



**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



February 1, 2017

California State Board of Optometry  
2450 Del Paso Road, Suite 105  
Sacramento, CA 95834

Dear California State Board of Optometry,

Re: Returned CE Course Approval Request – The Other Glaucoma

This letter serves to furnish the items requested after preliminary review of my initial application.

A sincere effort was made to submit the initial application 45 days in advance of the presentation date; however, I did not receive the presentation materials from Dr. Neda Shamie within an acceptable time frame. That said, I waited to mail the entire CE application packet until I was in possession of all presentations for the Kaiser Permanente 2017 Optometry Symposium. In the future, I will be more stringent with each instructor to ensure I have all necessary materials well in advance of the symposium date.

Additionally, there was a misunderstanding of the CE Course Approval Application process as I was unaware of the requirement that the application be submitted electronically and not by mail. Moving forward, I am now clear of the requirements and will submit future applications via email.

If you have any questions, please feel free to contact me at (626) 405 – 4648 or by email [jennifer.n.iacuaniello@kp.org](mailto:jennifer.n.iacuaniello@kp.org).

Sincerely,

A handwritten signature in cursive script that reads "Jennifer Iacuaniello".

Jennifer Iacuaniello

# \$350 Paid for the 7 Courses

Receipt #	Payor ID	Beneficiary ID	Amount
1-2257	6423620	4274838	50

BUSINESS, CONSUMER SERVICES, AND HOUSING AGENCY

GOVERNOR EDMUND G. BROWN JR.



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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.**

<b>Course Title</b> The Other Glaucoma	<b>Course Presentation Date</b> 02 / 11 / 2017
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### Course Provider Contact Information

<b>Provider Name</b> Jennifer (First) iacuaniello (Last) Nami (Middle)		
<b>Provider Mailing Address</b> Street 393 E. Walnut, 1st Fl City Pasadena State CA Zip 91188		
Provider Email Address <u>jennifer.n.iacuaniello@kp.org</u>		
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.

<b>Instructor Name</b> Andrew (First) Mick (Last) Boyd (Middle)		
License Number <u>11996</u>	License Type <u>Optometrist</u>	
Phone Number <u>(415) 221-4810 ext. 4606</u>	Email Address <u>andrew.mick@va.gov</u>	

**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.**

Jennifer Iacuaniello  
Signature of Course Provider

1.5.17  
Date



[Home](#) | [Agenda](#) | [Faculty](#) | [Information](#) | [Location](#) | [Handouts](#) | [Attendees](#) | [Fees](#) | [Register](#)

## WELCOME!

Please join us at this informative conference for Kaiser Permanente optometrists, opticians and other interested health care professionals. This event will provide a congenial atmosphere to exchange ideas and learn from notable experts in optometry and related fields.

Madhu Chawla, OD  
Chairperson, Optometry Symposium Committee

## DATE & LOCATION

Saturday, February 11, 2017

[The Waterfront Beach Resort, A Hilton Hotel](#)  
21100 Pacific Coast Highway  
Huntington Beach, CA 92648  
(714) 845 - 8000

## AGENDA

Download the symposium agenda

## FACULTY

[Click here to meet the faculty](#)

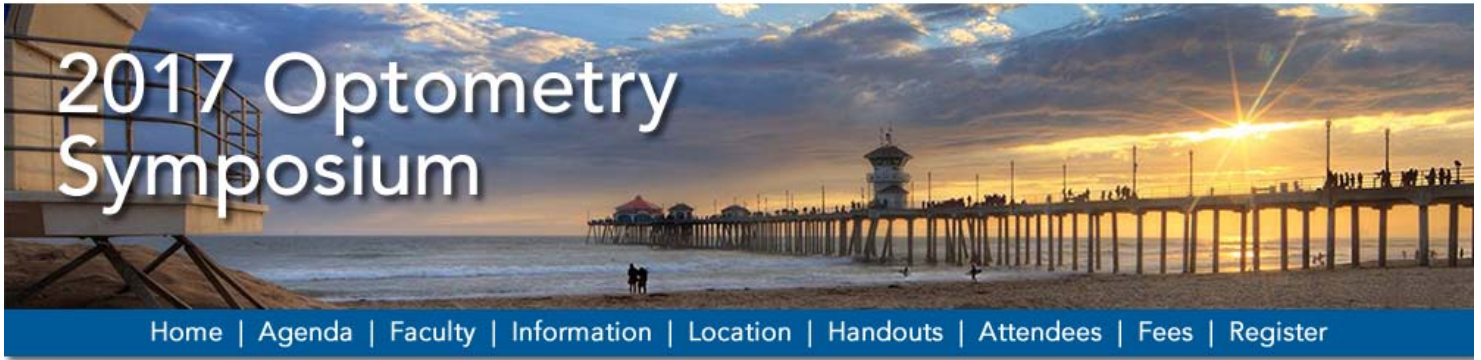
## SOCIAL MEDIA

Follow us on facebook and twitter for up to date information on all symposia.



## Reminder

Name badges will no longer be printed.  
Please bring your Kaiser Permanente issued badge for identification.



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## LEARNING OBJECTIVES

At the end of this activity, participants should be able to:

1. Enhance their knowledge surrounding the treatment and management of glaucoma
2. Co-manage patients with corneal disorders
3. Be informed and learn about new diagnostic technology available for patient care for the treatment and management of glaucoma and corneal disorders
4. Gain a better understanding of treatment options available for anterior segment disorders
5. Enhance knowledge of systemic disease as it applies to eye care
6. Reinforce knowledge of the standard of care within the profession and optimize care delivery

## TARGET AUDIENCE

Optometrists, Ophthalmologists, Opticians and any other interested health care professionals

## ACCREDITATION

**Optometrists** – California State Board of Optometry approval pending.

## PERSONS WITH DISABILITIES

In compliance with the Americans with Disabilities Act, all reasonable efforts will be made to accommodate persons with disabilities at the meeting. If you have any special dietary or accommodation needs, please notify the meeting planner listed, prior to the symposium at (626) 405-4648 or tie-line 8-335-4648. This advance notice will help us serve you better.



# 2017 Optometry Symposium

Saturday, February 11, 2017

## Agenda

7:00 am	<b>Registration and Breakfast</b>
7:50 am	<b>Welcome and Introductions</b>
8:00 am	<b>Potpourri of Corneal Cases</b> Neda Shamie, MD
8:50 am	<b>Corneal Dystrophies and Pathology</b> Neda Shamie, MD
9:40 am	<b>Morning Break</b>
10:00 am	<b>Systemic and Medical Jeopardy</b> David Sendrowski, OD
10:50 am	<b>Viral Infections of the Anterior Segment</b> David Sendrowski, OD
11:40 am	<b>OD of the Year</b>
11:50 am	<b>Lunch</b>
12:50 pm	<b>Lessons Learned as a Malpractice Consultant</b> Andrew Mick, OD
2:30 pm	<b>Afternoon Break</b>
2:40 pm	<b>The Other Glaucoma</b> Andrew Mick, OD
3:30 pm	<b>Enlarged Optic Nerve Cupping</b> Andrew Mick, OD
4:20 pm	<b>Closing Comments and Raffle</b>

*Agenda is subject to change*

**Course:** The Other Glaucoma

**Speaker:** Andrew Mick, OD, FAAO

**Time:** 2:40 pm – 3:30 pm

**CE Requested:** 1 Hour

**Summary:** Angle closure glaucoma has not received wide spread attention in the United States as the number of cases in Asia are significantly higher. Angle closure glaucoma is more prevalent than most suspect so it's imperative for optometrists to identify the disease. This lecture provides understanding of the causes, clinical signs, risk factors, and treatments for angle closure glaucoma.

**Objective:** Be informed and learn about new diagnostic technology available for patient care for the treatment and management of glaucoma.

### **Topical Outline**

1. Diagnosis
  - a. Characteristics signs/symptoms
  - b. Understanding at risk populations and causative factors
  - c. Gonioscopy
2. Definitions
  - a. Angle closure
  - b. Angle Closure Glaucoma
3. Classification
  - a. Primary Angle Closure Glaucoma
  - b. Secondary Angle Closure Glaucoma
4. Common Dynamic Influences
  - a. Iris Dilation
  - b. Lens Accommodation
  - c. Thickness
  - d. Volume
  - e. Variable Iris-Lens Morphology
  - f. Variable Lens Position
  - g. Choroidal Swelling
5. Classic Treatment Strategies for Acute Angle Closure
  - a. Topical therapeutic agents
  - b. Systemic therapeutic agents
  - c. Laser peripheral iridotomy
6. Other Treatment Options for Acute Angle Closure

- a. Argon laser peripheral iridoplasty
- 7. Preventing Recurrence and Managing Chronic Angle Closure
  - a. Does LPI prevent chronic disease?
  - b. The role of lens extraction





**The Other Glaucoma: A closer look at angle closure**

Andrew B. Mick, OD, FAO  
 San Francisco VA Medical Center Eye Clinic  
 UC Berkeley School of Optometry  
 UCSF Department of Ophthalmology



I have no financial disclosures



Why are we talking about angle closure glaucoma when most of treatments are surgical?

**Angle closure: Only a problem in Asia?**

World Region	PACG	
	Prevalence	Number
Asia	1.09 (0.43–2.32)	15.47 (6.26–32.41)
Africa	0.60 (0.16–1.48)	1.26 (0.34–3.30)
Europe	0.42 (0.13–0.98)	1.41 (0.43–3.37)
North America	0.26 (0.03–0.96)	0.39 (0.04–1.38)
Latin America and the Caribbean	0.85 (0.14–3.00)	1.59 (0.31–5.24)
Oceania	0.35 (0.05–1.15)	0.05 (0.01–0.16)
Worldwide	0.50 (0.11–1.36)	20.17 (7.39–45.86)

Evidence based estimation of angle closure glaucoma prevalence by continent in adults over aged 40

Based on projections, Asia accounted for 76.7% of the worlds ACG in 2013

Yih Chung. Ophthalmology 2014;121:2081-2090

**But I practice in the US and my patients are primarily white!**

US Caucasians: 3.8% over the age of 55 have occludable angles  
 Framingham Study. Surv Ophthalmol 1980;24(suppl): 335-610.

Meta analysis of angle closure glaucoma prevalence studies preformed in "European derived" populations :

- PACG in 40-49 year olds: 0.20%
- PACG in 50-59 year olds: 0.60%
- PACG in 60-69 year olds: 0.20%
- PACG in 70+ year olds: 0.94%

Day. Br J Ophthalmol 2012;96:1162-7

Study of US angle closure glaucoma prevalence in Caucasians based on diagnostic coding found a rate of 1.35% over the age of 40

Ophthalmology 2011;118:1031-1037

**Reality: Significant percentage of our patients are Asian**

Vietnamese Americans: 47.8% of consecutively presenting adults over the age of 55 have occludable angles  
 Nguyen. Ophthalmology 1996;103(9):1426-31

Chinese Americans: 60.2% of adults diagnosed with glaucoma or glaucoma suspicion have occludable angles (Mean age 69 for women, 66 for men)  
 Seider. J Glaucoma 2009;18(8):578-581.

Filipino Americans: 24% of consecutively presenting adults have occludable angles (Mean age = 60 years)  
 Seider. J Glaucoma 2010. April e pub.

Ophthalmology 2011;118:1031-1037

**Differences in Rates of Glaucoma among Asian Americans and Other Racial Groups, and among Various Asian Ethnic Groups**

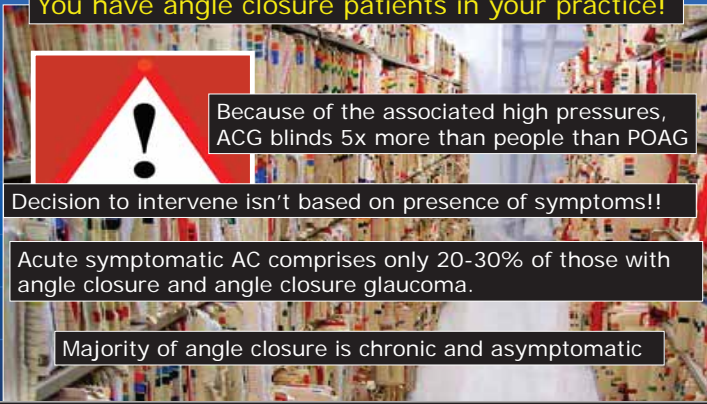
Group of 2.25 million eye care recipients over the age of 40 years

Strata	Risk (%)	Rate Ratio	CI
Overall	1.45		
Race			
White	1.35	1.00	(reference)
Black	1.65	1.23	1.16-1.30
Latino	2.04	1.51	1.45-1.59
Asian	3.03	2.24	2.12-2.37
Other	1.23	1.28	1.14-1.45
Ethnicity			
Non-Asian	1.41		
Vietnamese	4.08	2.90	2.54-3.31
Japanese	1.97	1.45	1.34-1.71
Chinese	3.74	2.76	2.45-2.99
Filipino	2.07	1.47	1.12-1.96
Korean	2.30	1.64	1.33-2.01
Indian	2.66	1.99	1.66-2.16
Pakistani	2.10	1.49	0.97-2.29
Other Asia	1.49	1.06	0.75-1.49

**Narrow-Angle Glaucoma**

Hazard ratios for developing angle closure glaucoma compared to non-Hispanic whites

**You have angle closure patients in your practice!**



Because of the associated high pressures, ACG blinds 5x more than people than POAG

Decision to intervene isn't based on presence of symptoms!!

Acute symptomatic AC comprises only 20-30% of those with angle closure and angle closure glaucoma.

Majority of angle closure is chronic and asymptomatic

And that is why we are talking about it today:

**Optometry's responsibility to diagnosis it!**

Yip. Current Opin Ophthalmol 2006;17:175-180.

**New Patient Routine Eye Exam**

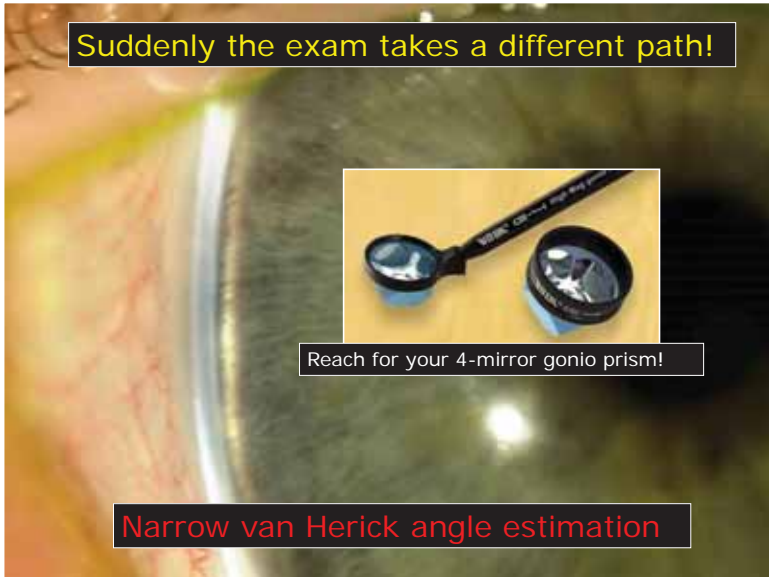


67 year old Caucasian female

Last eye exam: 2-years ago, mild cataracts

20/25+ vision with hyperopic refraction

**Suddenly the exam takes a different path!**



Reach for your 4-mirror gonio prism!

**Narrow van Herick angle estimation**

**Gonioscopy: Confirms narrow angles!**



Schwalbe's line and anterior trabecular meshwork visible

**While doing gonioscopy.....**

After assessing most posterior structure visible

Perform compression gonioscopy:

- Are angles narrow due to irido-trabecular contact or synechiae?
- During compression, is there a "Double Hump" Sign?
- Are there any abnormalities in the narrow angle?



Alward. Color Atlas of Gonioscopy

**It is decision time!!**

67 year old hyperopic white female with mild cataract

Narrow van Herick estimation

No posterior TM visible gonioscopically

All irido-trabecular touch, no synechiae

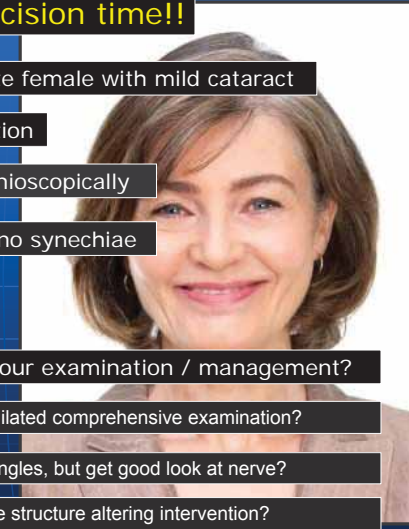
IOP: 16/16

What is the next step in your examination / management?

IOP is fine, so continue on with dilated comprehensive examination?

Don't dilate because of narrow angles, but get good look at nerve?

Refer for consideration of a angle structure altering intervention?



Pressure! Glaucoma!! Laser!!  
But I just came in for glasses!!!!

**Reasonable questions to follow:**

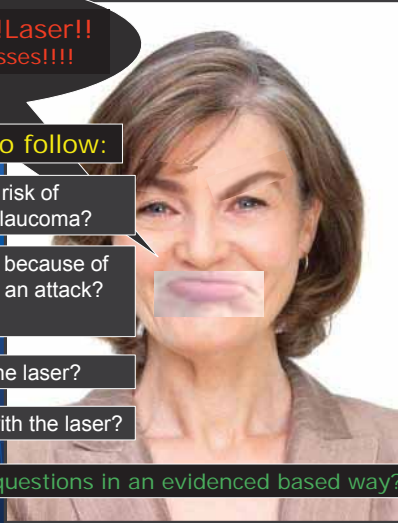
With narrow angles, what is my risk of developing a high pressure or glaucoma?

If I always have been a suspect because of my anatomy, why haven't I had an attack? What triggers angle closure?

What are the complications of the laser?

How much is my risk reduced with the laser?

How do you answer these questions in an evidenced based way?



**Let's start with angle closure basics**

**Angle Closure Definitions:**

Angle Closure:

Disorder of ocular anatomy characterized by closure of the drainage angle by appositional or synechial approximation of the iris against the trabecular meshwork blocking aqueous outflow

Angle Closure Glaucoma:

Common result in related anatomical disorders. The IOP is elevated secondary to blocked aqueous outflow resulting in glaucomatous optic neuropathy

**Anatomical/Functional Classification**

Primary Angle Closure Suspect (PACS):

Patient has occludable angles  
less than 180° of posterior pigmented TM visible without indentation  
No peripheral anterior synechiae  
No elevated IOP (<21 mmHg)

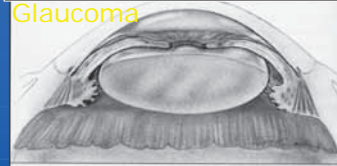
Primary Angle Closure (PAC):

Patient has occludable angles  
less than 180° of posterior pigmented TM visible without indentation  
Elevated IOP and/or peripheral anterior synechiae  
Normal optic nerve and visual field

Primary Angle Closure Glaucoma (PACG):

Primary angle closure with glaucomatous optic neuropathy

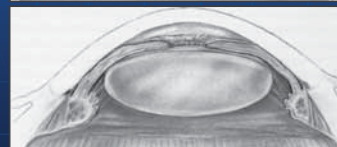
**Mechanistic Classification of PRIMARY Angle Glaucoma**



Pupillary Block Glaucoma



Plateau Iris Configuration



Phacomorphic

Stamper, Lieberman, Drake. Diagnosis and Therapy of the Glaucomas. 8th Edition

**SECONDARY Angle Closure Glaucoma**

Any cause of angle closure besides PAC

**"Push or Pull"**

"Push" from behind:

-Ciliary body masses / cysts



"Pull" peripheral iris into the angle:

-Neovascularization  
-Iridocorneal endothelial syndromes

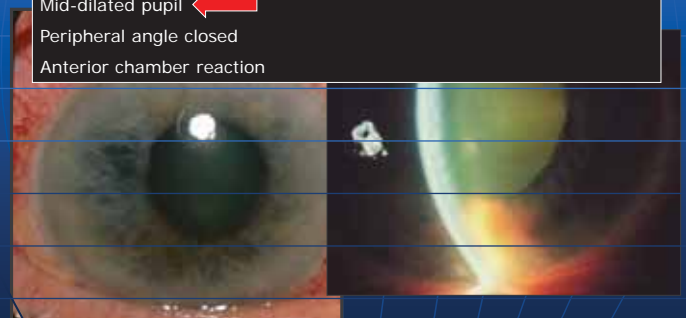


Tello. Semin Ophthalmol 2002; 17(2): 69 89

**Only Spending 2 Slides on "Acute" PAC**

Presenting Signs / Symptoms:

Marked elevation in IOP	Ocular pain
Corneal edema	Decreased vision/ halos
Conjunctival injection	Nausea
Mid-dilated pupil	
Peripheral angle closed	
Anterior chamber reaction	



## Treatment for Acute AC: Get the IOP down and cornea clear

### Topical Medications:

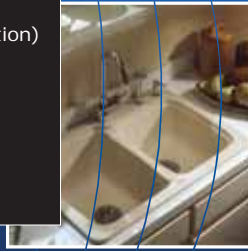
- beta-blocker
- topical carbonic anhydrase inhibitor
- topical alpha agonist (Lopidine)
- topical steroid (optional for inflammation)
- Pilocarpine?

### Oral Medications:

acetazolamide/methazolamide

### Oral Hyperosmotics

Anterior Chamber Paracentesis



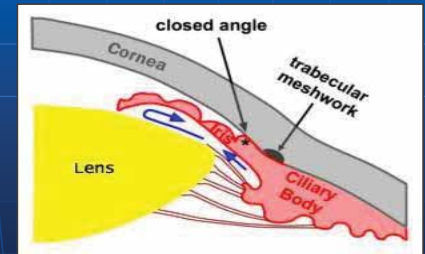
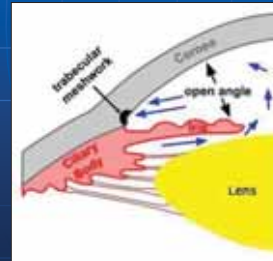
## Second: Relieve pupillary block component

Laser Peripheral Iridotomy (LPI)

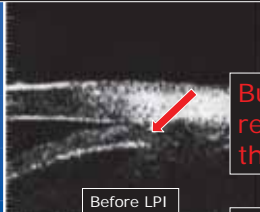
## Pupillary Block Primary Angle Closure

### The "Primary" Mechanism for Primary Angle Closure:

Mechanism that accounts for the vast majority of primary angle closure  
Anatomically narrow anterior chamber  
Relative pupillary block results in intolerable pressure differential  
Peripheral iris bows forward resulting in angle closure



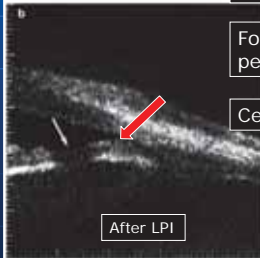
## LPI: Treatment for pupillary block mechanism



Before LPI

But is an abnormal iris lens channel responsible for pupillary block all that is unique about these eyes?

Effectively equalizes IOP between chambers



After LPI

Forward bow of the iris is reversed opening the peripheral angle

Central chamber depth remains essentially stable

Mansouri. Br J Ophthalmol 2009;23:2046-2051.

Jacobs. Am J Ophthalmol 1980;89:865-867.

## What is unique about angle closure eyes?

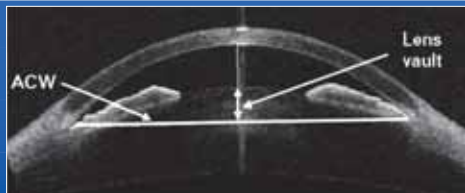
### Patients with Primary Angle Closure (PACS):

- Narrow central anterior chamber depth
- Increased lens thickness
- Greater anterior lens vault
- Short axial length
- Thickened sclera
- Smaller corneal diameter (limbus to limbus)
- Thicker iris that retains/gains large volume with dilation

Tello. Seminars in Ophthalmology 2002; 17(2): 69-78.

Celeste. Invest Ophthalmol Vis Sci 2013; 54: 5281-5286.

## What is unique about angle closure eyes?



- Narrow central anterior chamber depth
- Increased lens thickness
- Greater anterior lens vault
- Short axial length
- Thickened sclera
- Smaller corneal diameter (limbus to limbus)
- Thicker iris that retains large volume with iris dilation

Celeste. Invest Ophthalmol Vis Sci 2013; 54: 5281-5286.

## Why should I get the laser?

### What is my risk of PAC/G?

129 PACS followed for mean of 2.7 years without LPI:

- 121 White, 6 Black, 2 Asian
- 6% had acute PAC attacks
- 13% developed chronic PAS
- 19% overall risk of PAC in ~3 years

Wilensky. Am J Ophthalmol 1993; 115:338.

50 Asian Indian PACS initially classified and then reexamined 5 years later showed a 22% progression rate to PAC

Thomas. Br J Ophthalmol 2003; 87: 450.

Preferred Practice Patterns of the AAO cites 25% of PCS will develop PAC within 5 years (2010)

aao.org

Frustratingly, we only know a few patient characteristics that predict who will be this 20-25%

## Known risk factor for of PAC

### Risk factors for higher rates of conversion from PACS to PAC/PACG:

Fellow eyes of acute angle closure glaucoma

#### Family history of PACG

57.9% of siblings with a family member having ACG are on disease spectrum

14.7% have angle closure glaucoma

Increased age

Female gender (3x risk of developing ACG)

High hyperopia

High risk ethnicities

#### High and Low Risk Ethnicities:

Eskimo and Inuit (Highest Risk)

East Asian (High Risk)

White, Black, Latino (Lower Risk)

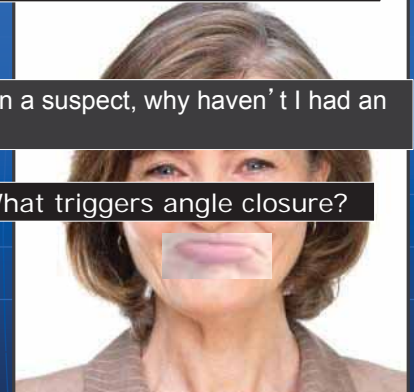
Yazdani. J Glaucoma 2014;24:149-153

Quigley. Br J Ophthalmol 2006;90:262-267

## That's Good!! I am not in a high risk group

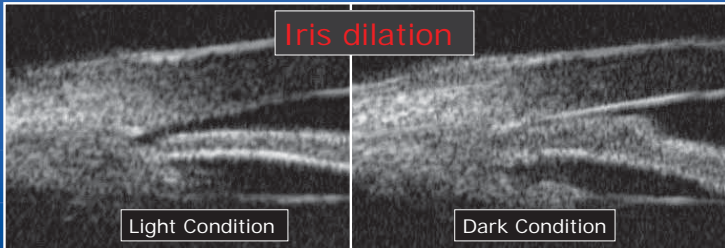
But if I always have been a suspect, why haven't I had an attack in the past?

In other words: What triggers angle closure?

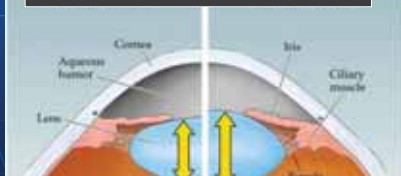


What are the dynamic changes that influence static anatomical risk factors for AC?

## Common Dynamic Influences



## Lens accommodation



Quigley. Am J Ophthalmol 2009;148:657-669

## More than just the position of the iris: The thickness

### Differences in iris structural measurements among American Caucasians, American Chinese and mainland Chinese

Dandan Wang MD,<sup>1,3</sup> Mingguang He MD,<sup>1</sup> Lingling Wu MD PhD,<sup>2</sup> Stephanie Yaglee BA,<sup>3</sup> Kuldev Singh MD MPH<sup>4</sup> and Shan Lin MD<sup>1</sup>

Customized AS-OCT programs were used to measure the thickness of the iris at a distance of 750 and 2000 um from the scleral spur

The irises of four aged matched groups: American Caucasians, Southern Chinese, and Northern Chinese were measured

Chinese individuals have thicker irises and greater iris area than American Caucasians independent of pupil size

Clin Exp Ophthalmol 2012;40:162-169.

## More than just the position of the iris: The thickness

### Increased iris thickness and association with primary angle closure glaucoma

B-S Wang,<sup>1,2</sup> A Narayanaswamy,<sup>3</sup> N Amerasinghe,<sup>1</sup> C Zheng,<sup>1</sup> M He,<sup>3</sup> Y-H Chan,<sup>4</sup> M E Nongpiur,<sup>1</sup> D S Friedman,<sup>5</sup> T Aung<sup>1,4</sup>

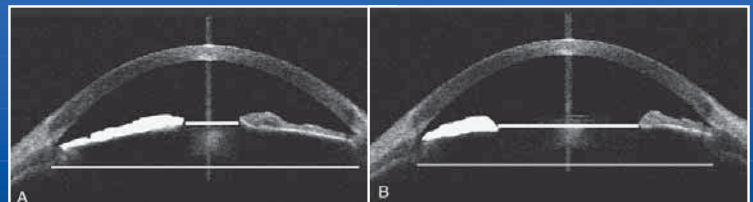
Customized AS-OCT programs were used to measure the thickness of the iris at a distance of 750 and 2000 um from the scleral spur

Irises of angle closure glaucoma patients, fellow eyes of patients with acute angle closure, and normal patients were measured

Irises in angle closure glaucoma patients and fellow eyes of acute angle closure patients were statistically thicker than in normals

Br J Ophthalmol 2011;95:48-50. doi:10.1136/bjo.2009.178129

## More than just the Thickness: The dynamic volume



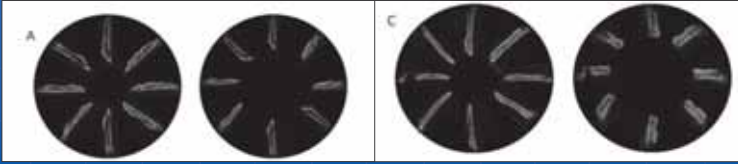
The structure of the iris allows for fluid to pass in/out with ease

Theory: Cross sectional area of the iris decreases with pupillary dilation

The irises of AC eyes have a much smaller change in cross sectional area with pupillary dilation compared to OAG and OAG suspect irises

Quigley. J Glaucoma 2009; 18(3):173-9

**More than just the Thickness: The dynamic volume**



Compared the fellow eyes of AC to age/sex matched controls

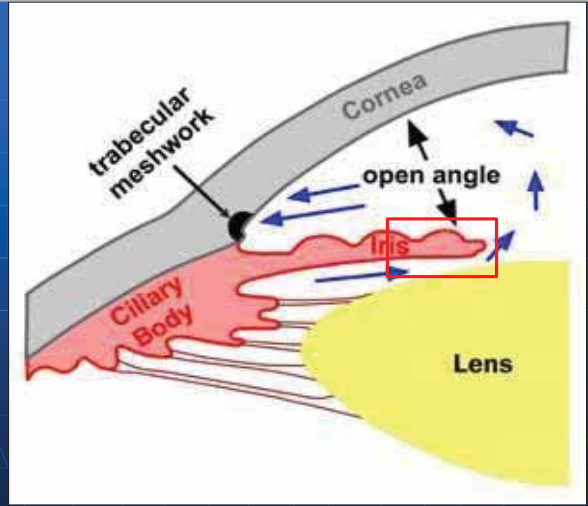
Prior to dilation, there was not a significant difference in iris volume

Thirty minutes post-dilation, the cross-sectional iris volume of fellow eyes of AC had increased by a statistically significant amount while controls decreased in volume.

Difference could lead to pathologic crowding of peripheral angle

Aptel. Ophthalmology 2010; 117: 3-10.

**Dynamic influences: Variable iris-lens morphology**



**Dynamic influences: Variable iris-lens morphology**

Relative IOP difference varies with height and width of channel



The channel is so thin, it can't be imaged with UBM (~3 20 um)

Width of channel has Intra- and inter variability (0.5 2.0 mm)

Results in a greater pressure in posterior chamber (2-5 mmHg)

Alward. Color Atlas of Gonioscopy. 2nd Edition 2008

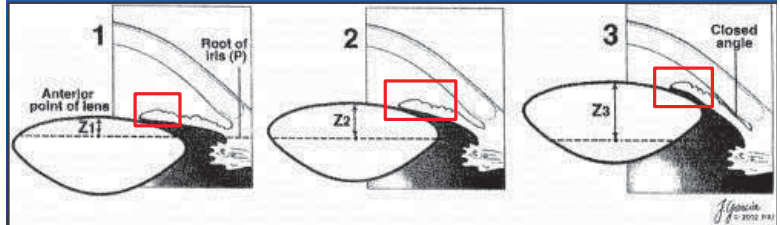
Caronia. Am J Ophthalmol 1996; 122:53 57.

**Dynamic influences: Variable lens position**

Moving the lens forward within the anterior chamber:

Narrow the peripheral angle mechanically

Increase the width of the irido-lenticular touch



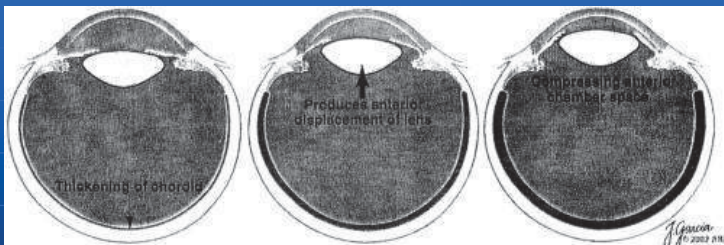
Clinical Observation:

The lens appears to move anteriorly during acute PAC

Quigley. J Glaucoma 2003; 12: 167 180.

**Dynamic influences: Variable lens position**

What causes the lens to move anteriorly?



Clinical Observation :

Conditions that result in choroidal expansion can lead to angle narrowing

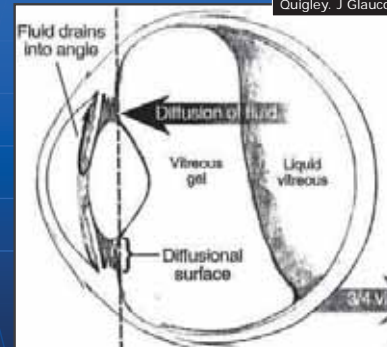
- VKH
- Suprachoroidal hemorrhage
- Uveal effusion syndrome
- S/P panretinal photocoagulation

Quigley. J Glaucoma 2003; 12: 167 180.

**Dynamic influences: Variable lens position**

How does choroidal swelling lead to anterior lens movement?

Quigley. J Glaucoma 2003; 12: 167 180.

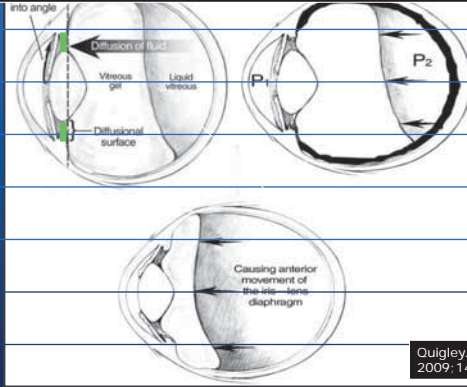


Important anatomical property:

- The anterior vitreous cortex is thick and resistant to fluid flow

**Dynamic influences: Choroidal swelling**

Lens moving forward is due to relative flow resistance between lens and ciliary processes across the anterior vitreous cortex

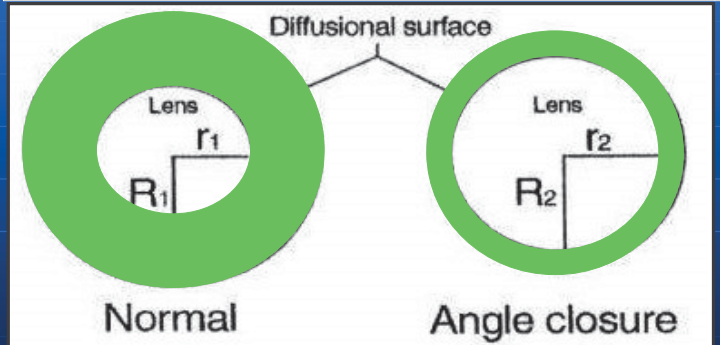


Quigley. Am J Ophthalmol 2009; 148(5):657-669.

Fluid flow from vitreous will depend on size and lenticular channel

**Dynamic influences: Choroidal swelling**

Resistance to anterior fluid flow a function of total area between the lens and the ciliary processes



Remember that AC eyes have large lenses and decreased limbus to limbus diameter, reducing the area of this fluid flow

**Has the choroidal swelling theory been proven?**

**Confirmation of the Presence of Uveal Effusion in Asian Eyes With Primary Angle Closure Glaucoma**

An Ultrasound Biomicroscopy Study

Rajesh S. Kumar, MS; Desmond Quirk, MBBS; Kelvin Y. Lee, MRCSEd; Francis T. Yen, FRCS(Ed); Hiroshi Sakai, MD, PhD; Victor F. Riva, MBBS; Lakshmana S. MohanRao, CCT; Mani Raghavan, FRCO; Tina T. Wong, FRCS(Ed), PhD; Tin Aung, FRCS(Ed), PhD

Arch Ophthalmol 2008; 126(12):1647-1651

Uveal swelling was demonstrated in 25% of acute PAC

Uveal swelling was demonstrated in 15.7% of PACG

**Uveal Effusion in Primary Angle-Closure Glaucoma**

Hiroshi Sakai, MD; Sayo Maruo-Shigeno, MD; Maruko Shimizu, MD; Yoshino Nakamura, MD; Miyako Sakai, MD; Shiroki Sawaguchi, MD

Ophthalmology 2005; 112:413-419

Uveal swelling was demonstrated in 58% of acute PACG

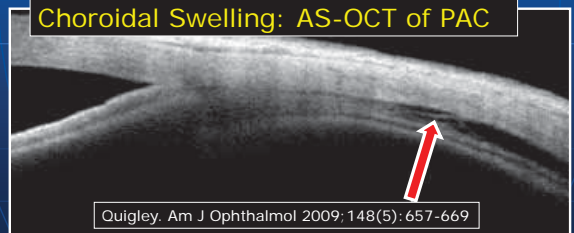
Uveal swelling was demonstrated in 23% of fellow eyes

**Choroidal Swelling: UBM of Acute PAC**



Sakai. Ophthalmology 2005; 112:413-419

**Choroidal Swelling: AS-OCT of PAC**



Quigley. Am J Ophthalmol 2009; 148(5): 657-669

**Dynamic influences: Choroidal swelling**

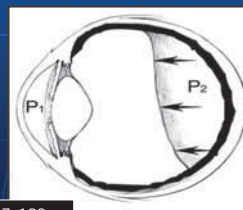
Once exiting the choroidal vessels, proteinaceous fluid must diffuse through sclera to reenter circulation

Unique anatomy of AC eyes:

- Thickened sclera decreases rate of diffusion
- Shorter axial length decreasing scleral surface area for diffusion

End Result:

Unique anatomy of AC eyes leads to prolonged uveal swelling



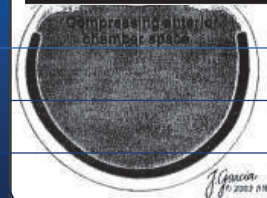
Quigley. J Glaucoma 2003; 12: 167-180.

**Dynamic influences: Choroidal swelling**

Does uveal swelling occur in normal eyes?

**YES!:**

- During increases in choroidal arteriole pressure
- During elevations in choroidal venous pressure (Valsalva)
- When there is a change in vascular permeability to protein (Mechanism of angle closure when taking sulfa meds)



Quigley. J Glaucoma 2003; 12: 167-180.

## A quick note about medications and PAC

Eye drops	Mydriatics	Phenylephrine, tropicamide, atropine, homatropine, cyclopentolate
Local drugs	In the anterior chamber	Acetylcholine, carbachol
	Intranasal	Ephedrine, naphazoline, cocaine
	Periocular	Botulinum toxin
Systemic drugs	Aerosolized drugs	Salbutamol, albuterol, terbutaline, ipratropium bromide, atropine [52]
	Vegetative nerve system drugs	Ephedrine, epinephrine (adrenaline)
	Anticoagulants	Heparin, warfarin, enoxaparin
	Central nerve system drugs	Topiramate, amphetamines, some antidepressant agents
	Diuretics	Acetazolamide, hydrochlorothiazide
	Other drugs	Cotrimoxazol, histamine H1 and H2 receptor antagonists

Lee et al. Clin Exp Ophthalmol 2007; 35: 55-58.

### Sulfa-Derived Meds are Common

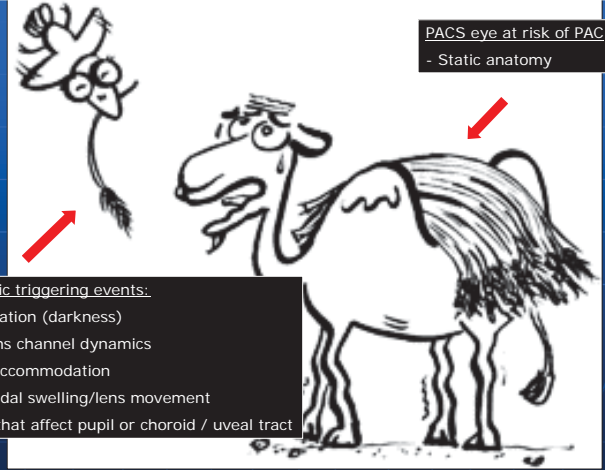
Topiramate  
Zonisamide  
  
Hydrochlorothiazide (HCTZ)  
Metolazone  
  
Triamterene and HCTZ  
Spiranolacone and HCTZ  
Atenolol and chlorthalidone  
Bisoprolol and HCTZ  
Lisinopril and HCTZ  
Enalapril and HCTZ  
Losartan and HCTZ  
Valsartan and HCTZ  
Ibuprofen and HCTZ  
Furosemide  
Acetazolamide  
Methazolamide

Glipizide  
Glimepiride  
Glyburide  
Sulfadiazine  
Sulfamethoxazole/trimethoprim

Meds that dilate pupils or influence choroidal swelling can facilitate PAC!

Lachkar and Bouassida, Cur Opin Ophth 2007, 18: 129-133.

## Events that occur daily and without consequence in normal eyes can lead to PAC/G in PACS eyes!



PACS eye at risk of PAC:  
- Static anatomy

### Dynamic triggering events:

- Iris dilation (darkness)
- Iris lens channel dynamics
- Lens accommodation
- Choroidal swelling/lens movement
- Meds that affect pupil or choroid / uveal tract

## What are the complications of the laser?



### Neodymium:YAG Laser Iridotomy

MICHAEL V. DRAKE, M.D.

Department of Ophthalmology, University of California at San Francisco, San Francisco, California

### Common Complications:

#### Transient elevated IOP: (25-40%)

- Usually 1-3 hours after laser application
- Pressure can get as high as 50-60 mmHg
- Pigment liberation? Shockwave damage to TM?

#### Mild anterior chamber reaction (~10%)

### Rare Complications: (< 1%)

- Anterior lens capsular damage
- Corneal epithelial / endothelial burns
- Bleeding from iridotomy site
- Retinal burns

Surv Ophthalmol 1987;32:171-177

## How much is my risk reduced with laser?

### What is the risk of going from PACS to PAC or PACG?

- 469 eyes of phakic Caucasian followed for minimum of 2 years after LPI
- None of the subjects had an acute and extremely high IOP (AC attack)
- At 10 years, IOP increased in 38.7% with 17.3% required medication

Blondeau. Can J Ophthalmol 2011; 46: 247-53

### What is risk of going from PACS to acute PAC or PACG?

- Fellow eyes of PACG, low risk Caucasian American patients (n = 20)
- PACS treated with LPI and followed up for mean of 53 months
- None of the PACS patients developed extremely high IOP or PACG

Robin. Arch Ophthalmol 1982;100:919-923.

## How much is my risk reduced with laser?

### What is risk of going from PACS to PAC or PACG?

- Higher risk Mongolian population (n = 74)
- PACS treated with LPI and reexamined mean of 35 months later
- None of PACS subjects had signs of acute PAC or developed PACG

Nolan. Br J Ophthalmol 2000; 84: 1255-1259

### What is risk of going from PACS to PAC?

- Higher risk Asian Indian population (n=82)
- None of the PACS patients had acute PAC or raised IOP
- 29% developed synechiae

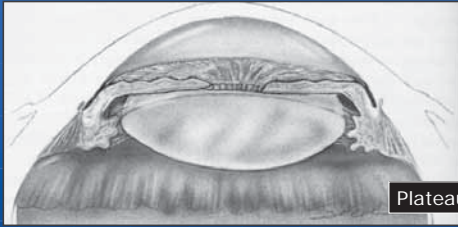
Raman. J Glaucoma 2009; 18:521-527

LPI dramatically reduces the risk of "acute" PAC

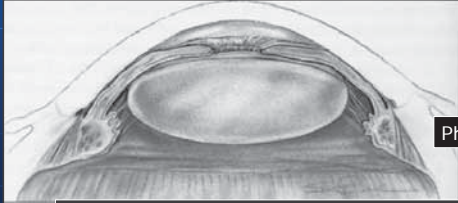
LPI reduces but doesn't eliminate the risk of progression to chronic PAC or PACG



## The other primary angle closure mechanisms



Plateau Iris Syndrome

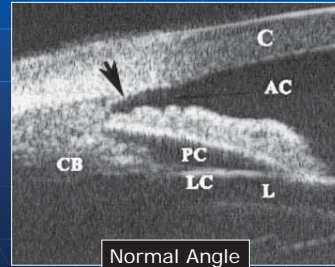


Phacomorphic

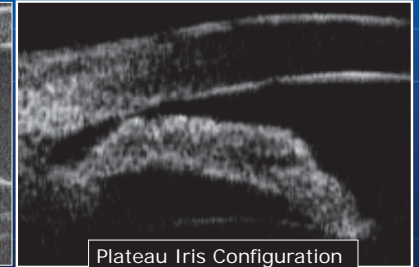
Stamper, Lieberman, Drake. Diagnosis and Therapy of the Glaucomas. 8<sup>th</sup> Edition

## Plateau Iris Configuration/Syndrome

Peripheral iris turns sharply to insertion  
 Inserts medially CB reducing or eliminating the ciliary sulcus  
 Flat central iris plane  
 Anteriorly positioned or rolled ciliary body may be present  
 Relatively deep central anterior chamber compared to peripheral angle  
 Can have components of pupillary block, but **narrow peripheral angle persists after LPI**  
 "Double hump sign on gonioscopy"

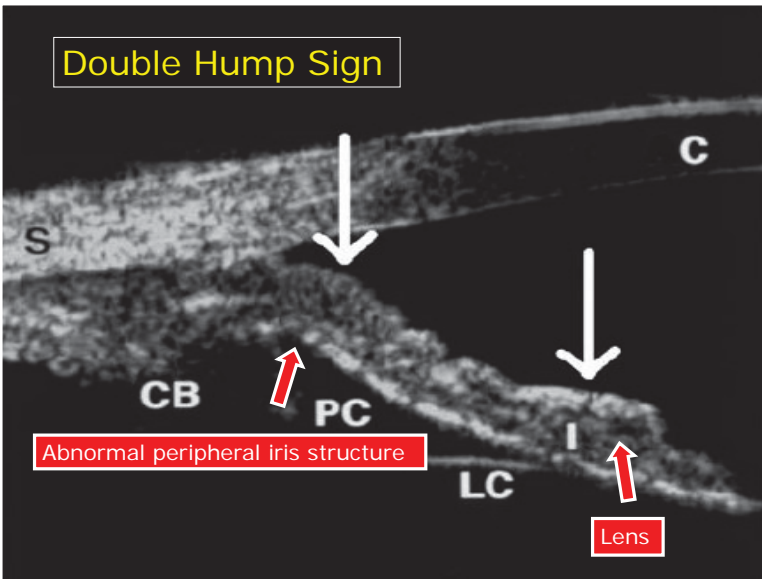


Normal Angle



Plateau Iris Configuration

## Double Hump Sign



Abnormal peripheral iris structure

Lens

## Plateau Iris Configuration

More common in females  
 Inheritance is autosomal dominant  
 Peak incidence is 30-50 years of age (compared to 60s for pupillary block)  
Common in Chinese and Southwest Asia:  
 Found in 10% of Chinese population  
 Found for 32.3% of patients > 50 years referred for LPI in Singapore  
 Found in 30% of Chinese AC and ACG eyes and 60% of PACS  
Uncommon in Europe/United States:  
 Found in 22% of Swiss < 60 years with recurrent PAC after LPI  
 Rare in US population but found in ~50% of patients < 50 years with PAC

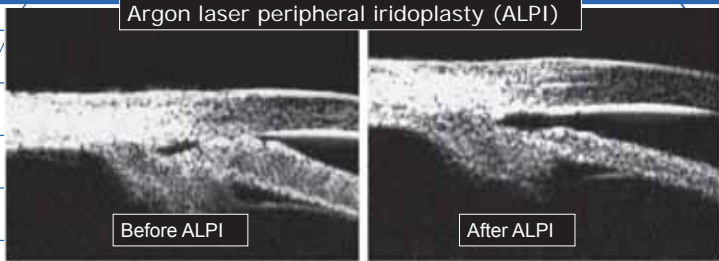
### Think Plateau Iris:

- Young patients with PAC
- Angle closure after patent LPI
- Southeastern Asian descent

He. Ophthalmology 2007; 114:1513-1519  
 Kumar. Ophthalmology 2009; 127:1269-1272  
 Ritch. Ophthalmol 2003; 110: 1880-1889  
 Kumar. Ophthalmology 2008; 115: 430-434  
 Steiger. Clin Exper Ophthalmol 2007; 35: 409-413

## Treatment Options: Plateau Iris Syndrome

### Argon laser peripheral iridoplasty (ALPI)



Before ALPI

After ALPI

Long duration, low power, large spot size laser application  
 Burns placed as far in the peripheral iris as possible  
 Contracts iris stroma to open the angle

Pilocarpine

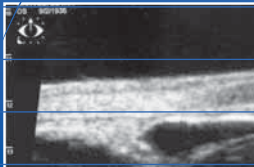
Cataract Surgery

Rich et al., Surv of Ophthalmol 2007, 52 (3): 279-288.



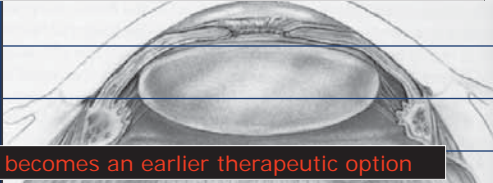
Ritch. Ophthalmology 2004; 111: 104-108

## Phacomorphic Angle Closure



### Abnormality of lens leads to angle closure:

- Enlarging cataract increases lens-iris interaction facilitating pupillary block
- Enlarging lens pushes the peripheral iris forward closing the angle



Cataract surgery becomes an earlier therapeutic option

## Chronic PAC and PACG

Regardless of the mechanism of irido-trabecular contact



Irido-trabecular contact (ITC) can lead to permanent angle closure (synechiae) and possible elevated IOP or glaucoma

Alward. Color Atlas of Gonioscopy

## Timing of LPI may make a difference in stopping progression

### YAG laser iridotomy treatment for primary angle closure in east Asian eyes

Winifred P Nolan, Paul J Foster, Joe G Devereux, Davataatseren Uranchimeg, Gordon J Johnson, Jamyanjav Baasanhu

Br J Ophthalmol 2000; 84: 1255-1259

Subjects treated with LPI were reexamined at median of 35 months

LPI considered to be a failure if severe glaucoma developed

85% of failures occurred in eyes grouped as PAC or PACG at baseline

### Laser peripheral iridotomy across the spectrum of primary angle closure

Surinder Singh Pandav, MD, Sushmita Kaulik, MD, Rajeev Jain, MD, Reema Bansal, MD, Anmol Gupta, MD

Pandav. Can J Ophthalmol 2007; 42: 233-237

At two years of follow-up, none of the PACS had disease progression compared to 9.3% of PAC and 75.8% of PACG

## Better evidence is on the way!

### Design and Methodology of a Randomized Controlled Trial of Laser Iridotomy for the Prevention of Angle Closure in Southern China: The Zhongshan Angle Closure Prevention Trial

Yuzhen Jiang,<sup>1</sup> David S. Friedman,<sup>2</sup> Mingguang He,<sup>1,3</sup> Shengcong Huang,<sup>1</sup> Xia Paul J. Foster<sup>4</sup>

ZAP Trial

Prospective study of 870 asymptomatic PACS randomized to LPI or observation

Three year follow up to determine if LPI is effective in stopping progression to PAC and PACG

Results pending

Jiang. Ophthalmic Epidemiology 2010; 17(5): 321-332

## Better evidence is on the way!

The effectiveness of early lens extraction with intraocular lens implantation for the treatment of primary angle-closure glaucoma (EAGLE): study protocol for a randomized controlled trial

Newly diagnosed PAC with high IOP or PACG and age greater than 50

Randomized to clear lens extraction or standard therapy (LPI First)

Planned three year follow-up

Results pending

Azuara Blanco. Trials 2011; 12: 133

## PACS/PAC need routine follow-up despite LPI!!

### Follow-up:

- Intraocular pressure measurement
- Gonioscopy looking for progressive narrowing
- Optic nerve assessment
- Possibly OCT of RNFL and periodic visual field testing



Elevated IOP with stable angles may mean intervention:

- Topical medications / glaucoma filtration surgeries

Progressive closure further angle structure altering treatments :

- Laser peripheral iridoplasty
- Consideration of cataract surgery (2<sup>nd</sup> line in certain scenarios)

## Current treatment algorithm for angle closure

Definitive first line treatment: Laser peripheral iridotomy

Especially in Plateau iris and pre-presbyopes

### Second Line Therapies:

- Argon Laser Peripheral Iridoplasty
- Pilocarpine

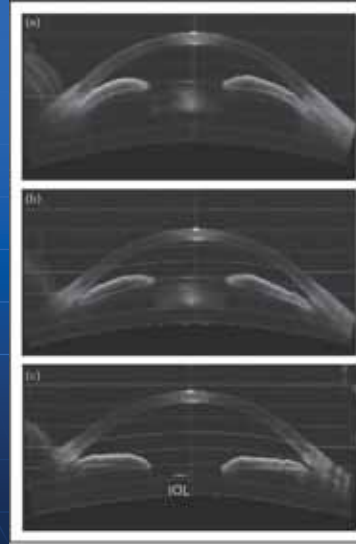
If angle is stable, but IOP High:

- Topical glaucoma therapy
- Glaucoma filtration surgeries

### Third Line Therapy

- Cataract surgery

Sooner if mechanism is phacomorphic



Pre-Intervention

Post LPI

Post Cataract Extraction

Nolan. Curr Opin Ophthalmol 2008;19:115 121

## Angle Closure Glaucoma Take Home Points

Van Herick estimates, but gonio quantifies risk of PAC/G

PACS eyes are unusual in structure and function

LPI reduces but doesn't eliminate the chance of PAC/PACG

LPI significantly protects against "acute" PAC

An LPI is less effective against the increased risk from the plateau iris configuration or phacomorphic components

The more advanced the condition at time of LPI, the greater the risk of progressing toward ACG

## Angle Closure Take Home Points

PACS patients need routine follow up even after LPI

Intervention/consultation may be indicated with progressive closure and/or elevated IOP in after LPI

Think plateau iris with PAC in Asians, younger patients with PAC, or any PAC that happens after LPI

Laser iridoplasty and might be considered for plateau iris and angle closure despite a LPI in pre-presbyopes

Cataract surgery becoming preferred secondary treatment especially in presbyopes regardless of AC mechanism

Ask about and warn about OTC cough/cold medications

## The Other Glaucoma: A closer look at angle closure

Andrew B. Mick, OD, FAO  
San Francisco VA Medical Center Eye Clinic  
UC Berkeley School of Optometry  
UCSF Department of Ophthalmology

Thank you for your attention!

# **Andrew B Mick, OD, FAAO**

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Eye Clinic (112-A)  
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## **EDUCATION**

1993-1997                    **University of Michigan**, Ann Arbor. Bachelors of Science in Biology  
1997-2001                   **University of California**, Berkeley. Doctorate of Optometry  
2001-2002                   **Bascom Palmer Eye Institute**  
**University of Miami, Department of Ophthalmology**  
Optometric Residency in Ocular Disease

## **EMPLOYMENT**

1995-1997                   **Kellogg Eye Center, University of Michigan, Department of Ophthalmology**  
Glaucoma/Molecular Biology Research Assistant  
Principle Investigator: Julia E. Richards, Ph.D.  
2002-2004                   **Meredith Morgan Eye Center, University of California Berkeley**  
Clinical Faculty, School of Optometry  
2002-Present                **San Francisco VA Medical Center**  
Staff Optometrist (2002-Present)  
Optometry Student Externship Coordinator (2002-2012)  
Optometric Residency Coordinator (2012-Present)

## **FACULTY APPOINTMENTS**

2002-Present                **University of California, Berkeley, School of Optometry**  
Associate Clinical Professor  
2007-Present                **University of California, San Francisco, Department of Ophthalmology**  
Associate Clinical Professor

## **HONORS AND AWARDS**

2000                            Harris Family Scholarship  
2000                            California Optometric Association Junior Leadership Award  
2001                            Thal/VSP Excellence in Primary Care Award  
2001                            Vision West Annual Scholarship

2001	Vistakon Award of Contact Lens Excellence
2001	Robert Gordon and Andrea Silvers Award
2001	William Feinbloom Low Vision Award
2001	Medical Eye Services Award
2001	University of California, Berkeley, Gold Retinoscope Award
2003	American Academy of Optometry Fellowship
2004	San Francisco VA Medical Center, Service and Patient Care Award
2012	Bernard Dolan Residency Mentor of the Year Award

## BOOK CHAPTERS

1. Mick AB. Lacrimal disorders. In Onofrey B, Skorin L, Holdeman N (Editors). Ocular Therapeutics Handbook: A Clinical Manual 2<sup>nd</sup> Edition 2005. Philadelphia: Lippincott, Williams, Wilkins.
2. Mick AB. Ocular Trauma. In Onofrey B, Skorin L, Holdeman N (Editors). Ocular Therapeutics Handbook: A Clinical Manual 2<sup>nd</sup> Edition 2005. Philadelphia: Lippincott, Williams, Wilkins.
3. Mick AB. Lacrimal disorders. In Onofrey B (Editor). Ocular Therapeutics Handbook: A Clinical Manual 3<sup>rd</sup> Edition 2011. Philadelphia: Lippincott, Williams, Wilkins.
4. Mick AB. Ocular Trauma. In Onofrey B (Editor). Ocular Therapeutics Handbook: A Clinical Manual 3<sup>rd</sup> Edition 2011. Philadelphia: Lippincott, Williams, Wilkins.

## PEER REVIEWED PUBLICATIONS

1. Othman MI, Sullivan SA, Skuta GL, Cockrell DA, Stringham HM, Downs CA, Fomes A, Mick AB, Boehnke M, Vollrath D, Richards JE. Autosomal dominant nanophthalmous (NN01) with high hyperopia and angle closure glaucoma maps to chromosome 11. *Am J Hum Genet* 1998;63:1411-1417.
2. Mick AB, Gonzalez S, Dunbar MT, McSoley JJ. A cost analysis of the prostaglandin analogs. *Optometry* 2002;73(10):614-619.
3. Tsou-Chong J, Mick AB. Choroidal metastasis: Case reports and review of the literature. *Optometry* 2005;76(5):293-301.
4. Hicks D, Mick AB. Recurrent conjunctival hemorrhage leading to the discovery of ocular adnexal lymphoma. *Optometry* 2010;81(10):528-32.
5. Harrison WW, Bearse MA, Schneck ME, Wolfe BE, Jewell NP, Barez S, Mick AB, Dolan BJ, Adams AJ. Prediction by retinal location of the onset of diabetic macular edema in patients with nonproliferative diabetic retinopathy. *Invest Ophthalmol Vis Sci* 2011;52(9):6825-6831.
6. Guan H, Mick A, Porco T, Dolan BJ. Preoperative factors associated with IOP reduction after cataract surgery. *Optom Vis Sci* 2013;90(2):179-184.

## PEER REVIEWED POSTERS

1. Carlson PE, Mick AB, McNamara NA, Fleiszig SMJ. Hypoxia protects human corneal epithelial cells from killing by cytotoxic *P. Aeruginosa*. ARVO, 2000.
2. Tran T, Mick A, Dolan B. Posterior segment complications of interferon therapy for chronic hepatitis C. American Academy of Optometry; Dallas 2003.
3. Fong C, Chen M, Mick A. Ocular side effects with reduced vision from high dose, long term chlorpromazine treatment. American Academy of Optometry; San Diego 2005.
4. Yoshiyama K, Mick A, Dolan B. Corneal crystal deposits secondary to multiple myeloma. American Academy of Optometry; Denver 2006.
5. Wong A, Dolan B, Mick A. Visual loss as the only presenting symptom in a patient with AIDS-associated progressive multifocal leukoencephalopathy. American Academy of Optometry; Tampa 2007.
6. Tobin L, Dolan B, Mick A. Idiopathic intracranial hypertension presenting as symptomless unilateral optic disc edema. American Academy of Optometry; Tampa 2007.
7. Hicks D, Mick A. Ocular adnexal lymphoma presenting as recurrent subconjunctival hemorrhage. American Academy of Optometry; Orlando 2009.
8. Bedwell A, Mick A. Spectral domain OCT in four patients with adult onset foveomacular vitelliform dystrophy. American Academy of Optometry; Boston, MA 2011.
9. Jones H, Mick A. Expanding the differential diagnosis of papilloedema: Ruling out cerebral venous thrombosis. American Academy of Optometry; Boston, MA 2011
10. Flettner J, Mick A, Dolan B. Federal aviation (FAA) vision requirements: What are your responsibilities when a pilot develops a disqualifying visual condition? American Academy of Optometry; Phoenix, AZ 2012
11. Meadows J, Bahn M, Mick A. Antibiotic therapy in anticoagulated patients with risk factors for community associated methicillin-resistant *Staphylococcus aureus*. American Academy of Optometry; Seattle, WA 2013.

## NON-PEER REVIEWED PUBLICATIONS

1. Mick AB. A revolution at Berkeley. *California Optometry* 1999;26(6):21.
2. Mick AB. A cancer patient's vision declines. *Review of Optometry* 2002;139(2):101-102
3. Mick AB. Book Review: Imaging the eye from front to back with RTVue fourier domain optical coherence tomography. *Optom Vis Sci* 2011;88:781.
4. Mick AB. Book Review: Cataracts: A patient's guide to treatment. *Optom Vis Sci* 2012;89(10).

5. Chen-Lynch M, Mick AB. Nonnecrotizing anterior scleritis mimicking orbital inflammatory disease. *Clin Optom* 2013;5:29-37.

#### **NATIONAL PROFESSIONAL APPOINTMENTS**

1999	<b>American Optometric Association</b> House of Delegates, Student Delegate
2004-2006	<b>American Academy of Optometry</b> Membership Committee
2005-2008	<b>National Board of Examiners in Optometry</b> Part III Examiner
2006-2010	<b>Accreditation Council on Optometric Education</b> Consultant (2006-2008) Team Chair (2009-2010)
2006-2016	<b>American Academy of Optometry, Scientific Program Committee</b> Member (2006-2012) Vice Chair (2012-2014) Chair (2014-2016)
2014-2016	<b>Optometric Glaucoma Foundation</b> Chief Financial Officer
2015-2016	<b>American Academy of Optometry, Awards Committee</b> Member
2015-Present	<b>American Academy of Optometry, Glaucoma Diplomate Program</b> Candidate Mentor

#### **VETERANS AFFAIRS COMMITTEE APPOINTMENTS**

2004-2006	<b>Advanced Clinic Access Committee</b> Eye Clinic Representative
2005-Present	<b>Veterans Integrated Service Network 21</b> Co-Consultant to National Optometry Service
2009-Present	<b>Reusable Medical Equipment Disinfection Committee</b> Eye Clinic Representative
2016 – Present	<b>Direct Scheduling Committee</b> Eye Clinic Representative

## ACADEMIC COMMITTEE APPOINTMENTS

1999-2000	<b>University of California, Berkeley, School of Optometry</b> Optometry Student Association President
2000	<b>University of California, Berkeley, School of Optometry</b> ACOE Self Study Committee: Student Education
2000	<b>University of California, Berkeley, School of Optometry</b> Admissions Committee
2002-2006	<b>University of California, Berkeley, Optometry Alumni Association</b> Vice President
2003-2004	<b>University of California, Berkeley, School of Optometry</b> Clinic Advisory Committee
2002-2005	<b>University of California, Berkeley, School of Optometry</b> Faculty Glaucoma Certification Program Instructor
2006	<b>University of California, Berkeley, School of Optometry</b> ACOE Self Study Committee: Resident Education
2006-2008	<b>University of California, Berkeley, School of Optometry</b> Clinical Curriculum Committee
2008	<b>University of California, Berkeley, School of Optometry</b> California State TPA Glaucoma Course Curriculum Committee
2008-2009	<b>University of California, Berkeley, School of Optometry</b> Curriculum Committee
2011-2012	<b>University of California, Berkeley, School of Optometry</b> California State Optometry Glaucoma Certification Course Beta II Course Reviewer Beta III Course Reviewer Examination Question Writer Grand Rounds Facilitator
2012	<b>University of California, San Francisco</b> <b>Department of Ophthalmology</b> Staff Optometrist Search Committee
2014	<b>University of California, San Francisco</b> <b>Department of Ophthalmology</b> San Francisco General Hospital Staff Optometrist Search Committee
2016	<b>University of California, San Francisco</b> <b>Department of Ophthalmology</b> Staff Optometrist Search Committee



## **EXPERT WITNESS CONSULTING**

2012                                    **Montana Fourth Judicial District Court**  
2012 - Present                        **Superior Court of the State of California**

## **JOURNALS EDITED**

2011-Present                        **Optometry and Vision Science**  
    **Journal of the American Academy of Optometry**  
    Associate Topical Editor (2011-2014)  
    Editorial Board (2014-Present)

## **JOURNALS REVIEWED**

2004-Present                        **Optometry and Vision Science**  
    Journal of the American Academy of Optometry

2007-2011                            **Optometry**  
    Journal of the American Optometric Association

2013-Present                        **Journal of General Internal Medicine**

## **INVITED PROFESSIONAL LECTURES**

1. **American Academy of Optometry, Dallas, TX, 2003**  
Recent large multi-center clinical trials and how they have shaped optometric glaucoma management
2. **University of California, Berkeley, 2003**  
**Optometry Alumni Association Reunion**  
The ocular ischemic syndrome
3. **Clinical Educators in Eyecare, San Jose, CA, 2003**  
Glaucoma treatment: A study driven philosophy
4. **University of California, Berkeley, 2003**  
**Meredith Morgan Symposium**  
Glaucoma management in optometric practice
5. **Sacramento Optometric Society, 2003**  
Integrating recent glaucoma clinical trials into patient management
6. **San Mateo Optometric Society, 2003**  
Uveitic glaucoma
7. **American Academy of Optometry, Tampa, FL, 20004**  
Seeing the whole picture: Ocular clues to systemic disease

8. **San Francisco Optometric Society, 2004**  
Anterior uveitis and the judicious use of steroids
9. **University of California, Berkeley, 2004**  
**Optometry Alumni Association Reunion**  
Diabetes and the eye: Diagnosis, management strategies, and potential future therapies
10. **American Academy of Optometry, San Diego, CA, 2005**  
Evidenced based medicine
11. **Tri-County Optometric Society, Santa Barbara, CA, 2005**  
Central corneal thickness: Its relationship to IOP and glaucoma
12. **VISN 21 Nurse Practitioners Conference, San Francisco, CA 2005**  
Ocular emergencies
13. **American Academy of Optometry, Denver, CO, 2006**  
Transient ischemic attack
14. **Kentucky Optometric Association, Louisville, KY, 2006**  
Current and future AMD treatments  
Ocular manifestations of systemic disease
15. **Asian American Optometry Study Group, San Francisco, CA, 2006**  
Corneal thickness: What is it telling us?
16. **Vision Expo West, Las Vegas, NV, 2007**  
Evidenced based medicine  
A review of the glaucoma medications  
Central corneal thickness and glaucoma
17. **American Academy of Optometry, Tampa, FL, 2007**  
The dilemma of early glaucoma diagnosis  
Transient ischemic attack
18. **University of California, Berkeley, 2007**  
Meredith Morgan Symposium  
Early glaucoma diagnosis dilemma: Should early diagnosis be followed by treatment?
19. **Northern California Optometric Society, Chico, CA 2007**  
Transient ischemic attack  
Early diagnosis dilemma: Should early diagnosis be followed by treatment?
20. **American Academy of Optometry, Anaheim, CA, 2008**  
Vitreous: Friend or Foe?  
The dilemma of early glaucoma diagnosis
21. **Santa Clara County Optometry Society, 2008**  
Transient ischemic attack

22. **Asian American Optometric Study Group, Berkeley, CA, 2008**  
Transient ischemic attack
23. **University of Alabama, Birmingham, 2009**  
**Primary Eye Care Update**  
Vitreous: Friend or Foe?  
The dilemma of early glaucoma diagnosis  
Ocular manifestations of systemic disease
24. **American Academy of Optometry, Orlando, FL, 2009**  
Vitreous: Friend or Foe?  
Angle Closure Glaucoma
25. **Kaiser Foundation Optometric Symposium, Anaheim, CA, 2009**  
Transient ischemic attack  
Early glaucoma diagnosis dilemma
26. **Santa Clara County Optometric Society, 2009**  
Ocular manifestations of systemic disease
27. **Northern California Optometric Society, Chico, CA, 2009**  
Vitreous: Friend or Foe?  
Ocular manifestations of systemic disease
28. **American Academy of Optometry, San Francisco, CA, 2010**  
Angle closure glaucoma  
The art of writing scientific abstracts  
The Viagra anterior ischemic optic neuropathy link
29. **Alameda Contra Costa County Optometric Society, 2010**  
Ocular manifestations of systemic disease
30. **Alameda Contra Costa County Optometric Society, 2010**  
Transient ischemic attack
31. **Santa Clara County Optometric Society, 2010**  
Early glaucoma diagnosis dilemma
32. **American Academy of Optometry, Boston, MA, 2011**  
The trabecular meshwork  
The art of writing scientific abstracts
33. **Wyoming Optometric Association, Cheyenne, WY, 2011**  
Angle closure glaucoma  
The vitreous: Friend or Foe  
Ocular manifestations of systemic disease
34. **San Francisco Optometric Society, 2011**  
Challenging cases from SFVA

35. **Bay Area Optometric Societies, San Jose, CA, 2011**  
Tales from the trenches
36. **Southeastern Council of Optometrists (SECO), Atlanta, GA, 2012**  
Talking TIA  
The other glaucoma: Angle closure glaucoma  
Tales from the trenches
37. **American Academy of Optometry, Phoenix, AZ, 2012**  
The trabecular meshwork  
The art of writing scientific abstracts  
Identifying glaucoma progression clinically
38. **Santa Clara County Optometric Society, 2012**  
SFVA grand rounds
39. **Alameda Contra Costa County Optometric Society, 2012**  
Angle closure glaucoma
40. **American Academy of Optometry, Seattle, WA, 2013**  
The cupped disc: Differentiating between glaucoma and compressive optic neuropathy
41. **Vision Expo East, New York, NY, 2013**  
Talking TIA  
The vitreous: Friend or Foe?  
Ocular manifestations of systemic disease
42. **Southeastern Council of Optometrists (SECO), Atlanta, GA, 2013**  
VA eye clinic grand rounds  
Current and future trends in AMD  
Ocular manifestations of systemic disease
43. **Santa Clara County Optometric Society, 2013**  
Lessons learned as a malpractice consultant
44. **Maine Optometric Association, Freeport, ME, 2013**  
The trabecular meshwork  
Lessons learned as a malpractice consultant  
Ocular manifestations of systemic disease  
Talking TIA  
The cupped disc: Differentiating between glaucoma and compressive optic neuropathy
45. **Broward County Optometric Association, Ft. Lauderdale, FL, 2014**  
Ocular manifestations of systemic disease  
VA eye clinic grand rounds
46. **Vision Expo East, New York, NY, 2014**  
Retinal manifestations of systemic disease and drugs  
Talking TIA  
The other glaucoma: Angle closure

47. **San Francisco Optometric Society, 2014**  
Lessons learned as a malpractice consultant
48. **American Academy of Optometry, Denver, CO, 2014**  
Ocular Herpes Management: Beyond HEDS  
OVS author workshop: Preparing a manuscript  
Glaucoma Special Interest Group Roundtable: Angle closure glaucoma
49. **Santa Clara County Optometric Society, 2014**  
Ocular herpes management: Beyond HEDS
50. **Redwood Empire Optometric Society, Petaluma, CA, 2015**  
Ocular herpes management: Beyond HEDS
51. **Southeastern Council of Optometrists (SECO), Atlanta, GA, 2015**  
Talking about TIAs  
The other glaucoma: A closer look at angle closure  
How to avoid a lawsuit  
Breakfast with the experts
52. **Vision Expo East, New York, NY, 2015**  
Enlarged optic nerve cupping: Differentiating glaucoma from compressive optic neuropathy  
Lessons learned as a malpractice consultant  
The other glaucoma: A closer look at angle closure
53. **Vision Expo West, Las Vegas, NV, 2015**  
Enlarged optic nerve cupping: Differentiating glaucoma from compressive optic neuropathy  
Lessons learned as a malpractice consultant  
The other glaucoma: A closer look at angle closure
54. **American Academy of Optometry, New Orleans, LA, 2015**  
Methicillin Resistant Staph Aureus: Ocular manifestations and clinical management
55. **Association of Lease-Holding Lenscrafters Doctors Meeting, Cancun, Mexico, 2015**  
Methicillin resistant Staph aureus: Ocular manifestations and clinical management  
Ocular herpes management: Beyond HEDS
56. **UC Berkeley Optometry Alumni: 65<sup>th</sup> Annual Alumni CE Program, Berkeley, CA 2015**  
Update on the optometric management of angle closure
57. **Maine Optometric Association, Freeport, ME, 2015**  
Methicillin resistant Staph aureus: Ocular manifestations and clinical management  
Ocular herpes management: Beyond HEDS  
VA Eye Clinic Grand Rounds  
Retinal manifestations of system disease and drugs
58. **San Mateo County Optometric Association, San Mateo, CA 2015**  
Methicillin resistant Staph aureus: Ocular manifestations and clinical management
59. **Santa Clara County Optometric Society, 2016**  
Methicillin resistant Staph aureus: Ocular manifestations and clinical management

60. **San Francisco Optometric Society, 2016**  
Methicillin resistant Staph aureus: Ocular manifestations and clinical management
61. **UC Berkeley School of Optometry: Sheldon M. Golden Conference, Berkeley, CA**  
The use of imaging in the diagnosis and management of glaucoma: Where are we?  
The use of visual fields in the diagnosis and management of glaucoma: Where are we?  
The surgical management of glaucoma: Where are we?  
Glaucoma panel discussion
62. **East West Eye Conference, Cleveland, OH, 2016**  
The early glaucoma diagnosis dilemma  
Enlarged optic nerve cupping: Differentiating glaucoma from compressive optic neuropathy  
The trabecular meshwork: Its role in glaucoma pathogenesis and as a target of therapy  
The other glaucoma: A closer look at angle closure glaucoma  
Methicillin resistant Staph aureus: Ocular manifestations and clinical management  
Ocular herpes management: Beyond HEDS
63. **American Academy of Optometry, Anaheim, CA, 2016**  
Headache disorders that affect the visual system  
Essentials of peer-review and constructive criticism  
Best practices for getting published
64. **Maine Optometric Association, Portland, ME 2016**  
Headache disorders that affect the visual system  
The early glaucoma diagnosis dilemma  
VA Eye Clinic Grand Rounds  
Retinal manifestations of system disease and drugs

## INVITED ACADEMIC LECTURES

1. **University of California, Berkeley, 2000**  
**Course: Optometry 106B**  
Problem based learning facilitator
2. **University of California, San Francisco, 2002-Present (Recurring)**  
**Department of Medicine**  
Differential diagnosis of the acute red eye  
Differential diagnosis of painless loss of vision  
Slit lamp and direct ophthalmoscopy techniques
3. **University of California, Berkeley, 2002-2005**  
**Course: 430**  
Glaucoma clinical trials: What they tell us  
Glaucoma management: A literature driven philosophy  
Common and uncommon retinal vascular diseases  
The pupil: Important clinical indicator  
Anterior ischemic optic neuropathy  
Macular degeneration basics  
Glaucoma medication review  
Diabetic retinopathy basics

4. **University of California, San Francisco, 2008**  
**Department of Ophthalmology Grand Rounds**  
Progressive multifocal leukoencephalopathy
5. **University of California, San Francisco, 2012**  
**Department of Ophthalmology Grand Rounds**  
FAA guidelines on reporting visual dysfunction
6. **University of California, San Francisco, 2013**  
**Department of Ophthalmology Grand Rounds**  
Brimonidine associated uveitis
7. **University of California, San Francisco, 2008-Present (Recurring)**  
**Department of Ophthalmology**  
**Fundamentals of Ophthalmology Course**  
Basic refraction and lensometry  
The optics of refraction and retinoscopy  
Introduction to rigid gas permeable contact lenses  
Introduction to hydrogel contact lenses  
Ophthalmic Knowledge Assessment Program (OKAP) Examination Optics Review
8. **University of California, Berkeley 2011-Present (Recurring)**  
**Course: 256**  
Retinal vascular occlusive disease
9. **University of California, Berkeley, 2014-Present (Recurring)**  
**Old Week 2014 Graduating Class Final Review**  
Clinical Advice to Avoid Malpractice
10. **University of California, San Francisco, 2014**  
**School of Nursing**  
Ocular disorders: The red eye
11. **University of California, San Francisco, 2016**  
**Department of Ophthalmology Grand Rounds**  
Topiramate associated ciliochoroidal effusion angle closure
12. **University of California, Berkeley, 2016**  
**School of Optometry Grand Rounds**  
Methicillin resistant Staphylococcus aureus keratitis

## **PROFESSIONAL ORGANIZATIONS**

American Academy of Optometry, Fellow, 2003-Present  
National Association of VA Optometrists, 2003-Present  
American Optometric Association; 2001-2009  
Optometric Glaucoma Society, 2013-Present

## **VOLUNTEER ORGANIZATIONS**

Project Homeless Veteran Connect, 2008-2010

Volunteer Optometric Service to Humanity, Costa Rica, Brazil, 2000-2003

Oakland Public Schools, Eyeball dissections in high school science curriculum , 1999-2000

## **OPTOMETRIC LICENSURE**

State of Florida, 2001-2015 (#OPC 3605)

State of California, 2002-Present (#11996TPLG)

State of Idaho, 2015-Present (#ODP-100330)