



STATE BOARD OF OPTOMETRY
2450 DEL PASO ROAD, SUITE 105, SACRAMENTO, CA 95834
P (916) 575-7170 F (916) 575-7292 www.optometry .ca.gov



Continuing Education Course Approval Checklist

Title:

Provider Name:

- Completed Application
 - Open to all Optometrists? Yes No
 - Maintain Record Agreement? Yes No
- Correct Application Fee
- Detailed Course Summary
- Detailed Course Outline
- PowerPoint and/or other Presentation Materials
- Advertising (optional)
- CV for EACH Course Instructor
- License Verification for Each Course Instructor
 - Disciplinary History? Yes No

1-1774 802599 802599 50

BUSINESS, CONSUMER SERVICES, AND HOUSING AGENCY

GOVERNOR EDMUND G. BROWN JR.



STATE BOARD OF OPTOMETRY
2450 DEL PASO ROAD, SUITE 105, SACRAMENTO, CA 95834
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CONTINUING EDUCATION COURSE APPROVAL APPLICATION

\$50 Mandatory Fee

Pursuant to California Code of Regulations (CCR) § 1536, the Board will approve continuing education (CE) courses after receiving the applicable fee, the requested information below and it has been determined that the course meets criteria specified in CCR § 1536(g).

In addition to the information requested below, please attach a copy of the course schedule, a detailed course outline and presentation materials (e.g., PowerPoint presentation). Applications must be submitted 45 days prior to the course presentation date.

Please type or print clearly.

Course Title Fall 2016 Optometry Symposium Anterior Segment/Ocular Surface	Course Presentation Date 7:30 AM - 3:15 PM 1 1 / 1 3 / 2 0 1 6
-----------------------------------------------------------------------------------------	-----------------------------------------------------------------------------

Course Provider Contact Information

Provider Name LOMA LINDA UNIVERSITY EYE INSTITUTE		
(First)	(Last)	(Middle)

Provider Mailing Address 1370 ANDERSON ST. Street # 2025 City Loma Linda State CA Zip 92354			
----------------------------------------------------------------------------------------------------------	--	--	--

Provider Email Address jpolanco@llu.edu

Will the proposed course be open to all California licensed optometrists?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
---------------------------------------------------------------------------	---------------------------------------------------------------------

Do you agree to maintain and furnish to the Board and/or attending licensee such records of course content and attendance as the Board requires, for a period of at least three years from the date of course presentation?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------

Course Instructor Information

Please provide the information below and attach the curriculum vitae for each instructor or lecturer involved in the course. If there are more instructors in the course, please provide the requested information on a separate sheet of paper.

Instructor Name Michael Rauser		
(First)	(Last)	(Middle)

License Number G85469	License Type MD
------------------------------	------------------------

Phone Number (909) 558.2076	Email Address jpolanco@llu.edu
------------------------------------	---------------------------------------

I declare under penalty of perjury under the laws of the State of California that all the information submitted on this form and on any accompanying attachments submitted is true and correct.

Signature of Course Provider *Michael Rauser*

Date 11/14/16

<u>Physician</u>	<u>Medical License #</u>	<u>email</u>
Affeldt, John C. MD	G38490	jaffeldt@llu.edu
Esmail, Fatema Q. MD	A126363	fesmail@llu.edu
Guan, Howard D. MD	A119766	hguan@llu.edu
Khazaeni, Leila M. MD	A92331	lkhazaeni@llu.edu
Luke, Priscilla K. MD	A107548	pluke@llu.edu
Rauser, Michael E. MD	G85469	mrauser@llu.edu
Sierpina, David I. MD	A126092	dsierpina@llu.edu
Cotter, Susan O.D., M.S.	7784TPA	cottlee@ohsu.edu

Dear Optometric CE Board,

Attached is the supplemental materials required for obtaining Optometric CE credit for the Nov 13, 2016 Optometry Symposium sponsored by the Loma Linda University Eye Institute. We followed the usual submission process for obtaining CE credit as in previous years; but became aware of the new additional requirements shortly before the scheduled conference date. In the future we will ensure that a complete application following the new requirements will be received by your office at least 45 days prior to the scheduled date, as now required.

Our annual conference is composed of lecture topics that provide updates in the management of common ocular disorders. This year's symposium can be grouped into 3 main categories :

① Anterior segment/ Ocular surface :

Phakic Intraocular lenses

Refractive Cataract Surgery – A Cost Effective Approach

Update on Dry Eye

The Mystery of Meibomian Gland Dysfunction

The Usual (Glaucoma) Suspects

② Pediatric Eye Disorders:

Challenging Strabismus Cases

Myopia

Adult Strabismus

The Preschool Eye Exam Made Easy

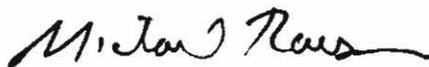
Management of Refractive Error on Preschool Children

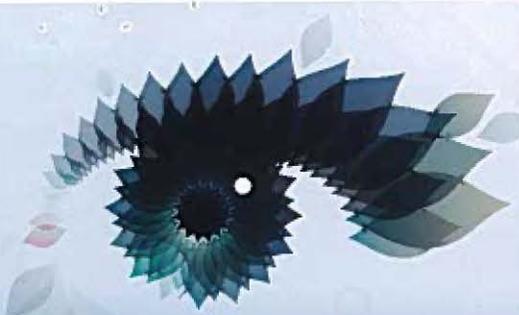
③ Current Research Studies at the Loma Linda University Eye Institute

Based on the current application requirements, this symposium would require 3 separate applications to obtain CE approval for the conference. Thanks for your consideration.

Sincerely,

Michael Rauser, MD
Chairman, LLU Eye Institute
Associate Professor, LLU SOM Ophthalmology





Fall 2016

Optometry Symposium

SCHEDULE OF EVENTS

7:30 a.m. Registration & Breakfast

7:55 a.m. Michael Rauser, MD
Welcome and Overview

8:00 a.m. Frank Hwang, MD
Phakic Intraocular Lenses

8:30 a.m. Timothy Winter, MD
Challenging Strabismus Cases

9:00 a.m. Fatema Esmail, MD
Myopia

9:30 a.m. Leila Khazaeni, MD
Adult Strabismus

10:00 a.m. **Break**
Visit with Speakers at Designated Tables

10:30 a.m. Sue Cotter, OD
The Preschool Eye Exam Made Easy

11:15 a.m. Sue Cotter, OD
Management of Refractive Error in Preschool Children

12:00 p.m. Buffet Lunch

12:30 p.m. Michael Rauser, MD
Department Update

12:45 p.m. Michael Rauser, MD
Refractive Cataract Surgery, A Cost Effective Approach

1:15 p.m. John Affeldt, MD
Update on Dry Eye

1:45 p.m. Priscilla Luke, MD
The Mystery of Meibomian Gland Dysfunction

2:15 p.m. Howard Guan, MD
The Usual (Glaucoma) Suspects

2:45 p.m. David Sierpina, MD
Current Research Activities at Loma Linda University Eye Institute

3:15 p.m. **Closing Remarks and Adjournment**

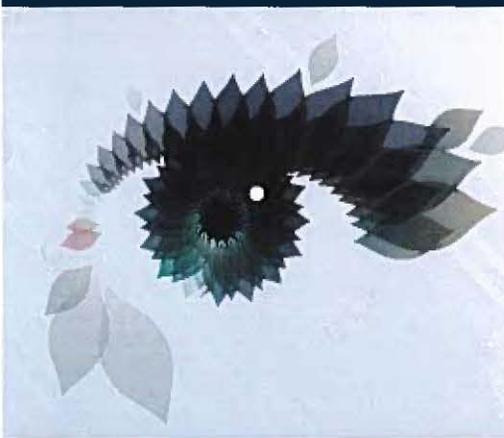


LOMA LINDA
UNIVERSITY

Eye Institute

Loma Linda University Eye Institute

Fall 2016 Optometry Symposium



Sunday, November 13, 2016
7:30 a.m. – 3:30 p.m



LOMA LINDA UNIVERSITY
Eye Institute

FALL 2016 Optometry Symposium

SCHEDULE OF EVENTS

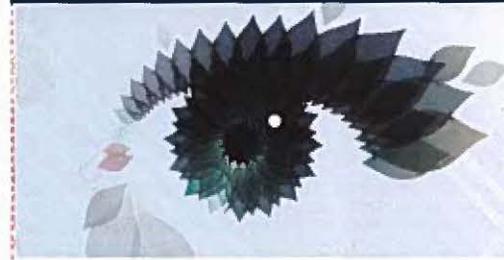
- | | | | |
|-------------------|-----------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------|
| 7:30 A.M. | Registration & Breakfast | 12:30 P.M. | Michael Rauser, MD
<i>Department Update</i> |
| 7:55 A.M. | Michael Rauser, MD
Welcome and Overview | 12:45 P.M. | Michael Rauser, MD
Refractive Cataract Surgery,
A Cost Effective Approach |
| 8:00 A.M. | Frank Hwang, MD
Phakic Intraocular Lenses | 1:15 P.M. | John Affeldt, MD
Update on Dry Eye |
| 8:30 A.M. | Timothy Winter, MD
<i>Challenging Strabismus Cases</i> | 1:45 P.M. | Priscilla Luke, MD
The Mystery of Meibomian
Gland Dysfunction |
| 9:00 A.M. | Fatema Esmail, MD
<i>Myopia</i> | 2:15 P.M. | Howard Guan, MD
The Usual (Glaucoma) Suspects |
| 9:30 A.M. | Leila Khazaeni, MD
<i>Adult Strabismus</i> | 2:45 P.M. | David Sierpina, MD
<i>Current Research Activities at
Loma Linda University Eye Institute</i> |
| 10:00 A.M. | Break
<i>Visit with Speakers at
Designated Tables</i> | 3:15 P.M. | Closing Remarks
and Adjournment |
| 10:30 A.M. | Sue Cotter, MD
<i>The Preschool Eye Exam Made Easy</i> | | |
| 11:15 A.M. | Sue Cotter, MD
<i>Management of Refractive Error in
Preschool Children</i> | | |
| 12:00 P.M. | Buffet Lunch | | |



LOMA LINDA UNIVERSITY
Eye Institute

Loma Linda University Eye Institute

Fall 2016 Optometry Symposium



Registration Form

Name _____

Mailing Address _____

City _____ State _____ Zip _____

Telephone _____ License # _____

Email _____

(Needed for RSVP Confirmation)

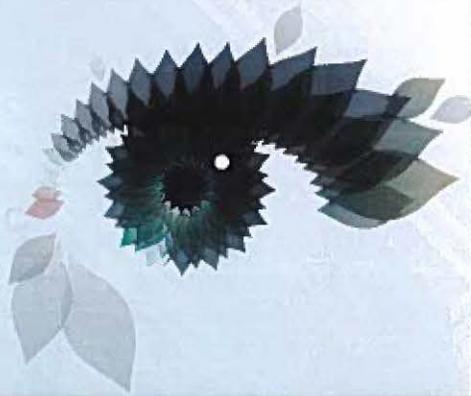
**Please RSVP by mailing registration form
with payment to: LLU EYE INSTITUTE**
Attn: Jason Polanco
11370 Anderson Street, Suite 2025
Loma Linda, CA 92354
Fee: \$25.00

Please make check payable to:
LLU Eye Institute

*No refunds will be given after Monday, October 31, 2016.

Loma Linda University Eye Institute

Fall 2016 Optometry Symposium



LOMA LINDA UNIVERSITY
Eye Institute
11214 Anderson Street
Loma Linda, CA 92350

Nonprofit
Organization
US Postage
PAID
San Bernardino, CA
Permit No. 1772

STATEMENT OF OBJECTIVES

Upon completion of this course, participants will be able to:

1. Understand how structural abnormalities in the visual pathway correspond to visual field pattern defects
2. Better understand the clinical entity of neurotrophic keratitis
3. Recognize the clinical findings of common yet often overlooked corneal causes for suboptimal vision.
4. Know the role of Aflibercept in the treatment of age-related macular degeneration, diabetic macular edema and retinal vein occlusion
5. Understand the potential etiologies of ocular torticollis including cranial nerve palsies, strabismus syndromes, pattern strabismus and nystagmus and how to manage each
6. Know the clinical indications for functional eyelid surgery

ACCREDITATION

This course is pending approval from the State Board of Optometry for a total of 6.0 CE.

COURSE DESCRIPTION

Loma Linda University Eye Institute is pleased to invite you to the Fall 2016 Optometry Symposium.

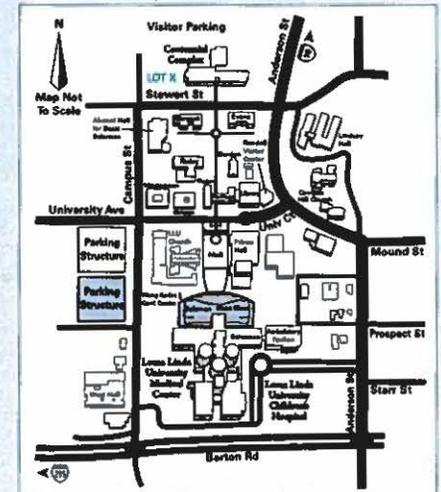
The symposium will emphasize when to appropriately treat or refer patients for specific eye conditions. The use of new pharmacological agents and new technologies in the diagnosis and treatment of ophthalmic disorders will be highlighted. The fee for this meeting is \$25.00 and six hours of CE credits will be provided for attendance. All attendees will receive a gift at the end of the conference.

We sincerely hope you will join us for this meeting. Please RSVP by Monday, October 31, 2016, as seating is limited.

For further information regarding this conference, please contact Jason Polanco at 909-558-2076 or jpolanco@llu.edu.

LOCATION & PARKING

The meeting will be held at the Loma Linda University Medical Center Wong Kerlee International Conference Center located at the Coleman Pavilion. Parking is available in the parking structure on Campus Street and in Lot X – turn west on Stewart Street (behind Centennial Complex).



Wong Kerlee International Conference Center
Loma Linda University Campus
11175 Campus Street
Loma Linda, CA 92354

Save
the Date

Loma Linda University Eye Institute

Fall 2016

Optometry Symposium



MANY STRENGTHS. ONE MISSION.
A Seventh-day Adventist Organization



LOMA LINDA
UNIVERSITY
Eye Institute

Loma Linda University Eye Institute

Fall 2016 Optometry Symposium

Sunday, November 13, 2016
7:30 a.m. – 3:30 p.m.

Location

Loma Linda University Medical Center
Wong Kerlee International Conference Center
11175 Campus Street Loma Linda, CA 92350

RSVP

To RSVP or to obtain more information,
please contact Jason Polanco
909-558-2076 | jpolanco@llu.edu

Fee
\$25



LOMA LINDA UNIVERSITY
Eye Institute

Loma Linda University
Eye Institute
11234 Anderson Street
Loma Linda, CA 92350

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Permit No. 1272

09494251-104-104-150715-000

Optometric Symposium 2016 - Notes
Summary paragraph of the lectures

Dr Frank Hwang- Phakic Intraocular Lenses:

Phakic intraocular lens (ICL) are a viable option for patients desiring refractive surgery to reduce the need for glasses or contact lenses. These have the advantage of correcting highly myopes of > 8 diopters refractive error without the risk of corneal ectasia development that exists with laser refractive surgery (LASIK or PRK). The benefits of ICL placement and the surgical procedure will be reviewed in detail. The potential risk of cataract development will be reviewed, including the potential for ICL removal and cataract surgery in the future.

Dr Timothy Winter- Challenging Strabismus Cases

Speaker: Frank Hwang, MD

Title: Phakic Intraocular Lenses

Objectives

1. Learn to evaluate patients with high refractive errors intolerant to contact lenses for surgery, even those who may not be a candidate for laser refractive surgery.
2. Learn about recovery time, steps of surgery and post-operative drops for phakic Intraocular lens surgery.
3. Learn about the risk of complications associated with phakic intraocular lenses.

Outline

- Case presentation of patient intolerant of contact lenses
- Discuss options available to patients with high myopia including glasses, laser refractive surgery, and other surgical options. Discuss risks/benefits of each available option.
- Specialized diagnostic testing of patients undergoing work up for refractive surgery (Topography, manifest/cycloplegic refraction, Pachymetry, axial length measurements, and endothelial cell count)
- Overview/current models/selection criteria/surgical techniques of phakic intraocular lenses currently available in the market.
- Discussion of surgical technique of phakic intraocular lenses.
- Postoperative management of phakic intraocular lenses (post operative slit-lamp appearance, adjunct testing with anterior segment OCT/UBM)
- Outcomes and complications of phakic intraocular lenses including but not limited to glare/halos, surgically induced astigmatism, pigment dispersion/IOP elevation, chronic inflammation/uveitis, pupil ovalization/iris retraction, pupillary block, malignant glaucoma, decentration/rotation, retinal detachment and cataractogenesis
- Comparative outcomes of phakic intraocular lenses vs. laser refractive surgery.

**PHAKIC INTRAOCULAR LENSES
AND COMPLICATIONS**

Frank S. Hwang M.D.
Assistant Professor
Cornea, External Disease and Refractive Surgery



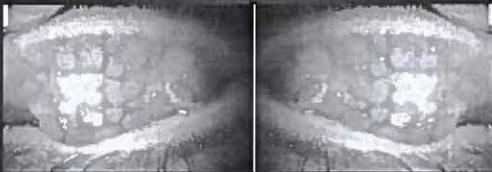
Chief Complaint: "I'm not able to wear contacts anymore!"

Chief Complaint: "I'm not able to wear contacts anymore!"

Physical Exam:

	Right Eye	Left Eye
UDVA	CF @ 6ft	CF @ 6ft
BSCVA	20/15-2	20/15
MRx	-13.75 + 0.25 x 45	-13.50 + 0.50 x 135
CRx	-13.75 + 0.25 x 30	-13.50 + 0.25 x 135

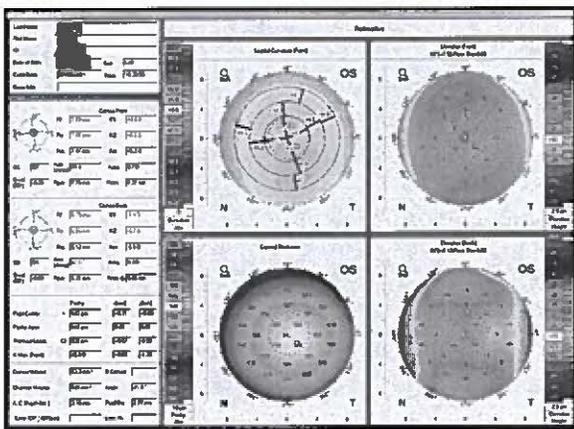
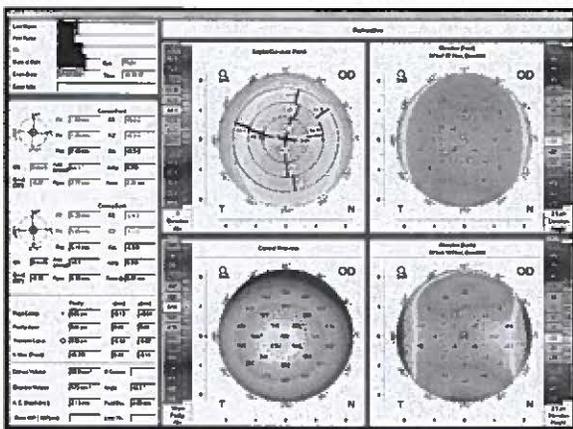
Chief Complaint: "Not able to wear contacts"



What options are available for this patient?

- ### OPTIONS
- Glasses
 - LASIK
 - PRK
 - Clear lens exchange
 - Phakic IOL
 - Re-attempt CL fitting?

• What additional testing would be appropriate?



Manual K's R: 45.00/45.75 @ 85
 L: 44.75/45.50 @ 95

Pachymetry 530/539

Axial Length 27.25/27.08

Endothelial Cell count 3265/3271

MUNNERLYN FORMULA

- Estimates residual stromal bed after laser refractive surgery.
- $Depth = (diameter^2 \times diopters) / 3$





REVIEW/UPDATE

Phakic intraocular lenses

Part 1: Historical overview, current models, selection criteria, and surgical techniques

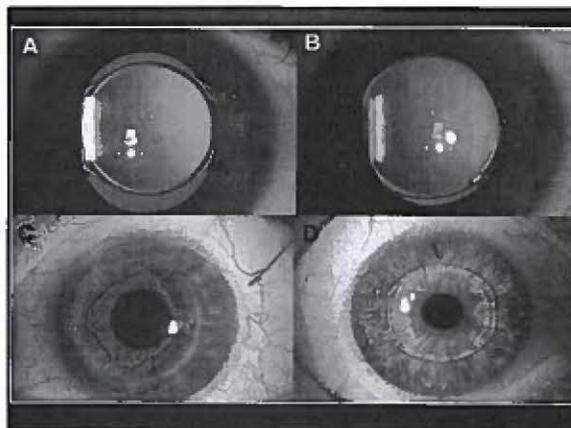
Jose Luis Goell, MD, Merv Morral, MD, Daniel Koek, MD, Thomas Kohner, MD, PhD, FERD

J Cataract Refract Surg 2010; 36:1976-1993 © 2010 ASCRS and ESCRS

Table 1. Phakic IOLs either FDA approved or with CE mark.

Type/Trademark	FDA/CE	Material	Power (D)	Cyctic Diameter (mm)	Overall Diameter (mm)
Angle-supported AC					
Nature Duet	- / -	PMMA haptic, silicone optic	-8 to -20	5.5	12.5 to 13.5
Aryof	- / -	Hydrophobic acrylic, 1 piece	-6 to -16.5	6	12.5 to 14.0
iris-Claw AC					
Vitreous/Artisan	- / -	PMMA, 1 piece	Myopia -3 to -13.5 Hyperopia -14 to -23.5	6	8.5
Vitreous/Artisan	- / -	PMMA haptic, polyethylene optic	Toric -12 to -23.5, torus +1 to -7 Myopia -3 to -14.5 Toric -7 to -13.5, torus -1 to -5	6	8.5
Posterior chamber ICL	+ / -	Collamer	Myopia -3 to -23.0 Torus +1 to +6 Hyperopia +3 to +22	6.65 to 5.5* 5.5	11.5 to 13.0 11.0 to 12.5
PVL	- / -	Silicone	Myopia -3 to -20 Hyperopia +3 to +10	4.5 to 5.5* 4.0	10.0 and 11.3 9.0

AC = anterior chamber
*Depending on dioptric power



PHAKIC INTRAOCULAR LENS

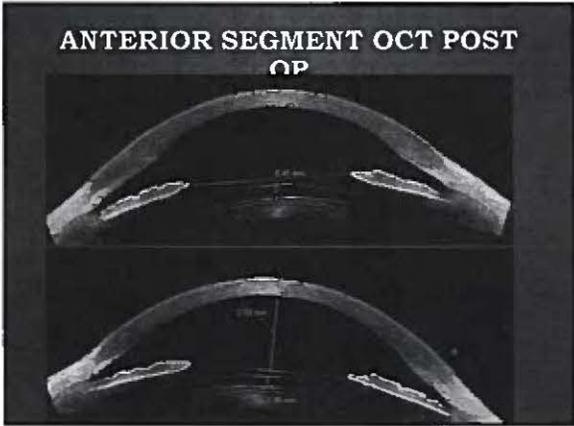
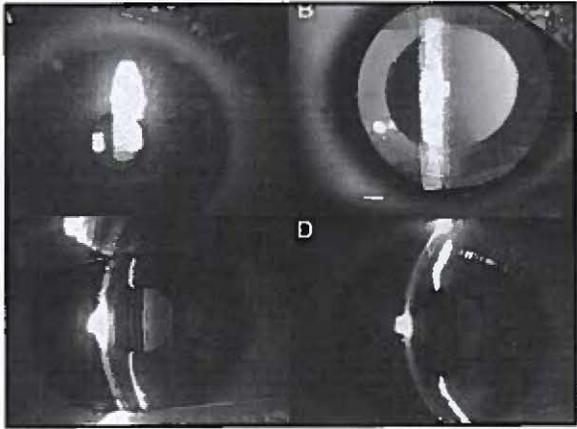
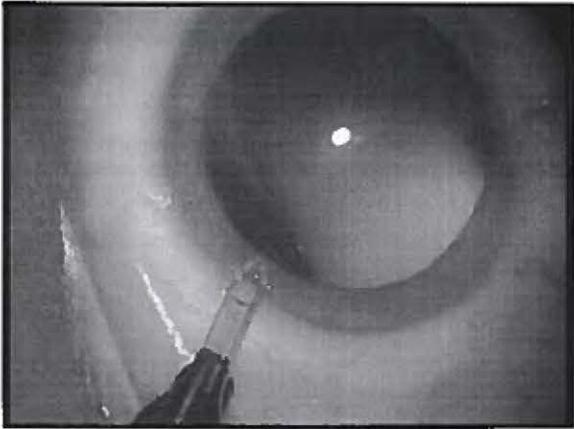
Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> Age >21 years Stable refraction at least 1 year Anisometropia not correctable with eximer laser surgery Unsatisfactory vision with/intolerance of contact lenses or spectacles Iridocorneal angle $\geq 30^\circ$ cKCC $>2300 \text{ cm}^3/\text{hour}^2$ ($>2500 \text{ cells}/\text{mm}^2$ if >21 years old, >2000 if >40 years old) No anomaly of iris or pupil function Meiotic pupil size <5.0 mm 	<ul style="list-style-type: none"> Background of active disease in the anterior segment Recurrent or chronic uveitis Any form of clinically significant cataract Previous corneal or intraocular surgery (to be evaluated) IOP >21 mm Hg or glaucoma Precipitating macular degeneration or macular pathology Abnormal retinal condition Systemic diseases (eg, autoimmune disorder, connective tissue disease, acroia, diabetes mellitus)

ACD Requirements (Measured from Endothelium)

- Artisan-Vitreous/Artisan-Veriflex ≥ 2.7 mm
- ICL ≥ 2.8 mm for myopia, ≥ 3.0 mm for hyperopia

STARR VISIAN ICL

- The STARR ICL is a foldable, plate haptic lens made of a copolymer of hydrophilic porcine collagen (0.1%) and 2-hydroxyethyl methacrylate (HEMA) with an ultraviolet chromophore.
- The lens is implanted within the sulcus in the posterior chamber of the eye.
- It had been marketed internationally before FDA evaluation and approval in December 2005



REVIEW / REVISION

Phakic intraocular lenses

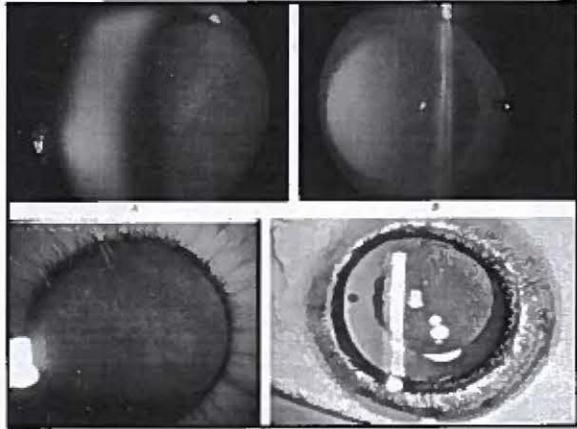
Part 2: Results and complications

Thomas Kohner, MD, PhD, FEBO, Daniel Kook, MD, Merce Morral, MD, Jose Luis Güell, MD

J Cataract Refract Surg 2010; 36:2168-2194 © 2010 ASCRS and ESCRS

COMPLICATIONS

- Glare/halos
- Surgically induced astigmatism
- Pigment dispersion/IOP elevation
- Chronic inflammation/uveitis
- Pupil ovalization/iris retraction
- Pupillary block
- Malignant glaucoma
- Decentration/rotation
- Retinal detachment
- Cataractogenesis



(Invited Review)
Excimer laser refractive surgery versus phakic intraocular lenses for the correction of moderate to high myopia

Allen Bartram¹, Bruce D. Allan²

¹Moorfields Eye Hospital NHS Foundation Trust, London, UK; ²External Disease Service, Moorfields Eye Hospital NHS Foundation Trust, London, UK

Contact address: Allen Bartram, Moorfields Eye Hospital NHS Foundation Trust, City Road, London, EC1V 2PD, UK, abartram@nhs.uk

Editorial group: Catherine Cox and Yvonne Corbett
Publication status and date: Not published on June 5, 2010.
Review requests received as up-to-date: 8 December 2009

Comment: Bartram A, Allan BD. Excimer laser refractive surgery versus phakic intraocular lenses for the correction of moderate to high myopia. *Cochrane Database of Systematic Reviews* 2010, Issue 5, Art. No. CD009679. DOI: 10.1002/14651146.CD009679.pub2



Frank S. Hwang, M.D.
Curriculum Vitae

Office Address:
Kresge Eye Institute
4717 St. Antoine
Detroit, MI 48201
Cell Phone: 510-919-5997
E-mail Address: frank.s.hwang@gmail.com

EDUCATION

DATES

Graduate:

5/02 - 5/07

Mount Sinai School of Medicine, New York, NY

Doctor of Medicine

Baccalaureate:

8/98 - 6/02

University of California at Berkeley, Berkeley, CA

Bachelor of Arts in Molecular and Cell Biology, Psychology

Minor: Business Administration

Graduated with distinction in general scholarship

POSTGRADUATE TRAINING

Wilmer Eye Institute of Johns Hopkins University, Baltimore, MD

7/11 - 7/12

Cornea, External Disease and Refractive Surgery Fellowship

University of Wisconsin Hospital and Clinics, Madison, WI

7/08 - 6/11

Residency in Ophthalmology

St. Luke's-Roosevelt Hospital of Columbia University, New York, NY

6/07 - 6/08

Internship in Internal Medicine

FACULTY APPOINTMENTS

Wayne State University – Kresge Eye Institute, Detroit, MI

8/12 - Current

Assistant Professor

Wilmer Eye Institute of Johns Hopkins University, Baltimore, MD

7/11 - 7/12

Cornea, External Disease and Refractive Surgery Fellowship

HOSPITAL OR OTHER PROFESSIONAL APPOINTMENTS

John D. Dingell VA Medical Center - Staff Ophthalmologist

7/14 - Current

MAJOR PROFESSIONAL SOCIETIES

American Academy of Ophthalmology, Member

2008 - Current

American Society of Cataract and Refractive Surgery, Member

2008 - Current

American Academy of Ophthalmic Executives, Member

2008 - Current

Association for Research in Vision and Ophthalmology, Member

2008 - Current

Michigan Society of Eye Physicians and Surgeons, Member	2012 - Current
Cornea Society, Member	2014 - Current
International Society of Refractive Surgery, Member	2011 - Current

MEDICAL LICENSURE

Michigan 4301100805. Active	5/12 - Current
Maryland D71980. Inactive	Expired 9/12
Wisconsin 52233-20. Inactive	Expired 10/11

BOARD CERTIFICATION

American Board of Ophthalmology, Certified #31639	2013 - 2023
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HONORS/AWARDS

WSU SOM Medical Education Research Scholars Program	2014 - 2015
Faculty Affairs Travel Award for AAMC Minority Faculty Career Development Seminar	2014
ASCRS Foundation Resident Excellence Award	2011
UW Department of Ophthalmology and Visual Sciences, Division of International Ophthalmology Travel Grant	2010
Clinical Research Training Program Fellow, National Institutes of Health	2005 - 2006
American Psychiatric Association Minority Medical Student Summer Fellowship	2003
Phi Beta Kappa	2002
Golden Key Honor Society	2002

SERVICE

Wayne State University

Department/Divisional

Associate Program Director, Ophthalmology	2012 - 2015
Cornea Clinical Rotation, Director	2012 - Current
OKAP Review Committee - Member	2012 - Current
Refractive Surgery - Director, Ophthalmology	2012 - Current
Program Evaluation Committee, Ophthalmology - Member	2012 - Current
Clinical Competency Committee, Ophthalmology - Chair	2013 - Current
Residency Selection Committee, Ophthalmology - Member	2012 - Current
Dearborn/Bingham Farms Clinic Committee - Member	2012 - Current
Iverson Lectureship Planning Committee - Member	9/2013
Mock Examiner for ABO Oral Exam Preparation for Fellows	10/2013
Research Curriculum Committee, Ophthalmology - Co-Director	10/2013
Compensation Committee - Member	4/2014
Jampel Prize Selection Committee	5/2014
Annual Clinical Conference Referee	5/2014

School of Medicine

Mock Interviewer for MS4	9/13 - Current
Robert R. Frank Student Run Free Clinic - Ophthalmology Consultant	9/13 - Current

University

Faculty Liaison to Fencing team	2013 - Current
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UPG or other physician practice plan

EMR Development Committee - Member 2012 - Current
 "Eye Health 101" Lecture a "Ladies Night Out - Health Crawl II" 5/2013

Professional

Department of Veteran Affairs, Independent Medical Expert 2014 - Current

Community

Michigan Prime Magazine, Interview "Diseases of the Aging Eye" 8/2013

Consulting

Lead, Educate and Develop Advisory Board, Allergan, Irvine, CA – Consultant 2012 - 2013

Scholarly Service**Review of Manuscripts:**

Public Library of Science ONE, Peer Reviewer 2010 - Current
 Ophthalmic Plastics and Reconstructive Surgery, Peer Reviewer 2011 - Current
 Journal of Refractive Surgery, Peer Reviewer 2013 - Current
 Ocular Immunology and Inflammation, Peer Reviewer 2013 - Current

Other Service

Scholarly Exchange/Medical Mission with Christopher Croasdale M.D. - supported by 2/2010
 Combat Blindness Foundation, SightLife and International Ophthalmology Division at
 UW Madison, Foundation Vision, Asuncion, Paraguay

Health Link Resident Super-user, University of Wisconsin Hospitals and Clinics, 4/10 - 6/11
 Madison, WI.

Graduate Medical Education Appeals Committee, Member, University of Wisconsin 7/10 - 6/11
 Hospitals and Clinics, Madison, WI.

Fee – Basis Physician - Compensation and Pension, William S. Middleton Memorial 10/09 - 6/11
 Veterans Hospital, Madison, WI.

Teaching at Wayne State University**Undergraduate/Graduate Students**

Biology of the Eye, Lecturer, Annually 9/13 - Current

Medical Students

Physical Diagnosis Course, Ophthalmology, Lecturer 11/2013

Residents/Fellows

Refractive Surgery/Cornea, Ophthalmology, Lecturer 8/12 - Current
 Clinical Ambulatory/Surgical Instruction, Cornea/Refractive Surgery 8/12 - Current
 Henry Ford Microsurgery Course, Surgical Instructor 4/13 - Current

Teaching at other institutions

Clinical Ambulatory Instruction, Ophthalmology, Medical Students, University of Wisconsin, Madison, WI	8/08 - 6/11
Clinical Ambulatory/Surgical Instruction, Ophthalmology Residents, Wilmer Eye Institute at Johns Hopkins University, Baltimore, MD	7/11 - 7/12

Mentorship

Shruti Agrawal MS1 - Medical Student Mentoring Program	3/2014
Aalem Singh High school Student	4/2014
Jordan Huang MS1	4/2014
Nikita Khetarpal WSU Undergraduate	10/2014
Adnan Kurtovic MS3 - Medical Student Mentoring Program	10/2014
Abdala Sirajeldin MS3 - Medical Student Mentoring Program	12/2014
Nilesh Raval MS1 - Medical Student Mentoring Program	1/2015
Anshu Wadehra MS1	2/2015
Amanda Ismail MS3	2/2015
Brenton Kinker MS1 - Medical Student Mentoring Program	3/2015
Aws Hasan MS3	3/2015
Mamta Kanwar MS2 - Medical Student Mentoring Program	4/2015
Hollister Swenson MS1	8/2015
Tahsin Khundkar MS3	9/2015
Michael Gemayel MS3 - Medical Student Mentoring Program	1/2016

Course or curriculum development

Refractive Surgery Curriculum, Ophthalmology, Resident/Fellow Refractive Surgery Program, Wilmer Eye Institute Baltimore, MD	7/2011
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Visiting Professor/Lecturer

Cornea Surgery Lecture, Ophthalmic technician students, Henry Ford Community College, Dearborn, MI	3/2013
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GRANTS, CONTRACTS, AND OTHER FUNDING**Active Other Grants and Contracts**

DMC Foundation Grant, Co-PI, 1% effort, "Vision Detroit", DMC Foundation, 3 years, \$99126	12/2014- 12/2017
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Previously Funded Grants and Contracts

The Richard J. Kolker Research Grant, Co - I, 1% effort, "Variability in Pentacam measurements in patients with Keratoconus", Wilmer Eye Institute, 1 year, \$2000	7/11 - 7/12
American Medical Association Seed Grant, Co - I, 1% effort, "Induction of apoptosis by HIV infected monocytic cells", American Medical Association, 1 year, \$2500	10/04 - 10/05

Previously Submitted, Not Funded Grants and Contracts

Communications, Circuits, and Sensing-Systems (CCSS) Program, Co-PI, 1% effort, "Smart Contact Lens for Wireless Detection of Infectious Keratitis Using Transparent Graphene Bioelectronics", 3 years, \$308779	5/2015 - 4/2018
Scientific Research Award, Principal Investigator, 1% effort, "Transforming growth factor beta signaling in diabetic keratopathy", Midwest Eye Banks, 1 year, \$25000	3/2014
ASCRS Foundation Research Grant, Co-Investigator, 1% effort, "Randomized Therapeutic Trial to Assess Efficacy of Generic Compared to Brand Name Artificial	1/2014

Tears”, American Society of Cataract and Refractive Surgery, \$5000
 Multidisciplinary Research Group Incubator Program, Co-Investigator, 1% effort, 12/2012
 “Tissue Engineering and Regeneration Therapies”, Wayne State University, 3 years,
 \$750000
 ASCRS Foundation Research Grant, Co-Investigator, “Patient Satisfaction and Outcome 12/2010
 of Resident/Fellow Performed LASIK”, American Society of Cataract and Refractive
 Surgery, \$5000

CLINICAL TRIALS ACTIVITIES

A Double-Masked, Randomized, Multicenter, Placebo-Controlled, Parallel-Group 3/14 - 3/15
 Study of SJP-0035 Ophthalmic Solution Compared with Placebo to Assess Safety and
 Efficacy of SJP-0035 Ophthalmic Solution for Corneal Epithelial Wound Healing in
 Patients With Moderate to Severe Corneal Epithelial Disorders Protocol No SJP-
 0035/2-01. Sponsored by Senju Pharmaceutical Co. Role- Co-Investigator

PUBLICATIONS

Peer-Reviewed Publications

Reports of Original Work

1. Ahmad S*, Mathews PM, Lindsley K, Alkharashi M, **Hwang FS**, Ng SM, Aldave AJ, Akpek EK. “Boston Type 1 Keratoprosthesis versus Repeat Donor Keratoplasty for Corneal Graft Failure: A Systematic Review and Meta-analysis” *Ophthalmology*. 2016 Jan;123(1):165-77. doi: 10.1016/j.ophtha.2015.09.028. Roles: Study design, implementation, data collection/analysis, manuscript writing.
2. Vianna LM*, Muñoz B, **Hwang FS**, Gupta A, Jun AS. “Variability in oculus pentacam tomographer measurements in patients with keratoconus” *Cornea*. 2015 Mar;34(3):285-9. doi: 10.1097/ICO.0000000000000344. Roles: Study design, implementation, data analysis, manuscript writing.
3. Nehls SM, Ghoghawala SY, **Hwang FS**, Azari AA, “Patient Satisfaction and Clinical Outcomes with Laser Refractive Surgery Performed by Surgeons in Training” *Journal of Cataract and Refractive Surgery*. *J Cataract Refract Surg*. 2014 Jul;40(7):1131-8. Roles: Study design, implementation, data analysis, manuscript writing.
4. Yeh S, Li Z, Forooghian F, **Hwang FS***, Cunningham MA*, Pantanelli S*, Lew JC, Wroblewski KK, Vitale S, Nussenblatt RB. “CD4+ Foxp3+ T-regulatory cells in noninfectious uveitis” *Arch Ophthalmol*. 2009 Apr;127(4):407-13. Roles: Study implementation, manuscript writing
5. Liu B, Li Z, Mahesh SP, Pantanelli S*, **Hwang FS***, Siu WO*, Nussenblatt RB. “Glucocorticoid-induced tumor necrosis factor receptor negatively regulates activation of human primary natural killer (NK) cells by blocking proliferative signals and increasing NK cell apoptosis”, *J Biol Chem*. 2008 Mar 28;283(13):8202-10 Roles: Study implementation, manuscript writing.
6. Li Z, Mahesh SP, Shen DF, Liu B, Siu WO*, **Hwang FS***, Wang QC, Chan CC, Pastan I, Nussenblatt RB. “Eradication of tumor colonization and invasion by a B cell specific immunotoxin in a murine model for human primary intraocular lymphoma (PIOL)”, *Cancer Res*. 2006 Nov 1;66(21):10586-93 Roles: Study implementation, manuscript writing.

Case Reports

1. Liu MP, **Hwang FS**, Dunn JP, Stark WJ, Bower KS. “Hypopyon uveitis following LASIK in a patient with ulcerative colitis” *J Refract Surg*. 2012 Aug;28(8):589-91. Roles: Manuscript writing
2. **Hwang FS**, Neekhra A, Lucarelli MJ, Warner TF, Snow SN, Albert DM. “Sebaceous Cell Carcinoma of the Eyelid: A Rapidly Enlarging Lesion With Massive Xanthogranulomatous Inflammation”, *Ophthal Plast Reconstr Surg*, 2010 May-Jun;26(3):208-10.

Review Articles

1. Khundkar T*, **Hwang FS**, "DALK". EyeWiki. <http://eyewiki.aao.org/DALK>. Dec 2015. Roles: Manuscript writing
2. Khan R*, **Hwang FS**, McDermott M "Ocular Cicatricial Pemphigoid". EyeWiki. http://eyewiki.aao.org/Ocular_cicatricial_pemphigoid. Nov 2015. Roles: Manuscript writing
3. Sirajeldin A*, **Hwang FS**. "Mooren's Ulcer". EyeWiki. http://eyewiki.org/Mooren%27s_Ulcer. Sep 2015. Roles: Manuscript writing
4. Yin J*, McDermott ML, **Hwang FS**, Yu FS. "Sensory nerve regeneration after epithelium wounding in normal and diabetic cornea". Expert Review of Ophthalmology. July 2015: 10 (4):383-392 Roles: Manuscript writing
5. Hasan A*, **Hwang FS**. "Retrolbulbar Hemorrhage". EyeWiki. http://eyewiki.org/Retrolbulbar_hemorrhage. May 2015. Roles: Manuscript writing
6. Rambhatla PV*, Brescoll J*, **Hwang F**, Juzych M, Lim HW. "Photosensitive Disorders of the Skin with Ocular Involvement". Clin Dermatol. 2015 Mar-Apr;33(2):238-46. doi: 10.1016/j.clindermatol.2014.10.016. Roles: Manuscript writing regarding ophthalmic manifestations.
7. Sirajeldin A*, **Hwang FS**. "Salzmann's Nodular Degeneration". EyeWiki. http://eyewiki.org/Salzmann_Nocular_Degeneration. Feb. 2015. Roles: Manuscript writing
8. Montenegro D*, **Hwang FS**. "Management of Ocular GVHD". EyeWiki. http://eyewiki.org/Management_of_Ocular_GVHD. Nov 2014. Roles: Manuscript writing
9. Muhlstein M*, **Hwang FS**. "Terrien's Marginal Degeneration". EyeWiki. http://eyewiki.aao.org/Terrien%27s_Marginal_Degeneration. Oct. 2014. Roles: Manuscript writing
10. Akpek EK, Alkharashi M, **Hwang FS**, Ng SM, Lindsley K. "Artificial corneas versus donor corneas for repeat corneal transplants". Cochrane Database of Systematic Reviews 2014 Nov 5;11:CD009561. doi: 10.1002/14651858.CD009561.pub2. Roles: Data analysis, manuscript writing.

Editorials/Commentaries

1. Gupta OP, Garg SJ, Negrey JN, Jahnle R, Pasion R, Ip MS, **Hwang FS***, Kaines A, Jain AK, Schwartz SD. "Diagnostic and Therapeutic Challenges" Retina. 2010 Jun;30(6):975-80. Roles: Manuscript writing, commentary on presented case

Non-peer-reviewed Publications

1. **Hwang FS**, Bower KS. BMJ Point of Care Monograph: Keratitis. Annual Updates Sept 2011-2015 (Invited review) <https://online.epocrates.com/u/2911561/Keratitis>

PRESENTATIONS**Invited Lectures/Presentations**

International/National

1. Rodrigues-Torres Y*, Wadehra A*, Swanson H*, Muhlstein M*, **Hwang FS**. "Resident Compliance with the American Academy of Ophthalmology Preferred Practice Pattern® Guidelines for Diabetic Retinopathy", Association of Research in Vision and Ophthalmology Annual Meeting, May, 2016. (Poster Presentation)
2. Khan A*, Ismail A*, **Hwang FS**. "Management of Antithrombotic Medications Perioperatively in Ophthalmology", American Academy of Ophthalmology Annual Meeting, Nov, 2015. (Poster Presentation)
3. Yin J*, Muhlstein M*, McDermott ML, Juzych M, **Hwang FS**. "Resident Compliance with the American Academy of Ophthalmology Preferred Practice Pattern® Guidelines for

- Conjunctivitis”, Association of Research in Vision and Ophthalmology Annual Meeting, May, 2015. (Poster Presentation)
4. Huang J*, Muhlstein M*, Kromrei H, Juzych, M, **Hwang FS**. “Resident compliance with the American Academy of Ophthalmology (AAO) Preferred Practice Patterns (PPPs) for Dry Eye Syndrome (DES)”, Association of Research in Vision and Ophthalmology Annual Meeting, May, 2015. (Poster Presentation)
 5. Zaidi S*, **Hwang FS**. “Physician Compliance With the HEDS Recommendation of Antiviral Prophylaxis in Patients Diagnosed With Herpetic Stromal Keratitis at KEI”, World Cornea Congress VII, April 15-17, 2015 (Poster Presentation)
 6. Muhlstein M*, Huang J*, **Hwang FS**. “Comparison of Resident and Attending Cataract Surgical Outcomes”, American Society of Cataract and Refractive Surgery Annual Meeting, April, 2015 (Poster Presentation)
 7. Yin J*, **Hwang FS**. “Aniridic Keratopathy” Cornea Society Young Physician Dinner VISTA Case Presentation, Association of Research in Vision and Ophthalmology Annual Meeting, May 4th, 2014 (Podium Presentation)
 8. Zaidi S*, **Hwang FS**. “Fusarium Keratitis” Cornea Society Young Physician Dinner VISTA Case Presentation, Association of Research in Vision and Ophthalmology Annual Meeting, May 4th, 2014 (Podium Presentation)
 9. Nehls SM, Ghoghawala SY, **Hwang FS**, Azari AA. “Clinical Outcomes and Patient Satisfaction with Laser Refractive Surgery Performed by Surgeons in Training” Association of University Professors in Ophthalmology Annual Meeting, Jan 29-Feb 1st, 2014 (Podium Presentation)
 10. Ghoghawala SY, **Hwang FS**, Nehls SM. “Clinical Outcomes and Vision-Related Quality of Life After LASIK and PRK Surgery Performed by Refractive Surgeons in Training” American Society of Cataract and Refractive Surgery Annual Meeting, April 19-23, 2013 (Poster Presentation)
 11. **Hwang FS**, Jun AJ, “Variability in Pentacam measurements in patients with Keratoconus”, Association for Research in Vision and Ophthalmology Annual Meeting, May 2012 (Poster Presentation)
 12. **Hwang FS**, Nehls SM. “Patient Satisfaction and Outcome of Resident/Fellow Performed LASIK” American Society of Cataract and Refractive Surgery Annual Meeting, April 21st, 2012 (Podium Presentation), also invited to present at inaugural ASCRS Resident and Fellow Program.

Local/Regional

1. Wadehra A*, Rodrigues-Torres Y*, Swanson H*, Muhlstein M*, **Hwang FS**. “Resident Compliance with the American Academy of Ophthalmology Preferred Practice Pattern® Guidelines for Diabetic Retinopathy”, WSU SOM Research Symposium, Jan, 2016. (Poster Presentation)
2. **Hwang FS**, “Ophthalmology Pearls from the Cornea/ Anterior Segment Expert”, Ophthalmology Pearls for the Primary Care Physician: An Overview from the Experts Course, Michigan State Medical Society Annual Meeting, October 2015 (Podium Presentation)
3. Huang J*, Muhlstein M*, Kromrei H, Juzych, M, **Hwang FS**. “Resident compliance with the American Academy of Ophthalmology (AAO) Preferred Practice Patterns (PPPs) for Dry Eye Syndrome (DES)”, WSU SOM Research Symposium, Jan, 2015. (Podium Presentation)
4. **Hwang FS**, “Ophthalmology Pearls from the Cornea/ Anterior Segment Expert”, Ophthalmology Pearls for the Primary Care Physician: An Overview from the Experts Course, Michigan State Medical Society Annual Meeting, October 2014 (Podium Presentation)
5. Zaidi S*, Ismail A*, **Hwang FS** “Physician compliance with the Herpetic Eye Disease Study’s recommendation of antiviral prophylaxis in preventing recurrences of HSV disease in patients diagnosed with herpetic stromal keratitis at the Kresge Eye Institute” Annual Clinical Conference, June 2014 (Podium Presentation)

6. **Hwang FS**, “Terrien’s Marginal Degeneration” Current Concepts Baltimore, December 2011 (Podium Presentation)
7. **Hwang FS**, Nehls S. “Patient Satisfaction and Outcome of Resident/Fellow Performed LASIK” Resident’s Day, University of Wisconsin, Madison, WI, June 17, 2011 (Podium Presentation)
8. **Hwang FS**, Barney NP. “Ocular Health of Wisconsin Ophthalmologists” Resident’s Day, Medical College of Wisconsin, Milwaukee, WI, June 11, 2010 (Podium Presentation)
9. **Hwang FS**, NIH Clinical Research Training Program Scientific Presentations, NIH Clinical Center, Bethesda, MD, May 2006 (Podium Presentation)
10. **Hwang FS**, Sperber K, “Induction of Apoptosis by HIV infected Monocytic Cells”, Mount Sinai Medical Student Research Day, New York, NY, Nov. 2004 (Poster Presentation)

Invited Seminars and Grand Rounds

1. Montenegro D*, McDermott ML, Hwang FS “Gonococcal Keratitis”, Kresge Eye Institute Grand Rounds, Jan 2016
2. Patel H*, Hwang FS “Pentacam for Noobs”, Kresge Eye Institute Friday AM Lectures, Jan 2016
3. Rodriguez Torres Y*, Hwang FS “AAO PPP”, Kresge Eye Institute Basic Science Lectures, Jan 2016
4. Zhou D*, Hwang FS “Corneal Dystrophies”, Kresge Eye Institute Friday AM Lectures, Dec 2015
5. Fatima S*, Hwang FS “Fusarium Keratitis”, Kresge Eye Institute Grand Rounds, Nov 2015
6. Winkler K*, Hwang FS “Conjunctival Neurofibroma”, Kresge Eye Institute Grand Rounds, Oct 2015
7. Fatima S*, Hwang FS “Lattice Corneal Dystrophy”, Kresge Eye Institute Grand Rounds, Sept 2015
8. Montenegro D*, Dixon R, McDermott ML, Hwang FS “GVHD”, Kresge Eye Institute Grand Rounds, Apr 2015
9. Yin J, Dang S, Rana S, Xu S, Hwang FS “Research Collaboration between the Basic Science Team and Clinical Team”, Vision Research Retreat: Integration and Collaboration, Mar 2015
10. Hwang FS. “Corneal Transplantation”, Maple Surgery Center Nursing Education, Feb 2015
11. Lillvis J*, Hwang FS “Resident Cataract Education”, Kresge Eye Institute Grand Rounds, Feb 2015
12. Fernandez M*, McDermott ML, Hwang FS “Phlyctenular Keratoconjunctivitis”, Kresge Eye Institute Grand Rounds, Jan 2015
13. Zaidi S*, Hwang FS “Conjunctival Lymphoma”, Kresge Eye Institute Grand Rounds, Jan 2015
14. Fatima F*, Hwang FS “Pediatric Diseases of Anterior Segment”, Kresge Eye Institute Friday AM Lectures, Dec. 2014
15. Zaidi S*, Hwang FS “Prevention of Refractive Surprises”, Kresge Eye Institute Friday AM Lectures, Oct. 2014
16. Yin J*, Hwang FS “Corneal Transplantation”, Kresge Eye Institute Friday AM Lectures, Sept. 2014
17. Montenegro D*, Hwang FS “Ocular Graft vs. Host Disease”, Kresge Eye Institute Friday AM Lectures, Jul. 2014
18. “Graduate and Faculty Performance”, Annual Program Evaluation, May 2014
19. Rana S, Xu S, Tosi J, Hwang FS “Resident and Fellow Research Curriculum and Opportunities”, Vision Research Retreat: Integration and Collaboration, Mar 2014
20. Zaidi S*, Hwang FS “Cornea OKAP Review Questions”, Kresge Eye Institute Friday AM Lectures, Nov. 2013
21. Kadikoy H*, Hwang FS “Ocular Cicatricial Pemphigoid”, Kresge Eye Institute Grand Rounds, Oct. 2013
22. Yin J*, Hwang FS “Brief Introduction of Refractive and Corneal Surgeries”, Kresge Eye Institute Friday AM Lectures, Oct. 2013
23. Zaidi S*, Hwang FS “Keratoconus” Kresge Eye Institute Friday AM Lectures, Aug. 2013

24. "Red Eye", Kresge Eye Institute Resident Orientation, July 2013-15
25. Yin J*, Momi R, Hwang FS, Hughes B "Traumatic Hyphema", Kresge Eye Institute Grand Rounds, Jan 2013
26. Dang S*, Hwang FS "LASIK Associated Interface Haze", Kresge Eye Institute Grand Rounds, Jan 2013
27. "Terrien's Marginal Degeneration", Kresge Eye Institute Grand Rounds, August 2012
28. "Phakic IOL and Complications", Wilmer 17th Annual Technician Course, March 2012
29. "Phakic IOL and Complications", Kresge Eye Institute, January 2012
30. "Femtosecond Laser Applications in Corneal Surgery", Albert Einstein College of Medicine, January 2012
31. "Phakic IOL and Complications", Wilmer Grand Rounds, November 2011
32. "Ocular and Orbital Trauma", UW Madison Surgery Program, January 2011
33. "Peripheral Ulcerative Keratitis", UW Madison Grand Rounds, January 2011
34. "Ocular and Orbital Trauma", UW Physician Assistant Program, November 2011
35. "Best's Disease", UW Madison Grand Rounds, March 2010
36. "Neuro-sarcoidosis", UW Madison Grand Rounds, January 2009
37. "Red Eye", UW Madison Physician Assistant Program, November 2009
38. "Ocular Manifestations of Systemic Diseases", UW Madison Physician Assistant Program, November, 2009
39. "Purtscher's-like Retinopathy" UW Madison Grand Rounds, July 2009

Educational Conferences/Courses Attended

1. Association of University Professors in Ophthalmology, Jan 2015
2. Stanford Faculty Development Program in Medical Teaching, Jan 2014
3. SEMCME Faculty Development Series, Oct-Dec. 2013
4. AHME/SEMCME Academy, Sept. 2013
5. ACGME Annual Educational Conference, Mar. 2013, 2015

Dr Michael Rauser- Refractive Cataract Surgery, A Cost Effective Approach

Patient expectations with cataract surgery have never been higher. Yet the patient cost components of cataract surgery continue to rise, especially for patients desiring an excellent refractive outcome. These can provide financial barriers that may preclude the best refractive outcome with cataract surgery. The individual cost components (co-pays, intraocular lens, surgeon costs, outpatient surgical center add-ons, and perioperative medication use) will be reviewed in detail and an evidence-based algorithm with patient customization will be emphasized. The goal is to provide cost effective refractive cataract surgery for all patients!

Speaker: Michael Rauser, MD

Title: Refractive Cataract Surgery - A Cost Effective Approach

Goals/Objectives:

1. To review the current technologies and techniques available to maximize refractive outcomes with cataract surgery
2. To understand the relative benefits of intraoperative aberrometry in post refractive eye surgery patients undergoing cataract surgery
3. To review the cost/ benefit and relative indications/contraindications of Droplless cataract surgery

Outline:

Refractive cataract surgery - A Cost Effective Approach

Michael Rauser, MD November 13, 2016

- to review the current technologies and techniques available to maximize refractive outcomes with cataract surgery
- To understand the relative benefits of intraoperative aberrometry in post refractive eye surgery patients undergoing cataract surgery
- To review the cost/ Benefit and relative contraindications of Droplless cataract surgery

Outline:

Introduction

Cost components of refractive cataract surgery

- Intraocular lens
- Surgeon fees (ancillary testing, follow-up)
- Surgical center (“add-ons”)
 - o Femtosecond
 - o Ora intraoperative aberrometry
- Pre-op and Post-op eye drop cost

Intraocular lenses

- Monofocal
 - o Single vision distance

- Single vision near
- “Blended” vision
- Mono-vision
- Toric IOLs
- Multifocal IOL’s
- Accommodative IOL’s

Surgeon’s fees

- Diagnostic testing
 - Corneal topography : OPD; Pentacam
 - Retina OCT
- Additional work
 - Data input, analysis , IOL choice, astigmatism management
 - Treatment of unsatisfactory refractive outcomes
 - PRK / LASIK / LRI’s / IOL exchange

Surgical center “ add-ons”

- Femtosecond laser use
 - Cost / benefit
 - “Best case” use
- Ora intraoperative aberrometry
 - Cost/ benefit
 - “Best case” use

Pre-op and postop eye drop usage

- Current cost estimates
- Cost / benefit of “ drop-less” cataract surgery
 - Best case use
 - LLUEI experience

Summary

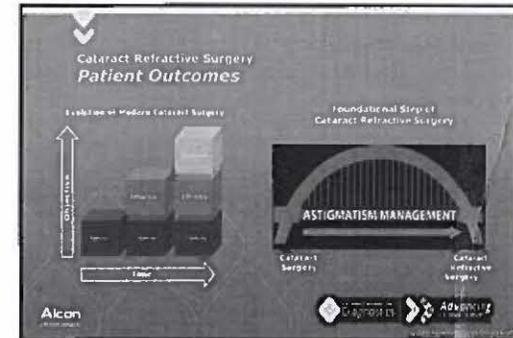
MICHAEL RAUSER, MD

Refractive Cataract Surgery- A Cost Effective Approach

Michael Rauser, M.D.
Chair
Associate Professor
Loma Linda University Eye
Institute

Why Cover This Topic?

- Patient expectations for cataract surgery are higher than ever
- "Refractive options" of cataract surgery remain cost prohibitive for many patients
- We desire to meet or exceed patient expectations



Potential Patient Cost Components to Cataract Surgery

- Deductible / Copay for surgery
- Intraocular lens
- Surgeon fees (ancillary testing, follow-up)
- Surgical center ("add-ons")
 - Femtosecond
 - Ora intraoperative aberrometry
- Pre-op and Post-op eye drop cost

Intraocular Lenses

- Monofocal
 - Single vision distance
 - Single vision near
 - "Blended" vision
 - Mono-vision
- Toric IOLs
- Multifocal IOL's
- Accommodative IOL's

Intraocular Lenses – Cost Component

- Monofocal - No charge!
 - Single vision distance
 - Single vision near
 - "Blended" vision
 - Mono-vision
- Toric IOLs - \$400
- Multifocal IOL's - \$850
- Accommodative IOL's - \$850

Surgeon's Fees

- Diagnostic testing
 - Corneal topography : OPD, Pentacam
 - Retina OCT
- Additional work
 - Data input, analysis , IOL choice, astigmatism management
 - Treatment of unsatisfactory refractive outcomes
 - » PRK / LASIK / LRI's / IOL exchange

Surgeon's Fees – Toric IOL - \$600

- Diagnostic testing
 - Corneal topography : OPD, Pentacam
 - Retina OCT
- Additional work
 - Data input, analysis , IOL choice, astigmatism management
 - Treatment of unsatisfactory refractive outcomes
 - » PRK / LASIK / LRI's / IOL exchange

Surgeon's Fees – Multifocal IOL / Crystalens: \$1550

- Diagnostic testing
 - Corneal topography : OPD, Pentacam
 - Retina OCT
- Additional work
 - Data input, analysis , IOL choice, astigmatism management
 - Treatment of unsatisfactory refractive outcomes
 - » PRK / LASIK / LRI's / IOL exchange

Surgical Center " Add-ons "

- Femtosecond laser use
 - »Cost / benefit
 - » "Best case" use
- Ora intraoperative aberrometry
 - »Cost/ benefit
 - » "Best case" use

Femtosecond Laser

Femtosecond Laser

- "Add-on" charge to monofocal IOLs for "Limbal Relaxing Incisions" - \$1200
- Cost usually incorporated into Premium IOL cases ("click fee" adds \$100-200)
- Device cost
 - Purchase: 250K
 - Lease options

Femtosecond Laser

- Advantages :
 - Centration / customization of anterior capsular opening
 - Softens nucleus = less phaco energy used for removal
 - Effective lens position likely more predictable

Femtosecond Laser

- Disadvantages:
 - NOT proven to be safer than conventional cataract surgery
 - » Higher rate of anterior capsular tears
 - Cost (of device and click fee)
 - Longer case time due to " 2 steps"
 - Not suitable for all cases
 - » Mature cataracts , small pupils

Femtosecond Laser

- Best cost/ benefit ratio:
 - Dense nuclear cataract
 - Weak zonules
 - Endothelial Corneal Dystrophy

Ora Intraoperative Aberrometry

ORA™ System
What is the ORA™ System?
Optiwave Refractive Analysis

ORA™ System

- **VeriEye™ Technology**
 - Real-time, intraoperative IOL calculation
 - Unique ray-trace aberrometry to reveal the refract in cornea of the eye
- **AnalyzOR™ Technology**
 - Curative set of algorithms (powered by a growing database of ACT/Alcon cases)
 - Customized pre-measure, reporting and analysis system

Rapidly approaching 500,000 completed ORA™ System cases

Clinically Proven in cataract procedures

- Improved Outcomes
- Post-Operative Refractive Error Reduction

Alcon  **Advancing**



ORA™ System
What does VeriEye+™ Technology provide?

Real-time, Streaming aphakic and pseudophakic refractions

Anterior and posterior cornea cylinder assessment

Aphakic and pseudophakic IOL sphere, cylinder, and alignment recommendations

Intuitive, dynamic guidance reticle in the right eye

Limbal Relaxing Incisions guidance

**Streaming Guidance,
1. Precision**

Alcon  **Advancing**



ORA™ System
Generations of Development

ORA VeriVue™ with Adaptive Optics using 25x5 Energy Patterns

ORA VeriVue™ Dynamic Astigmatism Prediction

ORA VeriVue™ Dynamic Astigmatism Prediction with Energy-Linked Refractive Error

Alcon **Advancing**

ORA™ System with VeriEye™ Technology

Clinical Studies
Cataract procedures with the ORA™ System have shown:

Improved Astigmatic Outcomes:

- Proven to improve final IOL outcomes, reduces % of patients falling outside of intended astigmatic target by over half.

Post-Refractive Myopic + Lens Power Selection:

- Proven to significantly increase accuracy of lens power selection and decrease post-operative error in prior myopic LASIK patients.

Alcon **Advancing**

ORA™ System with VeriEye™ Technology
Improved Astigmatic Outcomes

12.6% ADDITIONAL patients' outcome achieved intended target

This clinical study demonstrates cataract procedures using the ORA™ System with VeriEye™ Technology resulted in better astigmatic outcomes.

Alcon **Advancing**

ORA™ System with VeriEye™ Technology
Improved Astigmatic Outcomes

53% FEWER patients' outcome fell outside the intended target.

This clinical study demonstrates cataract procedures using the ORA™ System with VeriEye™ Technology resulted in better astigmatic outcomes.

Alcon **Advancing**

PRIOR MYOPIC REFRACTIVE SURGERY PATIENTS

Cataract surgeries using the ORA™ System have been proven to significantly increase the accuracy of lens power selection and decrease post-operative error in prior myopic LASIK patients. See involved study published in *Ophthalmology* on 1/1/14.

Intentional Refractive Error or Post-Refractive Error	Conventional Pre-Operative Refraction	ORA™ System	Conventional Pre-Operative Refraction	ORA™ System
Mean Error (SD)	0.18 (0.18)	0.12 (0.12)	0.18 (0.18)	0.12 (0.12)
% of Patients within ±0.50 D of Target	46%	67%	46%	67%

Percent of patients achieving outcomes within ±0.50 D of target:

- Conventional (pre-refractive) methods = 46%
- Using the ORA™ System = 67%

Alcon **Advancing**

ORA™ System with VeriEye™ Technology
Improved Astigmatic Outcomes

Real-time, streaming information in your ocular
Streaming data to position toric IOLs within 1°

Alcon **Advancing**

Ora Intraoperative Aberrometry – Cost

- Cost of device : \$70K
 - \$100 use fee/ case

ORA + Intraocular Lenses

- Monofocal - \$350 (\$250 SF + \$100 Click Fee)
 - Single vision distance
 - Single vision near
 - “Blended” vision
 - Mono-vision
- Toric IOLs (+ \$100 Click Fee)
- Multifocal IOL's (+ 100 Click Fee)
- Accommodative IOL's (+\$100 Click Fee)

Ora Intraoperative Aberrometry

- Cost / Benefit is most favorable for:
 - Post-refractive cases
 - » Myopic LASIK > Hyperopic LASIK > RK
 - Multifocal IOLs
 - » less PRK/ LASIK
 - Toric IOL's
 - » Minimizes misalignment issues
 - “Insurance ” for monofocal IOL patients

Pre-op and postop eye drop usage

- Costs of eye drops continue to rise
- Generic drops are not necessarily cheap!
- Generic antibiotics - cheaper but higher resistance to common causes of endophthalmitis is greater

Standard Eye Drop Regimen – Cost is Tremendously Variable ! “LLU Pharmacy Cash Prices”

- Antibiotic
 - Vigamox : \$150
 - Besivance: \$150
 - Ciprofloxacin \$5
- Topical Steroid
 - Prednisolone Acetate 1%: \$40
 - Durezol: \$150

Standard Eye Drop Regimen – Cost is Tremendously Variable ! “LLU Pharmacy Cash Prices”

- Topical NSAID
 - Once Daily use
 - » Ilevro: \$235
 - » Prolensa: \$235
 - » Bromfenac 0.9%: \$140
 - Four times a day generics
 - » Diclofenac: \$50

"Dropless" Cataract Surgery – Viable Alternative

- Depot injection of Tri-moxi (triamcinolone/moxifloxacin) into anterior vitreous during cataract surgery
 - Transzonular or intravitreal injection
- Goal is to minimize the need for post-operative eyedrops with same efficacy
 - Use of topical NSAIDS likely reduces "breakthrough" inflammation and CME rates

Transzonular injection

- Done after IOL implantation but before viscoelastic removal



My "Drop less" Experience So Far

- 354 cases since February 2015
- Topical NSAID (Ilevro) for > 2 weeks after surgery
- Well tolerated with high patient satisfaction

Dropless vs Traditional

- A retrospective cohort study comparing the outcomes of intravitreal injection of Trimoxi (triamcinolone acetate 15 mg/ml and Moxifloxacin 1 mg/ml) versus traditionally required eye drops at post-operative day 1, week 1, and month 1.

Eden Yoon, MD PGY-1, Bronson Laclair MS 4

Methods

- Chart review of patients from 2015-2016 that had cataract surgeries done by Dr. Michael Rauser
 - » Dropless cataract surgeries had 0.2 mL of Trimoxi placed via intravitreal injection immediately after intraocular lens placement in the during cataract surgery (patients also used a topical NSAID)
 - » Traditional cataract surgeries were given four-week tapers of 3 different medications: an NSAID, steroid, and antibiotic

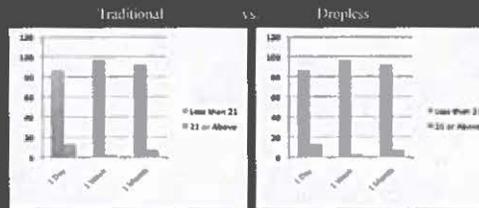
Outcomes assessed

- Post-operative rates of infection
- Degree of inflammation in anterior chamber
- Degree of corneal edema
- Intraocular pressure

Baseline Characteristics

	Dropless	Traditional
Total	74 (207)	N=203
Age	73.77 ± 9.08	70.90 ± 11.38
Gender		
Female	168 (63.11%)	159 (60.46%)
Male	98 (36.84%)	104 (39.54%)
Eye: N (%)		
OD	157 (49.24%)	133 (50.57%)
OS	135 (50.56%)	130 (49.43%)

Intraocular pressure



Intraocular pressure

	Traditional		Dropless	
IOP	Less than 21	21 or Above	Less than 21	21 or Above
1 day	86.68%	13.31%	90.64%	9.36%
1 week	97.35%	2.16%	97.75%	2.25%
1 month	92.78%	7.22%	98.5%	1.5%

Corneal edema

Traditional	0	1	2	3	4
1 day	77.65%	13.31%	8.2%	0.38%	1.57%
1 week	95.87%	0.78%	1.11%	0%	0%
1 month	99.74%	0.13%	0%	0.38%	0%
Dropless	0	1	2	3	4
1 day	70.79%	14.31%	9.36%	1.87%	2.67%
1 week	95.88%	1.67%	0.75%	0.75%	0%
1 month	97.75%	0.75%	0%	0%	0.37%

Anterior chamber Inflammation

Traditional	0	+1	+2	+3	+4
1 day	78.90%	34.22%	28.42%	8.37%	1.6%
1 week	92.02%	5.75%	0.78%	0.38%	0.38%
1 month	98.48%	1.57%	0%	0%	0%
Dropless	0	+1	+2	+3	+4
1 day	78.87%	37.83%	23.97%	7.12%	1.87%
1 week	94.01%	2.17%	0.75%	0.37%	0.37%
1 month	97.38%	1.12%	0.37%	0%	0%

Conclusion

- Results showed no statistically significant difference in two cohorts in regards to rates of post-op infection, inflammation of anterior chamber, corneal edema, and intraocular pressure elevation

Indications

- Patients with higher risk of CME
 - Diabetic retinopathy
 - History of CME in opposite eye
 - Epiretinal membrane
 - Uveitis
- Ocular surface disease
 - Minimize surface toxicity

Indications

- Compliance concerns
 - Don't use drops properly
 - Difficulty installing eye drops
 - » Patient
 - » Family
 - Cost of meds

Cost Comparison – LLU Outpatient Surgical Center

- OSC cost
 - Tri-moxi- \$20
 - Tri-moxi-vanc- \$25
 - 1 bottle of Vigamox (used in "standard " pre-op regimen) - \$10.75
- Patient saves on the cost for Vigamox and Prednisolone Acetate 1%

Relative Contraindications

- Moderate to advanced glaucoma
 - Higher risk of steroid induced glaucoma
- Post-vitrectomy eyes
 - Faster clearance of meds from vitreous cavity
- Patients with increased retinal detachment risk
 - Ex : High myope with lattice / retinal tears
- Need for excellent vision within days of surgery
 - Decreased vision and post-op floaters due to opacity of injection

Putting It All Together !

- Cost components of refractive cataract surgery
 - Intraocular lens
 - Surgeon fees (ancillary testing, follow-up)
 - Surgical center ("add-ons")
 - » Femtosecond
 - » Ora intraoperative aberrometry
 - Pre-op and Post-op eye drop cost

Customization Is The Key! - IOL

- Choose the IOL best suited to the patient
 - Hate eyeglass wear = multifocal
 - h/o monovision = maintain monovision!
 - H/o myopia + reads without glasses = near vision IOL targets

Customization Is The Key! – Ancillary Testing

Based on IOL decision and eye glass independence desire :

- Corneal topography - all Premium IOL cases
 - » OPD; Pentacam
- Retina OCT – all Multifocal / Crystalens IOL cases

Customization Is The Key! - Surgical Center Add-ons

- Femtosecond laser use
 - » Very limited role in better outcomes
 - » Investment drives use
- Ora intraoperative aberrometry
 - » Post-refractive cases
 - » Premium IOL cases
 - » Monofocal IOLS with strong desire for eyeglass independence in chosen zone of focus

Customization Is The Key! - Eye Drop Usage

- Go drop-less unless relative CI exists:
- Moderate to advanced glaucoma
- Post-vitrectomy eyes
- Patients with increased retinal detachment risk
- Need for excellent vision within days of surgery

Total Cost Examples

- Monofocal
 - no charge without * add-ons
 - + Ora : \$350
 - + Femtosecond (+/- Ora) : \$1200
- Tonic IOLs - \$1000 (\$1100-1200 + Ora)
- Multifocal IOL's - \$2350*
- Accommodative IOL's - \$2350*
- *(cost bundled with ancillary testing)

Summary

- Technology and pharmacology advances are providing more options for patients undergoing "refractive" cataract surgery.
- Patient cost for surgery is influenced by many variables
- Customize the cataract surgical process to maximize cost/ benefit for patients
- Work with your patients to help them achieve their desired outcomes

Department Update

Michael F. Rauzer, MD
 Chairman
 Loma Linda University Eye Institute
 Optometric Symposium November 12, 2016



LOMA LINDA UNIVERSITY
 HEALTH SYSTEM

**LLU Eye Institute
 Clinical Practice - What's Happening!**

Where we are today:

- 16 Physician FTE ; 2 Optometrists; 2 Retina Fellows; 1 Chief resident
 - ✓ All subspecialties covered
- 56 staff members (54 last year)
- 6500 patient exams per month (6200 last year)
- 230 OR surgical procedures per month

“ Summer Departures”

Dr Enoch Nam, Corneal and Refractive specialist, joined a Cornea practice in Walnut Creek, CA, after serving three years with us.

Dr Terry Wood, Neuro-ophthalmologist, left to seek additional fellowship training (Ocular Genetics) at the University of Oregon.

Dr Simon Bababegy, Retina specialist, transitioned to a practice in LA for family reasons.

Recent Department Additions

Kimberly Chan, MD



Comprehensive Ophthalmology
 Loma Linda University School of Medicine
 Ophthalmology Residency:
 Loma Linda University
Joined faculty August 2016
SACHS SB Eye Clinic

Frank Hwang, MD



Corneal / Refractive/ Anterior Segment Surgery

- Mount Sinai School of Medicine
- Ophthalmology Residency : University of Wisconsin
- Corneal Fellowship: Johns Hopkins University
- Faculty Kresge Eye Institute
- **Joined faculty October 2016**

David Sierpina, MD



- **Medical Retina / Comprehensive**
- **Rosalind Franklin University in Chicago**
- **Ophthalmology Residency: Loma Linda University**
- **Medical Retina fellowship: Loma Linda University**

Joined Faculty August 2016

Timothy Winter, MD



Neuro-ophthalmology and Pediatric Ophthalmology

Western University of Health Sciences
 Ophthalmology Residency: Oklahoma State University Medical Center
 Neuro-ophthalmology Fellowship: Bascom Palmer Eye Institute
 Pediatric Ophthalmology Fellowship: University of Iowa
 Faculty U of New Mexico

- **Started this past week!**

SACHS Eye Clinic San Bernardino – Opened August 2016



Part of SACHS SB FQHC
 Comprehensive / Peds
 Expanded access for IEHP patients

Insurances Accepted

- **IEHP**
 - Direct
 - IFMG
 - LaSalle
 - Vantage
- **Molina**
 - IFMG
 - LaSalle
 - Vantage

Referrals Process

- ▶ **Contact Jessica Hernandez, Referral Coordinator for SACHS Ophthalmology**
 - ▶ 909-771-2888 (phone)
 - ▶ 909-771-2841 (FAX)

George P. Cheng, MD Children's Vision Screening Program

- **Sponsored by the Cheng Family Foundation**
 - Funding a full-time project coordinator
 - Lion's club assistance
- **Inception Sept 2015**
- **Program coordinator – Dr Dunbar**
- **9500 screenings thus far**
- **We are looking for optometrists to partner with us to see patients who “fail” screenings!**
 - **Speak with front desk for details**

Electrophysiologic Testing

- Began Jan 2015
- Only testing facility in the Inland Empire
- ERG
 - Full field
 - Multi-focal
 - Pattern
- EOG
- VEP

- Top Indications:
 - Hereditary retinal degenerations
 - Unexplained vision loss
 - Plaquenil toxicity eval

Implantable Miniature Telescope

- Hope for legally blind AMD patients
- FDA approved
 - ✓ 6 patients treated at LLU
 - ✓ Inclusion criteria age now 65 and older
- Regional site for implanting device
 - ✓ Post FDA safety and efficacy study
 - ✓ LLU Occupational therapy



Lusaka Eye Hospital – Zambia



One month elective option for senior residents with Dr Janie Yoo in Zambia

- Part of the LLUMC Global Health Institute Network

“See It Forward” Program

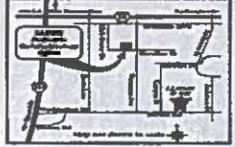
- New department initiative to support the cataract surgery mission program at Lusaka Eye Hospital
- For each bilateral refractive surgery procedure performed at LLUEI, we will fund one “outreach program” cataract surgery
 - <http://lusakaeyehospital.org>

Facilities

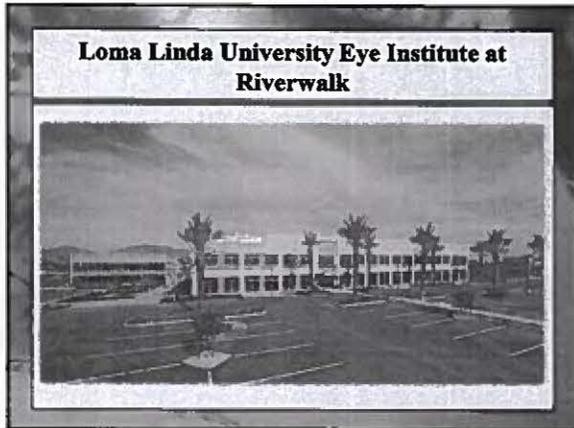



Main site located at Suite 1800 in Faculty Medical Office across from LLUMC and adjacent to Outpatient Surgical Center

Pediatric Ophthalmology Satellite




- Caroline St Office
- 10 exam lanes
- 4 Pediatric Ophthalmologists, 2 Orthoptists, 1 Optometrist



- Key Features of Riverwalk Office**
- Duplication of subspecialty service lines found in Loma Linda
 - Minor procedure room
 - Diagnostic testing
 - ✓ Fluorescein Angiography
 - ✓ Color photos
 - ✓ Cirrus OCT imaging (Optic nerve and macula)
 - ✓ OPD Scan and Orbscan
 - ✓ IOL Master
 - ✓ B- Scan
 - ✓ Visual Fields

- Riverwalk Office Providers**
- John AHeidt – Cornea
 - Jennifer Dunbar – Peds
 - Fatema Esmail – Peds
 - Howard Guan – Glaucoma and Comprehensive
 - Lynn Huang – Retina
 - Priscilla Luke – Comprehensive
 - Rosalynn Nguyen – Strongin – Comprehensive Optometry
 - Samantha Perea – Glaucoma and Cataract
 - Michael Rauser – Cataract and Medical Retina
 - David Sierpina – Comprehensive and Medical Retina
 - Donald Tohm – Comprehensive



- Highland Springs Clinic and Surgical Center**
- Clinic 3 days per week
 - Gradual expansion over the next year – possible new Suite!
 - Michael E. Rauser, MD - Cataract and Medical Retina
 - Donald G. Tohm, MD - Comprehensive
 - Samantha Perea, MD- Glaucoma and Comprehensive
 - Frank Hwang, MD- Cornea, Cataract, Refractive
 - Priscilla K. Luke, MD- Comprehensive
 - Howard Guan, MD – Glaucoma and Comprehensive
 - David Sierpina – Comprehensive and Medical Retina
 - William Kieman, O.D. – Comprehensive exams ; postop care

Residency Program



- 3 year residency
- 4 residents/year
- 90% in surgical volume/eye trauma
- Refractive surgery elective with SD Naval Center

LLUH Optometric Affiliation Plan

- New University initiative – launched Jan 2015
- Co-marketing arrangement between LLUH and participating optometric groups
- Revocable agreement
- No cost for participation

Current LLUEI Optometric Affiliates

- Paul Adams - San Bernardino
- Ethan Clayton - Moreno Valley
- Sandra Davidson - Riverside
- Steven Keller - Palm Desert
- Paul Kiyan- San Bernardino
- Daniel Navarro- Redlands
- Arash Sadeghian - Corona
- Tanya Vanguilder - Beaumont / Yucaipa
- Stacy Vo - Redlands

Website Presence LLUEYES.com → Optometric affiliates



Goal #1 – Better Community Eye Care

Better Patient Education

- Information sharing with affiliated optometrists
- Preventative eye care
 - ✓ AMD, cataracts, diabetic eye disease, etc.
- Disease treatment options
- Research opportunities

Improved Access to Quality Eye Care

- 2 way street
 - ✓ Facilitate ophthalmology referrals
 - ✓ Ensure optometric continuity of care

Goal #2- Improve the Patient Experience with LLU Eye Institute

- Appointment process
- Office visit
- Optometric follow-up
- Communication process with referring optometrists
 - ✓ Affiliated optometrists will be part of the LLUH Quality Management process
 - ✓ Real-time feedback
 - ✓ Meetings (+ CE) – 1st meeting held August 2015

Goal #3- Enhance the Practices of the Optometric Affiliates

- Tangible benefits for Optometric Affiliates
- Use of the "Loma Linda University Optometric Affiliate" brand
- Displayed on front office windows, office stationary, personal website, etc.
 - Yearly reminder cards
- Affiliates will be listed on "preferred provider" materials in our offices
- LLUH website presence
- "Tracking" of referrals to the affiliates
- May apply for Clinical Instructor academic appointment, if willing to give lectures at Grand Rounds or to the residents

It's time for your annual eye exam!

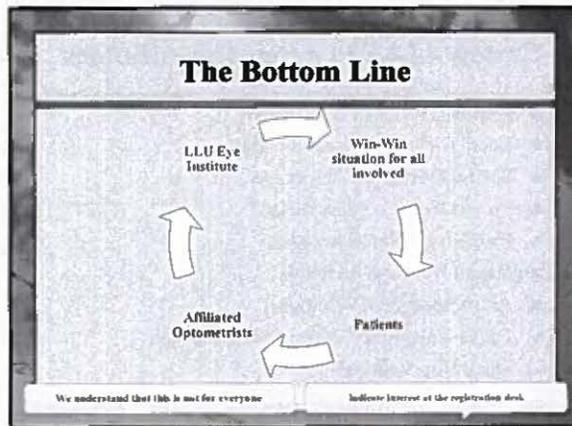
Optometric Affiliate of

MANY STRENGTHS. ONE MISSION.
A Seventh Day Adventist Organization

LLU LOMA LINDA UNIVERSITY
For Wholeness

What is Expected of the Optometric Affiliates?

- Will display LLUH affiliation decal on office window(s) and within office
- Will display LLU Eye Institute educational and physician BIO information prominently within offices
- Will actively share this information with patients
- Will NOT display materials of other "competing" ophthalmology entities
 - This does NOT preclude referrals to non-LLUH providers!
- Will commit to participation in the LLUH Quality management process



What's in Store for the Future ?

- Continued Department Expansion
 - 2nd floor FMO " Retina Center" – Opens Feb-March 2017
 - Staff growth in Oculoplastics and Retina
 - Retina Service Director
- SACHS Eye Clinic growth
- Webcasting of Grand Rounds

Vision 2020 LLUH – New Medical Center Complex

LLU LOMA LINDA UNIVERSITY
MEDICAL CENTER

Patient Access to LLU Eye Institute

- See referral forms and laminated information sheet in today's registration packet
- "Priority Optometry" slots exist in all physician's schedules
 To access these slots - your office needs to facilitate the referral as follows:
 1. Access line for Optometrists : 909-558-EYES or
 2. Fax completed Referral Request form to our office: 909-558-2180
- It's always helpful to send note with patient (to ensure referral letter back)
 Please include refraction with BCVA for cataract evals

Important Announcements!!!

To obtain CE Credits for Today's Conference ...

- You must turn in the Continuing Education Evaluation Form at the end of the conference to the registration desk
- Complete only the lectures attended if you are leaving early
- Complete duplicate CE verification form and turn in yellow copy
- Don't forget to pick up your gift!

Continuing Education Opportunities

**Grand Rounds at
 Faculty Medical Office - Loma Linda Suite 1800**

- 1st and 3rd Wednesday of each month from
7:00AM - 8:30AM
- 1.5 hrs. of CE credit at no charge

Thanks to Dr. Steven Keller!

- Juice and bagels provided (but BYOC!)

In Summary - Our Mission!



- ✓ **Quality Care**
- ✓ **Research**
- ✓ **Education**
- ✓ **Christian Environment**



CURRICULUM VITAE
Michael E. Rauser, MD

DEMOGRAPHIC AND PERSONAL INFORMATION

Home Address

714 East Sunset Drive N.
 Redlands, CA 92373

Office address

Loma Linda University Eye Institute
 11370 Anderson St., Ste. #1800
 Loma Linda, CA 92354
 Tel. 909.558.2182
 Fax. 909.558.2506
MRauser@llu.edu

Citizenship: U.S.A.

Birthplace and birthdate: Baltimore, Maryland, November 18, 1964

EDUCATION AND TRAINING

<i>Year</i>	<i>Degree/ Certification</i>	<i>Institution</i>	<i>Discipline</i>
06/1982-05/1986	B.A.	University of Maryland	Biology
05/1986-05/1990	MD	University of Maryland SOM	Medicine
06/1990-06/1991	Internship	Mount Sinai Medical Center, FL	Internal Medicine
07/1991-06/1994	Residency	University of Maryland	Ophthalmology
07/1994-06/1995	Fellowship	Mayo Clinic, Rochester, MN	Retina & Vitreous Surgery

PRIVATE PRACTICE

07/1995 – 11/1999 Albert Lea Eye Clinic – Mayo Health System, Albert Lea, MN
 12/1999 – Current Loma Linda University Eye Institute, Loma Linda, CA

CLINICAL AREAS OF EXPERTISE

I currently practice comprehensive ophthalmology with a subspecialty emphasis in medical retina. My areas of expertise are Cataract Surgery, Medical Retina (treatment of diabetic retinopathy, age-related macular degeneration, vein occlusion), & Retinopathy of Prematurity.

SPECIALTY BOARD CERTIFICATION

1996 American Board of Ophthalmology – Initial Certification
2005 American Board of Ophthalmology – Recertification
2015 American Board of Ophthalmology – Recertification (01/01/2017 – 12/31/2026)

CURRENT ACADEMIC APPOINTMENT

July 2005 – Current Associate Professor, LLU SOM Ophthalmology

PAST ACADEMIC APPOINTMENTS

2000 – 2002 Assistant Clinical Professor, LLU SOM Ophthalmology
2002 – 2005 Assistant Professor, LLU SOM Ophthalmology

CURRENT ADMINISTRATIVE APPOINTMENTS

01/2014 – Current Chairman, LLU Eye Institute

PAST ADMINISTRATIVE APPOINTMENTS

07/2013 – 06/2014 Associate Residency Program Director, LLU Eye Institute
07/2002 – 06/2013 Residency Program Director, LLU Eye Institute
07/2006 – 12/2013 Vice Chair for Clinical Affairs, LLU Eye Institute

MEDICAL LICENSES

California 1999 - Active
Iowa 1998 - Inactive
Minnesota 1994 - Inactive

CERTIFICATIONS

American Board of Ophthalmology
May 1996 Certification
May 2005 Re-certification

HOSPITAL APPOINTMENTS

Inactive, Ophthalmologist, Albert Lea Eye Clinic – Mayo Health System 1995-1999
Attending, Ophthalmologist, LLU Eye Institute December 1999 – Current
Active Member, Loma Linda University Medical Center January 28, 2000 – Current
Active Member, Riverside County Regional Medical Center February 27, 2001 – Current

Active Member, Saint Bernadine's Hospital October 1, 2002 – Current
Inactive Member, Catalina Island Medical Center 2007 – 2008
Active Member, Highland Springs Surgical Center May 11, 2009 – Current
Active Member, Parkview Medical Center 2013 – Current

HONORS AND AWARDS

1986 Magna cum laude graduate, University of Maryland Baltimore County, Baltimore, MD
1989 Alpha Omega Alpha (AOA), Beta Chapter, Junior Year
1989 – 1990 Who's Who Among Students in American Colleges and Universities
1990 Cum Laude graduate, University of Maryland SOM

ACADEMIC & ADMINISTRATIVE COMMITTEE ACTIVITIES AT LOMA LINDA

Loma Linda University Eye Institute

- Member, Academic Committee
- Member, Clinical Competency Committee
- Member, Program Evaluation Committee
- Member, Promotions Committee
- Member, Residency Review & Selection Committee
- Member, Research Committee
- Chair, Faculty Committee
- Member, Annual Postgraduate Convention Ophthalmology Planning Committee
- Member, Clinic Efficacy Committee
- Member, Compensation Committee
- Member, Electronic Medical Records Committee
- Member, Retina Fellow Review & Selection Committee
- Member, Marketing Committee
- Member, Operations Committee
- Director, Optometry Symposium Planning Committee
- Member, Website Planning Committee
- Member, Resident Research Symposium Planning & Implementation Committee
- Member, Strategic Planning Committee
- Chair, Cataract Surgeons' Committee
- Member, Annual Planning Evaluation (APE) Committee
- Member, Quality Assurance Committee (QA)
- Member, Loma Linda University International Institute of Eye Sciences (LLUIIES)

Loma Linda University

- Member, Loma Linda University Faculty Medical Group Board Committee

Loma Linda University Medical Center

- Member, Medical Staff Executive Committee

Highland Springs Surgical Center

- Associate Chair - Medical Executive Committee
- Member – Board of Managers

MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS

- Member, American Academy of Ophthalmology 1991-Current
- Member, Association for Research in Vision & Ophthalmology 2002 - Current

JOURNAL EDITOR/REVIEWER

- None at this time

EXTRAMURAL GRANTS

Principal Investigator

Percentage of time invested: 100%

- \$111,689.00 – EMMES Corporation
- \$16,125.84 – University of Wisconsin, Madison
- \$30,140.00 – Pfizer

Co-Investigator

Percentage of time invested: 80%

- \$5,262.67 – JAEB Center
- \$69,762.67 – JAEB Center
- \$3,427.00 – JAEB Center
- \$15,906.66 – JAEB Center
- \$5,730.50 – JAEB Center
- \$1,579.50 – JAEB Center
- \$21,352.00 – JAEB Center
- \$275,746.88 – JAEB Center
- \$34,459.75 – JAEB Center
- \$2,719.25 – JAEB Center
- \$1,438.00 – JAEB Center
- \$41,311.25 – JAEB Center
- \$13,523.80 – JAEB Center
- \$21,941.70 – JAEB Center
- \$42,155.05 – JAEB Center
- \$17,031.80 – JAEB Center

INTRAMURAL GRANTS

- None at this time

CLINICAL TRIAL EXPERIENCE

Site Principal Investigator

January 2005 – May 2009

Standard of Care vs. Corticosteroid for Retinal Vein Occlusion (SCORE Study) – Sponsor – National Eye Institute

May 2005 - June 2006

A Phase 2 Multi-Center Randomized, Masked, Controlled Study of MSI- 1256F (Squalamine lactate) for the Treatment of Subfoveal Choroidal Neovascularization Associated with Age-Related Macular Degeneration – sponsor –Genaera (Study completed)

January 2006 - 2009

(A Randomized, Double-Masked, Parallel Group, Multi-Center, Dose-Finding Comparison of the Safety and Efficacy of ASI-001A 0.5 µg/day and ASI-001B 0.2 µg/day Fluocinolone Acetonide Intravitreal Inserts to Sham Injection in Subjects with Diabetic Macular Edema

October 2006 - 2012

Age Related Eye Disease 2 Study – National Eye Institute Study: Multi-center, randomized trial designed to assess the effects of oral supplementation of macular xanthophylls (lutein and zeaxanthin and/or long-chain omega-3 fatty acids on the progression to advanced AMD)

2010 – 2012

ForeseeHome study- Home Vision Monitoring in the Age-Related Eye Disease Study 2 (AREDS2) for Progression to Neovascular AMD Using the ForeseeHome Device- Sponsor- National Eye Institute

2014- present

SCORE2 study – Study of Comparative Treatments in Retinal Vein Occlusion 2 - Sponsor- National Eye Institute

2014-present

A Prospective, Multicenter Post-Approval Study (PAS) Of The Implantable Miniature Telescope (by Dr. Isaac Lipshitz) In patients With Bilateral Severe To Profound Central Vision Impairment Associated With End-Stage Age-Related Macular Degeneration Protocol IMT-PAS-01 – Centrasight post-FDA approval Phase 4 study

Co-Investigator

2004 - 2006

Diabetic Retinopathy Clinical Research Network - A Pilot Study of Laser Photocoagulation for Diabetic Macular Edema – Protocol A; Sponsor – National Eye Institute

2004 - 2007

Diabetic Retinopathy Clinical Research Network A Randomized Trial Comparing Intravitreal Corticosteroids and Laser Photocoagulation for Diabetic Macular Edema – Protocol B; Sponsor National Eye Institute

2004 - 2006

Anti-Human VEGF Antibody Fab for the Treatment of Subfoveal Choroidal Neovascularization (PIER Trial) Sponsor-Genentech

2005 - 2008

Regeneron (Title: An exploratory study of the safety, tolerability and biological effect of intravitreal administration of VEGF trap in patients with neovascular age-related macular degeneration - sponsor: Regeneron)

2005 - 2007

DRCR- Protocol E - Peribulbar (Title: A Pilot Study of Peribulbar Triamcinolone Acetonide for Diabetic Macular Edema - sponsor: NEI/NIH) Protocol E

2004 - 2006

Acular Study Title: Pretreatment with ketorolac tromethamine and prednisolone acetate for Diabetics Undergoing Cataract Surgery - sponsor: LLU Ophthalmology Department

2005 - 2006

Oxigene (Title: A Phase II, Dose Ranging, Multi-Center Study to Evaluate the Safety and Efficacy of Combretastatin A4 Phosphate for Treating Subfoveal Choroidal Neovascularization (CNV) in Subjects with Pathologic Myopia (Amendment 1 May 11, 2005, Original Protocol November 23, 2004 - sponsor: Oxigene)

2005 - 2006

Allergan DME: (Title: A 3-Year, Phase 3, Multicenter, Masked, Randomized, Sham-Controlled Trial to Assess the Safety and Efficacy of 700 µg and 350 µg Dexamethasone Posterior Segment Drug Delivery System (DEX PS DDS Applicator System) in the Treatment of Patients with Diabetic Macular Edema – sponsor: Allergan)

2005 - 2008

Allergan RVO: (Title: A Six-Month, Phase 3, Multicenter, Masked, Randomized, Sham-Controlled Trial (with Six-Month Open-Label Extension) to Assess the Safety and Efficacy of 700 µg and 350 µg Dexamethasone Posterior Segment Drug Delivery System (DEX PS DDS) Applicator System in the Treatment of Patients with Macular Edema Following Central Retinal Vein Occlusion or Branch Retinal Vein Occlusion - sponsor: Allergan)

2005 - 2007

DRCR-Vitrectomy Protocol D (Title: Evaluation of Vitrectomy for Diabetic Macular Edema Study – sponsor: NEI/NIH)

2005 – 2007

DRCR- PRP: Protocol F (Title: An Observational Study of the Development of Diabetic Macular Edema Following Scatter Laser Photocoagulation - sponsor: NEI/NIH)

2005 - 2009

DRCR.Net Protocol G: Subclinical DME: (Title: Subclinical Diabetic Macular Edema Study- sponsor: NEI/NIH)

2005 - 2011

Regeneron 0605 (Title: An exploratory study of the safety, tolerability and biological effect of intravitreal administration of VEGF trap in patients with neovascular age-related macular degeneration - sponsor:

Regeneron)

2006 - 2008

Avastin and Diabetic Macular Edema Study – Phase 2 study DRCR.NET Protocol H

2007- Present

Laser – Ranibizumab – Triamcinolone for DME Study DRCR.NET Protocol I

2007- 2009

Laser – Ranibizumab – Triamcinolone for DME Plus PRP Study DRCR.NET Protocol J

2010- 2012

Intravitreal Ranibizumab for Vitreous Hemorrhage from PDR Study DRCR.NET Protocol N study

2008-2010

Cataract Surgery with Center-Involved DME Study DRCR.NET Protocol P Study

2008-2010

Cataract Surgery without Center-Involved DME Study – DRCR.NET Protocol Q study

2011- Present

Phase II non-Central DME NSAID Study DRCR.NET Protocol R study

2012- Present

Prompt Panretinal photocoagulation versus Intravitreal Ranibizumab with deferred Panretinal Photocoagulation for Proliferative Diabetic Retinopathy - DRCR.NET Protocol S study

2012- Present

Genes in Diabetic Retinopathy Project - DRCR.NET study

2013- Present

A Comparative Effectiveness Study of Intravitreal Aflibercept, Bevacizumab, and Ranibizumab for Diabetic Macular Edema - DRCR.NET Protocol T study

2014 – Present

Short-term Evaluation of Combination Corticosteroid+Anti-VEGF Treatment for Persistent Central-Involved Diabetic Macular Edema Following Anti-VEGF Therapy DRCR.NET Protocol U study

2014- Present

Treatment for Central-Involved Diabetic Macular Edema in Eyes with Very Good Visual Acuity - DRCR.NET Protocol V study

2015- Present

A Two-Year, Randomized, Double-Masked, Multicenter, Three-Arm Study Comparing the Efficacy and Safety of RTH258 versus Aflibercept in Subjects with Neovascular Age-Related Macular Degeneration – Alcon sponsored study

BOOKS, CHAPTERS

Howard V Gimbel MD, Sandra J. Sofinski MD, Katerina Kurteeva, **Michael Rauser MD** AdvanTEc Legacy System and the NeoSoniX Handpiece. Opinion of Ophthalmology 2003

PUBLICATIONS

Hosmane RS, Bhan A, **Rauser ME**, Facile Conversation of 4(5)-nitro-5(4)-methylimidazoles into 4(5)-nitro-5(4)-cyanoimidazoles, *Journal of Organic Chemistry*, 1985 December, Vol 50, Issue 26: 5892-5895

Hosmane RS, Burnett F, **Rauser ME**, Son C, Lim B, "Fat" Nucleosides and Nucleotides I. Abstract, Tenth International Congress of Heterocyclic Chemistry, 1985

Hosmane RS, Bhan A, **Rauser ME**, Models for "Fat" Nucleosides and Nucleotides: Synthesis of "Fat" Xanthine (fX), "Fat" Guanine (fG), and "Fat" Hypoxanthine (fHx) analogues of the Imidazo, 1986, (4,5-e) (1,4) Diazepine System, *Heterocycles* 24:2743-2748

Guth L, Albers W, Barrett C, Donati E, **Rauser ME**, Quantitative Evaluation of Axonal Regeneration by Immunocytochemical Assay for Neurofilament Protein, *Experimental Neurology*, 1988, 100:83-87

Rauser ME, Rismondo V, Ischemic Optic Neuropathy during Corticosteroid Therapy for Giant Cell Arteritis, *Archives of Ophthalmology*, 1995 June, 113: 707-708

Gimbel HV, Sofinski SJ, Kurteeva K, **Rauser M**, AdvanTec Legacy System and the neoSoniX handpiece, *Current Opinion Ophthalmology*, 2003 February, 14(1):31-34

Gimbel HV, Hedayi R, King J, **Rauser, M**, Capsular Membrane Optic Capture for Secondary Stabilization of Sulcus-Positioned Intraocular Lenses, *Journal of Cataract and Refractive Surgery*, July 2003

Chakrabarty A, Tying SK, Beutner K, **Rauser M**, Recent Clinical Experience with Famciclovir – a "Third Generation" Nucleoside Prodrug, *Antiviral Chemistry and Chemotherapy*, 2004 September, 15(5):251-253

Chakrabarty A, Pang KR, Wu JJ, Narvaez J, **Rauser M**, Huang DB, Beutner KR, Tying SK, Emerging therapies for herpes viral infections (types 1 - 8), *Expert Opin Emerg Drugs*, 2004 Nov, 9(2):237-56.

Browning DJ, Glassman AR, Aiello LP, Beck RW, Brown DM, Fong DS, Bressler NM, Danis RP, Kinyoun JL, Nguyen QD, Bhavsar AR, Gottlieb J, Pieramici DJ, **Rauser ME**, Apte RS, Lim JI, Miskala PH, Relationship between optical coherence tomography-measured central retinal thickness and visual acuity in diabetic macular edema, *Ophthalmology*, 2007 March, 114(3):525-36

Chan CK, Meyer CH, Gross JG, Abraham P, Nuthi AS, Kokame GT, Lin SG, **Rauser ME**, Kaiser PK, Retinal Pigment Epithelial Tears After intravitreal Bevacizumab Injection for Neovascular Age-Related Macular Degeneration, *Retina*, 2007 June, 27(5):541-51

Alasil T, **Rauser ME**, Intravitreal Bevacizumab in the treatment of neovascular glaucoma secondary to central retinal vein occlusion: a case report, *Cases Journal*, 2009 October, 30;2:176

Chan CK, Abraham P, Meyer CH, Kokame GT, Kaiser PK, **Rauser ME**, Gross JG, Nuthi AS, Lin SG, Daher NS, Optical coherence tomography-measured pigment epithelial detachment height as a predictor for retinal pigment epithelial tears associated with intravitreal bevacizumab injections, *Retina*. 2010 Feb, 30(2):203-11

Narváez J, Kronberg BP, Park H, Zumwalt JR, Wong B, Bacon G, **Rauser M**, Hoehn AS, Eiseman H, Zimmerman G, Pupil dilation using a standard cataract surgery regimen alone or with atropine 1.0% pretreatment: prospective comparative evaluation, *J Cataract Refract Surg*, 2010 April, 36(4):563-7

Thomas WJ, **Rauser M**, Dovich JA, Dustin L, Flaxel CJ, Oxygen saturation in premature infants at risk for threshold retinopathy of prematurity, *Eur J Ophthalmology*, 2011 March-April, 21(2):189-93

Alasil T, Khazai B, Loredó L, **Rauser ME**, Renal cell carcinoma metastasis to the ciliary body responds to proton beam radiotherapy: a case report, *J Med Case Reports*, 2011 August, 3;5:345

Collaborators (23), Lutein + zeaxanthin and omega-3 fatty acids for age-related macular degeneration: the Age-Related Eye Disease Study 2 (AREDS2) randomized clinical trial, *JAMA Ophthalmology*, 2013 May, 15;309(19):2005-15

Collaborators (23), Lutein/zeaxanthin for the treatment of age-related cataract: AREDS2 randomized trial report no. 4, *JAMA Ophthalmology*, 2013 July, 131(7):843-50

Collaborators (1006), Methods and reproducibility of grading optimized digital color fundus photographs in the Age-Related Eye Disease Study 2 (AREDS2 Report Number 2), *Invest Ophthalmol Vis Sci*, 2013 July, 8;54(7):4548-54

Diabetic Retinopathy Clinical Research Network Authors/Writing Committee, Baker CW, Almkhatar T, Bressler NM, Glassman AR, Grover S, Kim SJ, Murtha TJ, **Rauser ME**, Macular edema after cataract surgery in eyes without preoperative central-involved diabetic macular edema, *JAMA Ophthalmology*, 2013 July, 131(7):870-9

ELECTRONIC PUBLICATIONS

Browning DJ, Glassman AR, Aiello LP, Beck RW, Brown DM, Fong DS, Bressler NM, Danis RP, Kinyoun JL, Nguyen QD, Bhavsar AR, Gottlieb J, Pieramici DJ, **Rauser ME**, Apte RS, Lim JJ, Miskala PH, Diabetic Retinopathy Clinical research Network; Relationship between optical coherence tomography-measured central retinal thickness and visual acuity in diabetic macular edema; *Ophthalmology* 2007 Mar;114(3):525-36, Epub 2005 Nov 21

ABSTRACT AND POSTER PRESENTATIONS

Anterior Capsule Contraction Syndrome with the Acrysof SA60AT Acrylic lens; Carlindo Da Reitz Pereira, M.D., **Michael Rauser, M.D.** ARVO poster presentation, May 4, 2003

Immediate Pre-Laser Oxygen Saturations, Birthweight and Gestational Ages as Predictive Factors for Retinopathy of Prematurity (ROP) Progression; William Thomas, M.D., **Michael Rauser, M.D.** ARVO poster presentation, May 4, 2003

Evaluation of higher order aberrations In the Tecnis Z9000 and Acrysof SA60AT; J.C. Hartley, M.D., **M.E. Rauser, M.D.**, M.S. Niemeier, M.D., H.V. Gimbel, M.D. ARVO poster presentation, April 26, 2004

Evidence Based Screening Criteria for Retinopathy of Prematurity - The Loma Linda Experience; **M.E. Rauser, M.D.**, M.S. Niemeier, M.D. ARVO poster presentation, April 28, 2004

Anterior Capsule Contraction Syndrome with the Acrysof SA60AT lens – A Comparison of Surgical Techniques; P. Luke, M.D., **M. Rauser, M.D.** ARVO poster presentation, May 1, 2005

The Role of Intraoperative Pars Plana Intravitreal Kenalog During Cataract Extraction in Patients with Preoperative Clinically Significant Diabetic Macular Edema; J. Dovich, M.D., **M. Rauser, M.D.** ARVO poster presentation, May 1, 2005

Preliminary Study of the EYESI Ophthalmic Surgery Simulator; Robert M. Ford, M.D., **Michael Rauser, M.D.** ARVO poster presentation, May 2006

Short Term Visual Outcomes of the Alcon Toric Intraocular lens; Keith Tokuhara, M.D., **Michael Rauser, M.D.** ARVO poster presentation, April 27 2008

Prophylactic use of Intracameral Vancomycin in Cataract Surgery: a Retrospective Review of one Surgeon's Experience Supporting its Safety and Efficacy; David M. Skale, M.D., Tomas A. Lopez, **Michael E. Rauser, M.D.**, Carlo Manalo, Elliot Yoo. ARVO Poster Presentation, May 10, 2012

Intravitreal Ranibizumab for Diabetic Macular Edema with Prompt vs. Deferred Laser Treatment: 3 year results; **Michael Rauser, MD** for the Diabetic Retinopathy Clinical Research Network. ARVO Poster Presentation, May 5, 2013

Review of Ocular Findings in Patients With Orbital Wall Fractures: A 5 -Year Retrospective Analysis Heidi Eiseman; Michael E Rauser; Stephanie Terrill; So Eun Choi ARVO poster presentation May 2014

PAPER PRESENTATIONS

Anterior Capsule Contraction Syndrome with the Acrysof SA60AT Acrylic lens; Carlindo Da Reitz Pereira, M.D., **Michael Rauser, M.D.** AAO platform presentation, November 19, 2003

Kroll M, Narváez J, Nelson C, Kim D, **Rauser M.** Comparison of reading speed, near and intermediate visual acuities with the SA60AT and the posterior aspherical SN60WF intraocular lens. Presented as a paper in a symposium at the ASCRS annual meeting, March 19, 2006; San Francisco, CA. Awarded Best Paper of the Session.

ARTICLES WRITTEN

“Lifestyle changes may help prevent Diabetic Retinopathy” – The San Bernardino Sun – Feb 6, 2002

“Prevention of Macular Degeneration” – The San Bernardino Sun – June 26, 2003

Quarterly “Residency Report” – written in the Loma Linda University Department of Ophthalmology newsletter “Eye Contact” - Year 2003 – Present

Loma Linda University Nutrition and Health Letter – May 2004 “Ask the Expert” on “Macular Degeneration and Nutrition”

“Why Am I Losing My Central Vision?” - Tarek Alasil, MD, Jesse Knabb, Michael Rauser, MD, Morning Rounds EyeNet Magazine Feb 2011;

INVENTIONS, PATENTS, COPYRIGHTS

- None at this time

LECTURES AND CONFERENCES PRESENTED

YEAR 2000

02/16/2000 Diabetic Retinopathy – Primecare Riverside Staff (1/2 hour)
07/07/2000 Fluorescein Angiography conference – Staff & Residents (1 hour)
07/26/2000 Diabetic Eye Disease – Nursing Staff at FMO (1 hour)
08/02/2000 Review of Retinal Disorders (AMD, Retinal Vein Occlusion, Retinal Detachment, and Retinal Tumors) - Loma Linda Ophthalmology 1st year Residents (2 hours)
08/18/2000 Fluorescein Angiography conference – Staff & Residents (1 hour)
09/01/2000 Ophthalmology for the Primary Care physician – Family Practice Residents and Attendings (1 hour)
10/13/2000 The Aging Eye – Loma Linda Korean SDA Church (1 hour)
11/06/2000 Ophthalmology Review – Loma Linda Korean SDA Church Pathfinder’s Group (1/2 hour)

YEAR 2001

01/17/2001 Age Related Macular Degeneration Part 1 – Loma Linda Ophthalmology Residents (1 hour)
02/07/2001 Age Related Macular Degeneration Part 2 – Loma Linda Ophthalmology Residents (1 hour)
02/25/2001 Cataract Extraction in Diabetics – A Retina Surgeon’s Perspective Loma Linda APC Lecture (1/2 hour)
03/02/2001 The Aging Eye – Loma Linda Wellness Conference (1/2 hour)
04/26/2001 Choroidal Neovascularization - Loma Linda Ophthalmology Residents (1 hour)
06/01/2001 Grand Rounds Loma Linda FMO – Myopic Degeneration (1/2 hour)

- 06/15/2001 Fluorescein Angiography Conference - Loma Linda Ophthalmology Residents (1 hour)
- 07/06/2001 Ophthalmology for the Primary Care physician – Family Practice Residents and Attendings (1 hour)
- 08/01/2001 Diabetic Retinopathy - Loma Linda Ophthalmology Residents (1 hour)
- 08/01/2001 Review of Retinal Disorders (AMD, Retinal Vein Occlusion, Retinal Detachment, and Retinal Tumors) - Loma Linda Ophthalmology 1st year Residents (2 hours)
- 09/07/2001 Fluorescein Angiography Conference - Loma Linda Ophthalmology Residents (1 hour)
- 09/12/2001 Cataract Extraction in Diabetics – A Retina Surgeon’s Perspective Inland Empire Optometry Association (1 hour)
- 10/03/2001 Vascular Occlusive Diseases - Loma Linda Ophthalmology Residents (1 hour)
- 11/02/2001 Ophthalmology for the Internist – Internal Medicine Grand Rounds – Jerry L. Pettis VA Medical Center (1 hour)

YEAR 2002

- 01/04/2002 Fluorescein Angiography Conference - Loma Linda Ophthalmology Residents (1 hour)
- 02/01/2002 Fluorescein Angiography Conference - Loma Linda Ophthalmology Residents (1 hour)
- 02/07/2002 Age Related Macular Degeneration Part 1 – Loma Linda Ophthalmology Residents (1 hour)
- 02/13/2002 The Aging Eye – Senior citizens group –Butterfield hall Loma Linda Community Hospital (1 hour)
- 02/21/2002 Age Related Macular Degeneration Part 2 – Loma Linda Ophthalmology Residents (1 hour)
- 03/26/2002 Macular Degeneration and Cataracts - Highland Senior Center (1 hour)
- 03/27/2002 Diabetic Eye Disease - Senior citizens group –Butterfield hall Loma Linda Community Hospital (1 hour)
- 04/05/2002 Fluorescein Angiography Conference: Review for OKAP test - Loma Linda Ophthalmology Residents (1 hour)
- 04/11/2002 Macular Degeneration and Cataracts: Can Vision Loss be Prevented? Seminar at Redlands, CA SDA Church (1 hour)
- 04/14/2002 C & E Ocular Symposium: Macular Degeneration and Nutrition: Can Vision Loss be Prevented? Cataract Extraction in Diabetics – A Retina Surgeon’s Perspective Management of Eye Trauma (2 hours)
- 04/21/2002 Macular Degeneration: Can Vision Loss be Prevented? To Lion's Club at Loma Linda Ophthalmology Department (45 min)
- 04/28/2002 AREDS Study Results: Update on Macular Degeneration and Nutrition (15 minutes)
- 06/12/2002 Aging Eye part 3 –Macular Degeneration and Cataracts: Senior citizens group – Butterfield hall Loma Linda Community Hospital (1 Hour)
- 06/21/2002 Grand Rounds – Loma Linda Ophthalmology Department – Orbital Inflammatory Syndrome – Case presentation
- 07/05/2002 Fluorescein Angiography Conference – Intro to Fluorescein Angiography Loma Linda Ophthalmology Residents (1 hour)
- 07/24/2002 Diabetic Retinopathy and Retinal Vein Occlusion – 1st year resident lecture (1 hour)

- 07/31/2002 Macular Degeneration, Eye Tumors, Retinal Detachment - 1st year resident lecture (1 hour)
- 08/22/2002 Diabetic Retinopathy – Resident lecture (1hour)
- 09/06/2002 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 10/02/2002 Retinal Disorders – The Role of the Primary Care physician Part 1– Internal Medicine Grand Rounds – Loma Linda University (1 hour)
- 10/04/2002 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 10/16/2002 Retinal Disorders – The Role of the Primary Care physician Part 2– Internal Medicine Grand Rounds – Loma Linda University (1hour)
- 11/01/2002 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 11/06/2002 Macular degeneration and cataracts – can vision loss be prevented? Highland Senior Center (1 hour)
- 11/20/2002 Macular degeneration and cataracts – can vision loss be prevented? Just For Seniors group –Loma Linda Senior Center (1.5 hours)
- 12/06/2002 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 12/11/2002 Vision Loss in the Elderly – Just For Seniors group –Loma Linda Senior Center (1.5 hours)

YEAR 2003

- 01/03/2003 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 02/07/2003 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 02/09/2003 Choroidal Neovascularization – Part 1 - Resident Lecture (1 hour)
- 02/21/2003 Loma Linda Ophthalmology Grand Rounds – Case presentation- Myopic CNVM /PDT/Cataract surgery
- 03/07/2003 Fluorescein Angiography Conference – Loma Linda Ophthalmology Residents (1 hour)
- 03/09/2003 Diabetic Retinopathy, AMA, and Ocular Coherence Tomography – Inland Empire Optometric Society’s Second Annual CME Symposium – Ontario, CA (2 hours)
- 03/26/2003 Choroidal Neovascularization – Part 2 - Resident Lecture (1 hour)
- 04/04/2003 Fluorescein Angiography Conference – OKAP review – Loma Linda Ophthalmology Residents (1 hour)
- 04/11/2003 Fluorescein Angiography case presentations – VA Ophthalmology Grand Rounds
- 04/18/2003 Loma Linda Ophthalmology Grand Rounds – Case presentation- Pseudophakic CME
- 04/23/2003 Vision Loss in the Elderly – Just For Seniors group –Loma Linda Senior Center (1.5 hours)
- 05/02/2003 Resident Research Day – Loma Linda – State of the Residency Address
- 05/16/2003 Loma Linda Ophthalmology Grand Rounds – Case presentation- Update on AMD from ARVO – AMD and Nutrition and PDT therapy
- 09/06/2003 Ophthalmology for the Primary Care Physician – MS 3 quarterly Lecture (1 hour)

YEAR 2004

- 01/14/2004 Lecture to PA Students: "Ophthalmology for the Primary Care Physician" "Vision Loss in the Elderly"
- 02/18/2004 Macular Degeneration and Cataracts - Loma Linda Senior Center (1.5 hours)
- 03/07/2004 Loma Linda Annual Postgraduate Convention Conference – Ophthalmology Day "Cataract Surgery in the High Risk Retinal patient 2", "Macular Degeneration and Nutrition: Are We Properly Educating Our patients?"
- 03/18/2004 Loma Linda Annual Postgraduate Convention Conference – Macular Degeneration and Nutrition: Can Vision Loss be Prevented?
- 03/14/2004 Inland Empire Optometry Conference – Update on Macular Degeneration – 1 hour
- 04/02/2004 Fluorescein Angiography Conference – OKAP review – Loma Linda Ophthalmology Residents (1.5 hours)
- 05/21/2004 Loma Linda University Ophthalmology Grand Rounds – ARVO update
- 06/04/2004 State of the Residency – Resident Research Day- Loma Linda University
- 06/04/2004 Evidence Based Screening for Retinopathy of Prematurity - Resident Research Day- Loma Linda University
- 06/25/2004 Cataract Extraction in Patients with Diabetic Retinopathy – Canadian Rockies Symposium, Banff, Alberta, Canada (½ hour)
- 08/18/2004 "Ask the Doctor" Radio Program – Macular Degeneration and Nutrition
- 08/19/2004 How to Succeed in Clinical Practice – LLU Resident Lecture (1 hour)
- 09/30/2004 Macular Degeneration – Part 1 - LLU Ophthalmology Resident Lecture
- 10/08/2004 Ophthalmology for the Primary Care Physician – LLU Family Practice Residents (1 hour)
- 10/29/2004 Cataract Complications Video Review with Residents (1.5 hours)
- 10/31/2004 Cataract Surgery in the High Risk Retinal Patient – LLU Optometry Conference (1 hour)
- 11/09/2004 Ophthalmology for the Primary Care Physician – Internal Medicine Resident Lecture at VAMC (1 hour)
- 11/17/2004 Ophthalmology for the Primary Care Physician - Internal Medicine Resident Lecture at LLU (1 hour)
- 12/10/2004 Ophthalmology for the Primary Care Physician – MS 3 quarterly Lecture (1 hour)

YEAR 2005

- 01/05/2005 Coding Lecture to Ophthalmology Residents (1 hour)
- 01/12/2005 Ophthalmology for the Primary Care Physician And Vision Loss in the Elderly. PA Student Lecture series (2 hours)
- 01/19/2005 Retinal Disorders: The Role of the Primary Care Physician Management of Eye Trauma. PA Student Lecture series (2 hours)
- 03/07/2005 Macular Degeneration and Nutrition – Loma Linda APC Lecture (½ hour)
- 03/17/2005 Coding Lecture – Residents (½ hour)
- 03/17/2005 Practice Management Lecture (1 hour)
- 03/20/2005 Inland Empire Optometry Conference – Update on Macular Degeneration (1 hour)
- 04/01/2005 Fluorescein Angiography Conference – OKAP review – Loma Linda Ophthalmology Residents (1.5 hours)

- 05/12/2005 Review of the Eye and Eye safety – Redlands Adventist Academy 3rd Grade class (½ hour)
- 05/27/2005 State of the Residency – Resident Research Day- Loma Linda University
- 06/03/2005 Loma Linda Ophthalmology Grand Rounds – ARVO 2005 Update: Macular Degeneration Update
- 07/17/2005 C & E Optometry Symposium (Anaheim, CA) Diabetic Retinopathy 2005- What's New, What's Old; Update on Macular Degeneration (2 hours)
- 11/04/2005 Loma Linda Ophthalmology Grand Rounds – Fatigue
- 11/06/2005 Update on Macular Degeneration – Risk Factors and Preventative Therapy – Loma Linda University Department of Ophthalmology Fall 2005 Optometry Symposium
- 12/02/2005 Loma Linda Ophthalmology Grand Rounds - Prep for ACGME site visit

YEAR 2006

- 01/23/2006 Ophthalmology for the Primary Care Physician – MS 3 quarterly Lecture (1 hour)
- 02/09/2006 Ophthalmology for the Primary Care Physician And Vision Loss in the Elderly. PA Student Lecture series (2 hours)
- 02/16/2006 Retinal Disorders: The Role of the Primary Care Physician Management of Eye Trauma. PA Student Lecture series (2 hours)
- 03/05/2006 Review of Risk Factors and Prevention of AMD – Loma Linda APC Lectures – ½ hour; Corticosteroid Use During Cataract Surgery – ½ hour
- 06/02/2006 Resident Research Day Loma Linda University – State of the residency Address
- 06/16/2006 Loma Linda Ophthalmology Grand Rounds - ARVO Update 2006 and Neovascular Glaucoma and Avastin treatment
- 09/14/2006 Retina Basic Clinical Science Lecture – Hereditary Retinal and Choroidal Dystrophies (2 hours)
- 10/02/2006 San Diego Naval Medical Center Lecture Series: “Review of Risk Factors for AMD” (1 hour), “Cataract Surgery in the High Risk Retinal Patient” (1 hour), “Cataract Surgery Video Review” (2 hours)
- 11/05/2006 AMD Update Loma Linda University Department of Ophthalmology Fall 2006 Optometry Symposium

YEAR 2007

- 01/04/2007 Introduction to lasers – 1st year resident lecture
- 01/11/2007 Ophthalmology for the Primary Care Physician And Management of Eye Trauma. PA Student Lecture series(2 hours)
- 01/25/2007 Vision Loss in the Elderly and Retinal Disorders: The Role of the Primary Care Physician. PA Student Lecture series (2 hours)
- 11/04/2007 The Avastin Revolution: Shaken Baby Syndrome, Loma Linda University Department of Ophthalmology Fall 2007 Optometry Symposium (1 hour)

YEAR 2008

- 01/10/2008 Ophthalmology for the Primary Care Physician And Management of Eye Trauma. PA Student Lecture series (2 hours)

- 01/17/2008 Vision Loss in the Elderly and Retinal Disorders: The Role of the Primary Care Physician. PA Student Lecture series (2 hours)
- 05/2008 How to Succeed in Clinical Practice - Resident Lecture (1 hour)
- 05/23/2008 State of the Residency – Resident Research Day- Loma Linda University
- 11/02/2008 My Approach to the Cataract Patient 2008: Cataract Case Presentations. Moderator Dr Rauser, Loma Linda University Department of Ophthalmology Fall 2008 Optometry Symposium

YEAR 2009

- 01/08/2009 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, “Retinal Disorders – The Role of the Primary Care Physician” PA Student Lecture series (3 hours)
- 05/22/2009 State of the Residency – Resident Research Day- Loma Linda University
- 06/04/2009 How to Succeed in Clinical Practice - Resident Lecture (1 hour)
Cataract Case Presentations - Resident lecture (1 hour)
- 11/01/2009 AMD Update- Loma Linda University Department of Ophthalmology. Fall 2009 Optometry Symposium
- 11/12/2009 Update on Cataract and AMD – Prevention and Treatment – Sun Lakes Country Club, Beaumont, CA

YEAR 2010

- 02/08/2010 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, “Retinal Disorders: The Role of the Primary Care Physician”. PA Students Lecture series (3 hours)
- 03/07/2010 Prevention of AMD Progression – Loma Linda University APC meeting
- 03/17/2010 Update on Cataract and AMD – Prevention and Treatment – Air Force West Center, Moreno Valley, CA
- 04/23/2010 Update on AMD - Prevention and Treatment – Loma Linda University – Open House Presentation
- 05/18/2010 Cataract Surgery in the High Risk Retinal Patient – Optometry CE lecture, Riverside, CA
- 05/28/2010 State of the Residency – Resident Research Day- Loma Linda University
- 06/18/2010 Hereditary Retinal and Choroidal Degenerations, etc – Resident lecture (2 hours)
- 11/06/2010 “The Anti-VEGF Revolution”, Department Updated, Loma Linda University Department of Ophthalmology, Fall 2010 Optometry Symposium

YEAR 2011

- 01/2011 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, “Retinal Disorders: The Role of the Primary Care Physician”. PA Student Lecture series (3 hours)
- 05/27/2011 State of the Residency – Resident Research Day- Loma Linda University
- 11/06/2011 “When is Macular Degeneration Not Macular Degeneration?” Department Update

Loma Linda University Department of Ophthalmology, Fall 2011 Optometry Symposium
12/29/2011 Resident lectures: “How to build a successful practice”, “When is Macular Degeneration Not Macular Degeneration?” (2 hours)

YEAR 2012

01/25/2012 “Academic Improvement Plans” – Presentation at AUPO meeting – Miami, Florida
02/02/2012 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, Retinal Disorders – The Role of the Primary Care Physician” PA Student Lecture series (3 hours)
5/25/1012 State of the Residency – Resident Research Day- Loma Linda University
07/08/2012 Southern California College of Optometry Annual Ocular disease Part 2
“The Use of Anti-VEGF Agents in the Treatment of Retinal Disorders Cataract Surgery in the High Risk Retinal Patient” CE Program- Fullerton, CA
07/19/2012 Professionalism in Ophthalmology– Resident lecture
11/04/2012 “Update on the Current Management of Diabetic Retinopathy”, “Update on the Current Management of Acute Retinal Vascular Disorders”. “Department Update Loma Linda University Department of Ophthalmology” Fall 2012 Optometry Symposium

YEAR 2013

01/16/2013 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, “Retinal Disorders – The Role of the Primary Care Physician” PA Student Lecture series (3 hours)
01/17/2013 Management of Eye Trauma – ER resident lecture
03/03/2013 The Ocular Manifestations of the Metabolic Syndrome - Loma Linda University APC meeting
05/25/2013 State of the Residency – Resident Research Day- Loma Linda University
11/03/2013 “AREDS-2 Study Results, Implications on the Nutritional Management of Age-Related Macular Degeneration (ARMD)” ; “Department Update- LLU Dept of Ophthalmology” - Fall 2013 Optometry Symposium

Year 2014

01/8/2014 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, “Retinal Disorders – The Role of the Primary Care Physician” PA Student Lecture series (3 hours)
03/9/2014 “Intravitreal Injection for the Comprehensive Ophthalmologist” - Loma Linda University APC meeting
5/23/2014 State of the Residency – Resident Research Day- Loma Linda University

11/02/2014 “ IOL Selection 101 in 2014”; “Department Update – LLUEI” - Fall 2014 Optometry Symposium

Year 2015

01/07/2015 Ophthalmology for the Primary Care Physician: “Management of Eye Trauma”, “Vision Loss in the Elderly”, “Retinal Disorders – The Role of the Primary Care Physician” PA Student Lecture series (3 hours)
4/23/2015 “How to Succeed in Clinical Practice” – Resident lecture
7/29/2015 “Professionalism in Ophthalmology” – Resident lecture
8/10/2015 “ Introduction to Ophthalmology” – MS 1 lecture

MAJOR TEACHING RESPONSIBILITIES

As a full time comprehensive and medical retina specialist attending, I have had a great opportunity to teach residents and medical students in my clinic as well as in the OR. Having 11 years of Residency Program Directorship experience, I thrive to teach residents and medical students’ superb patient care, interpersonal and communication skills, professionalism, practice-based learning and improvement and system based practice, aside from the daily medical knowledge and surgical skills needed for them to become fine physicians, as they pursue their post-graduate training or professional career. As the current department Chair, I love to teach and identify the right tools and skills that faculty need to succeed in their practice within our department, as well as personally coach faculty on how to mentor, teach, supervise, and evaluate fellows, residents, and medical students.

COMMUNITY SERVICE

- Volunteer coach for The Christian Youth Soccer Organization (TCYSO)
- Volunteer coach for Azure Hills Seventh Day Adventist basketball league
- Member and Deacon of Loma Linda Korean Seventh Day Adventist Church
- Provided oversight in the development of the Social Action Community Health System (SACHS) clinic, as well as the oversight of resident and medical student involvement for the ophthalmology service. Currently on a stand-by call list to volunteer as an ophthalmology attending if needed

Dry Eye syndrome is the most common ocular surface disorder. It is now accepted as a legitimate and respected disease, yet it is still under diagnosed and under treated. Ocular pain and irritation are common symptoms; severe cases of dry eye syndrome can be vision threatening. Ocular lubricants have been the "mainstay" of therapy; recently developed pharmacologic therapies target the pathophysiology of the disease, and may prove more effective in preventing structural damage. The pathophysiology and stages of dry eye syndrome will be detailed. The newest therapies for the treatment of dry eye syndrome will be reviewed.

Speaker: John Affeldt

Title: Update on Dry Eye

Objectives:

1. To review the underlying pathophysiology of dry eye disease including molecular biology
2. To review current treatment strategies
3. To address the “steroid” controversy
4. To assess early returns on Xiidva

Outline:

Dry Eye 2016

- Introduction
 - Current definition of Dry Eye
 - Aqueous deficient vs. evaporative
 - Pathophysiology
 - Symptoms
 - Signs
 - Current treatments
 - Advancements
- Summation

Dry Eye 2016

John C. Affeldt MD

Associate Professor
Loma Linda University Eye Institute

Assistant Clinical Professor
USC Binkley Eye Institute / Beck School of Medicine of USC

Board of Directors - Professional Association
Delany Eye Institute - UCLA

Introduction

Dry Eye 2016

Acceptance of dry eye as a legitimate / respected disease

Introduction

Dry Eye 2016

- Acceptance of dry eye as a legitimate/respected disease
- Historically *dismissed* as a clinical nuisance

Introduction

Dry Eye 2016

- Dry eye as a *legitimate/respected* disease has *arrived*
- Historically *dismissed* as a clinic nuisance



Introduction

Dry Eye 2016

- Dry eye as a *legitimate/respected* disease has *arrived*
- Historically *dismissed* as a clinic nuisance



Introduction

Dry Eye 2016

- Dry eye as a *legitimate/respected* disease has *arrived*
- Historically *dismissed* as a clinic nuisance
- Classically has been *underdiagnosed* and *undertreated*



Introduction

Dry Eye 2016

- Acceptance of dry eye as a legitimate/respected disease
- Historically dismissed as a clinical nuisance
- Consequently *underdiagnosed* and *undertreated*

Why?

- DED pts viewed as unhappy, demanding *hypochondriacs*
- Historic *disconnect* between symptoms and signs
- Required *excessive* chair time and personal energy
- *Limited* diagnostics tools with inadequate reimbursement
- *Limited* treatment options
- *Negative etc.* impacted office efficiency

Why?

- Historic *disconnect* between signs and symptoms

Why?

- Historic *disconnect* between signs and symptoms
- Required *excessive* chair time

Why?

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- Required *excessive* chair time
- *Limited* diagnostics tools

Why?

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Why?

- Historic *disconnect* between signs and symptoms
- Required *excessive* chair time
- *Limited* diagnostics tools
- *Limited* treatment options
- Viewed as unhappy, demanding *hypochondriacs*

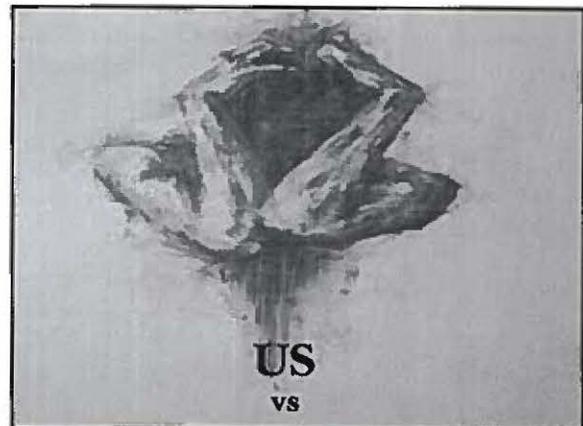
Why?

- Historic *disconnect* between signs and symptoms
- Required *excessive* chair time
- *Limited* diagnostics tools
- *Limited* treatment options
- Viewed as unhappy, demanding hypochondriacs
- *Negatively* impact office efficiency

Historic Milestones

Historic Milestones

"Early days" DE cycle with AT's and several depression





Historic Milestones

- 1995:
 - Report of the National Eye Institute/Industry Workshop on Clinical Trials in Dry Eye*
 - Defined and classified specific subtypes of dry eye
 - *Standardized* the terminology of, diagnostic testing for and the design of dry eye clinical trials



Lemp ME. Report of the National Eye Institute/Industry Workshop on Clinical Trials in Dry Eye. CLAO 1995; 22:2

Historic Milestones

- 1970s-1980s: Scherak-depression
- 1995: Report of the National Eye Institute/ Industry Workshop on Clinical Trials in Dry Eye
 - Defined specific subtypes of dry eye
 - Standardized dry eye terminology, diagnostic testing for, and design of dry eye clinical trials

Historic Milestones

- 1998: Identification of dry eye as an *inflammation* based and driven disease



Wong MT, Dawson RCV, Fox JJ, Chan J, MacLennan AL, Dumbleton S. The Pathology of Dry Eye: The Interaction Between the Aquear Surface and Lacrimal Glands. *Clin Exp Ophthalmol*. 1999; 27(1):10-15.

Historic Milestones

- 2003: Restasis FDA approved
 - Acceptance slow
 - Ultimately landscape *transformational*
 - Established high FDA approval bar for future drugs

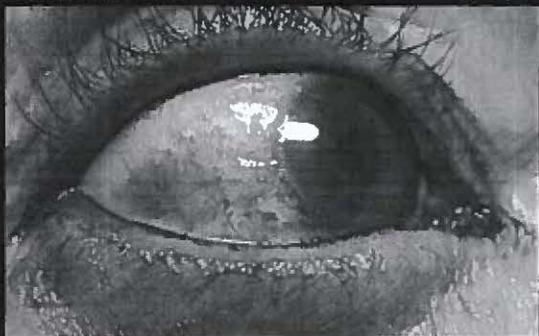
Historic Milestones

- 2006: *Dysfunctional Tear Syndrome: A Delphi Approach to Treatment Recommendations*
 - International Task Force (ITF)
 - Observed that diagnostically, symptoms trump signs
 - Symptoms + signs determine disease severity, not diagnostic testing
 - Provided a treatment algorithm based on disease severity
 - Benchmarked four severity levels

Belmont, Doyle, Stone, Lee et al. *Dysfunctional Tear Syndrome: A Delphi Approach to Treatment Recommendations*. *Clin Exp Ophthalmol*. 2006; 34(1):10-15.

Level One

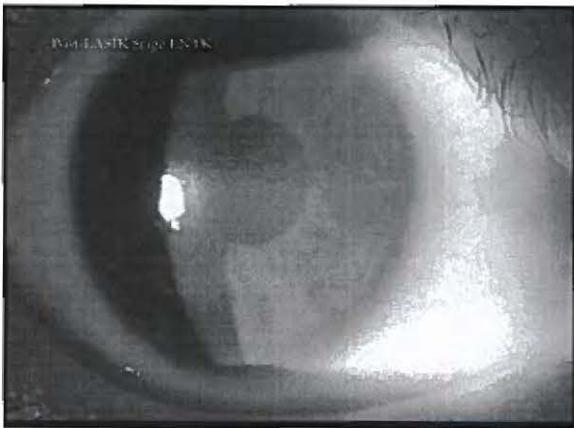
Symptoms mild-moderate / Conjunctival staining only



Xerophthalmia

Vitamin A Deficiency Secondary to Gastric Bypass Surgery







Historic Milestones

- 2007: *Report of the International Dry Eye Workshop (DEWS)*
 - Provided an *encyclopedic* evidence-based review of the classification, epidemiology, diagnosis, techniques of basic and clinical research, and management of dry eye disease.
 - Serves as the ultimate dry eye *reference* source.

Report of the International Dry Eye Workshop (DEWS). The Ocular Surface, 2007, 5, pp1-100

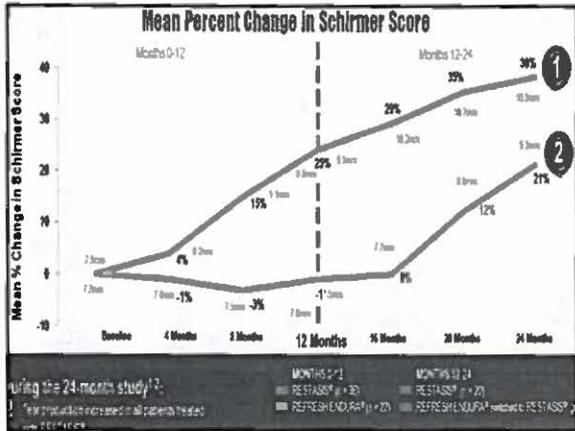
Historic Milestones

- 2010: Identification of dry eye as a *progressive* disease
 - ~ 1/3 of moderate DE progressed one full TFU severity level within 1 year
 - Emphasized importance of *early* intervention



Sanjay Rab



Historic Milestone?

- 2016: Xiidra FDA approved

Classification Dry Eye

- Aqueous deficient dry eye
- Evaporative dry eye

DEWS Report 2007

Classification Dry Eye

- Aqueous deficient dry eye
- Evaporative dry eye

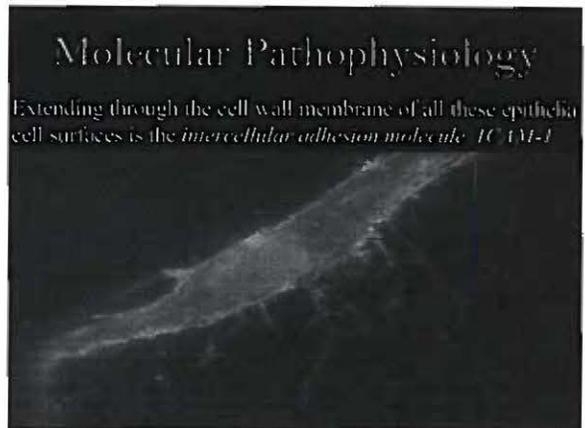
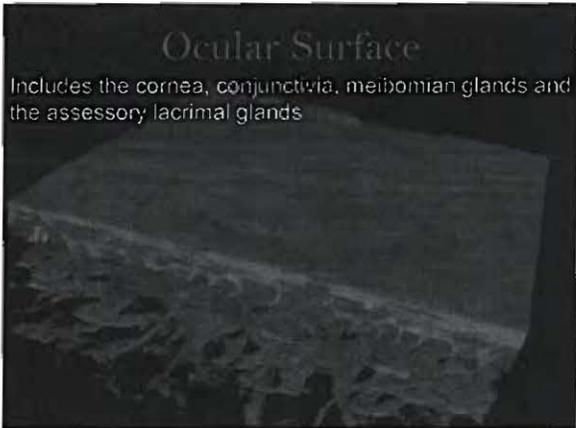
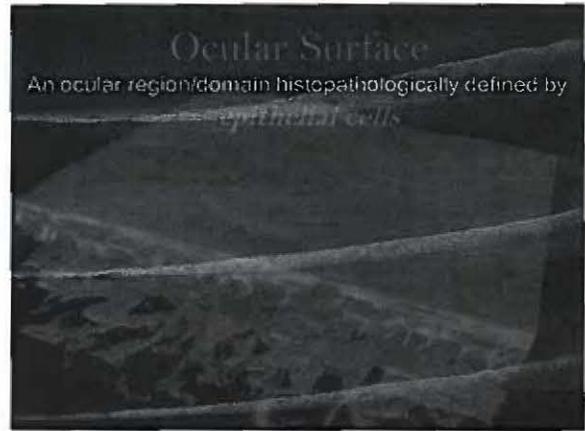
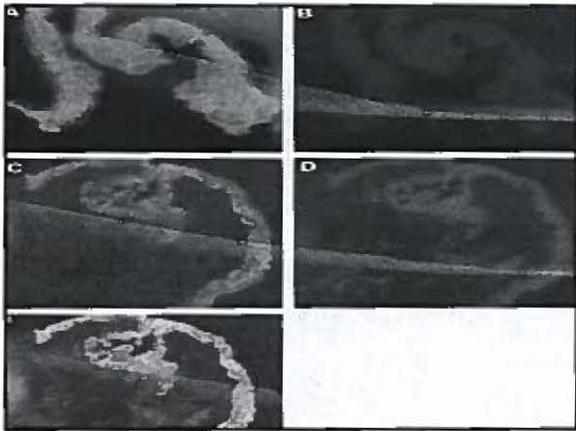
DEWS Report 2017

Classification Dry Eye

- Aqueous deficient dry eye
- Evaporative dry eye

DEWS Report 2017

Pathophysiology



Molecular Pathophysiology

- ICAM-1 is an *integrin*, which is a glycoprotein immunoglobulin responsible for cell-cell adhesion



Molecular Pathophysiology

- ICAM-1 is part of an integrin superfamily, which includes ICAM's 1,2,3,4 and 5



Molecular Pathophysiology

- The ICAM family plays an important role in intracellular signaling, immune responses and *inflammation*



Molecular Pathophysiology

When the ocular surface is stressed, it responds by *increasing* ICAM-1 expression

Rhodamine red fluorescent staining of ICAM-1 (red) (100x)




Review Inflammatory Cell Types

ACUTE

Macrophages
Monocytes
Neutrophils
Eosinophils
Basophils

CHRONIC

T-Lymphocytes (thymus-derived, cellular immunity)
B-Lymphocytes (bone-marrow, humoral immunity)
Macrophages
Monocytes
Plasma cells

Review Inflammatory Cell Types

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Plasma cells
Macrophages
Monocytes



SEM: T-lymphocyte

Molecular Pathophysiology

Dry eye is an inflammation based and driven disease.

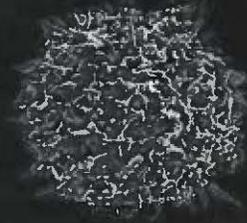
T-lymphocyte: the primary associated inflammatory cell type



SEM: T-lymphocyte

Pathophysiology

- T-lymphocyte is responsible for *cell-mediated immunity*
- This is in contrast/distinction to the B (bone-marrow) lymphocyte, which is associated with *humoral immunity*

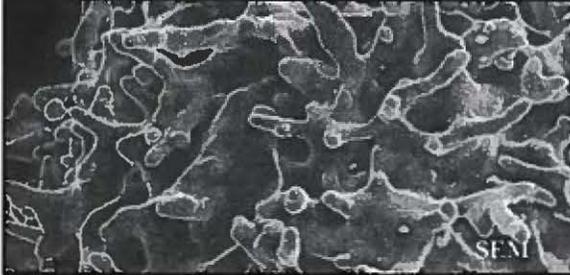


SEM: T-lymphocyte

Pathophysiology

On T-lymphocyte surface is LFA-1 (complex of two transmembrane antigens)

LFA-1 is an *integrin receptor*



Molecular Pathophysiology

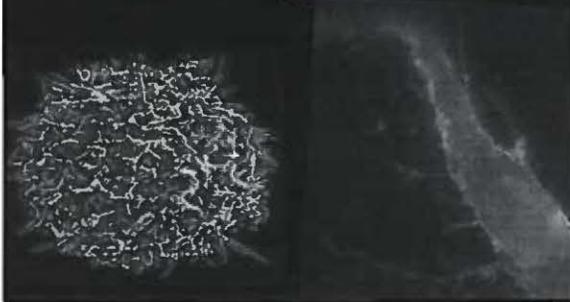
On surface of T-lymphocytes is LFA-1 (complex of two transmembrane antigens)

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Molecular Pathophysiology

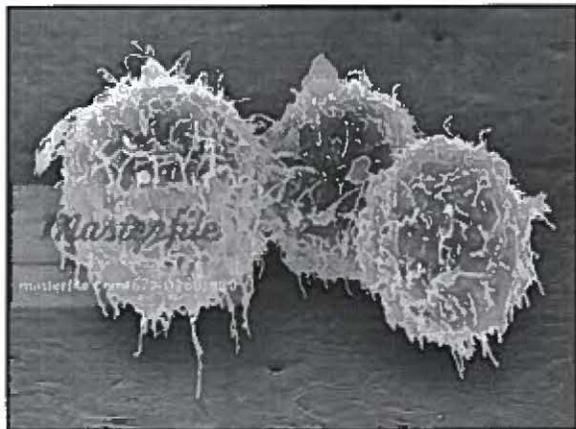
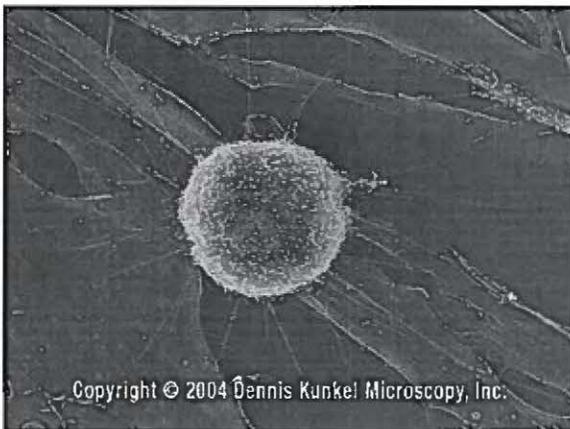
- LFA-1 is ICAM-1's *binding partner*

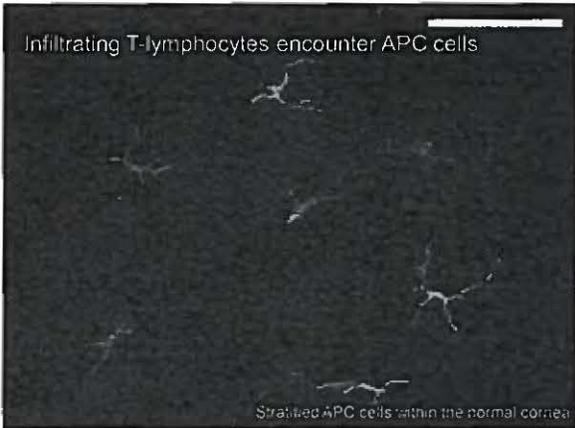
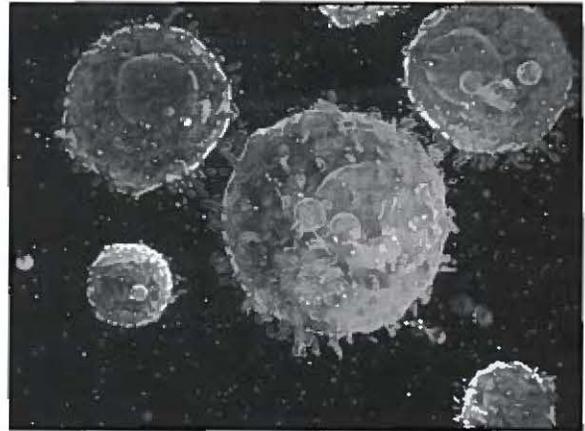


Pathophysiology

T-lymphocyte binding to the ocular surface *triggers*

- T-cell population expansion
- T-cell binding site migration
- T-cell tissue infiltration

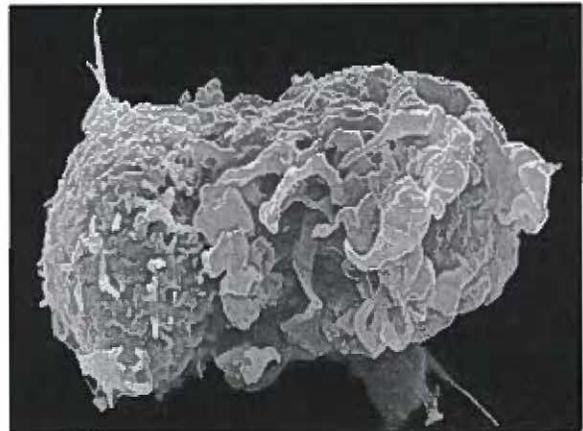
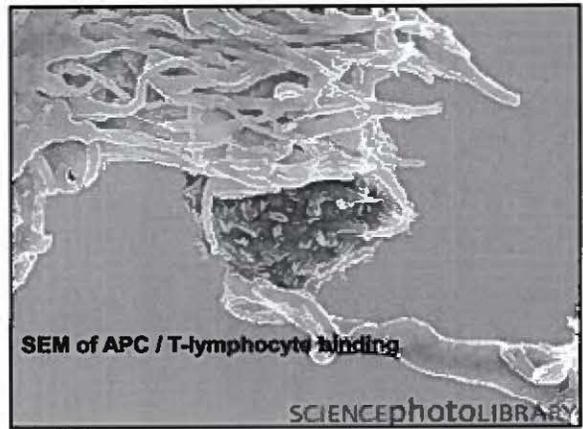
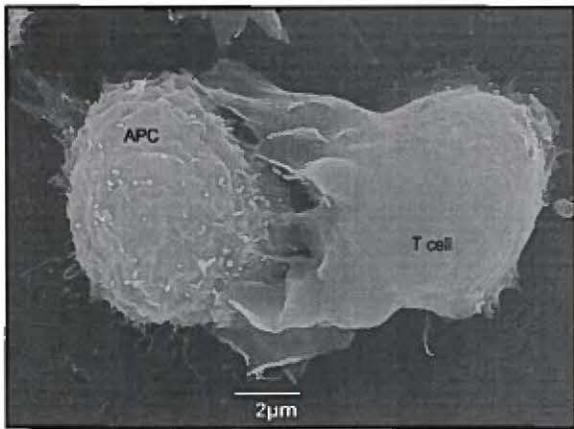
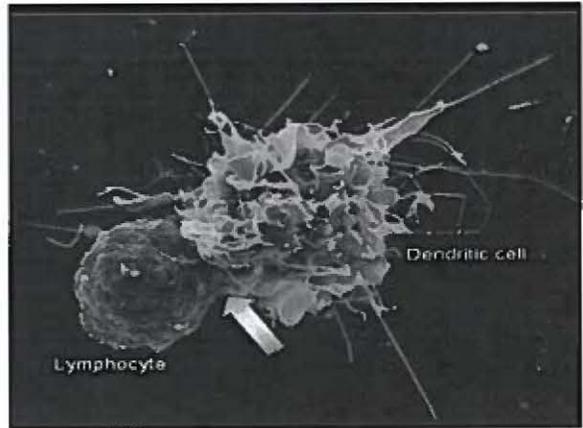


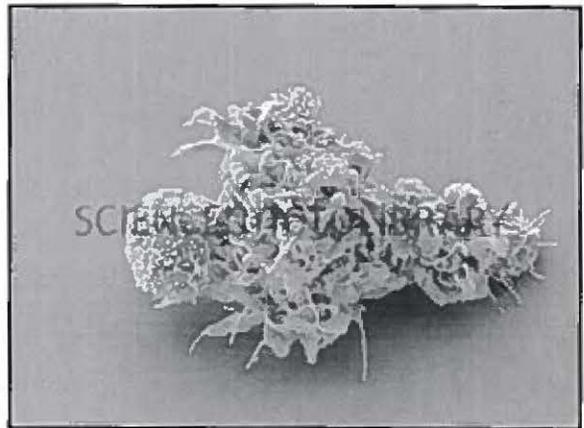
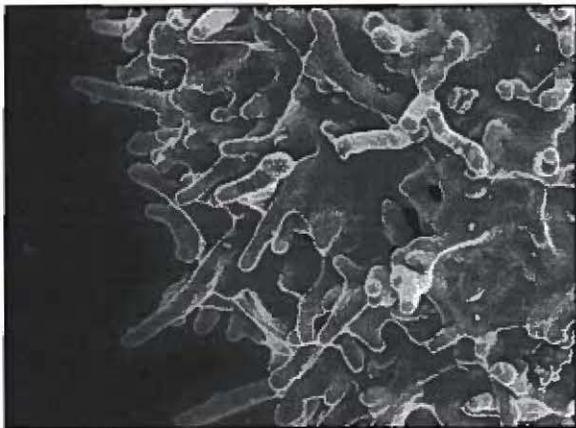
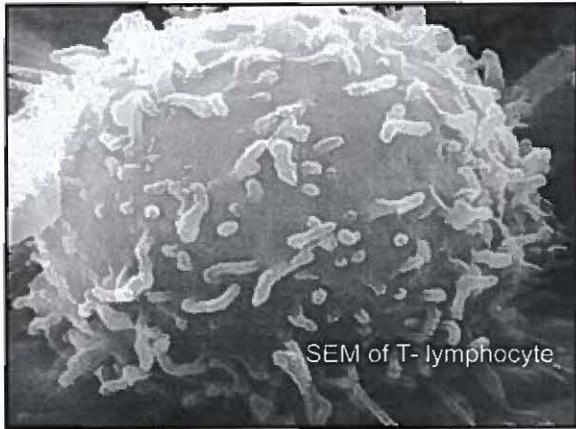
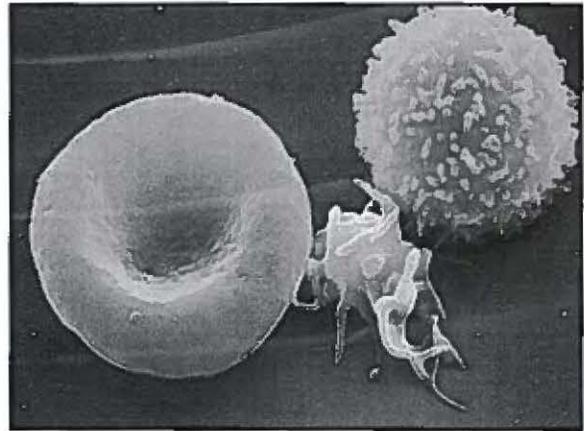
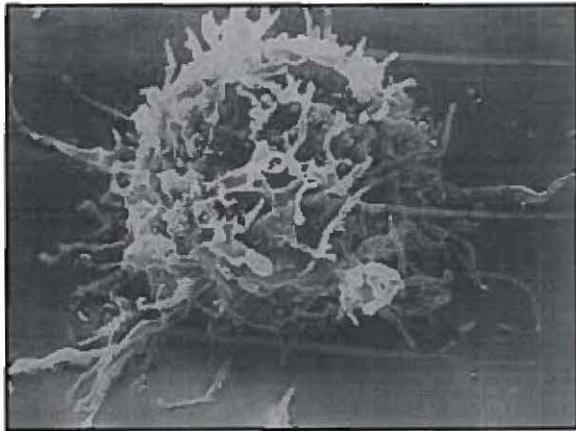


APC (Antigen Presenting Cells)

- Primarily *macrophages* can include B-lymphocytes or dendritic cells
- Serve to breakdown / process foreign antigens
- In conjunction with the major HLA complex molecules, they display or *present* antigen fragments for T-cell *recognition*
- All are surfaced with *MHC-I*







Lymphocyte/APC Binding

- Activates the T-cell
- Causes pro-inflammatory *cytokine* release
- Stimulates / perpetuates inflammatory response
- Cyclic disease progression



Pathophysiologic Summary



Pathophysiologic Summary



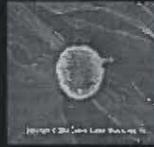

Pathophysiologic Summary





Pathophysiologic Summary



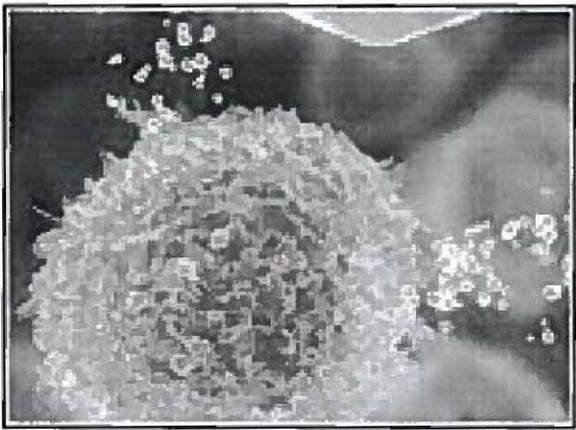
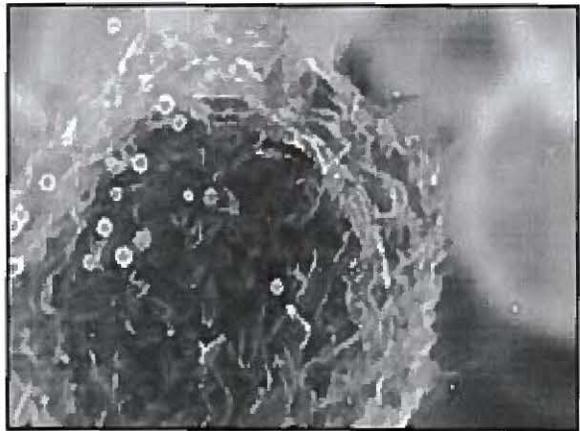
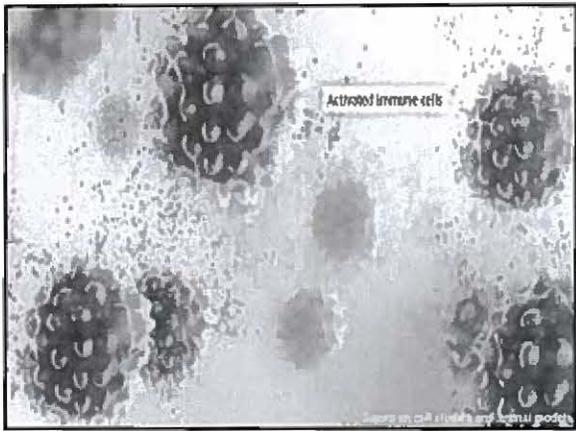
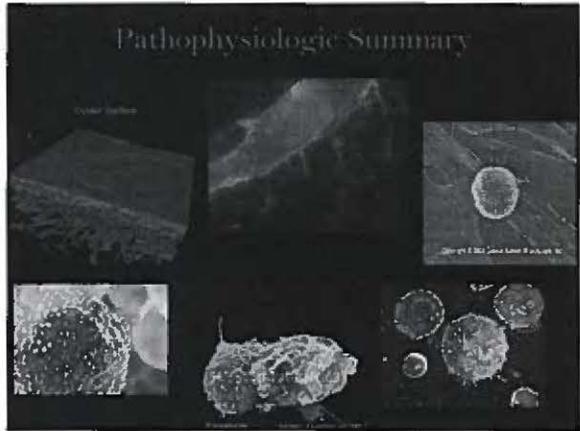
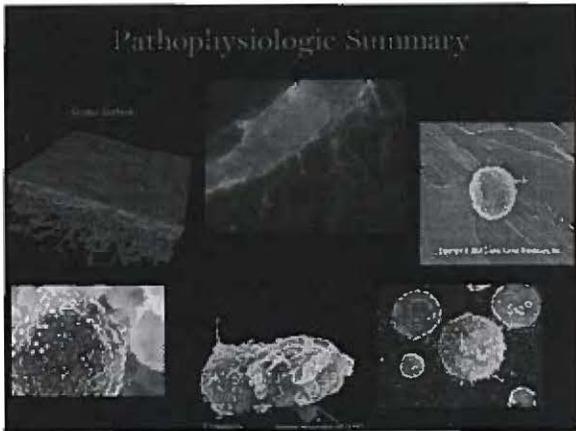


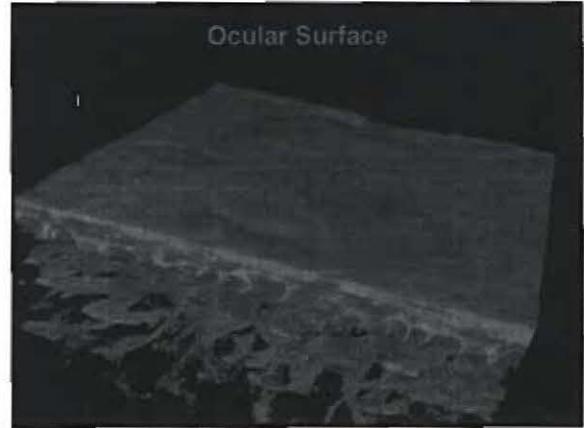
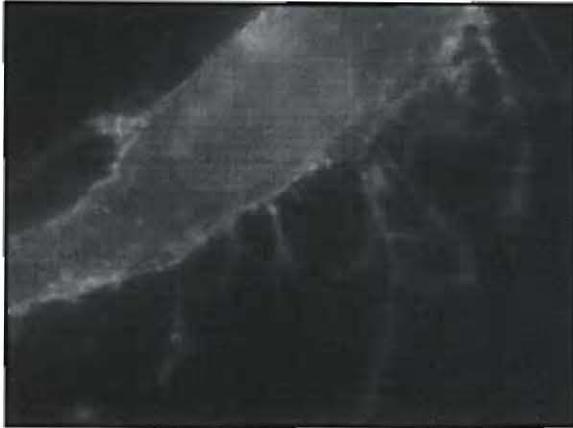

Pathophysiologic Summary











Signs and Symptoms

Signs

- Tear film (meniscus, debris, mucus clumping, TFBI/T)
- Conjunctiva (injection, vital dye staining)
- Cornea (fluorescein staining, filaments, frank erosions)

Symptoms

(Multiple and Varied)

- Blurred/fluctuating vision
- Feeling of dryness
- Scratchy/sandy/foreign body sensation
- Stinging/burning
- Pain
- Itching
- Photophobia
- Epiphora

Symptoms

(Multiple and Varied)

- Blurred/fluctuating vision
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- Pain
- Itching
- Photophobia
- Epiphora

PROOF Study

- Ongoing five-year *natural history* study of dry eye
- Sponsored by Allergan Pharmaceuticals
- Launched 2013
- Baseline data
 - 217 ITF \geq level 2 dry eye pts
 - 67 controls

PROOF Study

- Study entrance baseline findings:
 - Median VA both groups 20/20
 - Complaints of moderate/severe/very severe blurred VA
 - Dry eye pts: 68%
 - Controls: 16% ($p < 0.0001$)

Diagnostic Testing

- Corneal staining (fluorescein)
- Conjunctival staining (lissamine green/rose bengal)
- Tear meniscus
- Schirmer scores
- Tear osmolality (Leco Lab)
- MMP-9 protein levels (InflammDry)
- Goblet cell density
- Functional visual acuity
- Lipid staining (OSDI/ NLEDO/etc)

Dry Eye Risk Groups

- Refractive surgery (LASIK/PRK) 15%
- Allergy 25%
- Contact lens wear 50%
- Diabetes 54%
- Glaucoma 59%
- Preop cataract surgery 80%

Current Treatments

- Artificial tears (palliative only)
- Anti-inflammatories
- Punctal occlusion
 - Punctal plugs
 - Punctal cautery

Anti-Inflammatories

- Omega-3's
- Cyclosporine A (Restasis)
- Steroids
- Nifedipine
- Autologous serum

Omega-3's

- Oral re-esterified omega-3 fatty acids
(1000mg eicosapentaenoic acid/200mg docosahexaenoic acid daily)
- Twelve week clinical trial
- Results currently published online only in journal of *Ocular*
- Statistically significant improvement in:
 - Tear osmolarity
 - Omega-3 index levels
 - TBUT
 - MMP-9
 - OSDI symptom scores

Restasis

- Name derivation: "*Restoring homeostasis*" to the lacrimal functional unit. (Michael Stern)
- FDA approved 2003

Cyclosporine A (Restasis)

- Broad spectrum anti-inflammatory/immunosuppressant
- Blocks activation of T-lymphocytes
- No activity against already activated T-cells
- Activated T-cell life span ~ 120 days (4 months)
- Explains 4-6 month delay to clinically significant improvement in TBUT and schirmer scores

Restasis Clinical Trials TBUT Evaluated Q-4 Months for One Year



Schirmer Scores Evaluated Every 4 Months for 1 Year



Steroids

- Underused/over cautioned weapon
- Comfortable use of requires *paradigm shift* in thinking
- Ester class steroids (loteprednol) significantly safer than ketone class or combined class (dexamethasone)
- Incidence lotemax side effects:
 - Cataract formation ~0
 - Significant IOP rise: 1/1000 (0.2%)

Xiidra (Lafitegrast 5%)

- Represents a new class of drug (LFA-1 antagonist)
- Blocks LFA-1 receptor, preventing ICAM-1 binding
- Prevents T-lymphocyte activation
- Significant improvement in sx's within 2 weeks



Impending Future Treatments

- Essential fatty acid based hyaluronic acid AT's
- Restasis Multi-dose™ (Allergan)
- Secjera™ (cyclosporine A 0.05% in nanomicellar formulation)
- Lotemax (with omicron penetrating particle technology)
- Intracamillar dexamethasone depot
- Neurotrophin mimetic nerve growth factor
- Human recombinant nerve growth factor
- Raxon-Eye™ (transcutaneous periorbital electrical stimulation)
- Neurostimulation (Allergan)

Exotic Future Treatments

- EB1-005 (interleukin-1 antagonist)
- S1Q1 (antioxidant reactive oxygen species scavenger)
- RGN-259 (glycosylated beta-1 antagonist)
- Cis-urocanic acid (inhibits Juncus N-terminal kinase signaling)

Summary



CURRICULUM VITAE

JOHN C. AFFELDT, M.D.

BIOGRAPHICAL

Specialty:

Ophthalmology

Subspecialty:

Cornea & External Eye Disease

Expertise:

Ocular Surface Disorders
Corneal Dystrophies
Microbiology & Infectious Diseases

Licensure:

M.D. California, Issue date: November 28, 1978

Employer:

11/15/200 – Current

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EDUCATION

Undergraduate:

May 1965 – June 1970

Bachelor of Arts: Biology
University of the Pacific
Stockton, CA

Graduate:

Biology
Sept 1970 – Dec 1971

University of the Pacific
Stockton, CA

Microbiology
June 1971 – May 1973

Colorado State University
Fort Collins, Colorado

Medical School:
June 1973 – May 1977

Medical Doctorate
Keck School of Medicine of USC
Los Angeles, CA

Public Health:
Sept 1996 – June 1998

Department of Health Services
UCLA School of Public Health
Los Angeles, CA

Post-Graduate:

Internship: Rotating - Ophthalmology
June 1977 – June 1978 Doheny Eye Institute¹ - Dept. of Ophthalmology
Los Angeles County + USC Medical Center
Los Angeles, CA

Research Fellowship: Cornea and External Eye Disease
July 1978 – June 1979 Doheny Eye Institute¹
Keck School of Medicine of USC
Los Angeles, CA

Residency: Ophthalmology
July 1979 – June 1982 Doheny Eye Institute¹ - Dept. of Ophthalmology
Los Angeles County + USC Medical Center
Los Angeles, CA

Clinical Fellowship: Cornea and External Eye Disease
July 1982 – June 1983 Bascom Palmer Eye Institute²
University of Miami School of Medicine
Miami, Florida

1. Ranked #8 among all eye hospitals in the nation. *Best Hospitals in America; U.S. News & World Report, July 2010.*
2. "Ranked #1 among all eye hospitals in the nation. *Best Hospitals in America; U.S. News & World Report, July 2010.*

CERTIFICATION

Diplomat, National Board of Medical Examiners – 1978

Fellow, American Board of Ophthalmology – April 30, 1985

PUBLICATIONS**Abstracts:**

1. J.C. Affeldt, D.S. Minckler, and S.P. Azen: Prognosis in Uveal Melanoma with Extrascleral Extension. Investigative Journal of Ophthalmology, ARVO Supplement 12: 221, 1979.
2. J.C. Affeldt, S.P. Azen, L. Yeh, and D.S. Minckler: Multifactorial Predication of Metastatic Disease in Uveal Melanoma with Extrascleral Extension. Investigative Journal of Ophthalmology, ARVO Supplement 3: 108, 1980.
3. C.M. Kenny, C. Cheung, J.C. Affeldt, and R.E. Smith: Type I Collagen is Produced By Cells Isolated from a Cryo-induced Posterior Collagenous Layer -(PCL) in Rabbit Corneas. Investigative Journal of Ophthalmology, ARVO Supplement 12: 100, 1980.
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5. J.C. Affeldt, H.D. Flynn, R.K. Forester, S. Mandelbaum, J.G. Clarkson, and G.D. Jarus: Traumatic Endophthalmitis. AAO, Nov. 1985.
6. M.R. Agarwal, J.C. Affeldt, and K. Heider-Hunter: Dry Eye and the Treatment of Neurotrophic Keratitis.(ARVO Abstract) Invest. Ophthalmol. Vis. Sci. 42 (4): B145. Abstract nr 172, 2001.
7. K. Heider-Hunter, J.C. Affeldt, and M. Bali: Complications Associated with Herrick Silicone Punctal Plugs [ARVO Abstract] Invest. Ophthalmol. Vis. Sci. 2001; 42 (4): B 160. Abstract nr 187, 2001.
8. M.A. Meallet, J.C. Affeldt, T. McFarland, B. Appukuttan, R. Read, J. Stout, and N.A. Rao: Novel Phenotype of Avellino Corneal Dystrophy in an African American Female. Invest. Ophthalmol. Vis. Sci. 42(4): Abstract nr 624, 2001.
9. M.J. Mayberry, and J.C. Affeldt: Proliferative Vitreoretinopathy in Traumatic Endophthalmitis. (ARVO Abstract) Invest. Ophthalmol. Vis. Sci.; 42, 2001.
10. N.K. Pang, J. Wilson, J.C. Affeldt, and M. Sheety: Preshrunk Acuvue Therapeutic Soft Contact Lenses. (ARVO Abstract) Invest. Ophthalmol. Vis. Sci.; 2001; 42 (4): B334. Abstract nr 3192.
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12. J.E. Choe, J.C. Affeldt, and N.J. Rudometkin: Bacillus Thuringensis Keratitis (ARVO Abstract) Invest. Ophthalmol. Vis. Sci.; 2001; 42 (4): B767. Abstract nr 4748.
13. M.J. Mayberry, J.C. Affeldt, D.R. Hinton, and L.D. LaBree: Proliferative Vitreoretinopathy in Traumatic Endophthalmitis. AAO, Nov. 2001.
14. M. Sheety, J.C. Affeldt, and M. Manad: Corneal Perforation; Etiology and Relationship to Post-Gluing Complications. AAO, Nov. 2001.
15. N.K. Pang, J. Wilson, M. Sheety, J.C. Affeldt, and S.C. Yiu: Osmolarity-Induced Size Changes in Soft Contact Lenses. CLAO, Feb. 2002.

16. N.K. Pang, J. Wilson, M. Sheety, J.C. Affeldt, and S.C. Yiu: Preshrunk Therapeutic Lenses and Dry Eye Syndrome. CLAO, Feb. 2002.
17. K. Kurteeva, J.C. Affeldt, T. Albin, and M.R. Agarwal: Fibrillary Lines; New Clinical, Ultrastructure, and Theoretic Observations. Invest. Ophthalmol. Vis. Sci. 2002 43: E-Abstract 1663.
18. A.S. Ching, J.C. Affeldt, G. Baerveldt, and L. Bruce-Lyle: Late-Onset Glaucoma Implant Device Associated Sterile Endophthalmitis. Invest. Ophthalmol. Vis. Sci. 2002 43: E-Abstract 3429.
19. B.B. Quiroz and J.C. Affeldt: Complications Associated with Deep Thermal Punctal Occlusion. Invest. Ophthalmol. Vis. Sci.; 2002 43: E-Abstract 67.
20. C. da Reitz Pereira and J. Affeldt: Etiology of Neurotrophic Keratitis. Invest. Ophthalmol. Vis. Sci.; 2002 43: E-Abstract 58.
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22. J.A. King, J.C. Affeldt, and M. Agarwal: Central Corneal Hypoesthesia Secondary to Peripheral Corneal Inflammatory Disease. Invest. Ophthalmol. Vis. Sci. ; 2002 43: E-Abstract 34.
23. J.C. Affeldt and M.R. Agarwal: Lasik Related Stage III Neurotropic Keratitis. Invest. Ophthalmol. Vis. Sci.; 2002 43: E-Abstract 2120.
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27. K. Hunter, J. Affeldt, and M.R. Agarwal: Efficacy of Staged Punctal Occlusion for Treatment of Neurotrophic Keratitis. Invest. Ophthalmol. Vis. Sci. 2003 44: E-Abstract 4747.
28. J. Unger-Hendee and J.C. Affeldt: Phlyctenular Keratoconjunctivitis and Inflammatory Bowel Disease. Invest. Ophthalmol. Vis. Sci.; 2003 44: E-Abstract 4279.
29. E.K. Jacobson, J.C. Affeldt, and M.R. Agarwal: Contact Lens Related Limbal Stem Cell Deficiency. Invest. Ophthalmol. Vis. Sci.; 2003 44: E-Abstract 1405.
30. J.A. King, J.C. Affeldt, and M.R. Agarwal: Etiologic Profile of Vortex Keratopathy. Invest. Ophthalmol. Vis. Sci. 2003 44: E-Abstract 1381.
31. J. Gutmark and J. Affeldt: A Novel Phenotype of Avellino Corneal Dystrophy. Invest. Ophthalmol. Vis. Sci.; 2003 44: E-Abstract 3865.

32. R.S. Hedayi, J.C. Affeldt, and M.R. Agarwal: Epithelial Basement Membrane Dystrophy and Dry Eye. Invest. Ophthalmol. Vis. Sci. ; 2003 44: E-Abstract 3757.
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34. V.J. Hsu, J. Affeldt, and M. Meallet: Fibrillary Lines Secondary to Avellino Corneal Dystrophy. Invest. Ophthalmol. Vis. Sci.; 2004 45: E-Abstract 1518.
35. N.J. Rudometkin, J.C. Affeldt, L. Labree, and M. Agarwal: Clinical Risk Zones for Development and Staging of Neurotrophic Keratitis. Invest. Ophthalmol. Vis. Sci. ; 2004 45: E-Abstract 2955.
36. K.K. Chang, J.C. Affeldt, L. Labree, and M. Agarwal: Noninfectious Pseudodendritic Keratitis. Invest. Ophthalmol. Vis. Sci.; 2004 45: E-Abstract 2954.
37. K.P. Han and J.C. Affeldt: HIV Related Central Spheroidal Corneal Degeneration. Invest. Ophthalmol. Vis. Sci. 2004 45: E-Abstract 2951.
38. E.K. Jacobson, J. Affeldt, C. Blanton, and J. King: Total Limbal Stem Cell Deficiency Secondary to Anterior Segment Ischemic Syndrome. Invest. Ophthalmol. Vis. Sci. 2004 45: E-Abstract 4806.
39. J.A. King, J.C. Affeldt, A.J. Aldave, E. Kutzschers, and R. Chuck: Spermatocorneal Degeneration. Invest. Ophthalmol. Vis. Sci.; 2004 45: E-Abstract 3851.
40. J.G. Krassin and J.C. Affeldt: Combined Marginal Corneal Melt: Peripheral Corneal Melting Secondary to Combined Staph Marginal and Neurotrophic Keratitis. Invest. Ophthalmol. Vis. Sci.; 2004 45: E-Abstract 106.
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42. C.W. Vaughn and J.C. Affeldt: Neurotrophic Keratitis Associated with Goldenhar's Syndrome. Invest. Ophthalmol. Vis. Sci.; 2004 45: E-Abstract 104.
43. M.A. Kroll, J.C. Affeldt, J. Hayes, and M. Meallet: Methamphetamine Keratitis as a Variant of Neurotrophic Ocular Surface Disease. Invest. Ophthalmol. Vis. Sci. ; 2004 45: E-Abstract 103.
44. K. Hunter, J. Affeldt, and K. Schneider: Hyperopic Refractive Shift Secondary to Phlyctenular Keratoconjunctivitis. Invest. Ophthalmol. Vis. Sci. ; 2004 45: E-Abstract 2863.
45. M.A. Kroll, J.C. Affeldt, and D. McGrew: Vision Loss Secondary to Advanced Amiodarone Keratopathy. Invest. Ophthalmol. Vis. Sci.; 2005 46: E-Abstract 2656.
46. A.J. Aldave, S.A. Rayner, J.A. Affeldt, D. Katsev, and V.S. Yellore: Exclusion of Nine Positional Candidate Genes for Schnyder Crystalline Corneal Dystrophy. Invest. Ophthalmol. Vis. Sci.; 2005 46: E-Abstract 4923.
47. P. Lim and J.C. Affeldt: Simultaneous Phlyctenular Keratoconjunctivitis and Marginal Staphylococcal Keratitis in Inflammatory Bowel Disease. Invest. Ophthalmol. Vis. Sci.; 2005 46: E-Abstract 2633.

48. V.J. Hsu, J. Affeldt, and C. Blanton: Streptococcus Mitis Corneal Ulcer. Invest. Ophthalmol. Vis. Sci.; 2005 46: E-Abstract 2632.
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50. J. G. Krassin, J. C. Affeldt: Corneal Findings in Kabuki's Syndrome. Invest. Ophthalmol. Vis. Sci.; 2007 48: E-Abstract 5873.
51. K. Chan, J.C. Affeldt: New Perspectives on the Etiology of Neurotrophic Keratitis. Inves. Ophthalmol. Vis. Sci,; 2009 50: E-Abstract 4548.

Articles in Peer Reviewed Journals:

1. J.C. Affeldt, D.S. Minchler, S.P. Azen, and L. Yeh: Prognosis in Uveal Melanoma with Extrascleral Extension. Arch. Ophthalmolo. 98: 1975-1979, 1980.
2. J.C. Affeldt, H.W. Flynn, R.K. Forster, S. Mandelbaum, J.G. Clarkson, and G.D. Jarus: Microbial Endophthalmitis Resulting from Ocular Trauma. Ophthalmology. 94: 407-413, 1987.
3. E. Zamir, R.W. Read, J.C. Affeldt, D. Ramaswamy, and N.A. Rao: Gold Induced Interstitial Keratitis. Br J Ophthalmol. Nov;85(11):1386-7, 2001.
4. J. Affeldt, H. Byron, B. Dubow, K. Hunter, J. McCall, C. White, P. Williams, and J. Yassin: Complications of Lacrimal Plug Implantation. Ophthalmology.110(1):4-5, 2003.
5. M.A. Meallet, J.A. Affeldt, T.J. McFarland, B. Appukuttan, R. Read, J.T. Stoust, and N.A. Rao: An Unusual Clinical Phenotype of Avellino Corneal Dystrophy Associated with an Arg124Gus beta IG-H3 Mutation in an African-American Woman. Am J Ophthalmol. Apr;137(4):765-7, 2004.
6. A.J. Aldave, J.G. Gutmark, V.S. Yellore, J.A. Affeldt, M.A. Meallet, N. Udar, N.A. Rao, K.W. Small, and G.K. Klintworth: Lattice Corneal Changes in the TGFBI Gene. Am J Ophthalmol. Nov; 138(5);772-81, 2004.
7. A.J. Aldave, S.A. Rayner, J.A. King, J.A. Affeldt, and V.S. Yellore: A Unique Corneal Dystrophy of Bowman's Layer and Stroma Associated with the Gly623 Asp Mutation in the Transforming Growth Factor Beta-induced (TGFBI) Gene. Ophthalmology, June; 112(6):1017-22, 2005.
8. A.J. Aldave, S.A. Rayner, A.H. Principe, J.A. Affeldt, D. Kastsev, and V.S. Yellore: Analysis of Fifteen Positional Candidate Genes for Schnyder Crystalline Corneal Dystrophy. Mol Vis. Sep 2;11:713-6, 2005.
9. J. C. Affeldt, Co-Investigator; Cornea Donor Study Investigator Group. The Effect of Donor Age on Corneal Transplantation Outcome. Ophthalmology 2008;115:620-626. (<http://aaojournal.org>)

Books:

Ophthalmology at LA County General Hospital: 1885 – 2006. John C. Affeldt, M.D., Barbara J. Carrington, Wilma McConnell, A. Frances Wolonker. (Warren Printing & Mailing, Inc., 2007).

HONORS AND AWARDS

Heed Fellow
1982 (alternate)

"John C. Affeldt Award"

Annual award presented at the Loma Linda University Department of Ophthalmology Resident Research Symposium for best resident research paper (established 2000).

"Teacher of the Year"

Department of Ophthalmology, Loma Linda University School of Medicine, 1999 - 2000

"Teacher of the Year"

Doheny Eye Institute, Department of Ophthalmology, Keck School of Medicine of USC, 2002 – 2003

"Teacher of the Year"

Department of Ophthalmology, Loma Linda University School of Medicine, 2003 – 2004

President

Tri County Eye Society, 2005

Inland Empire's "Favorite Doctors"

Inland Empire Magazine 2006.

APPOINTMENTS**Academic Positions:**

Assistant Clinical Professor
Department of Ophthalmology
Doheny Eye Institute
Keck School of Medicine of USC

Associate Professor - 07/01/2010 to Present
Department of Ophthalmology
Loma Linda University School of Medicine

Academic Service (Current):

Program Evaluation Committee (PEC)
Department of Ophthalmology
Loma Linda University School of Medicine

Research Committee
Department of Ophthalmology
Loma Linda University School of Medicine

PROFESSIONAL ASSOCIATIONS

Treasurer, Board of Directors

Doheny Eye Institute - USC Professional Association

Doheny Eye Institute - USC Professional Association

Faculty Medial Group - University of Southern California

Faculty Medial Group – Loma Linda University

USC School of Medicine Alumni Association

Association for Research and Vision in Ophthalmology (ARVO)

Dr Priscilla Luke- The Mystery of Meibomian Gland Dysfunction

Meibomian gland dysfunction (MGD) is often under diagnosed and under treated. The meibomian glands play a key contribution to the ocular tear film, and disorders can lead to significant ocular surface disease through increased evaporation of the tear film. The pathophysiology of MGD will be reviewed, which includes the subsequent of loss glandular dysfunction, then atrophy. New imaging modalities designed to identify and quantitate the of loss of meibomian glands will be reviewed. Traditional and new therapies for this disorder will be reviewed.



The Mystery of Meibomian Gland Dysfunction

Outline

- Introduction of dry eye syndrome: evaporative vs. aqueous-deficiency etiology
- Definition and clarification of terminology: meibomian gland dysfunction, meibomian gland disease (broad term), meibomitis/meibomianitis/meibomian keratoconjunctivitis (involve associated inflammation), anterior blepharitis, posterior blepharitis,
- Review of anatomy, physiology, and pathophysiology of MGD including obstruction of the meibomian glands, lid margin, tear film layer (lipid, aqueous, and mucin components), and evaluation of ocular surface inflammation and damage
- Epidemiology and associated risk factors for MGD
- Diagnosis of MGD: clinical approach and testing; administration of symptom questionnaire; measurement of blink rate, tear meniscus height, tear osmolarity, tear break up time with fluorescein stain, Schirmer testing, expressibility of meibum, meibography quantification of dropout
- Management and therapy of MGD: current practice patterns including mechanical lid hygiene, warm compresses, artificial lubricants, topical lipid supplements, topical antibiotics, systemic medication, adjunctive treatment

Objectives:

1. To highlight the prevalence and associated risk factors for MGD
2. To assess methods of diagnosis, evaluation, and grading of MGD
3. To evaluate the structure of meibomian lipid and its interaction with the tear film
4. To alert healthcare practitioners the importance of counseling and educating patients on MGD

MYSTERY OF MEIBOMIAN GLAND DYSFUNCTION

PRISCILLA LUKE, MD
ASSISTANT PROFESSOR
LOMA LINDA UNIVERSITY EYE INSTITUTE
ANNUAL OPTOMETRY SYMPOSIUM
NOVEMBER 13, 2016

FINANCIAL DISCLOSURE:
I HAVE NO FINANCIAL INTERESTS OR CONFLICTS

PAGE 1

OBJECTIVES

- ▶ To highlight the prevalence and associated risk factors for MGD
- ▶ To assess methods of evaluation, grading, and diagnosis of MGD
- ▶ To evaluate the structure of meibomian lipid and its interaction with the tear film
- ▶ To alert healthcare practitioners the importance of counseling and educating patients on MGD



PAGE 2

OUTLINE

- to distinguish dry eye syndrome etiologies of evaporative vs. aqueous-deficiency
- to clarify terminology: marginal blepharitis, anterior vs. posterior blepharitis, meibomian gland dysfunction, meibomian gland disease, meibomitis, meibomianitis, meibomian keratoconjunctivitis
- to review the anatomy, physiology, and pathophysiology of MGD including obstruction of the meibomian glands; lid margin; tear film layer (lipid, aqueous, and mucin components) and evaluation of ocular surface inflammation and damage
- to identify the epidemiology and associated risk factors for MGD
- to evaluate how to diagnosis MGD through clinical approach and testing: symptom questionnaire, measurement of blink rate, tear meniscus height, tear osmolality, tear break-up time using fluorescein stain, Schirmer's test strips, expressibility of meibum, meibography quantification, dropout
- to utilize management of therapy of MGD: ocular practice patterns, mechanical lid hygiene, warm compresses, artificial lubricants, topical lipid supplements, topical antibiotics, systemic medication, adjunctive treatment

PAGE 3

DEFINITION

- ▶ Dysfunction vs. Disease
- ▶ Meibomian gland dysfunction is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation and ocular surface disease.
- ▶ Meibomian gland disease is a broader definition that incorporates dysfunction, neoplasia, and congenital diseases

PAGE 4

EVAPORATIVE VS. AQUEOUS-DEFICIENCY

- MGD has been attributed as the primary cause of evaporative dry eye syndrome, but occurs in conjunction with aqueous deficiency
- The key event in MGD is hyperkeratinization of the terminal duct linings. This leads to obstruction of glands and accounts for the discharge and increased viscosity of expressed meibum due to keratinized debris. With time, chronic glandular obstruction leads to a secondary diffuse atrophy of the glands and a loss of secretory acini. Glands frequently may be replaced by cystic changes.
- Hyposecretion of meibomian glands can result from gland fat loss or gland dropout which occurs near age 40-50 years.
- Scarring disease may affect the conjunctiva by dragging the terminal ducts of the gland back into the conjunctiva of the tarsal plate.



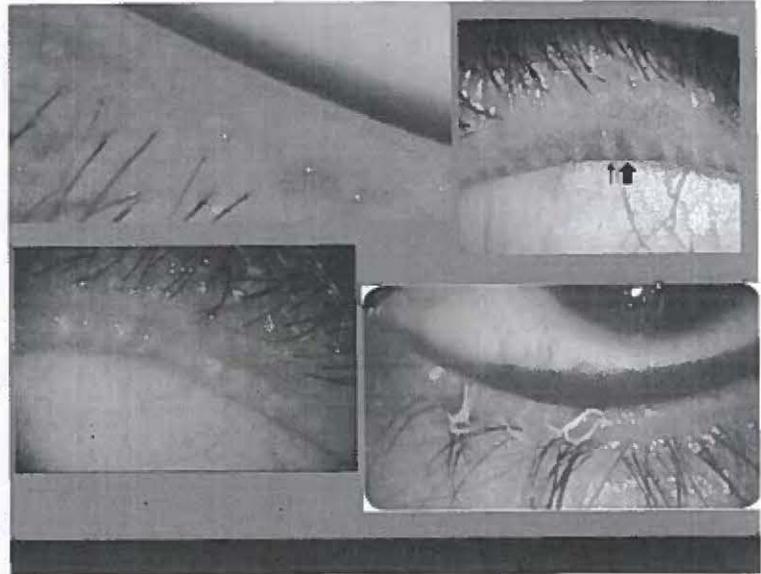
Photos courtesy of www.wisnoproct.com

MEIBOMIAN GLANDS: ANATOMY

- located in the tarsal plates of the eyelid
- large sebaceous glands which secrete lipid and proteins
- lipids are important for tear film stability
- secretions may vary from clear (healthy), cloudy, turbid, inspissated or "toothpaste-like" in consistency (unhealthy)



Photo courtesy of eyelabs.ca



TEAR FILM LAYERS

- mucin
- aqueous
- lipid



Lipid (oil) layer:
lubricates and prevents evaporation

Aqueous (water) layer:
nourishes and protects the cornea

Mucin layer:
adheres tears to the eye

Meibomian glands:
create the lipid (oil) layer of the tear film, a blockage can lead to evaporative dry eye

Photo courtesy of eyelabs.ca

TERMINOLOGY OF LID DISEASE

- **Marginal blepharitis**
- **Anterior blepharitis**
 - lid and lashes to gray (sebum) around lashes
- **Posterior blepharitis**
 - inflammation of posterior lid margin
 - substance at the lid margin
 - increased meibomian gland dysfunction
- **Meibomian gland dysfunction**
 - hyperplasia of posterior lid margin
 - blockage of oil leading to obstruction of meibomian ducts
 - glandular secretion loss (toothpaste-like)
- **Chalazion**
- **Milium cysts (small white bumps)**



TEAR FILM LAYERS

- mucin
- aqueous
- lipid



Lipid (oil) layer:
lubricates and prevents evaporation

Aqueous (water) layer:
nourishes and protects the cornea

Mucin layer:
adheres tears to the eye

Meibomian glands:
create the lipid (oil) layer of the tear film, a blockage can lead to evaporative dry eye

Photo courtesy of eyelabs.ca

<https://youtu.be/Q3d1UZxQP4E>

RISK FACTORS

- **Local eyelid disease**
 - **contact lens use** (eyelid fold, chemical burns, toxic eye, eyelid syndrome, giant papillary conjunctivitis, trachoma)
- **Systemic disease**
 - **rosacea** (lipid, protein, atopy, metabolic morphological, benign prostatic hyperplasia, Parkinson's disease, Sjogren's/dryness syndrome, erythema multiforme)
- **Medications**
 - systemic retinoids (Accutane for acne)
 - anti-androgen therapy (Finasteride, Spironolactone)
 - isotretinoin topical therapy
- **Hormonal changes**
 - Factor postmenopausal
- **Environmental causes** (smoking)



CLINICAL EVALUATION: TRIVIA QUESTIONS

- ▶ What is the average blink rate per minute for a person?
- ▶ How long is the duration of an average blink?

Answer:

1. 15-25 blinks per minute
2. 100-400 ms

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CLINICAL EVALUATION

- ▶ Symptom questionnaire
- ▶ Measure blink rate per min²
 - ▶ Conversation (76) > Rest (17) > Read (4.5)¹
- ▶ Women on birth control found to have higher blink rate (32% more often than women not on birth control) - unknown reason
- ▶ Dopamine production in the striatum associated with higher rate of spontaneous eye blinking
 - ▶ Parkinson's disease = reduced blink rate
 - ▶ Schizophrenia = increased blink rate

Balshingkar et al. (2009) Analysis of blink rate and visual evoked potentials. *Acta Otolaryng* 129:1201-1205

Calvert GW et al (2009) Ocular and ocular motor control: From spontaneous eyeblink rate. *Journal of Neurophysiology* 102:1021-1028

Reese JA et al (2002) The effect of dopamine on eye blink rate in Parkinson's disease. *Journal of Neurology* 249:1021-1025

Tyler D J et al (2001) The effect of dopamine and its metabolites on blink rate. *Journal of the American Ophthalmological Society*

PAGE 13

CLINICAL EVALUATION

- ▶ Symptom questionnaire
- ▶ Measure blink rate per min
- ▶ Measure tear meniscus height
- ▶ Tear osmolarity
- ▶ Tear break-up time with fluorescein stain
- ▶ Schirmer's test strips
- ▶ Expressibility of meibum
- ▶ Meibography quantification dropout

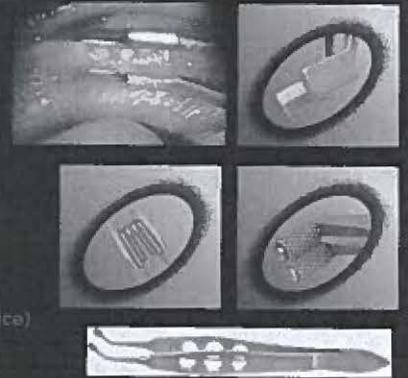
- ▶ <https://youtu.be/KmeuE7f8t0> (meibography)
- ▶ <https://youtu.be/Um8tFPVLD4> (lipreview)
- ▶ <https://youtu.be/1BYGNoEo> (lipflow)



PAGE 14

THERAPEUTIC STRATEGIES

- ▶ heat
- ▶ lid massage (gentle)
- ▶ improve lid hygiene
- ▶ contact lens holiday
- ▶ lipiflow
- ▶ manual compression (in office)



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REVIEW QUESTIONS

- ▶ Which medications may contribute to MGD?
 - ▶ A. Spironolactone
 - ▶ B. Finasteride
 - ▶ C. Accutane
 - ▶ D. All of the above

Answer: D - all of the above

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REVIEW QUESTIONS

- ▶ Which conditions may contribute to MGD?
 - ▶ A. Contact lens use
 - ▶ B. Rosacea
 - ▶ C. Blepharitis
 - ▶ D. All of the above

Answer: D - all of the above

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REVIEW QUESTIONS

- ▶ Which therapies improves MGD?
 - ▶ A. Heat
 - ▶ B. Lid hygiene
 - ▶ C. Lid massage
 - ▶ D. All of the above

Answer: D - all of the above

PAGE 18

REVIEW QUESTIONS

- ▶ Meibomian gland dysfunction results from:
 - ▶ A. Hyperkeratinization of terminal duct linings
 - ▶ B. Glandular obstruction
 - ▶ C. Glandular atrophy and/or dropout
 - ▶ D. All of the above

Answer: D - all of the above

PAGE 19

WHICH NBA TEAM WILL WIN TOMORROW NIGHT'S (11/14) GAME AT THE STAPLES CENTER?

- ▶ A. LOS ANGELES CLIPPERS
- ▶ B. LOS ANGELES LAKERS
- ▶ C. BROOKLYN NETS
- ▶ D. THERE IS NO NBA GAME



THE EYES ARE NOT

THE EYES ARE NOT
JUST WINDOWS
TO YOUR SOUL,
BUT TO YOUR
HEALTH AS WELL

Thank you for your attention
and time

PRISCILLA K. LUKE, MD

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Redlands, CA 92373
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priscillakluke@gmail.com

WORK EXPERIENCE

Assistant Professor, Loma Linda University Eye Institute, CA
Comprehensive Ophthalmology
February 2014 to current

Clinical Instructor / Chief Residency, Loma Linda University, CA
February 2013 to January 2014

Comprehensive Ophthalmologist (locum tenens)
Ventura Eye Institute, Camarillo
July 2012 to December 2012

EDUCATION

Ophthalmology Residency, Loma Linda University, CA
June 2011 to June 2012

Ophthalmology Residency, New York Medical College, Valhalla
July 2008 to January 2011

Internal Medicine Intern, Loma Linda University Medical Center
July 2007 to June 2008

M.D., Loma Linda University School of Medicine
August 2003 to May 2007

B.S., UCLA College of Letters and Science
Microbiology, Immunology, & Molecular Genetics
Magna cum laude, Departmental Honors
June 2003

SKILLS

Cataract surgery, pterygium excision, ahmed valve implant, blepharoplasty, ptosis repair, ectropion/entropion repair, PRP & focal laser, cyclophotocoagulation, Nd:YAG laser, SLT/ALT, intravitreal injections, LASIK/PRK certification on VISX and Allegretto

PUBLICATION

“A Long Haul for the Construction Worker”
EyeNet, November 2014 Issue

**CONFERENCE
SPEAKER**

Ontario Convention Center, January 16, 2015
Breakout Session Speaker on behalf of Loma Linda Eye Institute for
Loma Linda University Annual Women's Health Conference
"Healthy Eyes for a Healthy Future"

Loma Linda University Annual Fall Optometry Symposium
November 2015, **Lecture on Eyelid Lesions**

Loma Linda University Annual Fall Optometry Symposium
November 2014, Lecture on Uveitis

Ontario Convention Center, January 17, 2014
Breakout Session Speaker on behalf of Loma Linda Eye Institute for
Loma Linda University Annual Women's Health Conference
"Keeping Your Eyes Pretty (and Healthy)"

Loma Linda University Annual Fall Optometry Symposium
November 3, 2013, Junior Faculty Speaker
"IMT – A New Horizon for AMD Patients"
Wong Kerlee Conference Center

New York Trauma Symposium, November 13, 2010
"Canalicular Dog Bite Injury in the Pediatric Population"
Faculty Presenter/Speaker, New York City for Clinical
Ophthalmology, sponsored by New York Eye & Ear Infirmary,
Institute for Continuing Medical Education
Lenox Hill Eye/Ear Hospital, E. 64th St, Manhattan NY

**COMMITTEE
PARTICIPATION**

Continued Medical Education for LLU Eye Institute
Medical Student Mock Interviews for Residency 2015
Interviewer for Ophthalmology Residency 2014, 2015

**MISSION
VOLUNTEER**

Pathways to Health – April 26-30, 2016
Free health clinic
LA Convention Center

San Manuel Health Fair – March 20, 2016
Marketing Outreach for Loma Linda University Health

Advent Hope Kauai Mission – July 2015
NEWSTART program

HELPS International – Guatemala, May 2012

Provided ophthalmology clinic and surgical skills including extracapsular cataract extractions under guidance of Dr. Kelly Keefe (cataracts) and Dr. Asa Morton (oculoplastics)

Thailand Dental Mission Trip - December 2002
Childrens' Orphanage Chiangmai, Thailand

RESEARCH

Co-Investigator for Loma Linda Eye Institute

“A phase 2/3, randomized, double-masked, sham-controlled trial of QPI-1007 delivered by single or multi-dose intravitreal injection(s) to subjects with acute nonarteritic anterior ischemic optic neuropathy” – PI: Dr. Rauser

“Association of Cystoid Macular Edema After Cataract Surgery in Patients with and without epiretinal membrane using Optical Coherence Tomography” – PI: Dr. Lynn Huang

“A prospective, multicenter post-approval study of VisionCare’s implantable miniature telescope in patients with bilateral severe to profound central vision impairment associated with end-stage age-related macular degeneration” – PI: Dr. Rauser

Resident Research Symposium, May 25, 2012

“Genetic Heterogeneity for Aniridia in a Family with Congenital Glaucoma”. Speaker, Loma Linda University, Department of Ophthalmology. Wong Kerlee Pavilion Conference Center.

ARVO Poster Presentation, May 1, 2011

“Genetic Heterogeneity in Aniridia – Part II”

Luke, P. Kauffmann-Jokl, D. Van Heyningen, V. Brown, AG. Williamson, KA. Kronn, D. NYMC Department of Ophthalmology, Medical and Developmental Genetics, Westchester Medical Center, Human Genetics Unit Western General Hospital, Edinburgh, United Kingdom.

ARVO Poster Presentation, May 2010

“Metabolic Corneal Diseases in the Pediatric Population”

Luke, P, Zaidman, G. NYMC Department of Ophthalmology, Westchester Medical Center, Valhalla NY.

ARVO Poster Presentation, May 2009

“Genetic Heterogeneity in Aniridia”

Luke, P. Kauffmann-Jokl, D. NYMC Department of Ophthalmology, Westchester Medical Center, Valhalla NY.

ARVO Poster Presentation, May 4, 2006

Concurrent Endophthalmitis and Orbital Cellulitis: A Review of Clinical Features, Predisposing Factors, and Outcomes. Joseph Fan, MD. Alice Song, MD. Julia Song, MD. Department of Ophthalmology, Loma Linda University.

ARVO Poster Presentation, May 1, 2005

Anterior Capsule Contraction Syndrome with the AcrySof SA60AT IOL: A Comparison of Surgical Techniques. Michael Rauser, MD. Department of Ophthalmology, Loma Linda University.

Research Assistant, UCLA Molecular Biology Institute

Arnold Berk, MD. Development of a novel helper-dependent adenovirus-Epstein-Barr virus hybrid system for the stable transformation of mammalian cells. J Virol. 2004 Jun;78(12):6556-66. 2002-2003

Research Assistant, UCLA MacDonald Research Lab

Jake Lusic, PhD. Investigated genetic and molecular mechanisms in the development of atherosclerosis in mutant mice strains. 2001-2002

**HONORS/
AWARDS**

Loma Linda University Macpherson Research Scholarship
2004

Phi Beta Kappa, UCLA
College & Departmental Honors
Mortar Board Senior Honor Society Scholar
Golden Key International Honor Society
Provost's Honors List
2003

Phi Eta Sigma, Sophomore & Junior Honor Society, UCLA
Alpha Lambda Delta, Freshman Honor Society, UCLA
2000-2002

Southwest Youth Musical Festival – Silver Medalist
Southwest Youth Music Festival – Bronze Medalist
Redlands Bowl Summer Music Festival – Semifinalist
John Walker Music Competition – Second place
John Walker Music Competition – Third place

SPECIALTY

Henry Ford Hospital, Detroit, Michigan

ELECTIVES

Ophthalmology Elective, October 2006

Jules Stein Eye Institute, UCLA
Ophthalmic Pathology, August 2006
Mentor: Dr. Ben Glasgow

Loma Linda University, Jerry Lewis Pettis VA Memorial Hospital
Pediatric and General Ophthalmology, April 2006

Loma Linda University, Riverside County Regional Medical Center
Oculoplastics, September 2005

Loma Linda University, Faculty Medical Offices
Anterior Segment, Cataract, & Refractive Ophthalmology
July 2004

St. Bernardine Hospital, San Bernardino, CA
Retina, July 2004

LEADERSHIP

Ophthalmology Residency Lecturer, Loma Linda University
“Tips on Surgical Techniques and Patient Selection”
January 29, 2016

Ophthalmology Residency Lecturer, Loma Linda University
“Advanced Surgical Techniques for Cataract Surgery”
August 2015

Ophthalmology Residency Lecturer, Loma Linda University
“Intro to Embryology”
August 2013, 2014, 2015

Ophthalmology Residency Lecturer, Loma Linda University
“Intro to Glaucoma”
July 2013

Grand Rounds Presenter, Loma Linda University Eye Institute
“Enucleation, Evisceration, Exenteration”
July 2013

San Bernardino County Medical Society, Medical-Legal
Student Committee Member.
2006-2007

Senator, Senior Class of 2007
Loma Linda University School of Medicine Senate
2006-2007

Loma Linda University Symphony Orchestra. First Violin Soloist, April 2006 Debut Concert. John Carter, Conductor 2005-2006

Youth Ministries Outreach Program, San Bernardino
Del Rosa Sabbath School of Seventh-day Adventists 2004-2005

Senator, Freshman Class of 2007
Loma Linda University School of Medicine Senate
2003-2004

American Youth Symphony. Alexander Tregger, Conductor.
Dorothy Chandler Pavilion, Walt Disney Concert, & Carnegie Hall
2000-2005

UCLA Symphony Orchestra. Dr. Jon Robertson, Conductor.
Concertmistress for Choral Conductors' Orchestra. Dr. Donald Neuen, Director. 1999-2001

Peer Counselor, UCLA Academic Advancement Program.
Provided counseling and support for pre-medical minority students
2000-2003

PROFESSIONAL MEMBERSHIPS

American Academy of Ophthalmology (AAO)
Association for Research in Vision & Ophthalmology (ARVO)
American Medical Association (AMA)

HOBBIES/ INTERESTS

Musical performances: violin, piano, orchestra

ARVO Classical Concert, May 2010, 2011, 2012, 2013, *2016

*Capuoya Trio with Piano, Clarinet, Violin, and Cello

*Schobert Piano Trio with Clarinet and French Horn

*Anderson Trio, Religioso with Piano, Violin, Cello

Duvernoy Trio No. 2 in F for Clarinet, Horn, Piano (piano)

Dvorak Piano Quintet No. 2 for Piano and Strings, Opus 81 (violin)

Dvorak Bagatelles String Quartet, Opus 47 (violin)

Shostakovich Three Violin Duets (violin)

*audio recording available upon request

Loma Linda University School of Medicine Graduation 2007

www.youtube.com/watch?v=siiYb8NTZW8

Yoga, tennis, skiing, snowboarding, dancing, cooking, traveling, and supporter for dog rescue groups

Glaucoma is one of the most common causes of blindness of the elderly population. Early diagnosis and treatment of glaucoma is critical to diagnosing this asymptomatic (until the late stages of the disease) disorder. On the other hand, the misdiagnosis of glaucoma or ocular hypertension will subject patients to unnecessary treatment, with the associated cost and potential side effects of therapy. The presentation will review several cases that highlight the multifactorial approach needed in assessing for glaucoma, the necessary diagnostic testing, and the decision making process for initiating glaucoma therapy.

Speaker: Howard Guan, MD

The Usual (Glaucoma) Suspects

Outline

- Sample Cases
- Definition of terminology:
 - o glaucoma vs glaucoma suspect
 - o ocular hypertension
 - o pre-perimetric glaucoma
 - o normal tension glaucoma
- Review of risk factors for glaucoma
- Calculating risk of conversion to glaucoma
 - o Lessons from OHTS
 - o <http://ohts.wustl.edu/risk/calculator.html>
- To treat or not to treat – pros and cons
- Involving the patient in the decision making process

Objectives

1. To identify various risk factors for glaucoma
2. To understand how to stratify risk in conversion to glaucoma
3. To learn how to approach and counsel patients when managing glaucoma suspects

6'0"	6'0"
5'5"	5'5"
5'0"	5'0"
4'5"	4'5"
4'0"	4'0"
3'5"	3'5"
3'0"	3'0"

**THE USUAL
(GLAUCOMA) SUSPECTS**

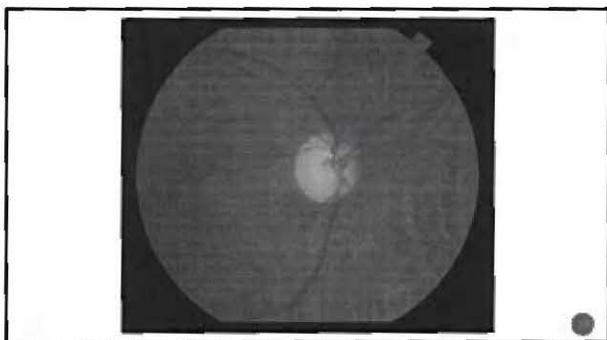
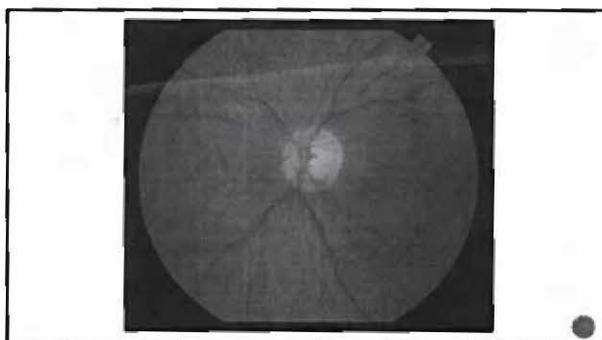
Howard Guan, MD
Loma Linda University Eye Institute

FINANCIAL DISCLOSURES

- None

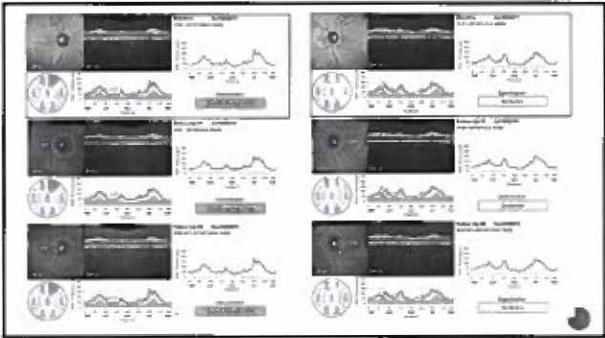
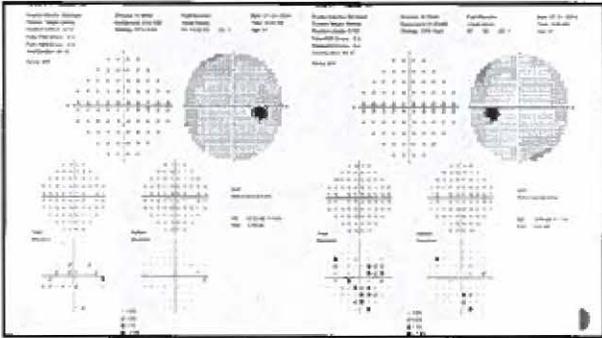
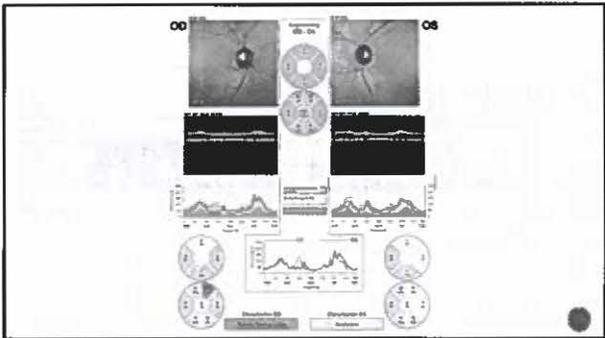
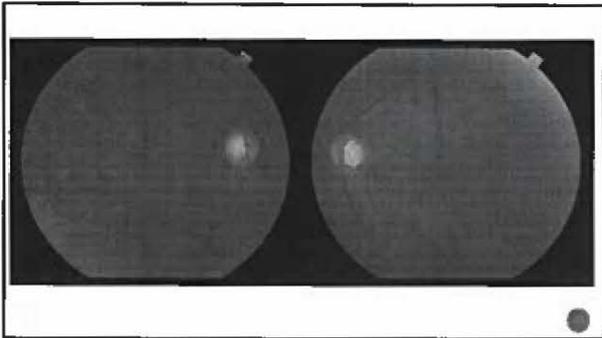
CASE 1

- 66 year old Hispanic M c/o blurry vision/glare OS. No fam hx glc
- Va
 - 20/80 -> PH 20/40 OD
 - 20/80 -> PH 20/28 OS
- Tap 16/17
- CCT 504/513
- Gonio open OU



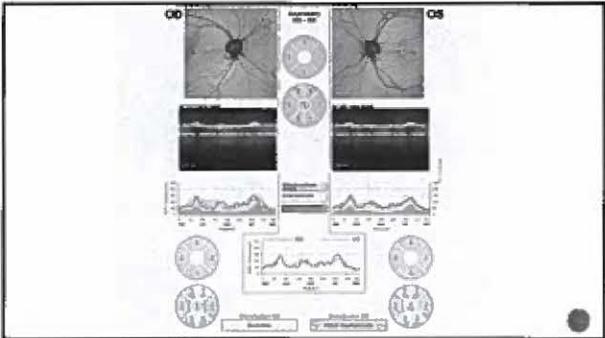
CASE 2

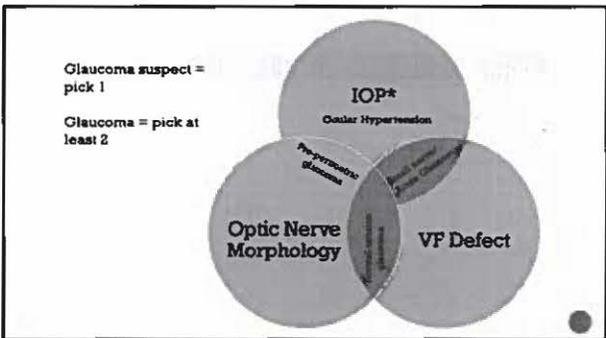
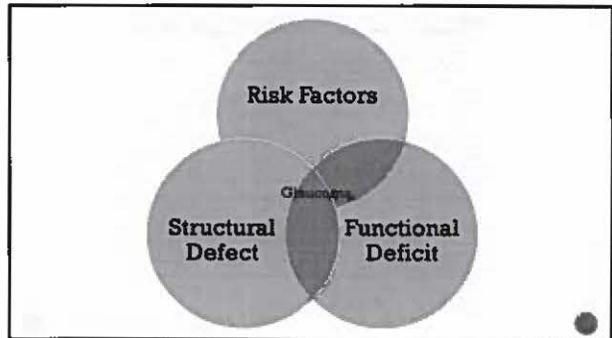
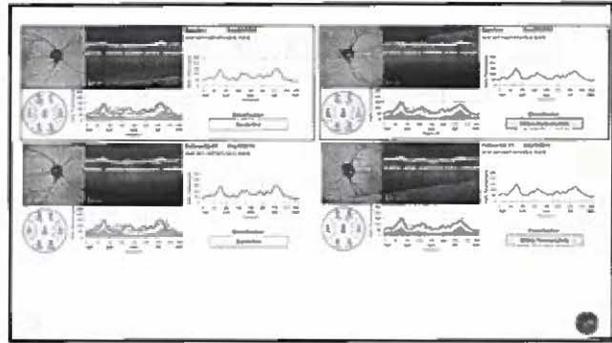
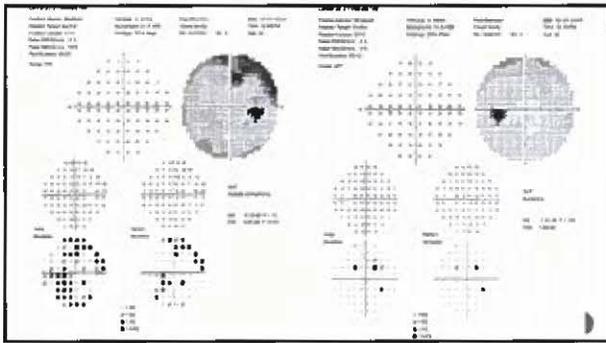
- 62 yo AA M here for routine exam. No new visual complaints.
- VA 20/30 OD, 20/40 OS
- Tap 12/13
- Gonio open
- CCT 580/582



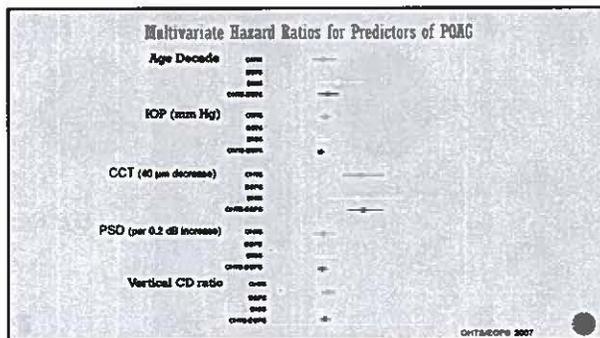
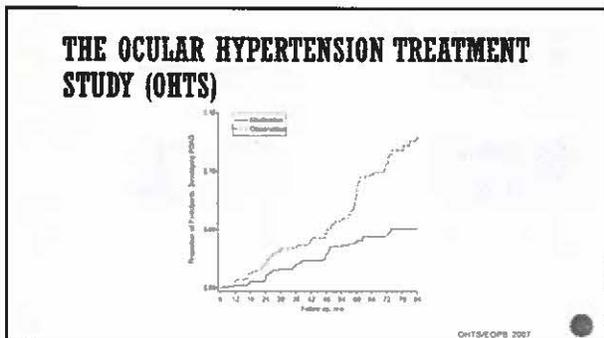
CASE 3

- 63 yo Caucasian M, referred for glaucoma eval. "Pressures have been high all my life."
- No visual complaints. No eye pain, no floaters or glc.
- Va 20/25, 20/25
- Tap 25/26
- CCT 637/630
- Gonio open
- CD 0.4/0.3





CALCULATING RISK



POINT SYSTEM FOR ESTIMATING 5-YEAR RISK OF DEVELOPING POAG

DEFINITIONS:
 1. Select the age and number like (average of multiple measures of right and left eyes). For Primary select one value for Secondary POAG or Glaucoma-Like Features depending on which treatment you want.
 2. Check "Multifactor" to obtain the total points and predicted risk.
 3. You can use the chart to obtain your result over any number years.

Factor	Points for Feature
Age decade	0, 1, 2, 3, 4
Secondary POAG (yes/no)	0, 1
Glaucoma-Like Features (yes/no)	0, 1
Vertical CD ratio (yes/no)	0, 1
Glaucoma-Like Features (yes/no)	0, 1

Sum of Points and Estimated 5-Year Risk of Developing POAG

Sum of Points	0-6	7-8	9-10	11-12	13-14
Estimated 5-Year Risk of Developing POAG	4.4%	10%	19%	28%	33%

<http://ohta.wustl.edu/risk/calculator.html>

LIMITATIONS OF OHTS

- Results cannot be generalized to patients with IOP <24 mmHg.
- Study IOP goal was 50% reduction. Results may vary with other targets.
- No measure of medication adherence
- Participants were healthy, not "real-world."

CCT (µm)	Adjustment to Measured IOP (mmHg)
445	-1.7
451	-1.6
461	-1.5
471	-1.4
481	-1.3
491	-1.2
501	-1.1
511	-1.0
521	-0.9
531	-0.8
541	-0.7
551	-0.6
561	-0.5
571	-0.4
581	-0.3
591	-0.2
601	-0.1
611	0
621	0.1
631	0.2
641	0.3
651	0.4
661	0.5
671	0.6
681	0.7
691	0.8
701	0.9
711	1.0
721	1.1
731	1.2
741	1.3
751	1.4
761	1.5
771	1.6
781	1.7
791	1.8
801	1.9
811	2.0
821	2.1
831	2.2
841	2.3
851	2.4
861	2.5
871	2.6
881	2.7
891	2.8
901	2.9
911	3.0
921	3.1
931	3.2
941	3.3
951	3.4
961	3.5
971	3.6
981	3.7
991	3.8
1001	3.9
1011	4.0
1021	4.1
1031	4.2
1041	4.3
1051	4.4
1061	4.5
1071	4.6
1081	4.7
1091	4.8
1101	4.9
1111	5.0
1121	5.1
1131	5.2
1141	5.3
1151	5.4
1161	5.5
1171	5.6
1181	5.7
1191	5.8
1201	5.9
1211	6.0
1221	6.1
1231	6.2
1241	6.3
1251	6.4
1261	6.5
1271	6.6
1281	6.7
1291	6.8
1301	6.9
1311	7.0
1321	7.1
1331	7.2
1341	7.3
1351	7.4
1361	7.5
1371	7.6
1381	7.7
1391	7.8
1401	7.9
1411	8.0
1421	8.1
1431	8.2
1441	8.3
1451	8.4
1461	8.5
1471	8.6
1481	8.7
1491	8.8
1501	8.9
1511	9.0
1521	9.1
1531	9.2
1541	9.3
1551	9.4
1561	9.5
1571	9.6
1581	9.7
1591	9.8
1601	9.9
1611	10.0

Adjusting Intraocular Pressure for Central Corneal Thickness Does Not Improve Prediction Models for Primary Open-Angle Glaucoma

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1461111/

OTHER VARIABLES IN THE EQUATION

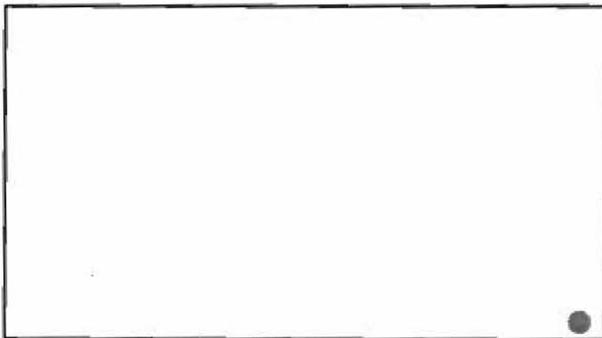
- Life expectancy
- Health status
- Patient preference

TO TREAT OR NOT TO TREAT

Pros	Cons
Prevention is key!	Side effects
VF loss is irreversible	Economic Cost
Low risk of treatment	Lifestyle changes
	Lack of functional benefit

THE CONVERSATION...

- What are the patient's goals and expectations?
- What if the patient refuses treatment?
- "Will I go blind?" – Dispelling misconceptions
- Emphasizing the importance of monitoring
- Focusing on the patient



HOWARD GUAN, M.D.

10763 Gala Ave • Rancho Cucamonga, California 91701
(949) 413-5971 • howard.guan@gmail.com

AFFILIATIONS:	Loma Linda Eye Institute Instructor	August 2015-present
TRAINING:	Boston Medical Center Glaucoma Fellowship	July 2014-June 2015
	Loma Linda University Medical Center Ophthalmology Residency	July 2011-June 2014
	Arrowhead Regional Medical Center Transitional Year Internship	June 2010-June 2011
	Loma Linda University School of Medicine M.D., Alpha Omega Alpha	August 2006-May 2010
	University of California, Irvine B.S., Biochemistry and Molecular Biology Honors and <i>Cum Laude</i>	September 2002-June 2006
PRESENTATIONS:	Why You Need an Eye Exam	May 2016
	OKAP Review: Glaucoma	March 2016
	Glaucoma Surgery	February 2016
	Uveitic Glaucoma	January 2016
	Visual Field Interpretations and Pitfalls	November 2015
	Introduction to Glaucoma	August 2015
	Anterior Segment Lasers	May 2015
	Postoperative Hypotony Management	March 2015
	Eye Care for Primary Care Physicians	December 2014
	Neonatal Corneal Opacities	January 2013
	Diagnostic Approach to Anisocoria	August 2012
	Retina Grand Rounds	April 2012
	Ocular movement disorders	December 2011
	Selected Amblyopia Cases	October 2011
	Optic Disc Drusen	September 2011
	Wegener's Granulomatosis	August 2011
	Management of Ocular Burns	May 2011
	Central Retinal Vein Occlusion with concurrent Branch Retinal Artery Occlusion, a Case Report.	April 2009
RESEARCH:	Experience with Ologen versus Mitomycin-C for trabeculectomy in a predominantly African American population. Babak Eliassi-Rad, MD. Poster and presentation presented at WGC 2015.	May 2015 Hong Kong

HOWARD GUAN

Syphilitic Papillitis in an HIV Positive Individual: Case Report and a Review of Current Literature. June 2014
Loma Linda, CA
Michael Ing, MD. Presented at Resident Research Day.
Poster presented at ICAAC 2014.

Validation of self-reported diagnosis of cataracts in Adventist Health Study-2. May 2013
Loma Linda, CA
Joseph Fan, MD. Presented at Resident Research Day.

**Role of subconjunctival Bevacizumab in post-
pterygium excision management.** May 2012
Colton, CA
Keith Tokuhara, MD. Presented at Resident Research Day.

Comparison of spectral domain optical coherence tomography and non-mydratic retinal photography to direct ophthalmoscopy for screening of diabetic retinopathy. May 2010
Loma Linda, CA
Joseph Fan, MD. Presented at Resident Research Day.

Capsular membrane suture fixation of decentered or dislocated IOLs. August 2009
Calgary, Canada
Howard V Gimbel, MD MPH. Submitted to JCRS 2009.

Implantation of Cionni ring with a Toric IOL in two patients with dislocated lenses. August 2009
Calgary, Canada
Howard V Gimbel, MD MPH. Submitted to JCRS 2009.

Volumetric analysis of traumatic brain injury lesions and trauma-induced cerebral atrophy. Summer 2007
Loma Linda, CA
Karen Tong, MD. Analyzed various computer based strategies for accurately and efficiently measuring brain lesions on MRI.

A real time monitoring viral entrance process during the course of HSV infection. 2005-2006
Irvine, CA
Guey-Chuen Perng PhD, Steven Wechsler PhD.
Created an HSV-1 gC-RFP mutant to examine role of glycoprotein gC in viral infection of rabbit cornea.
Presented at UCI Research Symposium.

HONORS: Alpha Omega Alpha Honor Medical Society, Epsilon Chapter 2009
Phi Beta Kappa Honor Society, Mu Chapter 2006
Summer Undergraduate Research Program Scholar 2005
Campuswide Honors Program 2002-2006
Regents Scholarship 2006

LEADERSHIP AND COMMUNITY SERVICE: **Vision Plus Clinique** May 2015
Cap Haitien, Haiti

HOWARD GUAN

Partnered with the Moran Eye Center to provide surgical care for underserved patients with cataracts and glaucoma.

Lusaka Eye Hospital

Performed manual small-incision cataract surgeries to restore vision in patients suffering from dense cataracts.

August 2013
Lusaka, Zambia

SACHS Clinic

Performed initial patient health assessments for monthly student-run clinic.

2009-2013
San Bernardino, CA

Hopital Adventiste d'Haiti

Performed ocular screening. Captured photographs for video and print media to raise funds for completing hospital improvements and developing a long term academic partnership.

June 2008
Port-au-Prince, Haiti

Special Ops after school program

Mentored at-risk youth at local high schools, meeting weekly throughout the year.

2007-2008
San Bernardino, CA

VA Health Fair

Performed basic eye screening and provided education about glaucoma, cataracts, and diabetic retinopathy to local veterans.

May 2008
Loma Linda, CA

Healthy Neighborhoods Health Fair

Screened local underserved population for various ocular problems and provided information about basic eye care.

2006, 2008, 2009
San Bernardino, CA

Class Historian - LLUSM Class of 2010

Captured moments with classmates throughout the year and presented slideshow at end of the year banquet.

2006-2008
Loma Linda, CA

International Service Learning

Partnered with local physicians to provide basic acute health care and preventative medicine to rural Central America.

Summer 2007
Costa Rica and Panama

DNB Photography

Founded a non-profit photography service specialized in large-venue performance art.

2006

Coordinator - **On Lok Senior Health Center**

Led a team of undergraduate students to develop various recreational activities for seniors living in nursing facilities.

April 2006
San Francisco, CA

HOWARD GUAN

Photographer - **New University Newspaper** 2005-2006
 Captured images of various news events for
 publication. Irvine, CA

Short Term Overseas Missions Program Summer 2005
 Worked with local farmers to build a tilapia farm as
 Thailand
 part of a plan for sustainable development in post-
 Tsunami Thailand. Captured footage for a
 documentary to raise funds for future projects.

Coordinator - **Estado 29 Orphanage** March 2005
 Led a team of volunteers to complete various
 Ensenada, Mexico
 construction projects at the orphanage.

Tutor - **Kidworks Donahue Center** 2004-2006
 Taught elementary school children basic math,
 Santa Ana, CA
 English, and computer skills in a weekly afterschool
 program.

Visual Arts Coordinator - **Newsong Community** 2004-2006
Church 2004-2006 Irvine, CA

Photographer - **UCI Anthology Yearbook** 2003-2006
 Designed a system to efficiently manage the
 Irvine, CA
 workflow for photography transitioning into the digital
 age.

Tutor - **UCI Learning and Academic Resource Center** 2003-2005
 Conducted bi-weekly small group learning sessions
 Irvine, CA
 for organic chemistry and biology.

Photographer - **This is My Neighborhood, A** March 2005
Documentary Santa Ana, CA

Volunteer - **Youth With A Mission** March 2003
 Los Angeles, CA

PROFESSIONAL American Glaucoma Society 2014-present
MEMBERSHIPS: American Academy of Ophthalmology 2010-present
 Ophthalmology Interest Group 2008-2010
 American Medical Student Association 2006-2010
 American Medical Association 2007-present

PERSONAL: Personal interests include photography, basketball, and making ice cream.