Laird MD  MD Class: 1968  Residency Class: 1974  Belton, MO

Ryan Larscheid MD  Residency Class: 1974  Fountain Valley, CA

Diana Lind DO  Residency Class: 1997  Kearney, NE

Timothy Lindquist MD  Residency Class: 2012  Overland Park, KS

Rebecca Linquist MD  Residency Class: 2013  Rapid City, SD

Robert A. Lowenthal MD  Residency Class: 1994  Springfield, IL

Barry C. Malloy MD  Residency Class: 1989  Wyomissing, PA

Jonathan Manhard, MD  Residency Class: 2019  Prairie Village, KS

Babak Marefat MD  MD Class: 1999  Topeka, KS

John Marsh MD  MD Class: 1992  Residency Class: 1996  Topeka, KS

Federico Mattioli MD  Residency Class: 2000  Houston, TX

Donald Maxwell MD  Residency Class: 1986  Oklahoma City, OK

Mark Mazow MD  Residency Class: 1990  Dallas, TX

Thomas L. McDonald MD  MD Class: 1984  Residency Class: 1988  Hays, KS

Lynne G. McElhinney MD  MD Class: 1995  Kansas City, MO

Wilber McElroy MD  MD Class: 1961  Topeka, KS

Frank E. McKee MD  MD Class: 1970  Overland Park, KS

Peter Mitrev MD  Residency Class: 1998  Chesapeake, VA

Reid Mollman MD  Residency Class: 2018  Prairie Village, KS

Louis Monaco DO  DO Class: 1982  Clinton, MO

Susan K. Mosier MD  MD Class: 1995  Lawrence, KS

Everett C. Moulton MD  Residency Class: 1979  Ft. Smith, AR

Andrew Moyes MD  MD Class: 1989  Kansas City, MO
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<tr>
<th>Name</th>
<th>Class Year</th>
<th>Residency Year</th>
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<tr>
<td>Brian C. Mulrooney MD</td>
<td>1999</td>
<td>2000</td>
<td>Huntsville, AL</td>
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<tr>
<td>Forrest P. Murphy MD</td>
<td>1978</td>
<td>1985</td>
<td>Rancho Mirage, CA</td>
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<td>Todd Nickel DO</td>
<td>2000</td>
<td>2004</td>
<td>Tyler, TX</td>
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<td>Robert Null MD</td>
<td>2017</td>
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<td>Bruce B. Ochsner MD</td>
<td>1965</td>
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<td>Sara O'Connell MD</td>
<td>1994</td>
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<td>Timothy Olsen MD</td>
<td>1989</td>
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<td>Richard A. Orchard MD</td>
<td>1965</td>
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<td>Charles F. Palmer MD</td>
<td>2000</td>
<td>1975</td>
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<td>Anna (Berry) Parlin MD</td>
<td>2016</td>
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<td>Theodore Pasquali MD</td>
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<td>Michael Pekas MD</td>
<td>1976</td>
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<td>Cindy Penzler MD</td>
<td>1985</td>
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<td>Ryan Pine MD</td>
<td>2012</td>
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<td>Kenneth C. Place MD</td>
<td>1973</td>
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<td>John Pokorny MD</td>
<td>1989</td>
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<td>Patrick (Frank) Price MD</td>
<td>1975</td>
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<td>Bradford S. Prokop MD</td>
<td>1961</td>
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<td>Gary V. Puro MD</td>
<td>1975</td>
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<td>Truth or Consequence, NM</td>
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<td>Anjulie Quick MD</td>
<td>2017</td>
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<td>Deborah Reid MD</td>
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<td>2000</td>
<td>Annapolis, MD</td>
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<td>Robert Reinecke MD</td>
<td>1959</td>
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<td>Martin Reinke MD</td>
<td>1995</td>
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<td>Donald A. Relihan MD</td>
<td>1954</td>
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<td>Garrick Rettele MD</td>
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<td>Michael G. Reynolds MD</td>
<td>1988</td>
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<td>Geoffrey L. Rice MD</td>
<td>1985</td>
<td>1985</td>
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<td>James R. Rinne MD</td>
<td>1984</td>
<td>1988</td>
<td>Campbellsville, KY</td>
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</tbody>
</table>
Wallace B. Smith MD  
MD Class: 1954  
Residency Class: 1962  
Lees Summit, MO  

Ryan Smith MD  
Fellow: 2009  
Augusta, GA  

David L. Spalding MD  
MD Class: 1959  
Residency Class: 1965  
Rogersville, MO  

Jennifer Spiegel MD  
MD Class: 2009  
Residency Class: 2013  
Thousand Oaks, CA  

Erin D. Stahl MD  
Residency Class: 2009  
Fellow: 2011  
Kansas City, MO  

Larry Stauffer MD  
MD Class: 1969  
Residency Class: 1975  
Jefferson City, MO  

Ann Stechschulte MD  
Residency Class: 2005  
Shawnee Mission, KS  

Richard A. Stein MD  
Residency Class: 1994  
Leavenworth, KS  

Michael Stiles MD  
MD Class: 1985  
Residency Class: 1989  
Overland Park, KS  

Carl Stout MD  
Residency Class: 1976  
Independence, MO  

Timothy M. Stout MD  
MD Class: 1995  
Residency Class: 1999  
Leawood, KS  

Manju Subramaninan MD  
Residency Class: 2002  
Boston, MA  

Beatty G. Suiter MD  
MD Class: 1999  
Residency Class: 2004  
Fellow: 2009  
Shawnee Mission, KS  

Merry Terry, MD  
Residency Class: 2019  
Prairie Village, KS  

Kevin Toller MD  
MD Class: 1994  
Grove, OK  

Patricia L. Turner MD  
Residency Class: 1984  
Reno, NV  

Chris Ullrich DO, FACS  
DO Class: 1992  
Washington, MO  

Steven Unterman MD  
Residency Class: 1987  
Prairie Village, KS  

Trent Vande Garde MD  
MD Class: 1995  
Topeka, KS  

Michael P. Varenhorst MD  
Residency Class: 1984  
Wichita, KS
<table>
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<tr>
<th>Name</th>
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<tr>
<td>Natalia Villate MD</td>
<td>2008</td>
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<td>Boca Raton, FL</td>
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<td>Them Vu MD</td>
<td>2000</td>
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<td>Plano, TX</td>
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<td>Brian Boxer Wacher MD</td>
<td>1998</td>
<td>Residency Class: 1998</td>
<td>Los Angeles, CA</td>
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<td>Matthew Wayner MD</td>
<td>1990</td>
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<td>Walter Dan Weaver MD</td>
<td>1969</td>
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<td>Robert Weir MD</td>
<td>1967</td>
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<td>Kansas City, MO</td>
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<td>Mark L. Wellemeeyer MD</td>
<td>1988</td>
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<td>Kent L. Wellish MD</td>
<td>1992</td>
<td>Residency Class: 1992</td>
<td>Las Vegas, NV</td>
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<td>Thomas Williams MD</td>
<td>1994</td>
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<td>Hickory, NC</td>
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<td>Stewart M. Wilson MD</td>
<td>1968</td>
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<td>Roseburg, OR</td>
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<td>Terria Winn MD</td>
<td>1982</td>
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<td>Chauncey B. Witcraft MD</td>
<td>1984</td>
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<td>Miami, OK</td>
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<td>Jerry B. Wurster MD</td>
<td>1964</td>
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<td>Scottsdale, AZ</td>
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<td>Lillian Yang MD</td>
<td>2016</td>
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<td>Michelle Yao MD</td>
<td>2009</td>
<td>Residency Class: 2009</td>
<td>Woodbury, NY</td>
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</tbody>
</table>

Thomas J. Whittaker MD, JD
MD Class: 1990
Prairie Village, KS
Contact information:

KU Eye Center, Optical Shop & University of Kansas Hospital Specialty Surgery Center: 7400 State Line Rd., Prairie Village, KS 66208

KU Eye Miller Clinic and Optical Shop:
3901 Rainbow Blvd., Miller Building, First Fl., Ste. 1011, Kansas City, KS 66160

Administration: 913-588-6605

State Line Optical Shop: 913-588-6600, Option 4
Miller Clinic Optical Shop: 913-588-6674

Billing: 877-287-6268
LASIK and Refractive Surgery: 913-588-0105

Medical Records: Phone: 913-588-6645 and Fax: 913-588-6655

The University of Kansas Hospital Specialty Surgery: 913-588-2020

Physician Referral and Consultation Urgent and Same-Day Transfers
913-588-1227, 913-588-5862 or 877-588-5862
For emergencies, after hours and weekends, call 913-588-6600 and press "0" to ask for the doctor on-call.