



Opening Up on Closed Angles

Bobby Saenz, OD, MS, FAAO

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Company	Role	Received
Biotissue	Consultant/lecturer	Honoraria
Carl Zeiss Meditec	Consultant/lecturer	Honoraria
Johnson & Johnson	Consultant/lecturer	Honoraria
LensAR	Consultant	Honoraria
Lumenis	Consultant	Honoraria
myODcoach	Founder	Honoraria
Novartis	Consultant	Honoraria
Glaukos/Glaukos corneal health	Consultant/lecturer	Honoraria
Ocular Therapeutix	Consultant/Research	Honoraria/Research Support
Sight Sciences	Consultant/Lecturer/Research	Honoraria/Research Support
Quidel	Consultant	Honoraria

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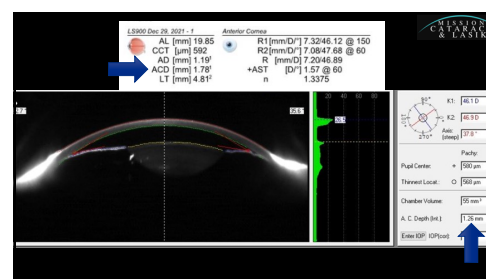


30 year old monocular patient

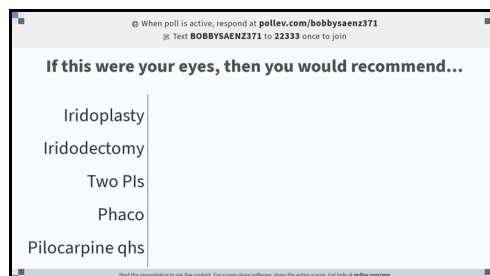
- OD 20/200 due to ROP
- IOP 16mmHG
- Episodes of blurred vision at night occasionally, one time on a plane at night

- IOP after dilation 36

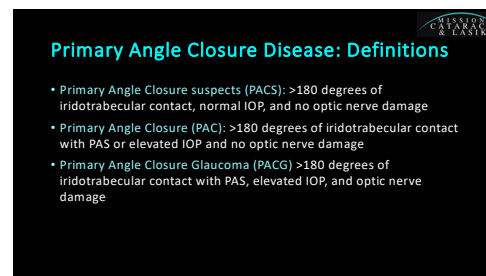
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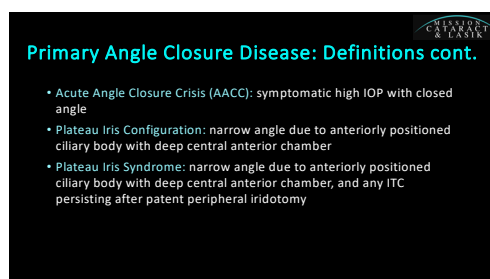
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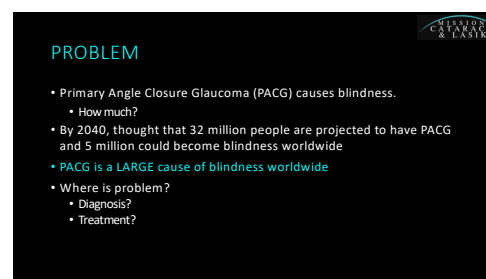
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Diagnosis: Problem?

- Narrow Angles can be very easy to diagnose... right?
- Angle closure causes symptoms/signs
 - Blurred Vision → why →
 - Halos around lights →
 - Eye Pain →
 - Headache →
 - Mid-dilated Pupil → Greatest amount of iris/lens contact occurs when pupil is mid-dilated, IOP increases, sphincter ischemia occurs → can't constrict
 - Circumferential Flush →
 - Glaucomflecken → whitish opacities on the lens capsule from epithelial cell necrosis
- BUT 65-75% of angle closure in the Asian population is ASYMPTOMATIC

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Diagnosis & Treatment?

Primary Angle Closure Disease Preferred Practice Pattern[®]

Background:
Primary angle closure disease (PACD) is classified into several groups. Primary angle closure suspect is defined as ≥ 180 degrees of iridolenticular contact (ILC) without intraocular pressure (IOP) elevation, peripheral anterior synchiae (PAS), or optic nerve damage. An eye with ≥ 180 degrees of ILC and elevated IOP or PAS is categorized as primary angle closure, and the additional presence of glaucomatous optic neuropathy indicates primary angle closure glaucoma. Acute angle-closure crisis (AAC) represents a variable, transient IOP elevation with complete ILC. Pseudo-exfoliation is defined as a narrow angle due to an anteriorly positioned ciliary body with a deep central anterior chamber, and glaucoma exfoliativa is a pseudo ILC where lens peripheral adhesion (LPI). Although 90% of cases of AAC are unilateral, PACD is generally bilateral. Risk factors for PACD include Asian descent, hyperopia, older age, female gender, short axial length, and thick and anteriorly positioned crystalline lens.

Rationale for Treatment:
Pupillary block is involved in the pathogenesis of PACD in most cases, and is resolved with LPI. Patients experiencing AAC should receive medical treatment to lower the IOP, and LPI should subsequently be performed in both eyes. Lens extraction has also been shown to be an effective treatment in some patients with primary angle closure and primary angle closure glaucoma.

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AAO PPP: LPI should be performed on narrow angles, angle closure, and angle closure glaucoma.

Bobby:

Cochrane Library
Systematic reviews
Evidence synthesis
Evidence-based
Cochrane Institute of Systematic Reviews
(Intervention Review)

Iridotomy to slow progression of visual field loss in angle-closure glaucoma

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Authors' conclusions

We did not find sufficient evidence to draw any meaningful conclusions on the use of iridotomy for the purpose of slowing progression of visual field loss. No study reported on progressive visual field loss, the primary outcome of this review. Although there is moderate certainty evidence that iridotomy results in improved gonioscopic findings, it is unclear if these findings translate to clinically meaningful benefits.

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American Journal of Ophthalmology
Volume 161, November 2017, Pages 111-117

Original article
Residual Angle Closure One Year After Laser Peripheral Iridotomy in Primary Angle Closure Suspects

Hani Bakker^{a,b}, Elizabeth Yang^{a,c}, Sameer Tikka^{a,b}, Rajesh S. Kumar^d, Han-Yen Wong^e, Minggang Hu^f

Conclusions
One year after LPI, >80% of PACS had gonioscopic residual angle closure. Greater baseline iris volume and higher IOP at baseline are independent risk factors for residual gonioscopic angle closure.

Abstract: Gonioscopy (GON) 1 year after laser peripheral iridotomy (LPI) in primary angle closure suspects (PACS).

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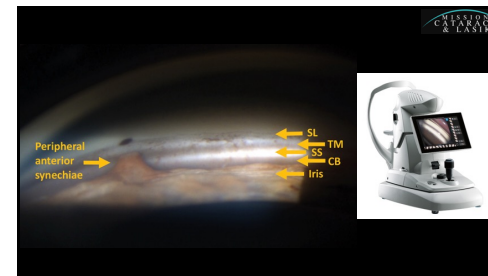


**PAC
Subgroups**

Can also subdivide based on duration/constancy of angle closure/symptoms

- **Acute Angle Closure** (20-30%)
 - Same as AACCC
 - Angle closes suddenly with high IOP, symptoms, and rapid ON damage
- **Subacute/intermittent**
 - Milder, self-limiting angle closure episodes
- **Chronic** (70-80%)
 - Usually insidious and asymptomatic progressive angle closure

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**Primary Angle
Closure
Suspect (PACS)**

- All PAC patients must be educated on the S/S of an acute angle closure attack
- **To perform LPI or not to perform LPI? That is the question!!**
 - Status of the lens and the benefit of cataract surgery should also be considered

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**Primary Angle
Closure Suspect
(PACS)**

Treatment

- Laser Peripheral Iridotomy (LPI)
 - Eliminates pupillary block component
 - Equilibrates pressure between the ant and post chambers

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Methods

In this randomised controlled trial, bilateral primary angle closure suspects aged 60–70 years were enrolled at the Zhongshan Ophthalmic Centre, a tertiary specialised hospital in Guangzhou, China. Eligible patients received laser peripheral iridotomy in one randomised primary eye, with the other remaining untreated. The primary outcome was incident primary angle closure disease as a composite of diagnosis of pupillary obstruction, peripheral anterior synechiae, or acute angle closure during 72 months of follow-up in an [intention-to-treat analysis](#) between treated eyes and contralateral controls. This trial is registered with the ISRCTN registry, number ISRCTN4313099.

Finding

Of 11 911 screened individuals, 889 individuals were randomly assigned from June 19, 2008/2009 treated and 889 untreated eyes. Incidence of the primary outcome was 4.19 per 1000 eye-years in treated eyes compared with 7.97 per 1000 eye-years in untreated eyes (hazard ratio 0.53; 95% CI 0.30–0.92; $p=0.02$). A primary outcome event occurred in 37 treated eyes and 16 untreated eyes with a statistically significant difference using pair-wise analysis ($p=0.003$). No serious adverse events were observed during follow-up.

Incidence of angle-closure disease was very low among individuals classified as primary angle closure suspects identified through community-based screening. Laser peripheral iridotomy had a modest, albeit significant, prophylactic effect. In view of the low incidence rate of outcomes that have no immediate threat to vision, the benefit of prophylactic laser peripheral iridotomy is limited; therefore, **widespread prophylactic laser peripheral iridotomy for primary angle-closure suspects is not recommended.**

Longitudinal Changes of Angle Configuration in Primary Angle-Closure Suspects
The Zhongshan Angle-Closure Prevention Trial

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Jianhui Chen, MD, PhD,^{1,2,3} Qianqian Li, MD, PhD,^{1,2,3} Yanyan Zhang, MD, PhD,¹
Jianhui Chen, MD, PhD,^{1,2,3} Qianqian Li, MD, PhD,^{1,2,3} Yanyan Zhang, MD, PhD,¹

Abstract: To determine longitudinal changes in angle configuration at the angle of primary angle-closure suspects (PACS), we conducted a 5-year longitudinal study in a community-based sample.

Design: Prospective, randomized controlled trial.

Participants: Primary angle-closure suspects aged 50 to 70 years were enrolled in a community-based sample.

Interventions: The intervention group received prophylactic laser peripheral iridotomy (LPI) at baseline, whereas the control group did not.

Main Results: The angle width of treated eyes increased after LPI, remained stable for 6 months, and then decreased significantly by 18 months after LPI. Untreated eyes experienced a more consistent and decrease in angle width over the same period of time.

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The Singapore Asymptomatic Narrow Angles Laser Iridotomy Study
Five-Year Results of a Randomized Controlled Trial

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Han-Tim Wong, FRCS,⁵ Paul T.K. Chew, FRCS,⁶ Raghavan Jeyaram, MMed,⁷ Anur Nijayanasamy, FRCS,⁸
Shamir A. Pomeroy, FRCS(Ed),⁹ Paul J. Foster, FRCS, PhD,¹⁰ Tim Ang, FRCS, PhD,^{1,2,3}

Purpose: To examine the efficacy of laser peripheral iridotomy (LPI) in patients who received a diagnosis of primary angle-closure suspect (PACS).

Design: Prospective, randomized controlled trial.

Participants: This multicenter, randomized controlled trial (ClinicalTrials.gov identifier, NCT02047178) enrolled 480 patients older than 50 years from glaucoma clinics in Singapore with bilateral asymptomatic PACS (defined as having ≥2 quadrants of appositional angle closure on gonioscopy).

Interventions: Each participant underwent prophylactic LPI in a randomly selected eye, whereas the fellow eye served as a control. Patients were followed up yearly for 5 years.

Main Outcome Measures: The primary outcome measure was development of primary angle closure (PAC), defined as presence of peripheral anterior synechia, iridocorneal pressure (IDP) of ≥35 mmHg, or both or acute angle closure (AAC) or primary angle-closure glaucoma (PACG) over 5 years.

Results: Of the 480 randomized participants, most were Chinese (82.7%) and were women (75.8%) with mean age of 62.8 ± 6.9 years. Eyes treated with LPI reached the end point less frequently after 5 years ($n = 24$ [5.0%]; incidence rate [IR], 11.66 per 1000 eye-years) compared with control eyes ($n = 43$ [8.4%]; IR, 21.84 per 1000 eye-years; $P = 0.001$). The adjusted hazard ratio (HR) for progression to PAC was 0.55 (95% confidence interval [CI], 0.37–0.85; $P < 0.001$) in LPI-treated eyes compared with control eyes. Older participants (per year; HR, 1.06; 95% CI, 1.03–1.10; $P < 0.001$) and eyes with higher baseline IDP (per millimeter of mercury; HR, 1.35; 95% CI, 1.22–1.50; $P < 0.001$) were more likely to reach an end point. The number needed to treat to prevent an end point was 12 (95% CI, 12.8–37.3).

Conclusions: In patients with bilateral asymptomatic PACS, eyes that underwent prophylactic LPI reached significantly fewer end points compared with control eyes over 5 years. However, the overall incidence of PAC or PACG was low. Ophthalmology 2022;130:147–158 © 2021 by the American Academy of Ophthalmology

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Ophthalmology Glaucoma
Volume 130, Number 10, October 2023, Pages 148–154

Rates and Patterns of Diagnostic Conversion from Anatomical Narrow Angle to Primary Angle-Closure Glaucoma in the United States

Yanlin Chen, MD, PhD,^{1,2,3} Yanlin Chen, MD, PhD,^{1,2,3} Yanlin Chen, MD, PhD,^{1,2,3} Yanlin Chen, MD, PhD,^{1,2,3} Yanlin Chen, MD, PhD,^{1,2,3}

Abstract: To assess rates of diagnostic conversion from anatomical narrow angle (ANA) to primary angle-closure glaucoma (PACG) in the United States and identify factors associated with diagnostic conversion.

Design: Retrospective cohort study.

Participants: Patients with ANA who were converted to PACG within the study period.

Interventions: None.

Main Results: Among 3983 patients meeting inclusion criteria, 439 (11.0%) had detected diagnostic conversion to PACG within the study period. The conversion rate was stable at 3.54% per year after the first 6 months of ANA diagnosis. In the Cox proportional hazards model, age > 70 years and early (within 6 months of ANA diagnosis) need for LPI or KSP-lowering drops were positively associated with diagnostic conversion (hazard ratio [HR] = 1.50; $P < 0.001$). Glaucoma surgery at any time and later (after 6 months of ANA diagnosis) need for KSP-lowering drops appeared protective against diagnostic conversion (HR = 0.46; $P < 0.004$).

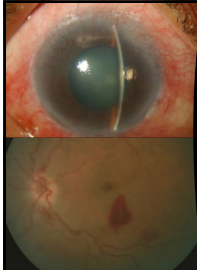
Conclusions: Annual risk of diagnostic conversion from ANA to PACG is relatively low overall; elderly patients are at higher risk whereas glaucoma surgery and/or laser iridotomy (LPI) may be protective. The utility of long-term monitoring seems low for most patients with ANA, highlighting the need for improved clinical methods to identify patients at higher risk for PACG.

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Narrow Angle SUSPECTS: What's the best treatment?

Nothing LPI Phaco

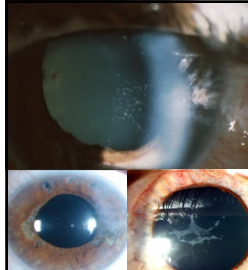
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Acute Angle Closure Crisis (AACC)

- **Acute Signs**
 - High IOP
 - Shallow anterior chamber
 - Mild AC rxn
 - Mid-dilated and irregularly shaped pupil with sluggish/no reaction
 - Corneal edema (microcystic epithelial/stromal edema, endothelial folds)
 - Conjunctival hyperemia (congested episcleral and conjunctival vessels)
 - NPL may be thickened for the first few days following the event
 - Retinal vascular occlusion
 - Ischemic nerve damage

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Acute Angle Closure Crisis (AACC)

- **Late Signs**
 - Glaucomatous ON damage/NFL loss
 - Diffuse or focal atrophy of the iris
 - Iris sphincter atrophy (nonreactive, dilated pupil may be asymmetric or misshapen)
 - Pigment dusting of the iris surface and corneal endothelium
 - Glaucomatous: small, anterior subcapsular lens opacities (epithelial ischemia and necrosis)
 - RW and posterior synechiae
 - Corneal endothelial cell loss

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Acute Angle Closure Crisis (AACC)

Treatment

- 1) **Lower the IOP**
 - **Topical β -adrenergic antagonists, topical α_2 adrenergic agonists, oral, topical, or intravenous CA**
 - Prostaglandins??
 - Avoid apraclonidine
 - **Parasympathetics**
 - Oral or IV hyperosmotic agent (glycerol, isosorbide, mannitol)
 - **Corneal compression**



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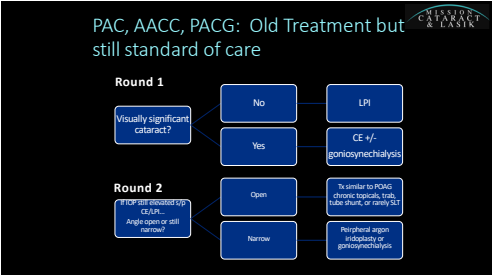
Acute Angle Closure Crisis (AACC)

Treatment

- 2) **Break the attack**
 - Globe compression and dynamic gonioscopy
 - **Pilocarpine 1-2%**
 - Usually only effective if IOP <40mmHg
 - Avoid stronger miotics (ex. pilo 4%)
 - If you cannot break the attack, attempt LPI or iridoplasty. If this is still unsuccessful, refer for surgical iridectomy.



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Predictors of long-term intraocular pressure control after lens extraction in primary angle closure glaucoma: results from the EAGLE trial

William Mitchell¹, Augusto Azavedo-Bianco^{1,2}, Paul Foster³, Omar Halawa^{1,4}, Jennifer Sun⁵, Craig R. Ramday⁶, David Cooper⁷, Clare Cochran⁸, John Horne¹⁰, David Friedman¹¹, Dolly Chang¹¹

Comprehensive Ophthalmology, Harvard Medical School, Harvard University, Cambridge, Massachusetts, USA

Patients with primary angle closure glaucoma/PAC are 10 times more likely to maintain drop-free good IOP control with initial CLE surgery than LPI.

Results A total of 369 patients (182 in CLE arm and 187 in LPI arm) completed the 36-month follow-up examination. After CLE, 90% met our predefined 'good response' criterion compared with 67% in the LPI arm, and 66% met 'optimal response' criterion compared with 18% in the LPI arm, with significantly longer drops/surgery-free survival time ($p=0.05$ for all). Patients randomised to CLE (OR=10.1 (6.1 to 16.8)), Chinese (OR=2.3 (1.3 to 3.9)), and those who had not previously used glaucoma drops (OR=2.8 (1.6 to 4.8)) were more likely to maintain long-term optimal IOP response over 36 months.

Conclusion Patients with primary angle closure glaucoma/PAC are 10 times more likely to maintain drop-free good IOP control with initial CLE surgery than LPI. Non-Chinese ethnicity, higher baseline IOP and using glaucoma drops prior to randomisation are predictors of worse long-term IOP response.

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Ten-Year Clinical Outcomes of Acute Primary Angle Closure Randomized to Receive Early Phacoemulsification Versus Laser Peripheral Iridotomy

Phuong P. Chee^{1,2}, Hong Y. Tang³, Dong Y. Liang^{3,4}, Thomas C. Lee^{1,2,5}, Jeffrey J. Wang^{1,2,6}, Chien-Chi Tseng^{1,2,6}

Abstract

Purpose: To compare the 10-year clinical outcomes of eyes with acute primary angle closure (APAC) randomized to receive either early phacoemulsification or laser peripheral iridotomy (LPI).

Methods: Fifty-two APAC patients, who underwent either early phacoemulsification (phaco group) or laser peripheral iridotomy (LPI group) in a randomised controlled trial, were included for assessment 10 years after the intervention. The results of the 2 groups were compared.

Results: Forty of 62 patients (64.5%; 19 in phaco group and 21 from LPI group) were examined. None of them underwent additional glaucoma procedures but 12 (30%) patients in the LPI group required lens extraction before the assessment. The mean follow-up duration was 10.1 (s.d. 1.2) years. The phaco group had lower median IOP (14.0 (s.d. 3.2) vs. 15.0 (s.d. 3.2) mmHg, $p=0.028$), had less moderate anterior synechia (0.0 (s.d. 0.0) vs. 0.4 (s.d. 0.8) degree, $p=0.015$), and greater mean corneal keratometry readings (43.9 (s.d. 0.5) vs. 44.4 (s.d. 0.5) diopter, $p=0.001$) than the LPI group. The eyes had persistent intraocular pressure elevations of ≥ 21 mmHg ≥ 2 consecutive visits and a new field defect in the phaco group, compared with none in the LPI group ($p=0.022$ and 0.045, respectively). There were no significant differences in the mean intraocular pressure, mean corrected visual acuity, and the number of eyes with visual field progression.

Conclusions: In 10 years, 40% eyes that underwent early phacoemulsification required lens extraction, less peripheral anterior synechia, lesser evidence of intraocular pressure elevation and a lower incidence of glaucoma compared with LPI. LPI eyes had greater anterior synechia and

• Early phaco group required less meds, had less PAS, and lower incidence of IOP elevation and BLINDNESS compared with LPI.

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Chronic Angle Closure

- Major cause of blindness in Asia
- Most often develops because of a chamber angle that gradually closes leading to a gradual rise in IOP
 - "creeping angle closure"
 - Typically accompanied by slow formation of PAS, which advance circumferentially
 - Usually asymptomatic unless significant VF loss has occurred
 - Over time IOP may rise substantially and be difficult to control
- May also develop after prolonged acute angle closure or multiple
 - episodes of subclinical attacks
- Important to distinguish from OAG. **DO GONIO!!**
 - Clinical course resembles that of OAG in its lack of symptoms,
 - initial modest elevation of IOP, progressive glaucomatous optic nerve damage, and characteristic VF loss

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Medical Necessity

Medical necessity for cataract surgery is not based solely on the presence of opacity in the lens(es). Lens extraction is considered medically necessary and therefore covered by Medicare when one (or more) of the following conditions or circumstances exists:

1. Cataract causing symptomatic (i.e., causing the patient to seek medical attention) impairment of visual function not correctable with a tolerable change in glasses or contact lenses, lighting, or non-operative means resulting in specific activity limitations and/or participation restrictions including, but not limited to reading, viewing television, driving, or meeting vocational or recreational needs.
2. Concomitant intraocular disease (e.g., diabetic retinopathy, or intraocular tumor) requiring monitoring or treatment that is prevented by the presence of cataract.
3. **Lens-induced disease threatening vision** or ocular health (including, but not limited to, phacomorphic or phacolytic glaucoma).
4. High probability of accelerating cataract development as a result of a concomitant or subsequent procedure (e.g., pars plana vitrectomy, iridocyclotomy, procedure for ocular trauma) and treatments such as external beam irradiation.
5. Cataract interfering with the performance of vitreoretinal surgery.
6. Intolerable anisometropia or aniseikonia uncorrectable with glasses or contact lenses exists as a result of lens extraction in the first eye (despite satisfactorily corrected monocular visual acuity).

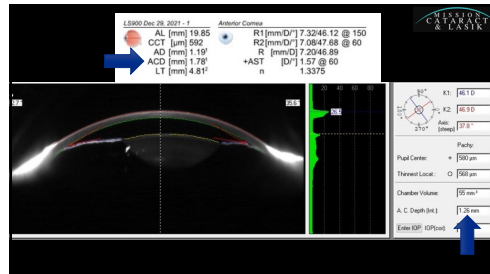
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30 year old monocular patient

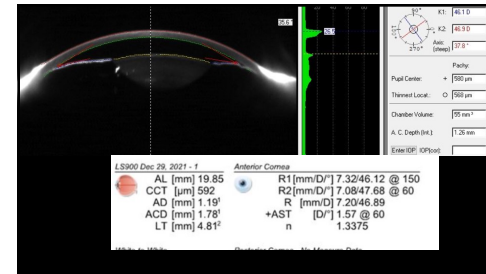
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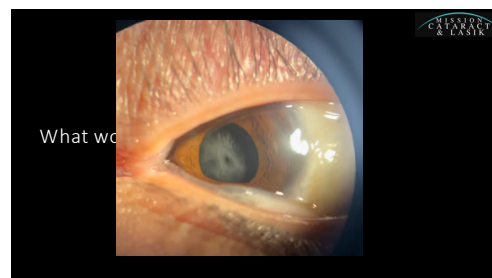
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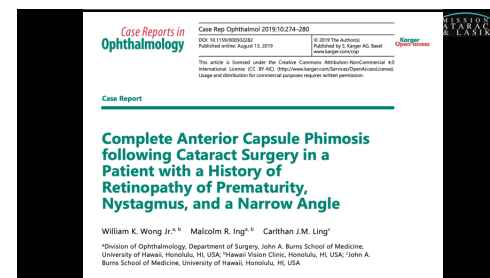
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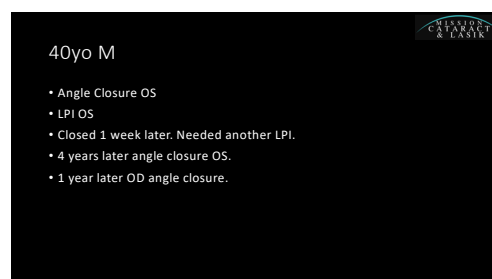
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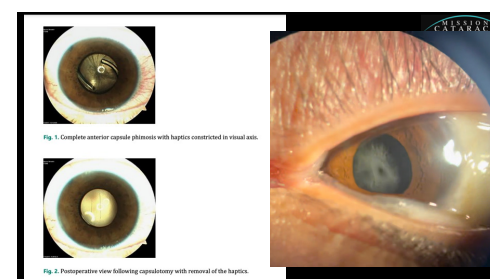
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MISSION
CATARACT
& LASIK

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A.Aminlari,* M.East, W.Wei, and D.Quillen

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Go to:

Topiramate is an oral sulphamate medication primarily used for seizure, migraine and neuropathic pain. It has been associated with secondary angle closure, which can mimic acute angle closure glaucoma. Suspicion for medication induced angle closure glaucoma should be higher whenever angle closure presents bilaterally. We present two cases of bilateral angle closure glaucoma secondary to topiramate.

MISSION
CATARACT
& LASIK

New grad (May 2017) posting an interesting case that I would like feedback on his anyone out there ever seen anything like this?

40yo HF (patient in our office) presents w/ severe labral and brachio-ice pain around eyes on Sunday.

Patient's medical hx includes dx of Meniere's disease for which she had recently received therapy by pcp from Transient to Metabolic side. She took a dose of the metabazodolone the Friday and Saturday night prior to the initial onset of [blue] soreness and did not take any more doses [poc ok]. Monday morning connected to 2020 with a -1.00 OD and OS [poc] was previously examined the week prior and was a pt [OK] in the low 20s.

AC extremely shallow peripheral and central but still within normal limits. IOP 10/10. AC extremely unremarkable. Due to the AC, pt was treated w/ liganin and conigan and given rx for both. Tuesday [my first day seeing pcp], his rx was climbing to -3.50. AC still shallow, but IOP dropped to 10-12. Pt still complains of eyes.

When reviewing the case, it sounded a lot to me like Topamax-related angle closure. So broke out some notes and did some research but couldn't find any reactions similar to this w/ methazolamide specifically. I realize Topamax and methazolamide are both sulfa derivatives though so we ended up

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