Nd:Yag Laser Capsulotomy Edition

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Kentucky Optometric Association
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Financial disclosures

- None

History of laser use in eyecare

- Prior to the implementation of lasers, pars plana capsulectomy was required to remove clouding of the posterior capsule
- Nd:Yag laser originated in 1960's
- Ophthalmology applications by Dr Aron-Rosa and Dr Franhauser in 1980 (posterior and anterior capsulotomies)
- As of April 2026, 15 states have optometric laser privileges
- Personal Experience?

Physics!!

- LASER (Light Amplification by Stimulated Emission of Radiation)
- Neodynium: Yttrium Aluminum Garnet Laser Medium (Nd:Yag)

Basically - a light source activates a solid-state crystal exciting the release of photons (1064nm)

The laser photons strip electrons from atoms within the tissue creating a plasma ball and the collapse of the plasma ball creates an acoustic shockwave that physically damages tissue

Also known as PHOTODISUPTION

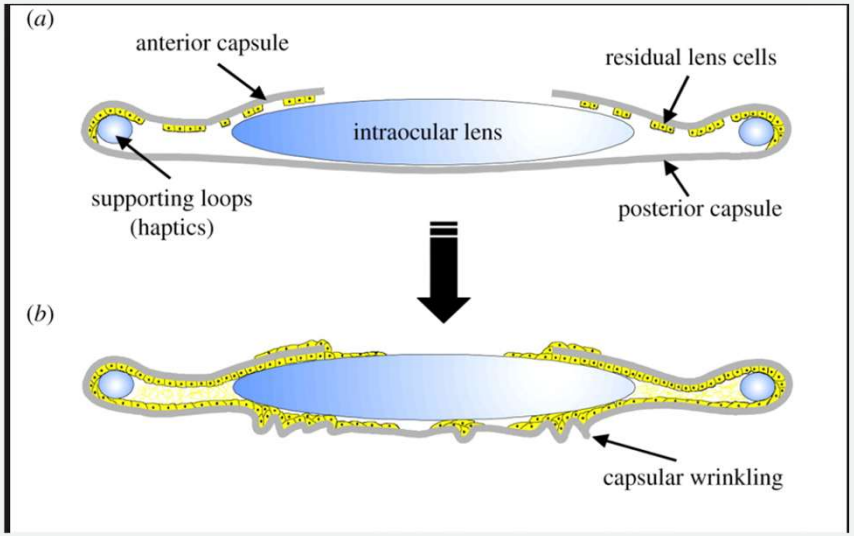
Physics!!

- 1064nm is within the infrared spectrum so additional HeNe Beams (632nm) are used to help the physician aim the placement of the laser energy
- Because of the prismatic effect of light entering the eye, there is a slight discrepancy between the precise location of the HeNe beam and the Nd:Yag laser
- This ”offset” is used to the physicians advantage to avoid unnecessary collateral damage

Clinical Applications

- Yag Capsulotomies
- Yag Peripheral Iridotomies
- Others?
- SLT

Yag Capsulotomy



- <u>Posterior capsular opacification</u>

  Posterior capsular opacification (PCO) is a common occurrence following uncomplicated modern day cataract surgery

  The migration of residual lens epithelial cells move posteriorly and can proliferate, obscuring the patients vision

  Adjustments to shape and edge of the IOL have reduced amount of PCO

  Capsule polishing technique has also aided in reducing the frequency of PCO

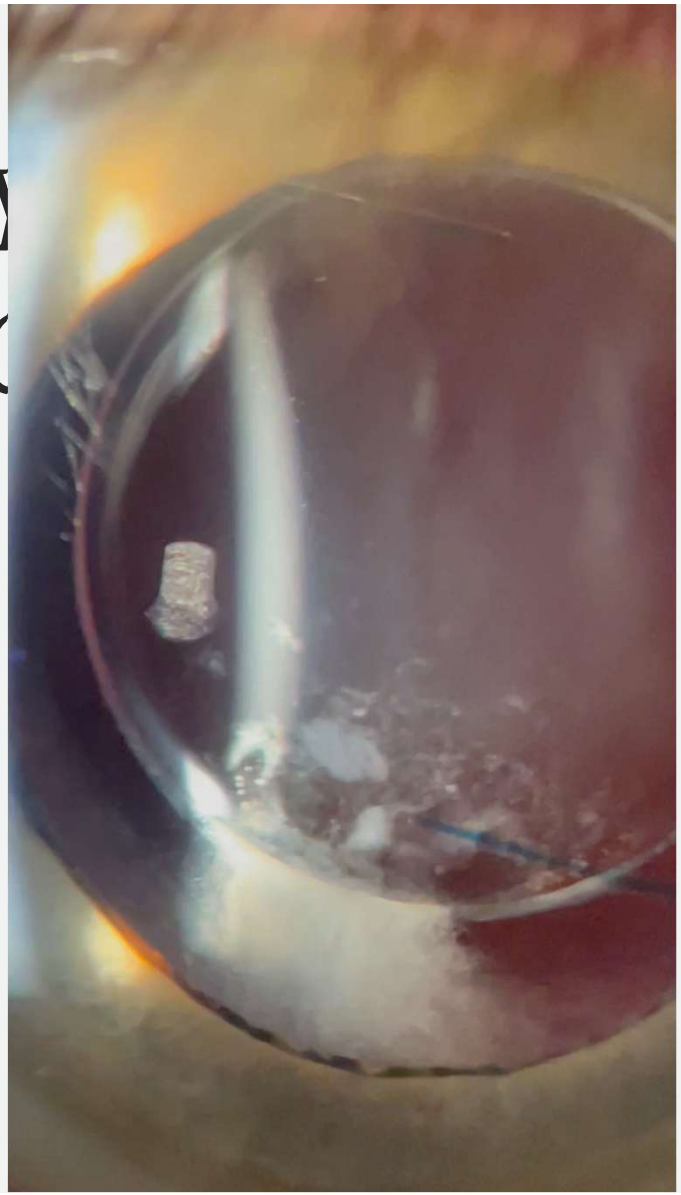
Yag Capsulotomy

- Capsular Distension Syndrome (turbid fluid)

  Decreased vision with a myopic refractive shift

  Accumulation of milky (turbid) fluid between the IOL and the posterior capsule

  Exact pathogenesis is unknown, some argue its from a small ant capsulorhexis and adhesion between the IOL optic and the capsule while others argue it is secondary to bacteria Propionibacterium acnes



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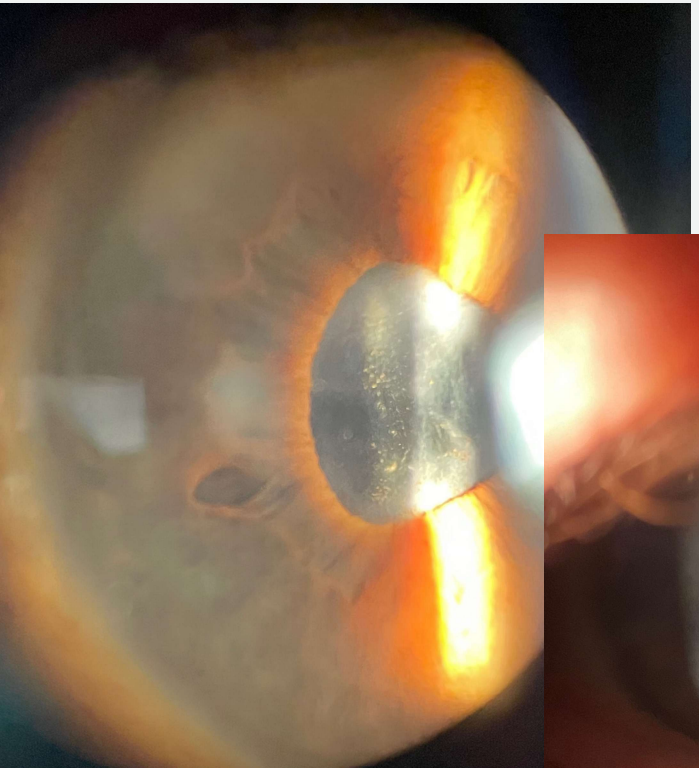
Yag Capsulotomy

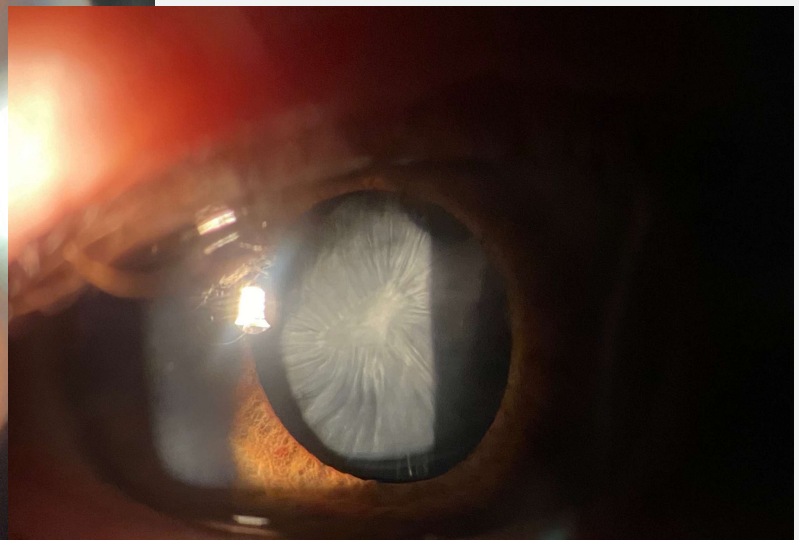
- Anterior Capsular Opacity

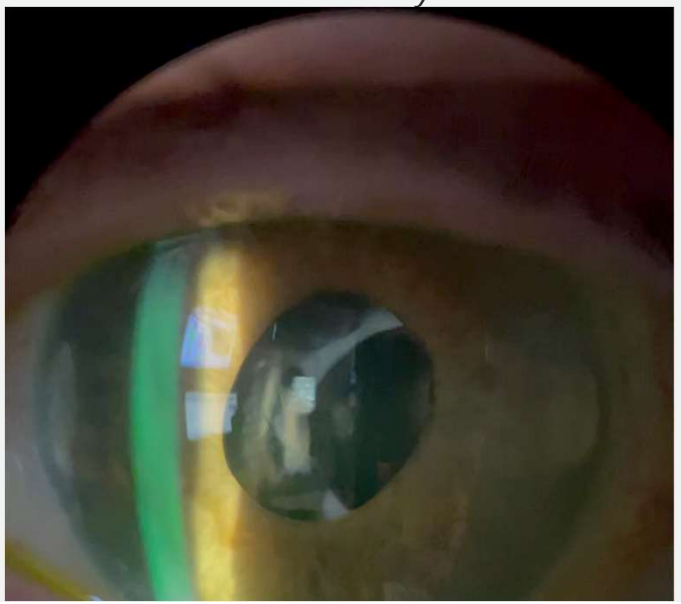
  Contraction of the capsulorhexis

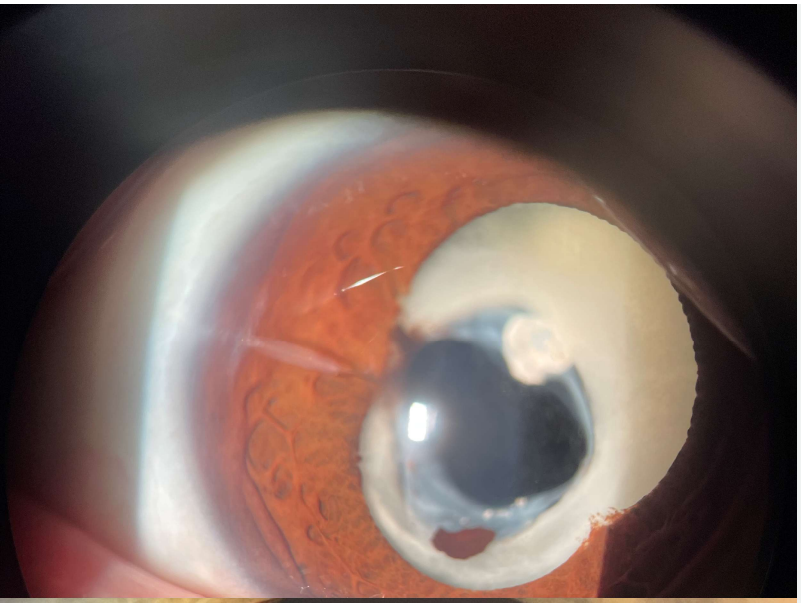
  May be secondary to zonular weakness

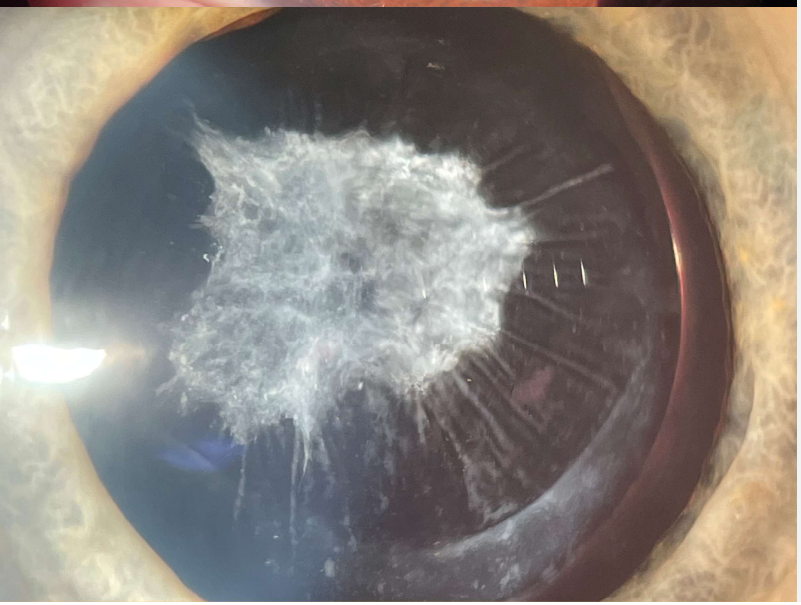
  Usually visually insignificant – but always look at patient undilated to determine if treatment is necessary











Yag Capsulotomy

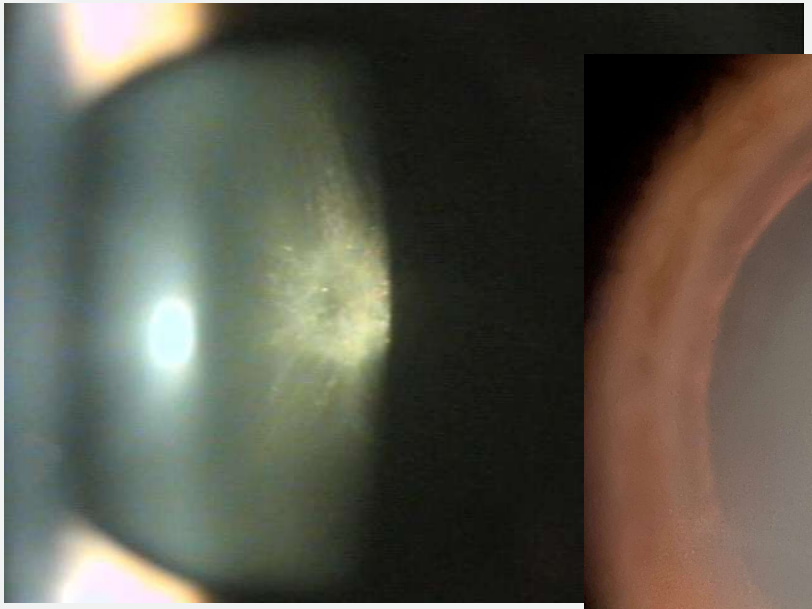
Yag Capsulotomy

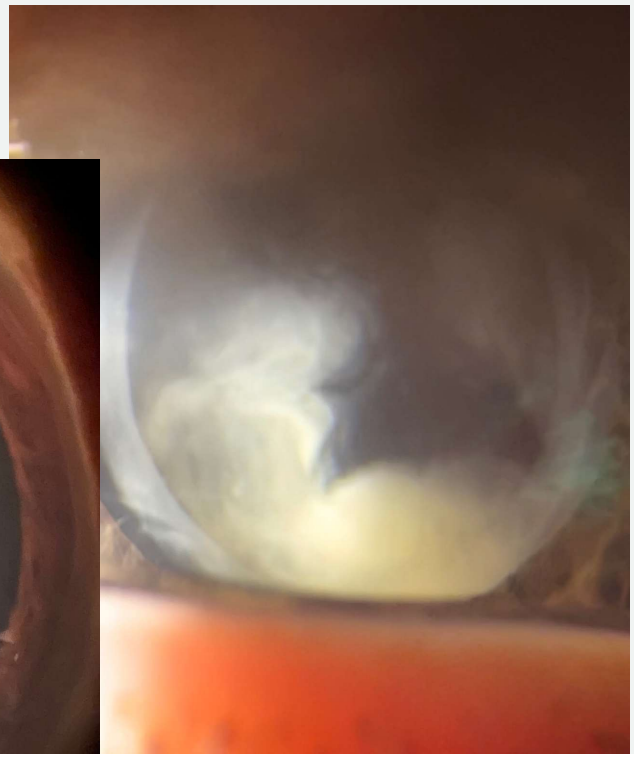
- Risk factors for developing PCO

  Age – more prevalent the younger you are

  Type of cataracts – more prevalent with PSC

  Lack of polishing





Indications & Ins Requirements

- Essentially the exact same as cataract surgery

  Must have a functional complaint secondary to the opacified capsule

  Have reasonable expectation the procedure will improve vision

  BCVA 20-50 or worse or glare decreases vision by 2 lines or greater

  Unable to view posterior pole and is required to evaluate or treat retinal pathology

  Timing in regard to cataract surgery??

Pre-operative examination

- Functional complaint
- Best corrected visual acuity +/- glare testing
- Dilated fundoscopic examination

- Does the PCO match the complaints?

Pre-operative examination

- Informed consent

  Required for any surgical procedure

  Discuss procedure in layman's terms

  Discuss Risk/Benefit/Alternatives and elective nature of procedure

  Patient must wish to have procedure done.

So what are the Risks? And who should we avoid?

Risk of Procedure

Elevated IOP

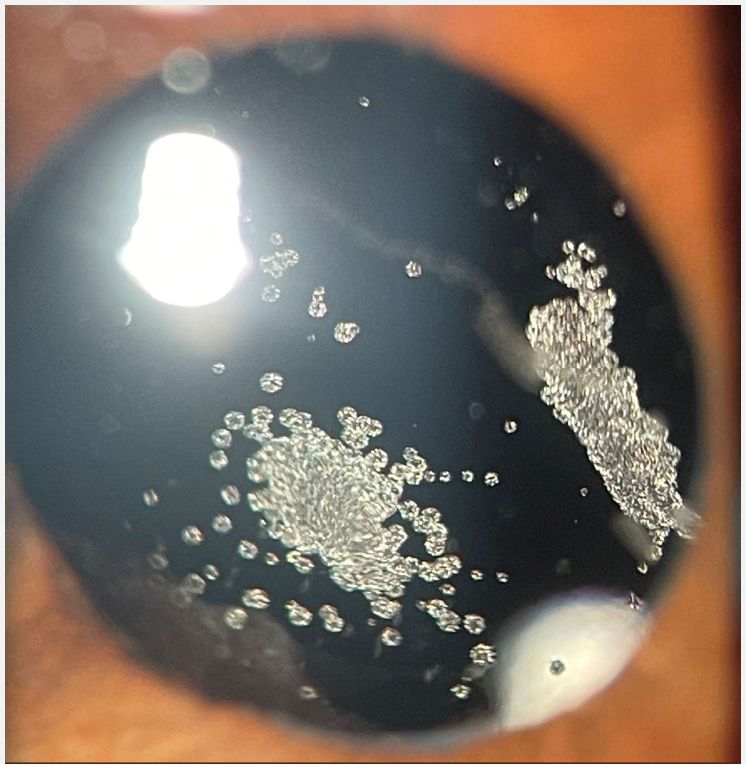
Inflammation

Retinal detachments

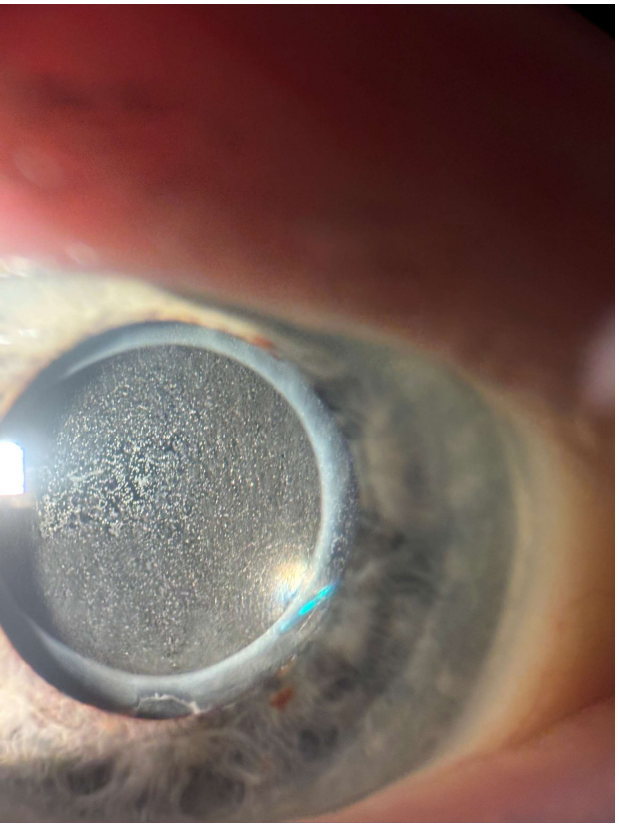
Who to avoid

- PCO doesn't match vision
- Active inflammation
- Untreated retinal tears/holes
- Ongoing or history of CME?
- Planning IOL exchange
- Dislocated or decentered IOL
- Plate haptic IOLs?
- IOL glistenings?

Iol Glistening's?



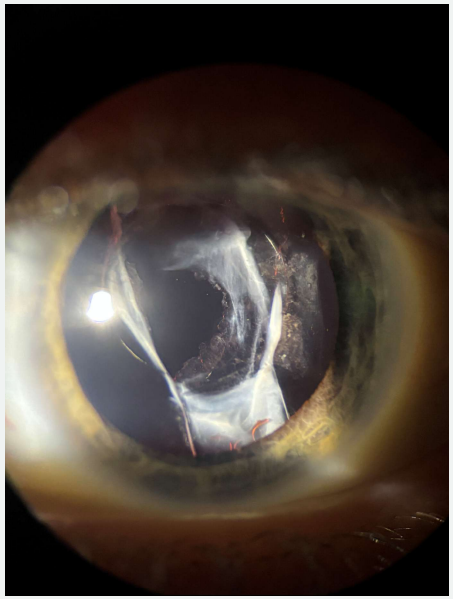
- Formation of fluid filled microvacuoles, is considered a complication of hydrophobic-acrylic IOL's
- Thought to be from water entering the polymer, coalesces and created pockets of refractile bodies that can scatter light
- Its effect on visual acuity is debatable, yag laser is not indicated and the only treatment (if necessary) is IOL exchange

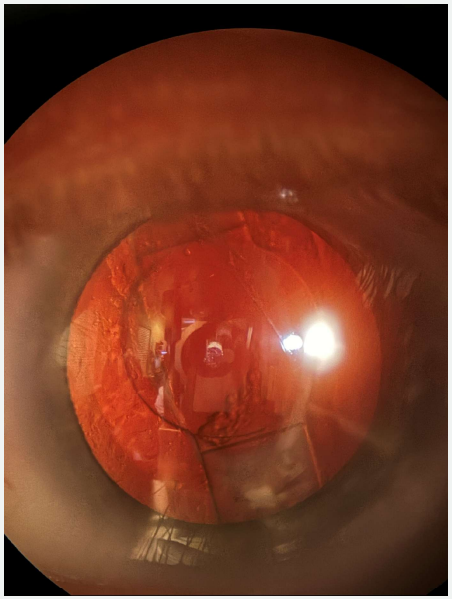


Iol Glistening

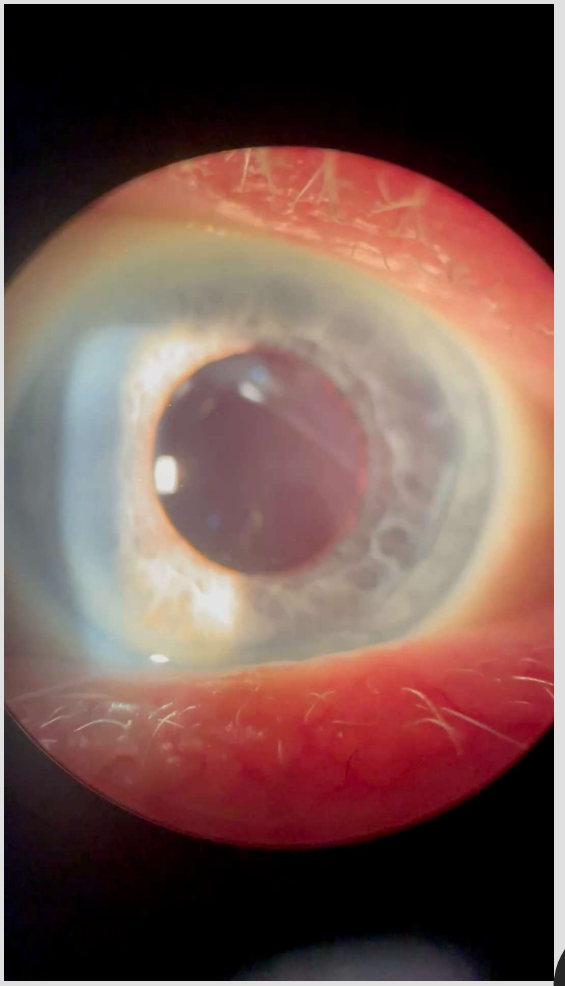
CrystaLens®

“Z-wave formation”

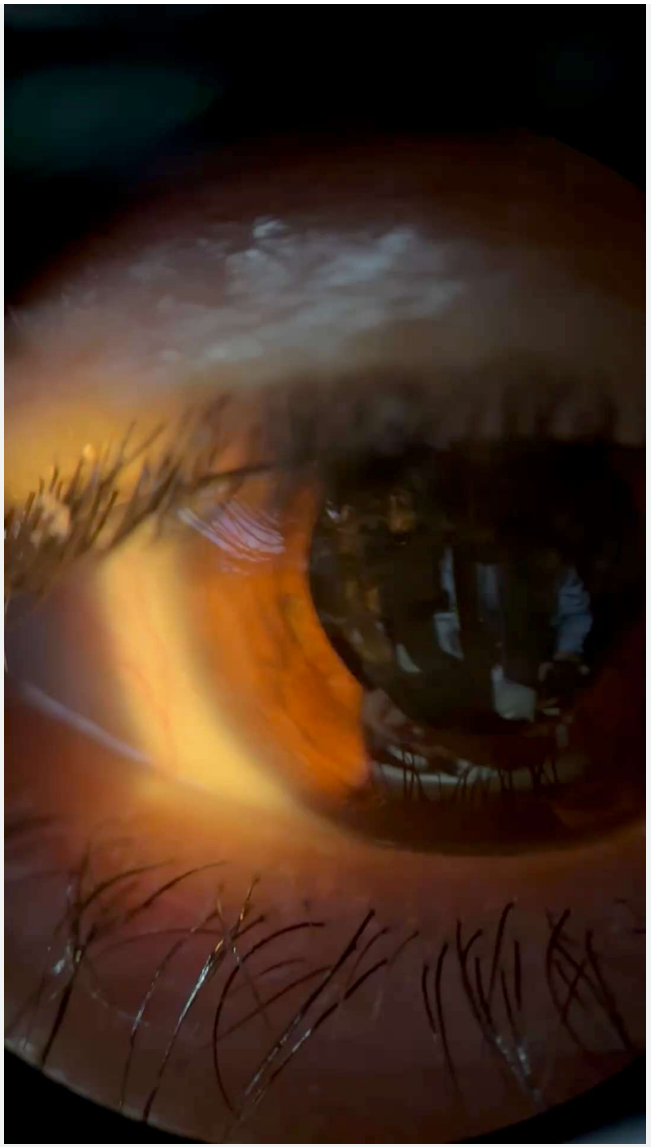




Dislocated IOL



Not PCO and not IOL dislocation



Equipment

- Stand alone unit vs combination SLT/Yag Laser

  In clinic vs in surgery center?

The procedure

Offset (Anterior/Posterior)

Number of shots

Burst of shots

Aiming Beam

Energy per shot

Laser ready/Standby

The procedure

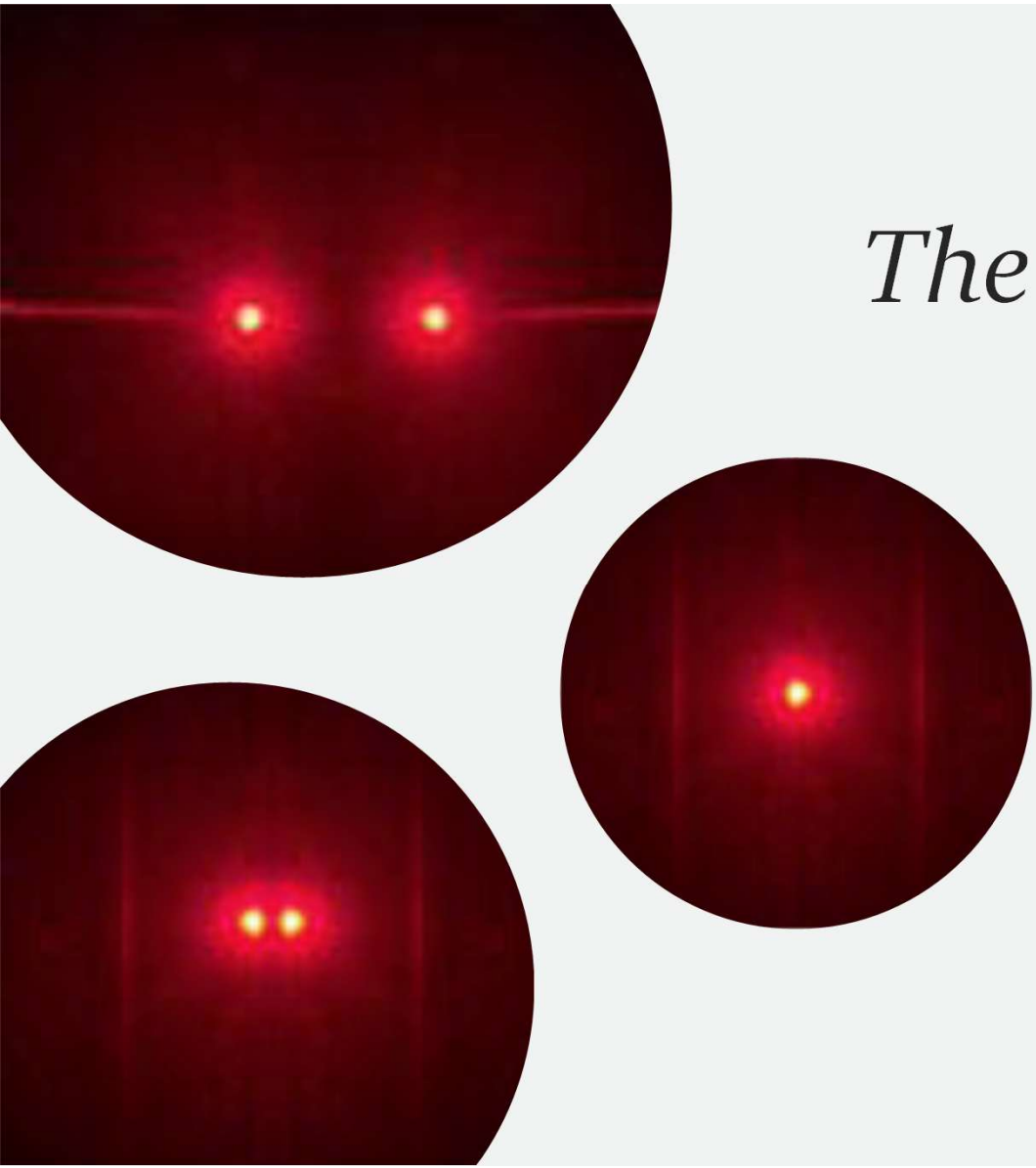
- Focusing lens

Stabilizes the eye

Less blinking

Less energy used

(need proparacaine + gel)



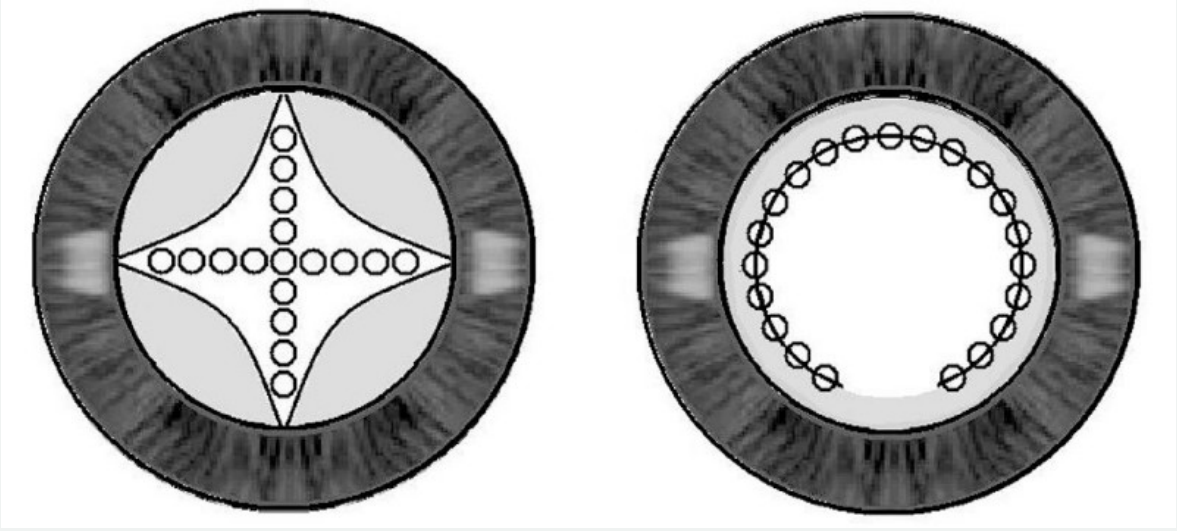
The procedure

Starting values (simply a suggestion)

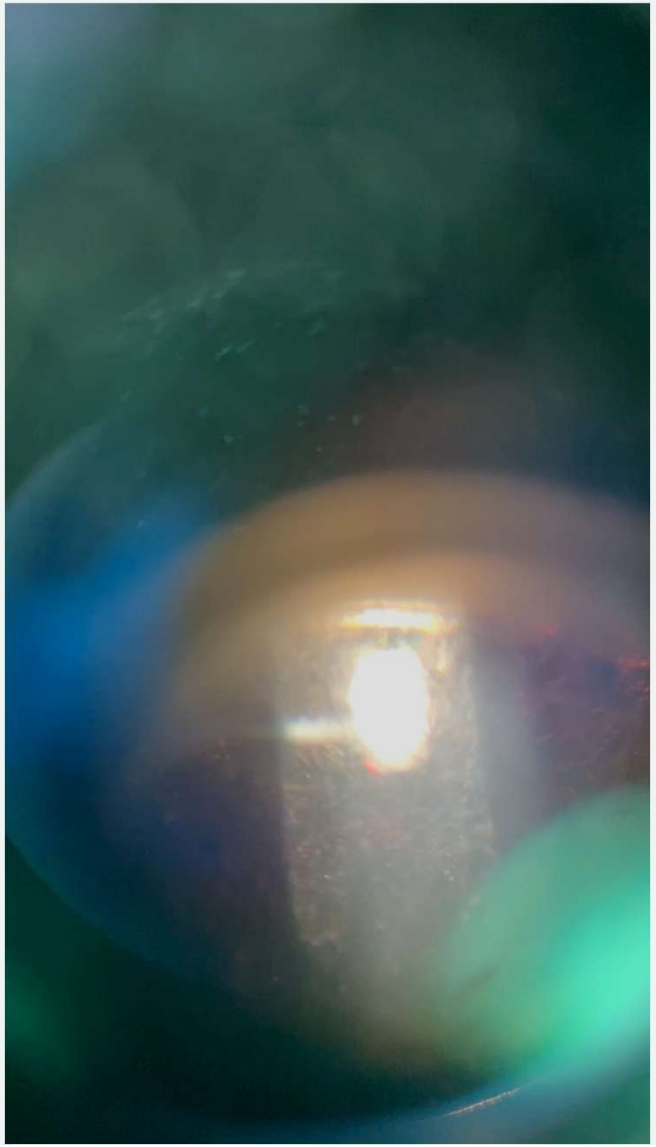
- *Offset (250-500um posterior)*
- *Burst (1 per shot)*
- *Energy per shot (1.5-2.0mJ)*
- *Light source slightly "off click" – to best visualize the capsule*
- *Don't be afraid to turn light source up for better visualization*

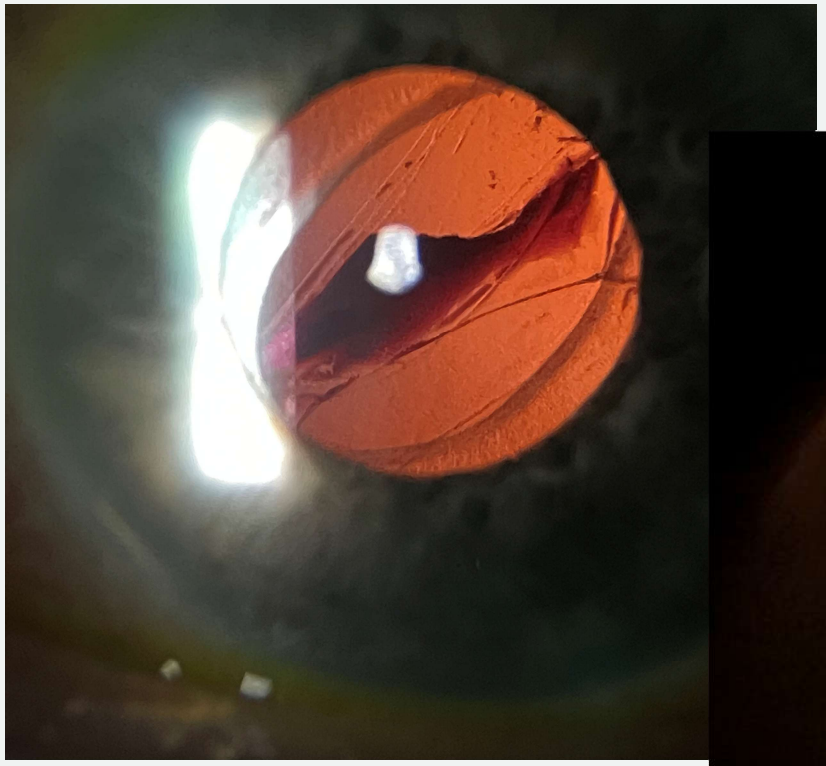
"Few clicks and beeps, you will see a red light moving around, just ignore it"

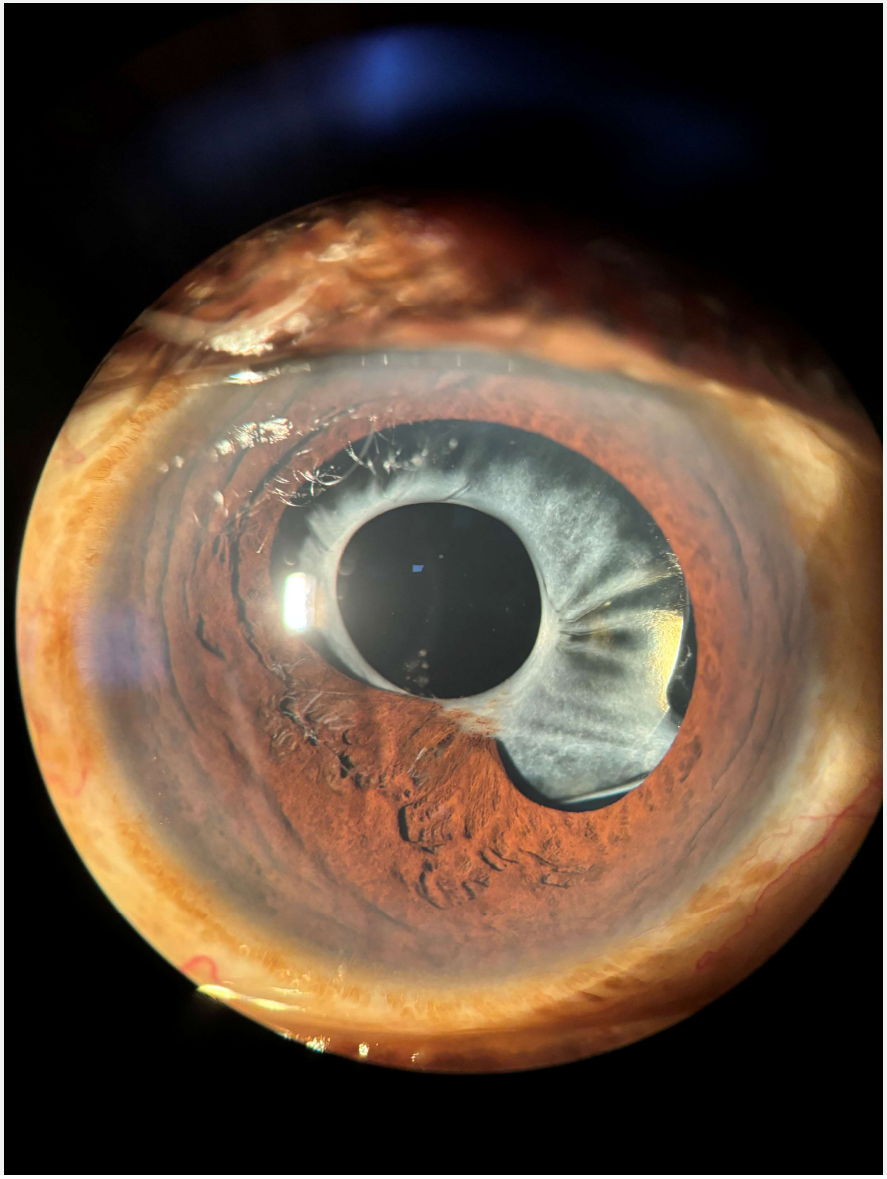
The procedure

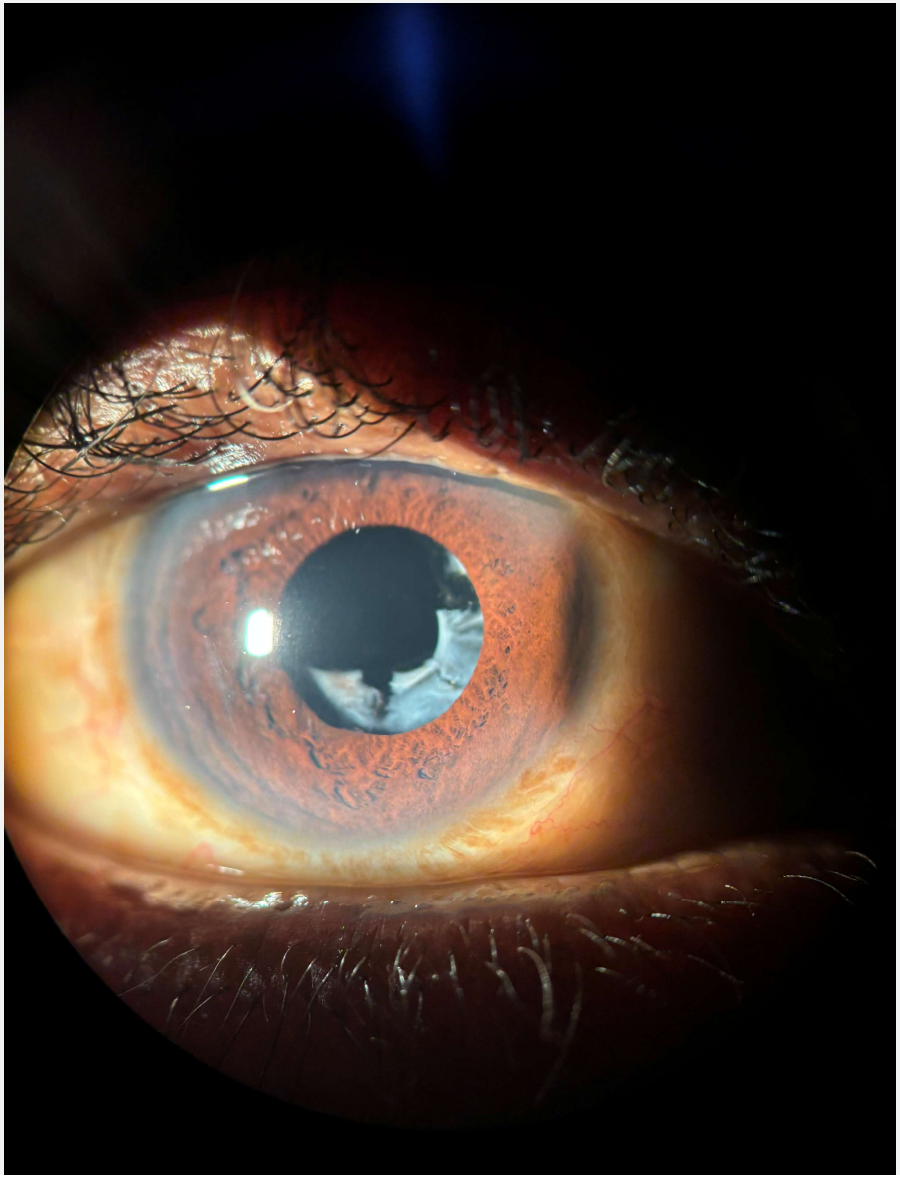


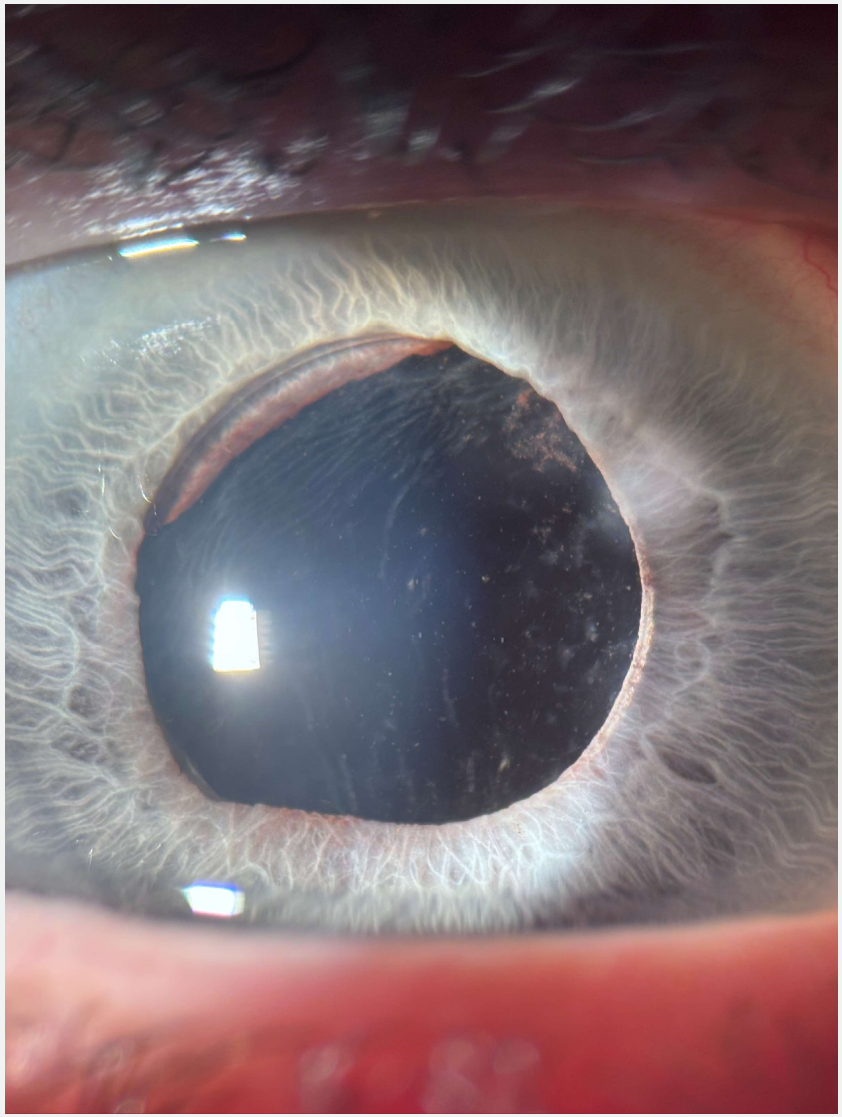
- Arm laser
- Pull trigger to fire shot
- Make a continuous opening
- Use least amount of energy level and number of shots to achieve the desired tissue effect
- Different pattern approach

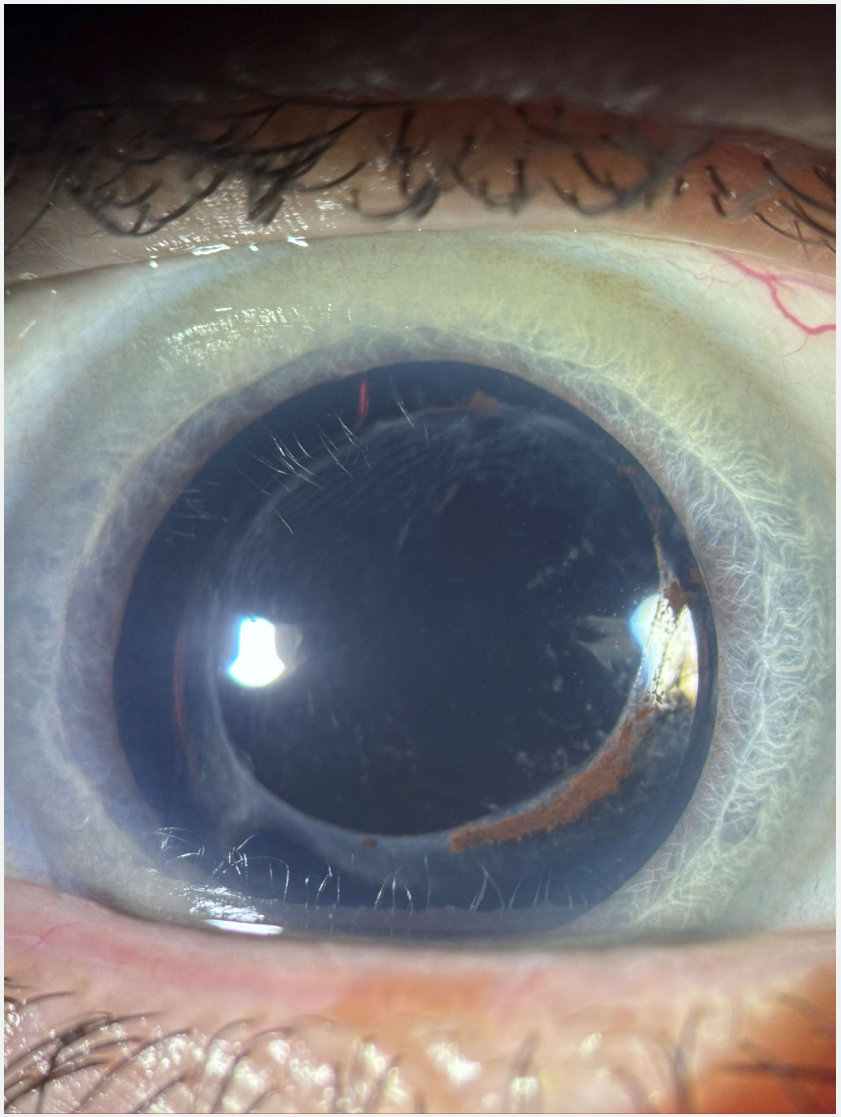


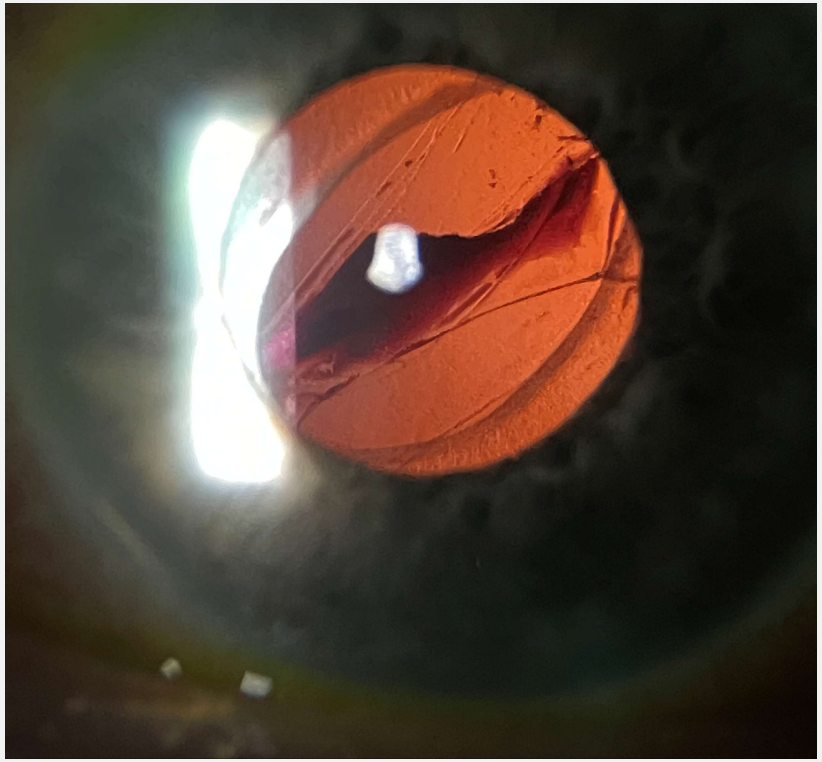


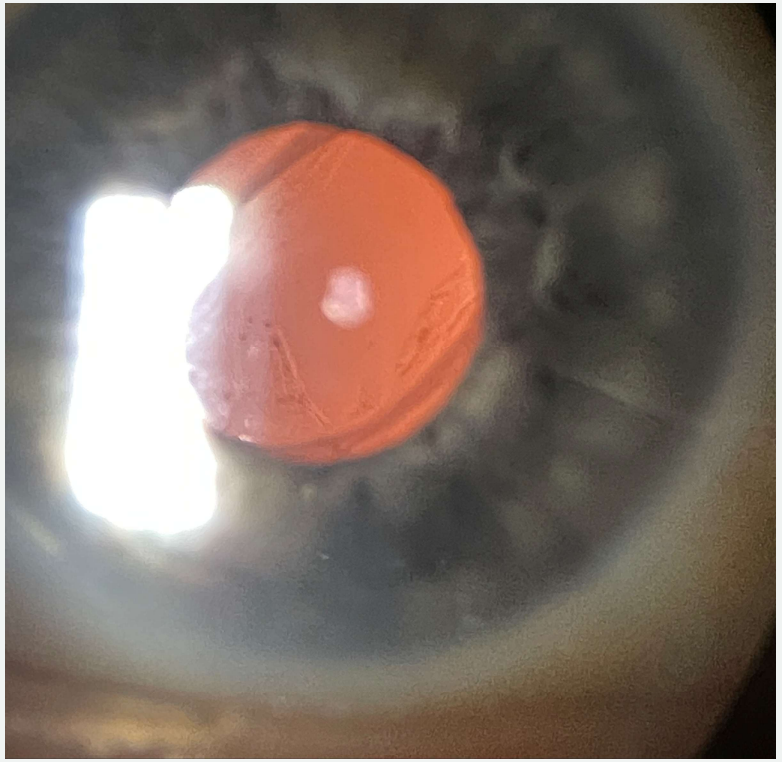












Procedure note

- Medications used
- Equipment used (ie: Lens)
- Number of shots
- Energy range of shots
- Total Energy
- Complications?
- IOP check?
- Post operative drops administered?

Post Op Instructions

Anti-inflammatory drops? Pred vs NSAID vs Nothing?

Patients should be aware they will see a few floaters but they are generally short lived

Vision generally improves in a few hours/next day

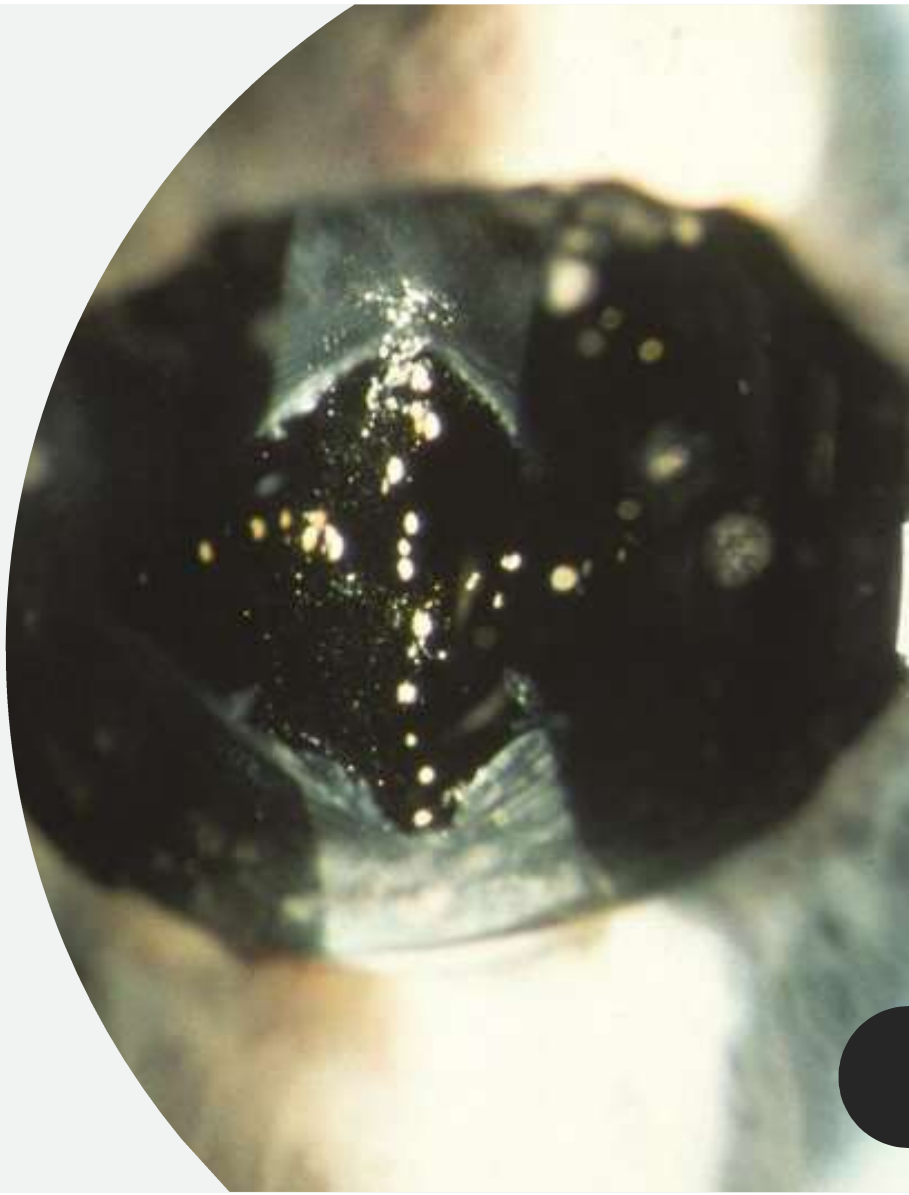
Dilated post operative exam within a few weeks

Complications

- Elevated IOP
- Cornea Edema
- Uveitis
- Cystoid macular edema
- Retina tears/Detachments
- Vitreous Prolapse/IOL decentration
- Residual PCO
- Floaters?
- Pitting?

Pitting

- Insufficient offset/poor focus/head movement
- Silicone > Acrylic
- Not clinically significant



Billing

- ICD-10

  H26.491 – Other secondary cataract , Right eye

  H26.492 – Other secondary cataract, Left eye

  H26.493 – Other secondary cataract, Both eyes

  ~~*H26.499 – Other secondary cataract, Unspecified Eye*~~

  Global period for procedure is 90 days

  - exam gets -57 modifier on EM code
  - second eye if within PO period gets -79 modifier

Billing

- Laser CPT code

  66821 – RT

  66821 – LT

  CPT 66821 Kentucky Medicare Reimbursement

  - Office $310.30 per eye

  - Surgery center $289.08 per eye

Billing

-54 Modifier – used when billing for procedure only

-55 Modifier – used when billing for post operative care only

Example for a new patient level 4 exam with same day laser

(H26.493) 99204 – 57

(H26.491) 66821 – RT

Example for same patient second eye laser only

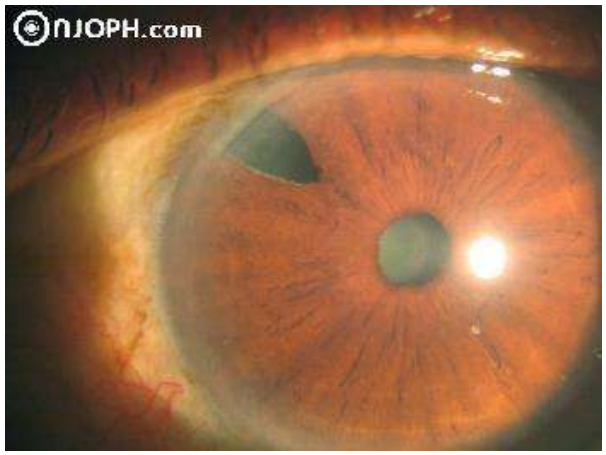
(H26.492) 66821 -79 – LT

History of laser use in eyecare

- Prior to the implementation of lasers, surgical iridectomy was performed routinely for AACG
- Argon Laser peripheral iridotomy replaced most iridectomies in 1970's
- Nd:Yag laser replaced argon lasers for iridotomies in 1980's

  Less energy and higher success rate compared to Argon

  Faster, cheaper, safer compared to iridectomy
- Personal Experience?



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- Because of the prismatic effect of light entering the eye, there is a slight discrepancy between the precise location of the HeNe beam and the Nd:Yag laser
- This ”offset” is used to the physicians advantage to avoid unnecessary collateral damage

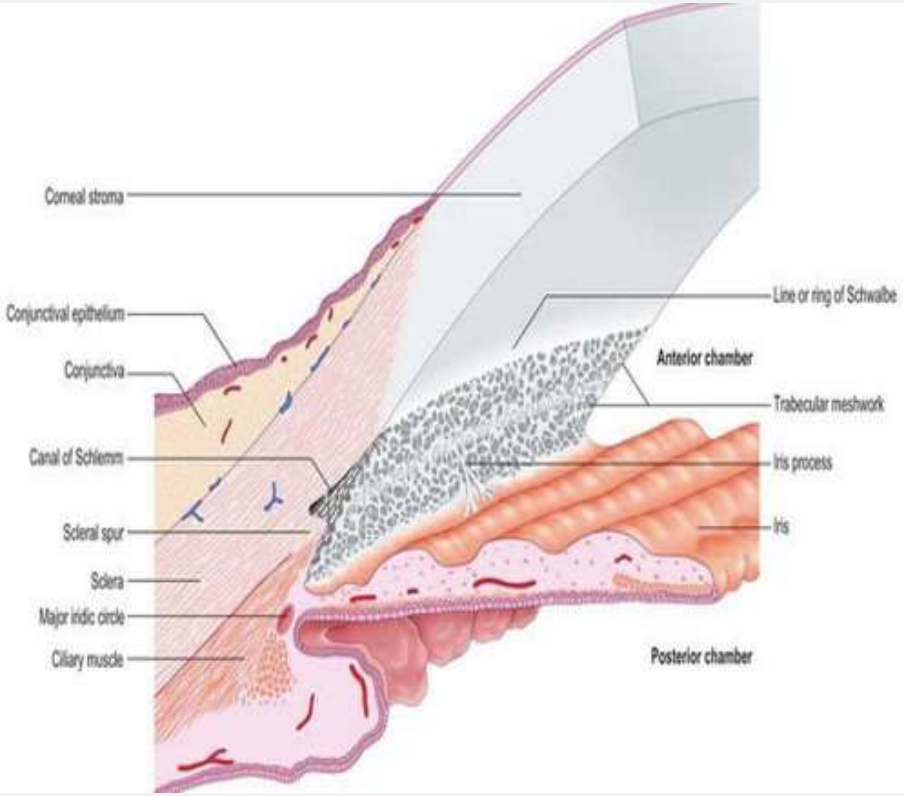
Yag Laser Peripheral Iridotomy

- Acute angle closure glaucoma
- Narrow angle glaucoma suspects
- Pigment Dispersion Syndrome
- Surgical pre-op (endothelial keratoplasty, ACIOL, ICL, sulcus lens PPV)
- Secondary Iris Bombe

Yag Laser Peripheral Iridotomy

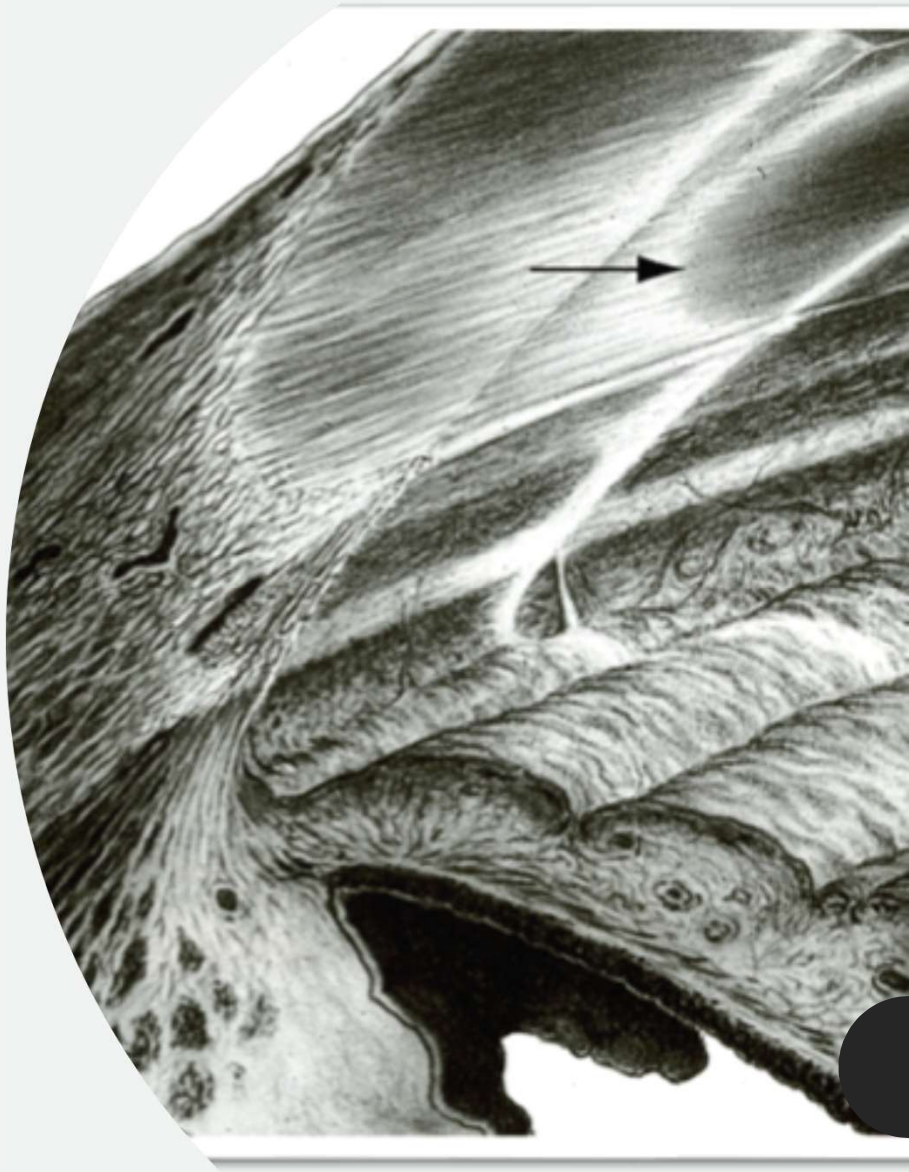
- Trabecular meshwork is a pressure dependent outflow responsible for 90% of IOP aqueous drainage

  Because its pressure dependent, the outflow increases as the IOP goes up, approximately 25% of the TM needs to be functional for normal IOP



Gonioscopy

- 3 vs 4 mirror
- Orient yourself with corneal wedge
- Start inferior angle
- Evaluate amount of pigment, angle of iris insertion
- Indent to evaluate for PAS



Angle Closure Glaucoma

Acute	*Intermittent*	*Chronic*	*Suspect?*
• *Sudden unilateral painful vision loss* • *Elevated IOP with corneal edema and injection* • *Shallow anterior chamber, mid dilated pupil and no visible anatomical structures on gonioscopy*	• *Asymptomatic with visible glaucoma damage* • *Not elevated or mildly elevated IOP, no K edema* • *Appositional angle structures with less than 180^0 of TM visible*	• *Symptoms depend on level of glaucoma, LPI already present?* • *IOP is often elevated and refractive to topical medication* • *Scattered low lying PAS on compression*	• *Data on LPI effectiveness in preventing AACG is limited* • *Zhongshan Angle Closure Prevention (ZAP) Trial is the largest randomized attempt to quantify prophylactic LPI benefit* • *Worth discussing exclusion criteria* • *Concludes LPI does reduce the risk of AACG in NAG patients, but the incidence was very low and widespread LPI's are not recommended.*

Angle Closure Glaucoma

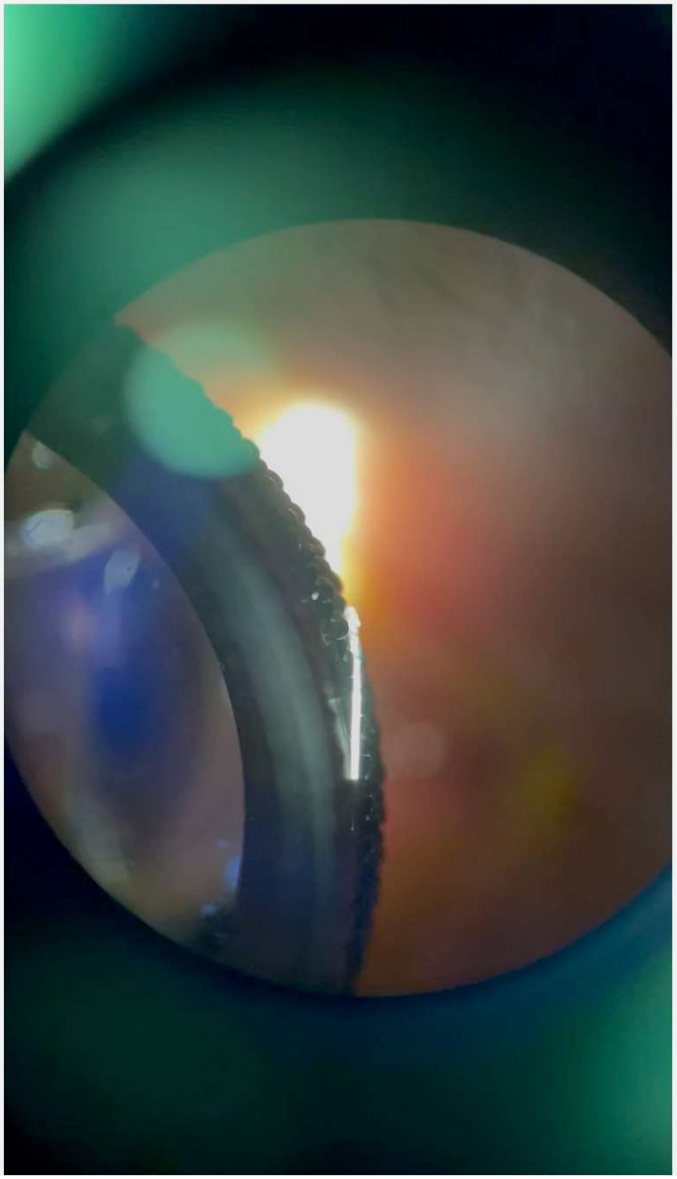
- The overwhelming majority of Caucasian patients with AACG are secondary to Plateau Iris Syndrome

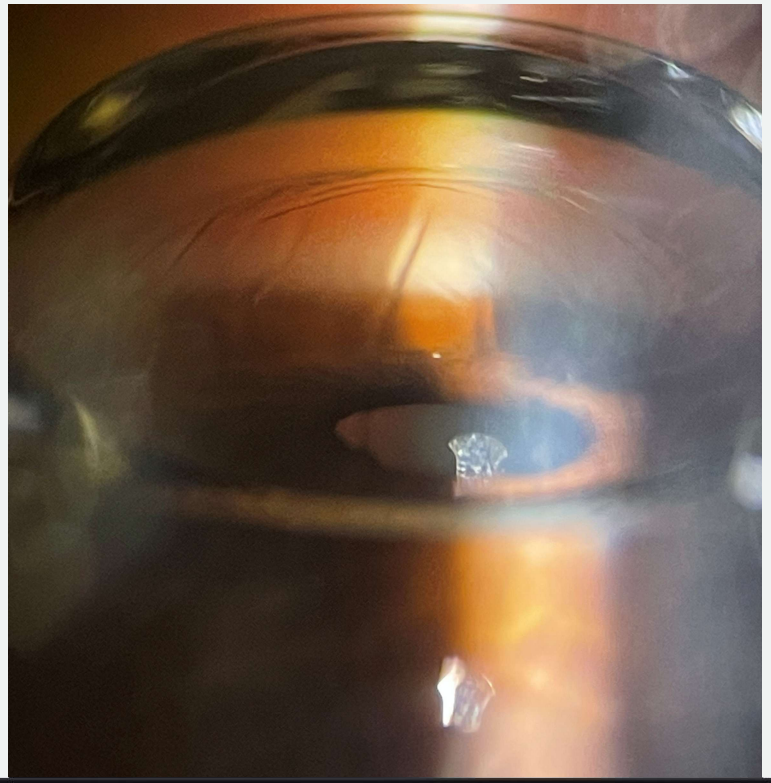
    Anterior rotation of the CB that forces the peripheral iris into the angle

    Diagnosis of PIS requires patient LPI without deepening of the angle structures

    Double hump? The peripheral iris is "draped" over the CB face

    Treatment is gonioplasty +/- Cataract Surgery +/- GSL






SONOMED
OS
May 07, 2009
12:37:50
Mag: 2.0X
15 Deg
35 MHz
San Raffaele
Gain: 85 dB
TVG: 0 dB
Sens: 124 V
Base: 0 dB
EGain: 30 dB

Angle Closure Glaucoma

- Clear lens extraction should be considered as first line therapy for high risk AACG patients

ARTICLES | VOLUME 388, ISSUE 10052, P1389-1397, OCTOBER 01, 2016

Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial

Prof Augusto Azuara-Blanco, PhD • Jennifer Burr, MD • Prof Craig Ramsay, PhD • David Cooper, PhD • Prof Paul J Foster, PhD • Prof David S Friedman, PhD • et al. Show all authors

Open Access • Published: October 01, 2016 • DOI: https://doi.org/10.1016/S0140-6736(16)30956-4 •

Secondary pupil block

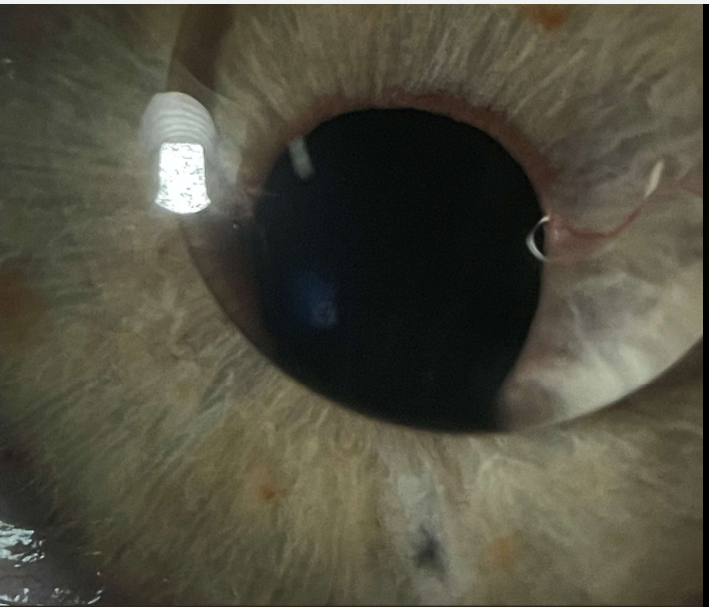
- Situations where aqueous flow is obstructed anteriorly

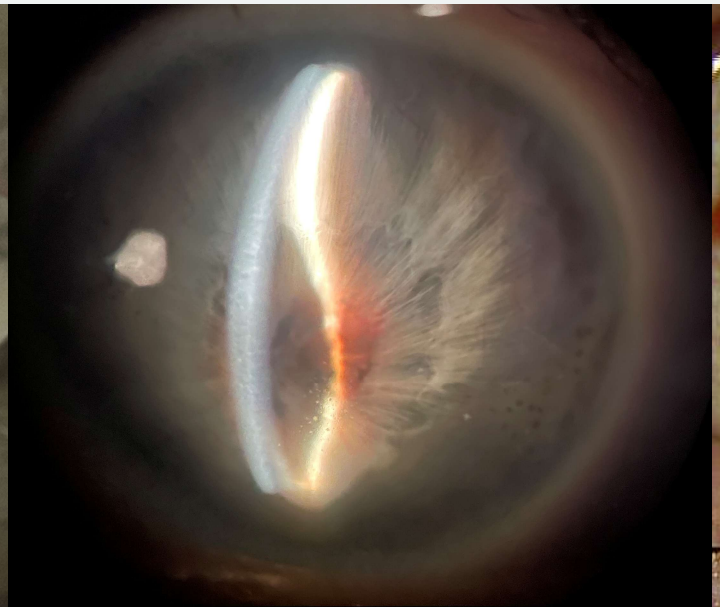
  Uveitis

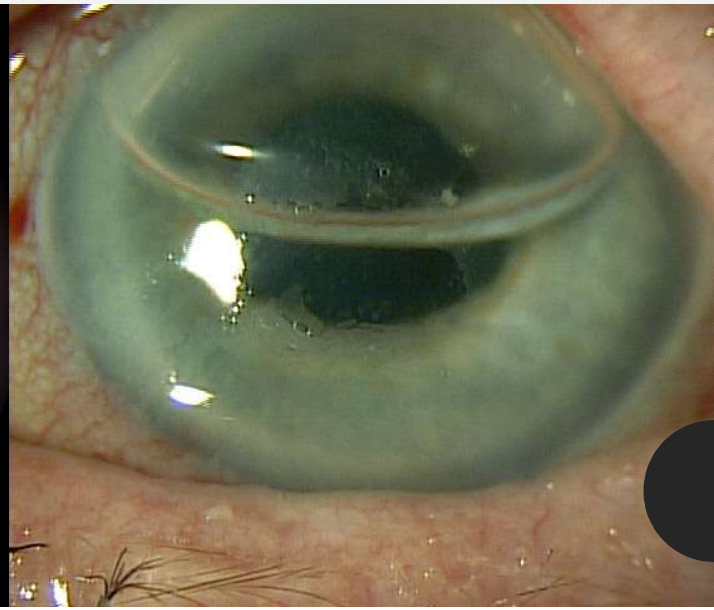
  DMEK

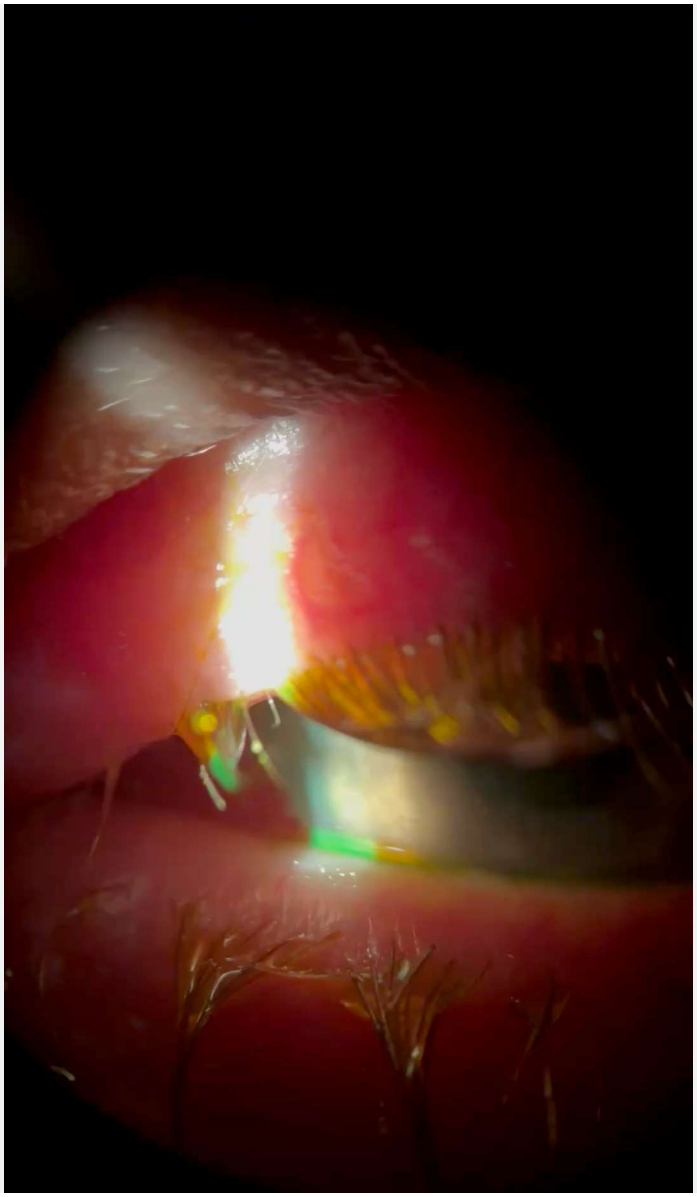
  ICL

  ACIOL

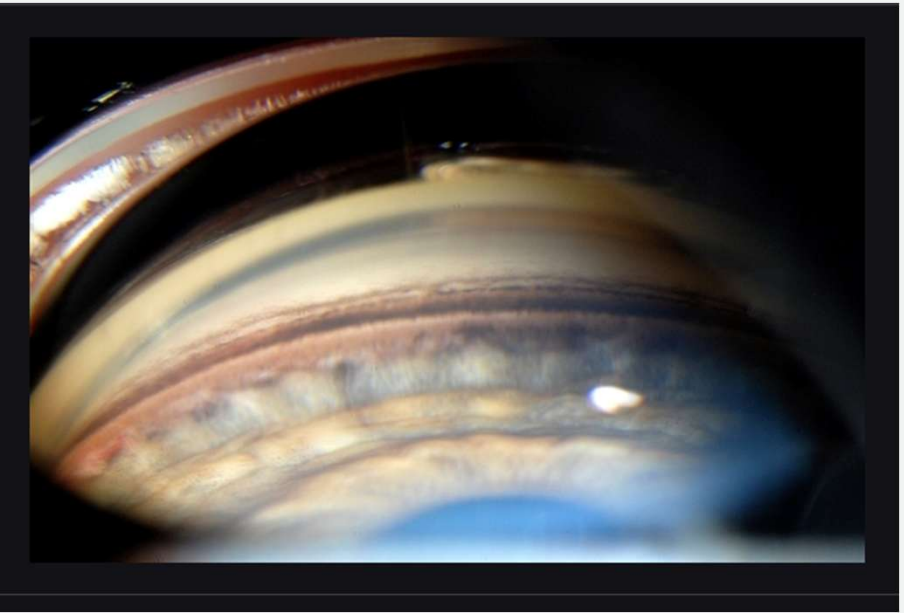








Pigment Dispersion Syndrome



- 2 theories leading to iris/lens chaffing
  - *A) Asymmetric pressure between anterior and posterior chamber*
  - *B) Convex iris insertion/iris is too big*

- How would a LPI help pigment dispersion syndrome?
- Evidence?
- Personal Experience?
- WHAT ABOUT PIGMENTARY GLAUCOMA?

Pigment Dispersion Syndrome

- Patients underwent phenylephrine stress test

  -Of those who failed test (high risk), 1 eye was randomized to LPI and one was left untreated

  -3/21 (14%) in treated arm demonstrated IOP spike of 5mmHg above baseline over timeline

  -13/21 (62%) in untreated arm demonstrated IOP spike of greater than 5mmHg from baseline

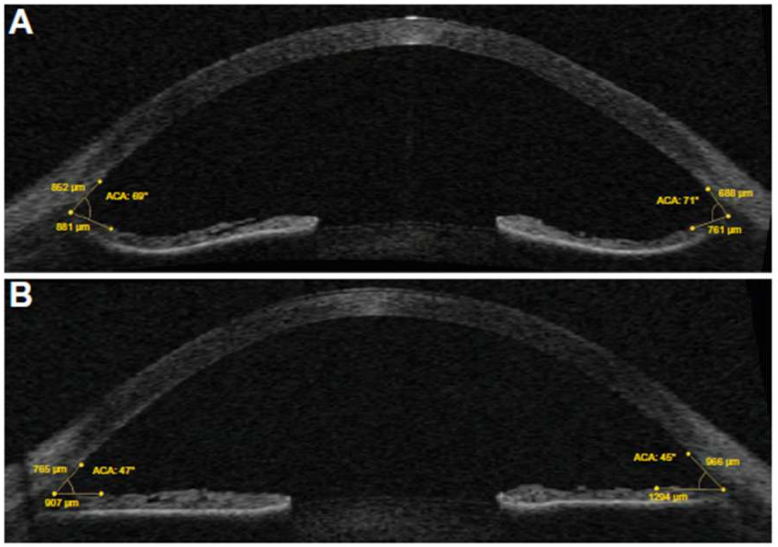
Randomized Controlled Trial > JAMA Ophthalmol. 2014 Dec;132(12):1433-8.
doi: 10.1001/jamaophthalmol.2014.3291.

A 10-year follow-up to determine the effect of YAG laser iridotomy on the natural history of pigment dispersion syndrome: a randomized clinical trial

Stefano A Gandolfi [1], Nicola Ungaro [1], Maria Grazia Tardini [1], Stella Ghirardini [1], Arturo Carta [1], Paolo Mora [1]

Affiliations + expand

PMID: 25188224 DOI: 10.1001/jamaophthalmol.2014.3291



Indications & Insurance Requirements

- CPT code 66761
- The patient's medical record must clearly show the medical necessity of performing the procedure including, but not limited to, the symptoms experienced by the patient, the intraocular pressure and the status of the angle as evaluated with gonioscopy.
- Iridotomy by laser surgery will be considered medically necessary and reasonable to treat acute, sub-acute, intermittent or chronic angle-closure glaucoma. Laser iridotomy can successfully eliminate the chance of acute or chronic angle-closure glaucoma in most cases. Additionally, when a patient is noted to have an occludable angle upon gonioscopic examination, even in the absence of symptoms, a peripheral iridotomy may be performed to prevent angle-closure glaucoma.

ICD-10 Codes	Description
H40.031 - H40.039	Anatomical narrow angle, right eye - Anatomical narrow angle, unspecified eye
H40.061 - H40.069	Primary angle closure without glaucoma damage, right eye - Primary angle closure without glaucoma damage, unspecified eye
H40.1310 - H40.1394	Pigmentary glaucoma, right eye, stage unspecified - Pigmentary glaucoma, unspecified eye, indeterminate stage
H40.20X0 - H40.20X4	Unspecified primary angle-closure glaucoma, stage unspecified - Unspecified primary angle-closure glaucoma, indeterminate stage
H40.211 - H40.219	Acute angle-closure glaucoma, right eye - Acute angle-closure glaucoma, unspecified eye
H40.2210 - H40.2294	Chronic angle-closure glaucoma, right eye, stage unspecified - Chronic angle-closure glaucoma, unspecified eye, indeterminate stage
H40.231 - H40.239	Intermittent angle-closure glaucoma, right eye - Intermittent angle-closure glaucoma, unspecified eye
H40.241 - H40.249	Residual stage of angle-closure glaucoma, right eye - Residual stage of angle-closure glaucoma, unspecified eye
H40.831 - H40.839	Aqueous misdirection, right eye - Aqueous misdirection, unspecified eye

Pre-operative examination

- Standard exam including IOP and gonioscopy
- More documentation the better
- Dilation stress test?
- Anterior segment imaging?

Pre-operative examination

- Informed consent

  Required for any surgical procedure

  Discuss procedure in layman's terms

  Discuss Risk/Benefit/Alternatives and elective nature of procedure

  Patient must wish to have procedure done.

So what are the Risks? And who should we avoid?

Risk of procedure

Inflammation

Elevated IOP (*Pigment storm!*)

Retinal detachments

- Don’t want to necessarily promise the IOP will go down, especially in NAG or PDS patients
- You will want to discuss the back up plan if things fail to improve

Who to avoid?

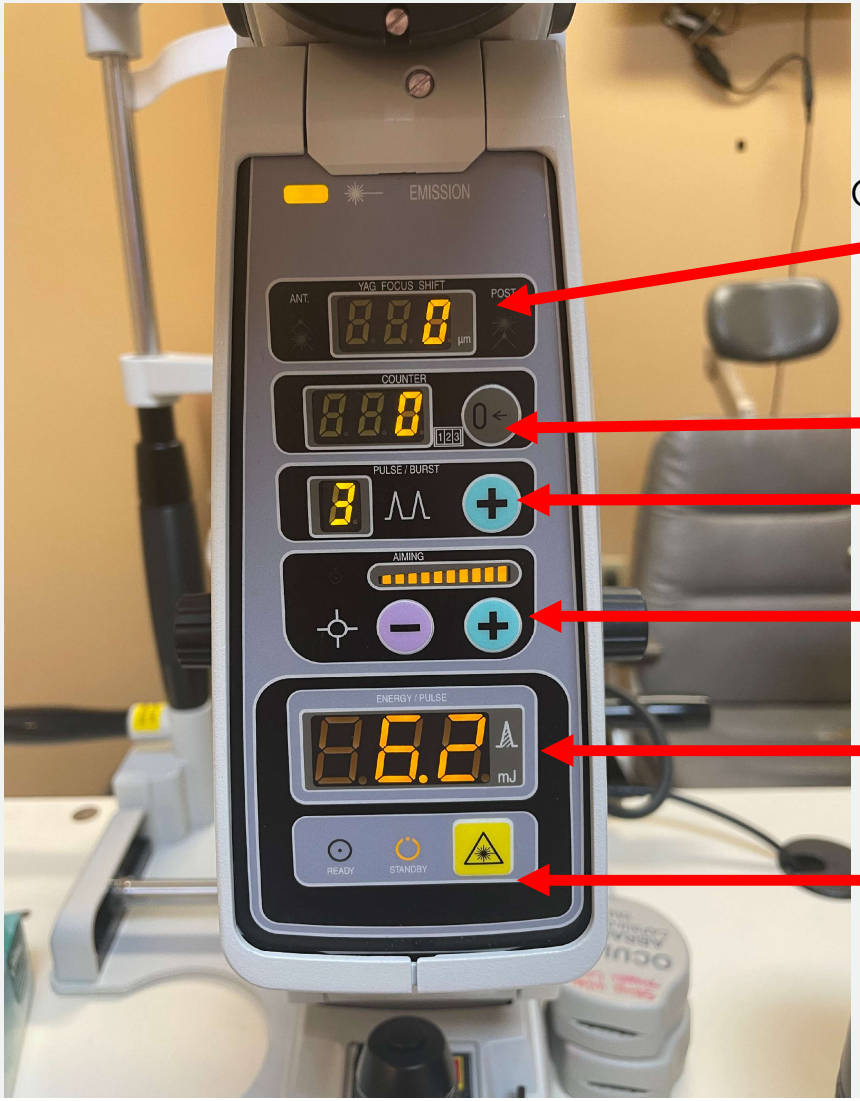
- Pigmentary Glaucoma – *Pigmentary Storm*!
- CACG with scattered PAS unless in crisis – *Pigmentary Storm*!
- Corneal Edema?
- Neovascular glaucoma
- Phacomorphic/Phacolytic glaucoma
- Uncooperative patient

Equipment

- Stand alone unit vs combination SLT/Yag Laser

  In clinic vs in surgery center?

The procedure



Offset (Anterior/Posterior)

Number of shots

Burst of shots

Aiming Beam

Energy per shot

Laser ready/Standby

The procedure

- Focusing lens

Stabilizes the eye

Less blinking

Less energy used

(need proparacaine + gel)

The procedure pre-op

1% or 2 % pilocarpine

Preoperative IOP lowering medicine

Starting Values (simply a suggestion)

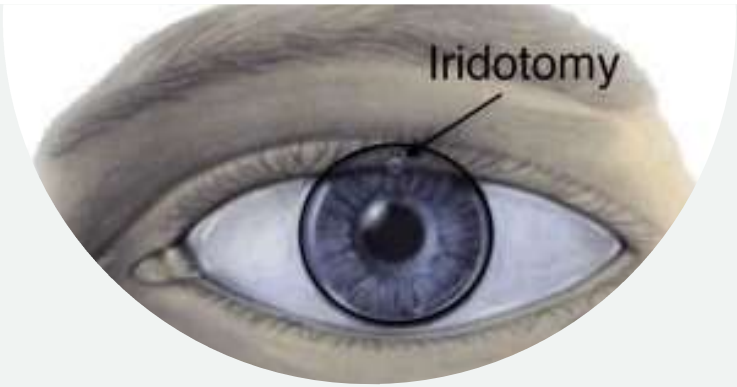
Offset (0 um)

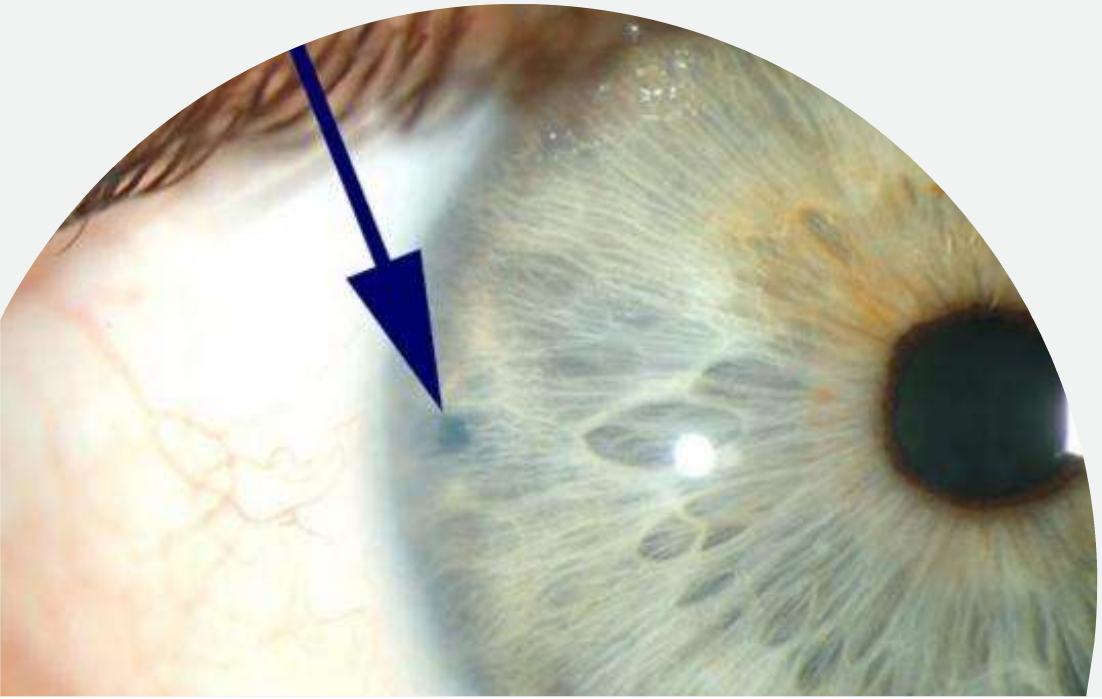
Burst (3 per shot)

Energy per shot (5-7mJ)

Light source in click

Prepare patient for a startling/snapping sensation, ensure they maintain pressure with there forehead





The procedure

- Arm laser
- Pull trigger to fire shot
- Aim for iris crypt, location matter?
- Continue until visible pigment plume indicates patency
- Size matters?

Post Op Instructions

Topical steroid QID for 1 week

Headache day of procedure is anticipated (partially from Pilocarpine)

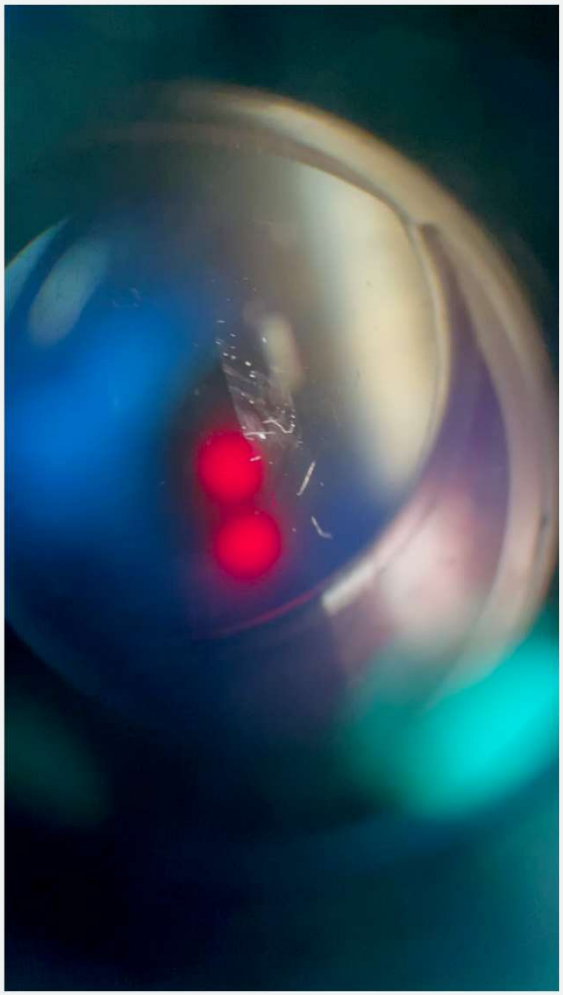
Vision generally improves in a few hours/next day

Non dilated follow up vs post op?

Gonio, imaging, dilation stress test?

Procedure note

- Medications used
- Equipment used (ie: Lens)
- Number of shots
- Energy range of shots
- Total Energy
- Complications?
- IOP check?
- Post operative drops administered?



Complications

- Elevated IOP (Acute vs Chronic)
- Hyphema
- Cornea Edema
- Uveitis
- Cystoid macular edema
- Retina tears/Detachments
- Dysphotopsia
- Angle fails to deepen

Billing

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Global period for procedure is 10 days

- exam gets -25 modifier on EM code
- second eye if within PO period gets -79 modifier

Billing

- Laser CPT code

  66761 – RT

  66761 – LT

  CPT 66761 Kentucky Medicare Reimbursement

  - Office $229 per eye

  - Surgery center $192 per eye

Billing

-54 Modifier – used when billing for procedure only

-55 Modifier – used when billing for post operative care only (must be done within the global period)

Example for a new patient level 4 exam with same day laser

(H40.031) 99204 – 25

(H40.011) 66821 – RT

Example for same patient second eye laser only

(H40.021) 66761 -79 – LT

Questions?

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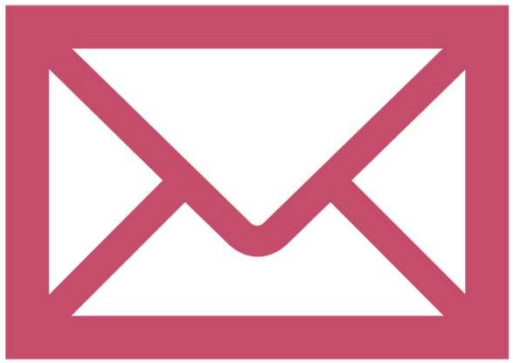
CHECK US OUT ON INSTRAGRAM
@Anterior_seg_rocks
@Retina_rocks



Clinical Pearls

- More power!
- Take breaks on thick irises
- Pre-treatment with Argon
- Know when to punt