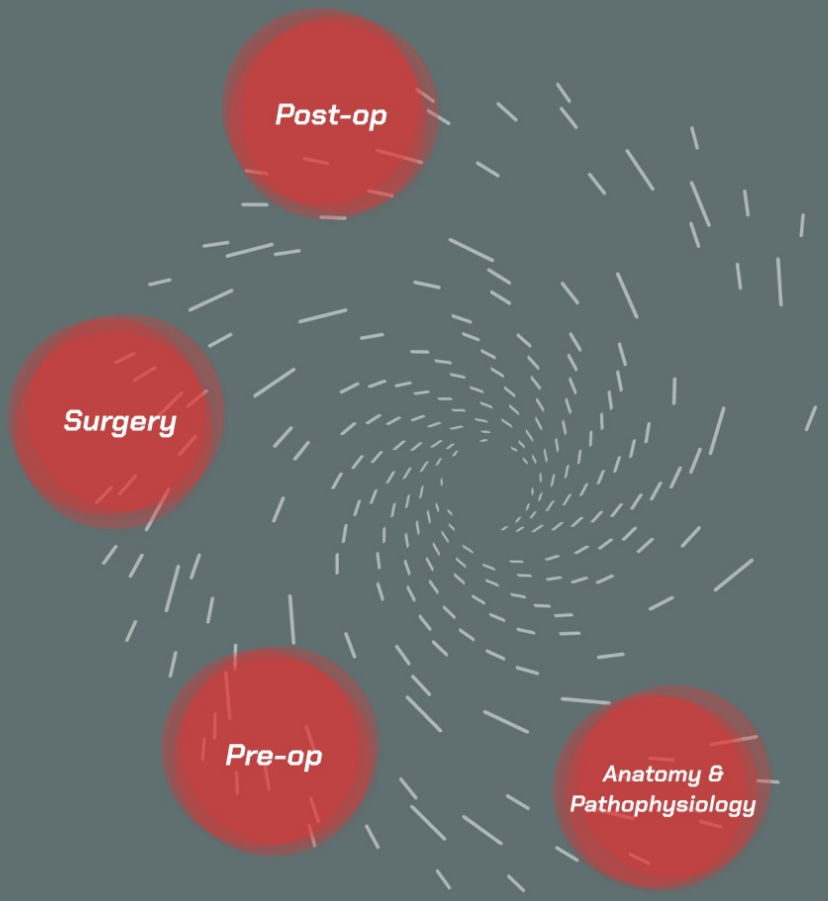
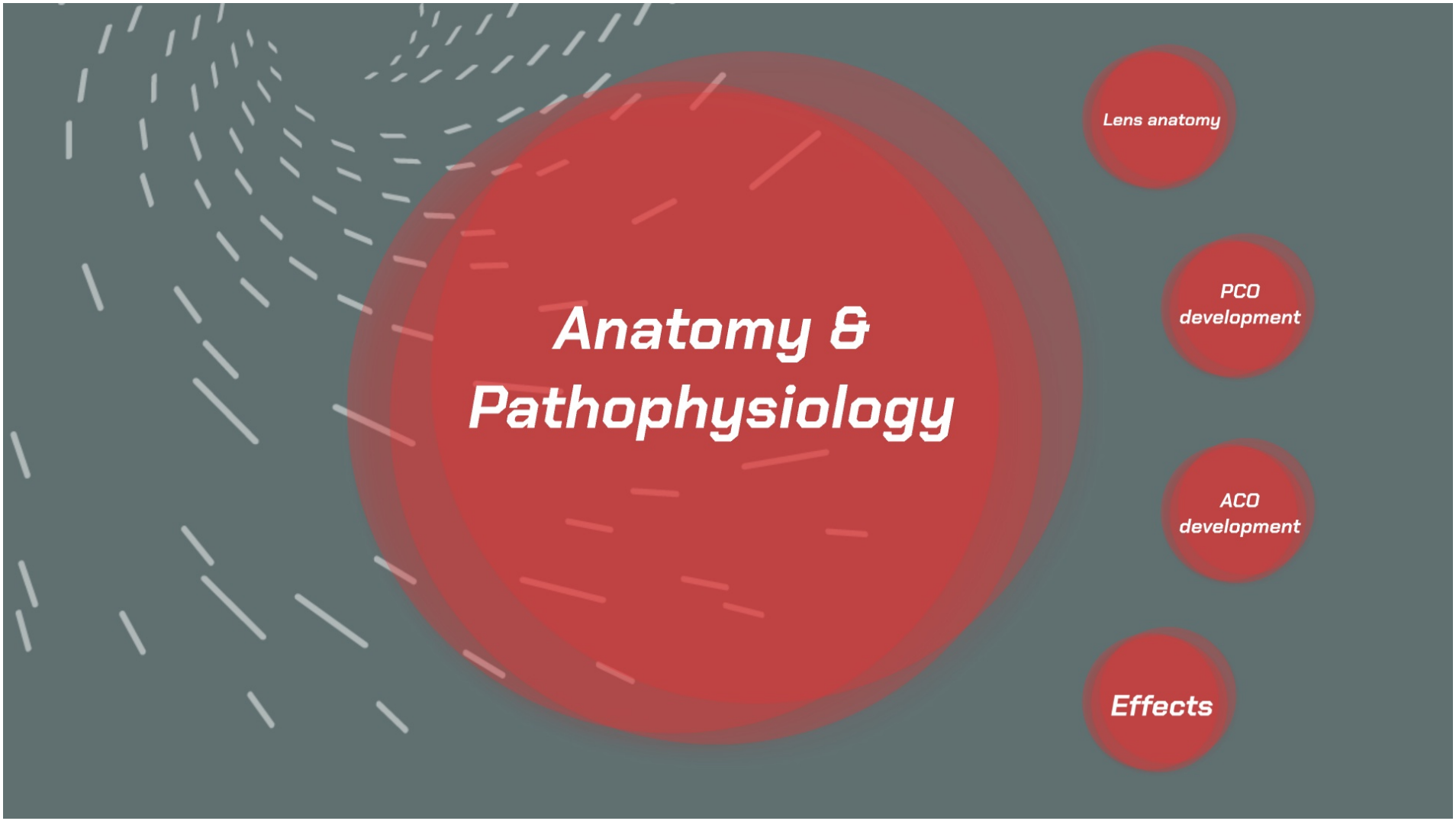


YAG Capsulotomy:

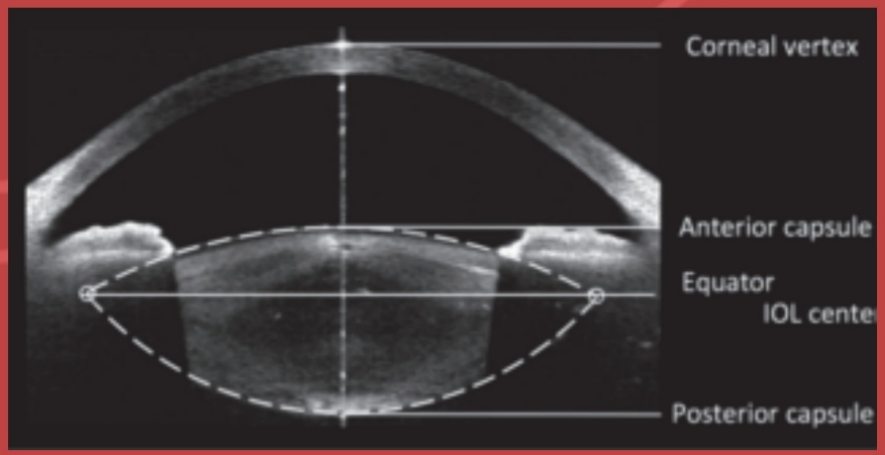
An Updated Introduction

COPE Course ID: 66712-LP
Qualified Credit: 1 hour(s)

Andrew J Steele, OD, FAAO
Bennett & Bloom Eye Centers

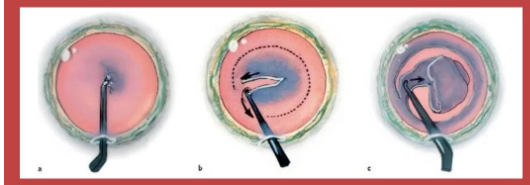

Anatomy &
Pathophysiology
Lens anatomy
PCO development
ACO development
Effects

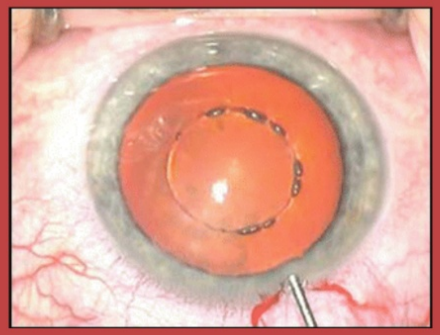
Lens anatomy



Capsule anatomy

- elastic bm secreted by epithelial cells
- type IV collagen
- thinnest at 2-4 microns (posterior pole)
- thickest 17-23 microns (equator)





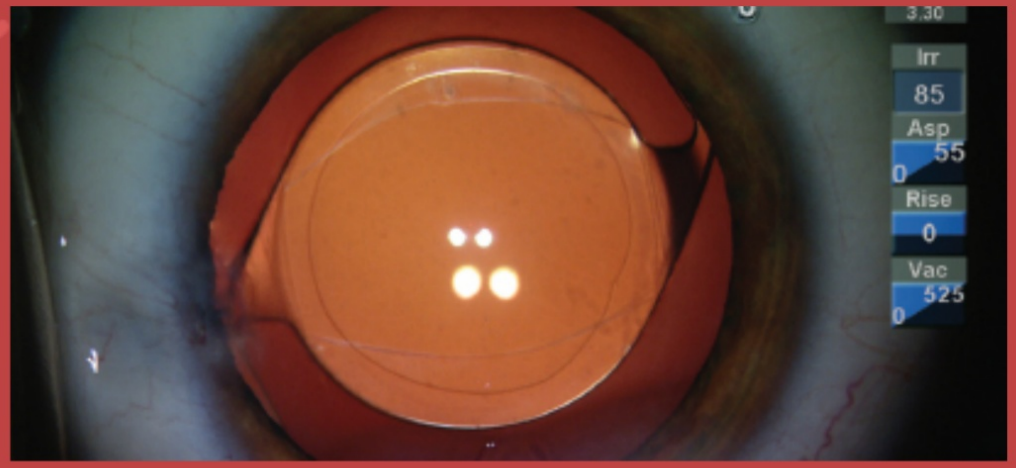
Anterior capsulorhexis (continuous curvilinear capsulorhexis-CCC)

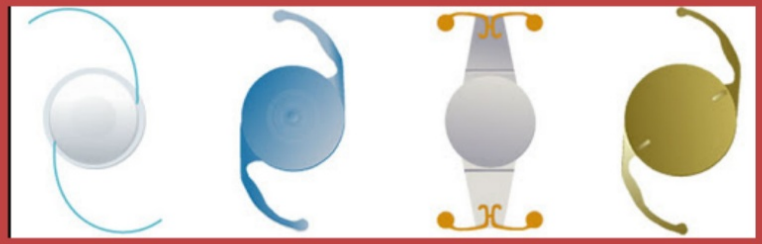
- various techniques (w/ visco)
- manual vs femtosecond laser

The IOL

Phacoemulsification -->

- IOL structure
  - 1 piece
  - 3 piece
  - plate
- IOL material
  - silicone (old)
  - acrylic
- IOL design
  - monofocal
  - toric
  - accomodating: crystalens
  - EDoF/multifocal/LAL/small aperture



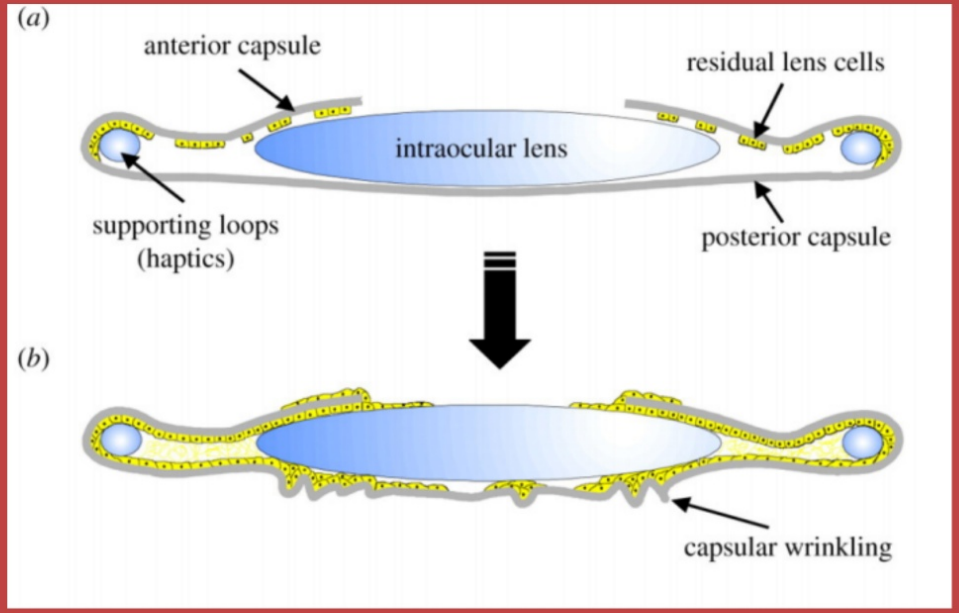


PCO pathophysiology

- Migration, proliferation and differentiation of lens epithelial cells(LEC) =opacification
  - "secondary cataract"

- Incidence
  - 5-50% (1/3 to 1/4)*
  - days to years
  - more common in younger
  - PSC, posterior-polor
  - lens design?
  - polish?

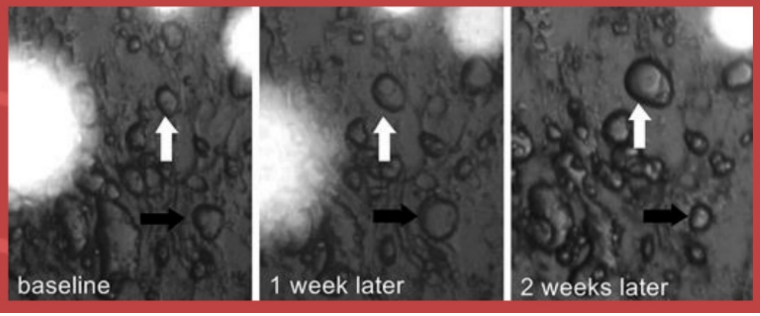
- Various "types"
  - Pearl
  - Fibrous
  - Striae
  - Turbid Fluid
  - Combination*



Pearl

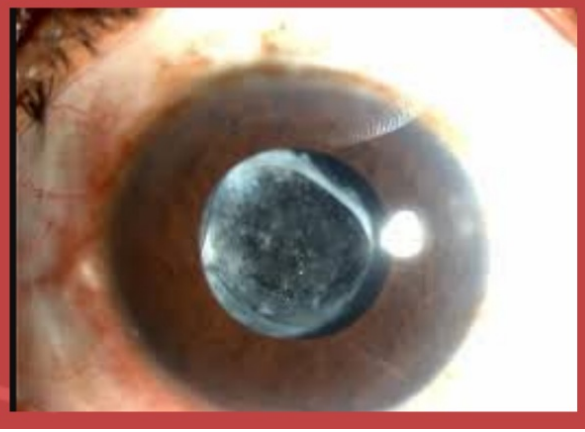
Elschnig's Pearls

- The LECs of the pre-equatorial zone = pearl PCO
- Clusters of swollen, opacified differentiated LECs called bladder or Wedl cells
- May contain fluid
- Rapid proliferation
- Can change size and shape quickly



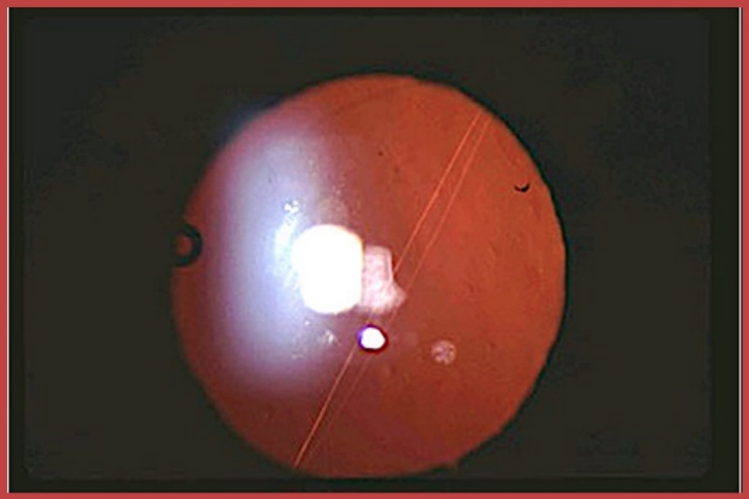
Fibrous

- The LECs that line the anterior capsule = fibrous PCO
- Occurs at the site of fusion of the anterior and posterior capsules
  - can cause contraction of the capsule
- Extracellular matrix (ECM) accumulation and the presence of elongated fibroblast cells

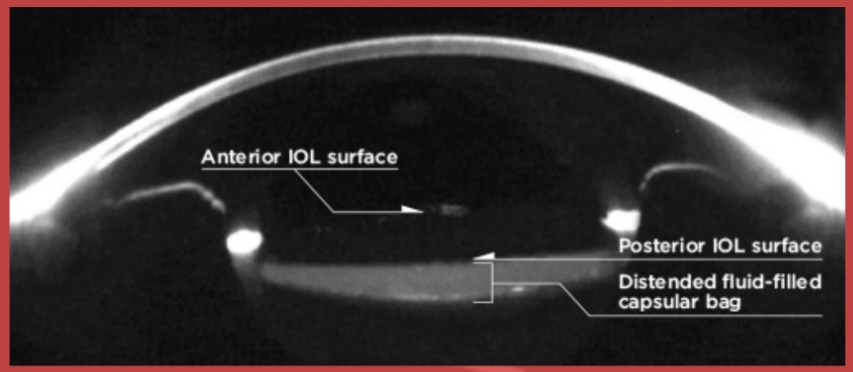


Striae/Folds/Wrinkles

- Striae appear to create a channel that allows epithelial cells to bypass the barrier created by the square-edge design of the IOL and migrate posteriorly in a linear pattern
- Form in a pattern parallel with haptics
- Can create maddox rod effects, glare
- Especially symptomatic in MF IOL



Turbid Fluid



- AKA Capsular Bag Distension Syndrome (CBDS)
- With or without refractive change, but often myopic shift
- 1% of cases
- Contraction of capsule creates a seal, trapping fluid which becomes opaque over time
- Retrolenticular psuedohypopyon
- Immediate or years

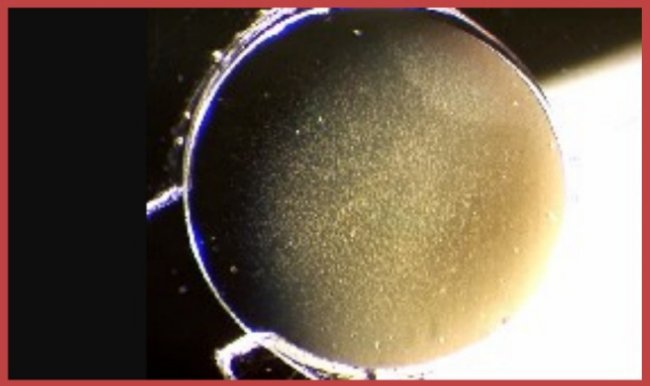
This is not PCO...

Calcified IOL

- Could happen with hydrogel/ hydrophilic IOLs
- Rare
- Requires IOL exchange

Glistenings

- Molded, acrylic IOLs
- Fluid-filled microvacuoles
- Temperature changes fill voids?
- Associated with higher power IOLs
- Negligible visual impact, possible increase in glare



PCO prevention

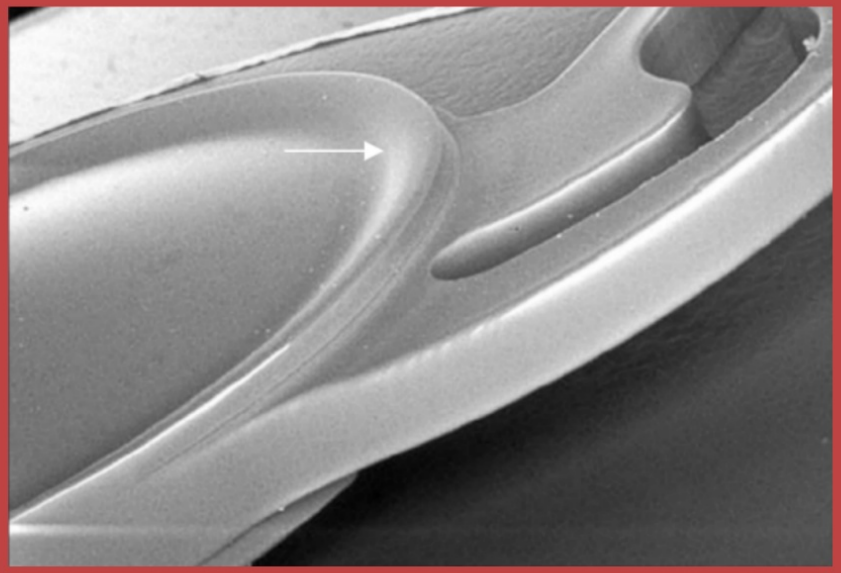
IOL design

- hydrophobic vs hydrophyllic
- Square/truncated edge design
- 3 piece vs 1 piece design

Surgical

- Hydrodissection-enhanced cortical cleanup, "polishing"
- A CCC diameter < IOL optic
- “In-the-bag” fixation of the posterior chamber IOL

"In terms of PCO prevention, the IOL design does the majority of the job."

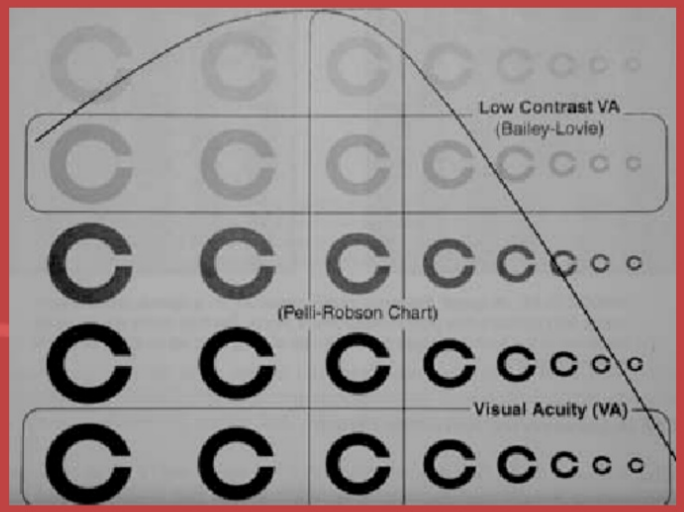


Anterior Capsule Phimosis

- AKA Anterior Capsule Contraction Syndrome
- Associated with the anterior capsulorohexis/CCC
- Anterior, cuboidal lens epithelial cell metaplasia with myofibroblastic transformation
- Weak zonules (pseduoexfoliation), inflammation, high myopes
- Usually occurs earlier than PCO
- Uncommonly obscures vision
  - < 4mm

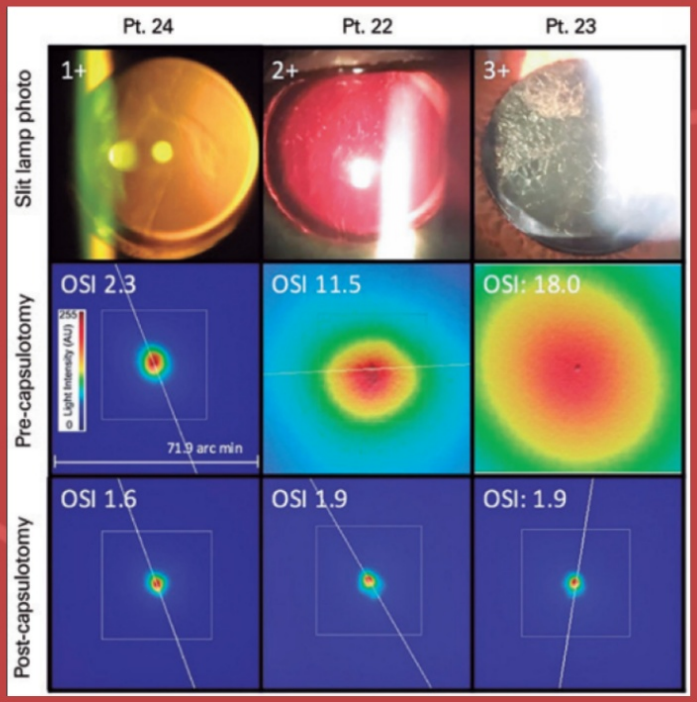
Effects on visual function

- Reduced visual acuity
- Increase glare
- Linear dysphotopsia
- Decreased contrast sensitiviy
- Reduced image quality



- Patients with multifocal lenes tend to have earlier loss of visual fucntion
- PCO may be more bothersome than cataracts with same VA

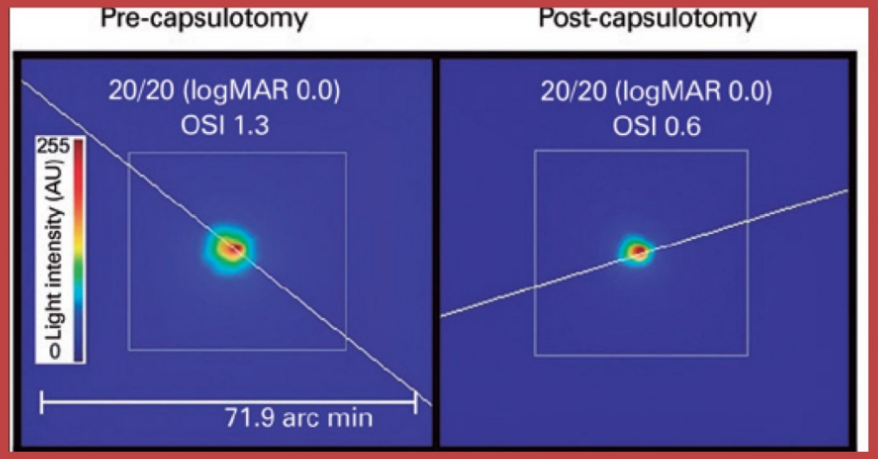
Image Quality

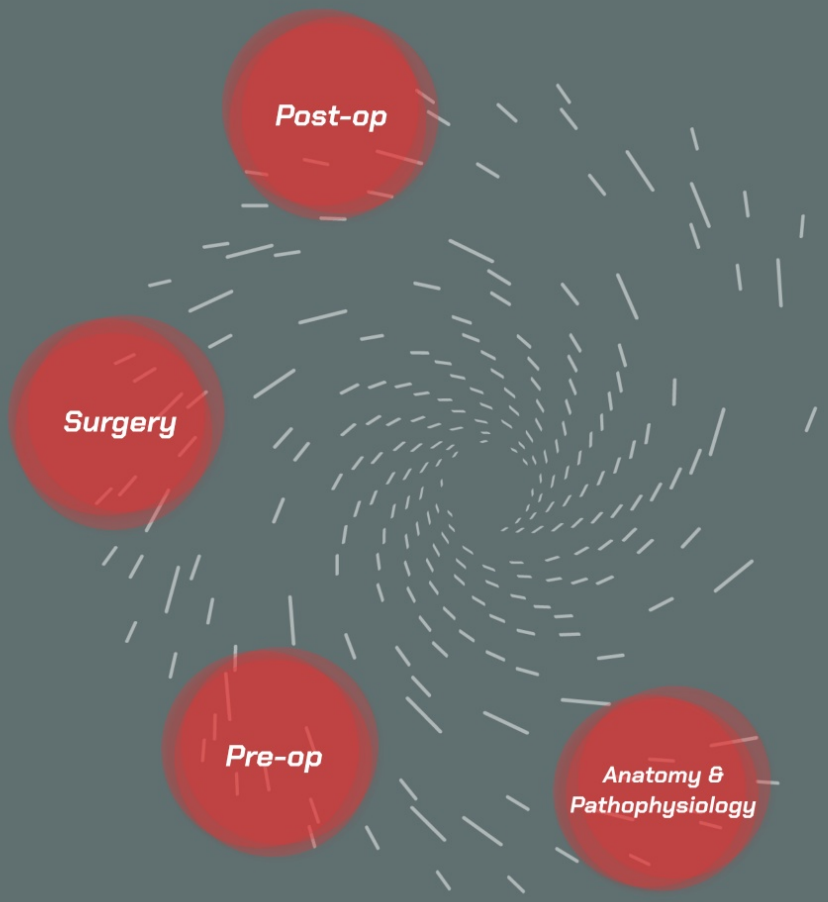


OSI=objective scatter index

Good visual acuity but complaints?

Remember, VA is a threshold--a single point on a graph. It's not descriptive of one's vision.



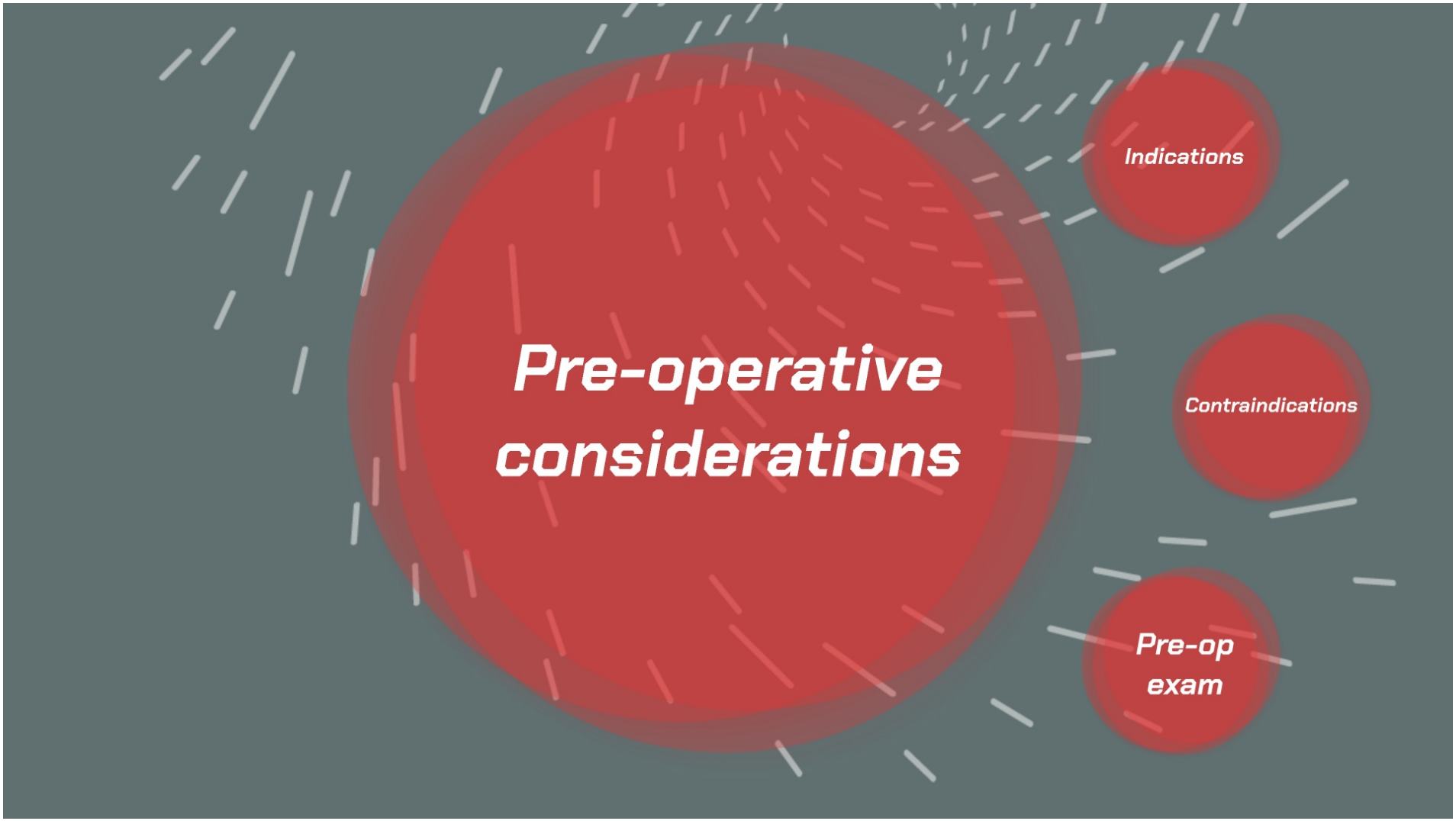


YAG Capsulotomy:

An Updated Introduction

COPE Course ID: 66712-LP
Qualified Credit: 1 hour(s)

Andrew J Steele, OD, FAAO
Bennett & Bloom Eye Centers


Pre-operative considerations
Indications
Contraindications
Pre-op exam

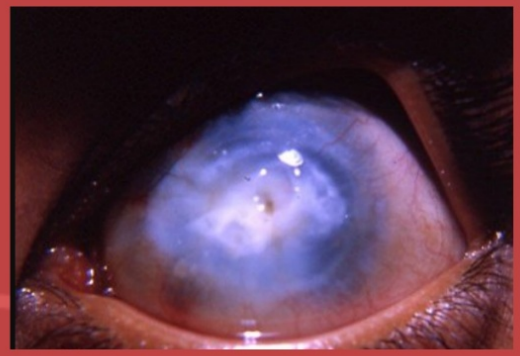
Indications

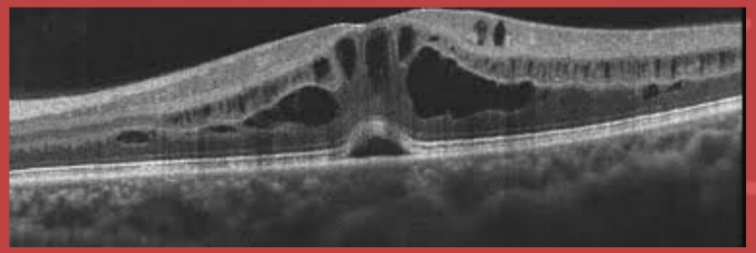
Local Coverage Determination--
Capsulotomy is covered when each of the following criteria are met and clearly documented:

- Functional complaint (reading, driving, etc.) NOT "blurry vision"
- BCVA 20/50 (distance or near) or glare testing reduces VA by at least two lines
  - 20/40 BCVA, glare 20/50: does not qualify
  - 20/20 BCVA, glare 20/30: qualifies
- Improvement in visual function expected with YAG capsulotomy
- The patient has been educated about the risks and benefits of capsulotomy and the alternative(s) to surgery (e.g., the avoidance of glare, use of optimal eyeglasses prescription, etc.)
- The patient has undergone an appropriate preoperative ophthalmologic evaluation.
- (3 months after surgery is typical minimum)

Contraindications (relative)

- Uveitis
- Macular edema
- Poor visibility/corneal opacity
- Poor cooperation
- Retinal tear/detachment risk?
- Unknown etiology of visual dysfunction
- Within 3 months of cataract surgery





Pre-operative ophthalmic examination

- History, CC (functional complaint)
- Visual acuity
- Refraction with determination of BCVA
  - glare testing
  - contrast sensitivity?
- IOP
- SLE
- DFE
  - PCO location, severity, presence of turbid fluid
  - other pathology, contraindications

- Diagnosis, assessment and plan
  - determination loss of visual function cause
  - determination that YAG capsulotomy would improve visual function

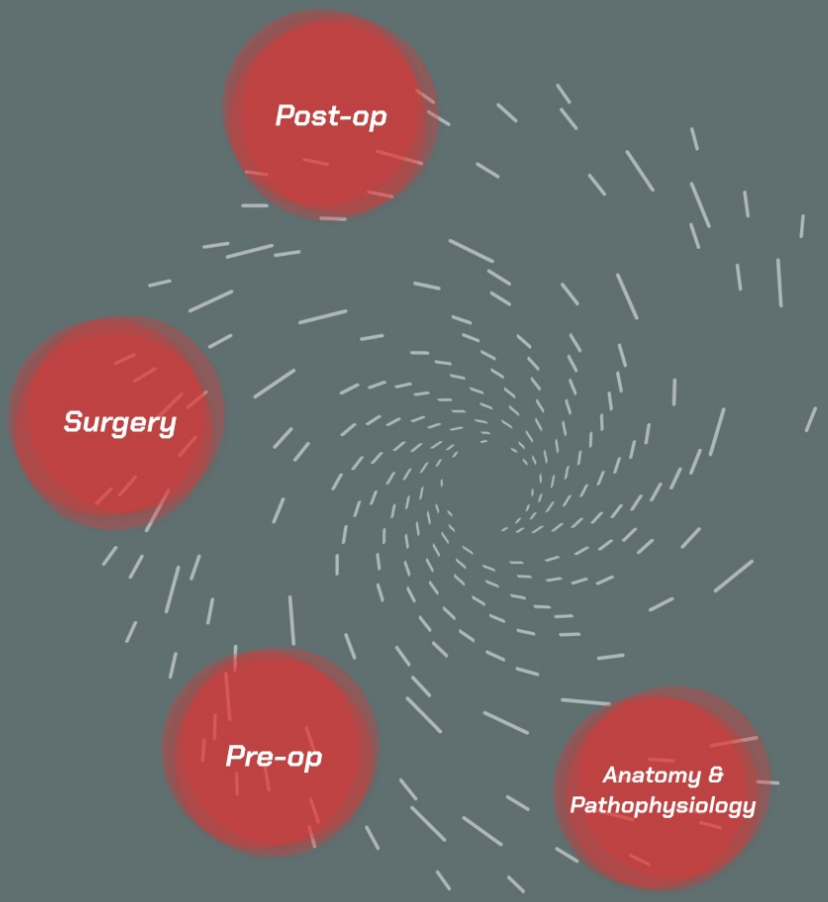
Medical Decision Making

Risks, benefits and alternatives explained to patient in terms they can understand

- -Risks: later...
- -Benefits: improved visual function, reducing/eliminating symptoms
- -Alternatives:
  - -essentially there are none; no other tx for PCO
  - -spectacles update?
  - -leave untreated?

Informed consent

- necessary for any procedure

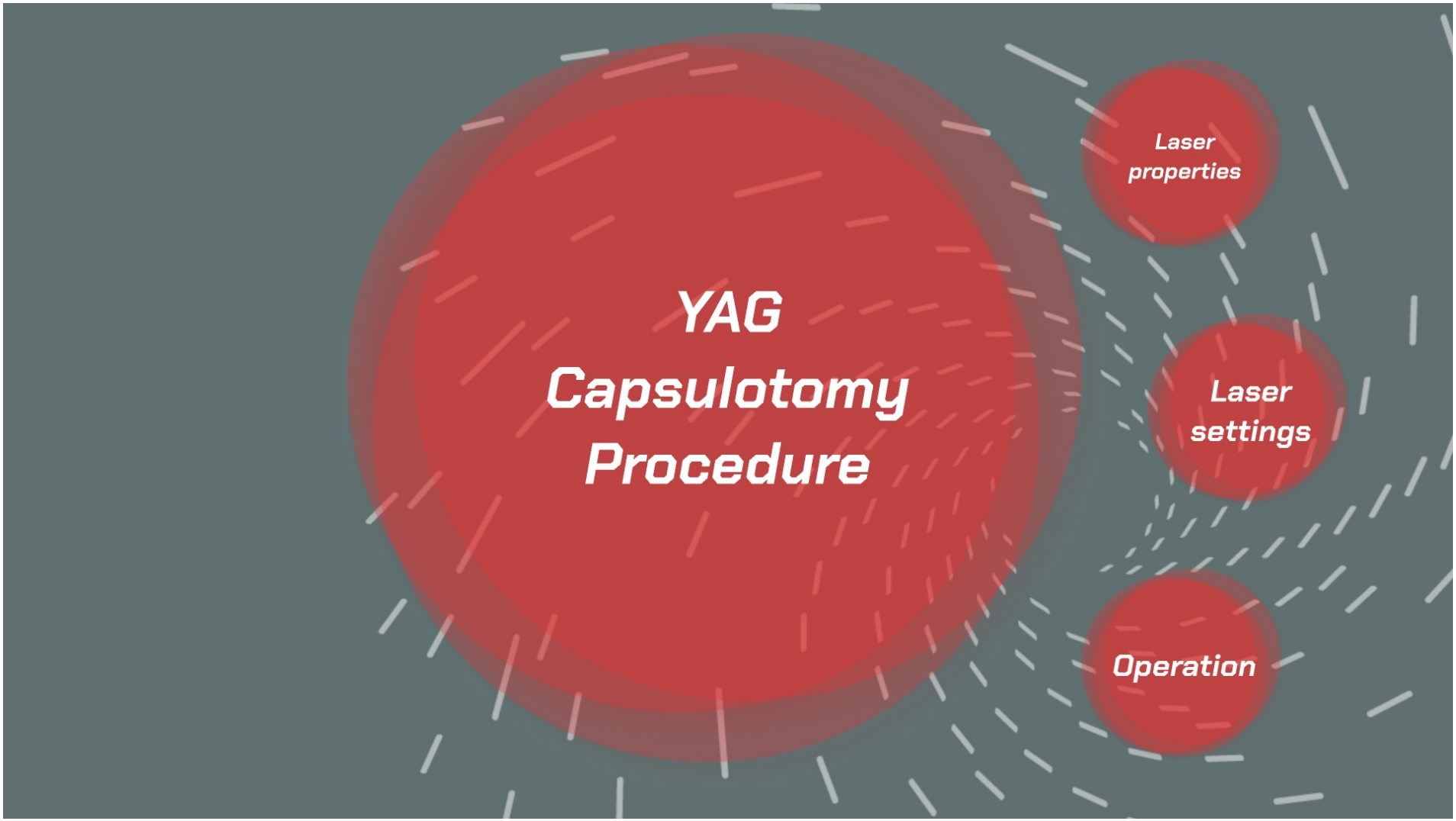


YAG Capsulotomy:

An Updated Introduction

COPE Course ID: 66712-LP
Qualified Credit: 1 hour(s)

Andrew J Steele, OD, FAAO
Bennett & Bloom Eye Centers


YAG
Capsulotomy
Procedure
Laser
properties
Laser
settings
Operation

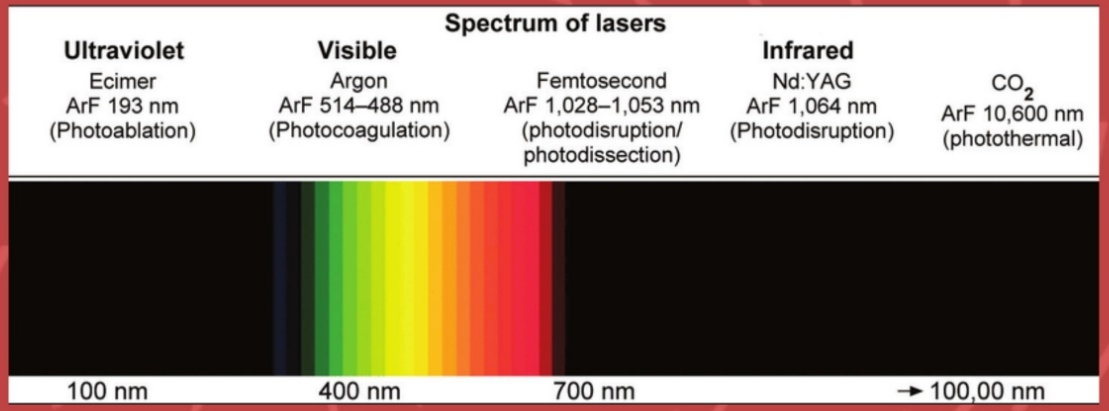
Nd: YAG

Neodymium-doped Yittrium Aluminum Garnet

- Wavelength determines which pigment/tissue will absorb energy
  - In general, longer wavelengths penetrate deeper
  - Ultraviolet: cornea (excimer 193um)
  - Green/yellow/red lasers: retina

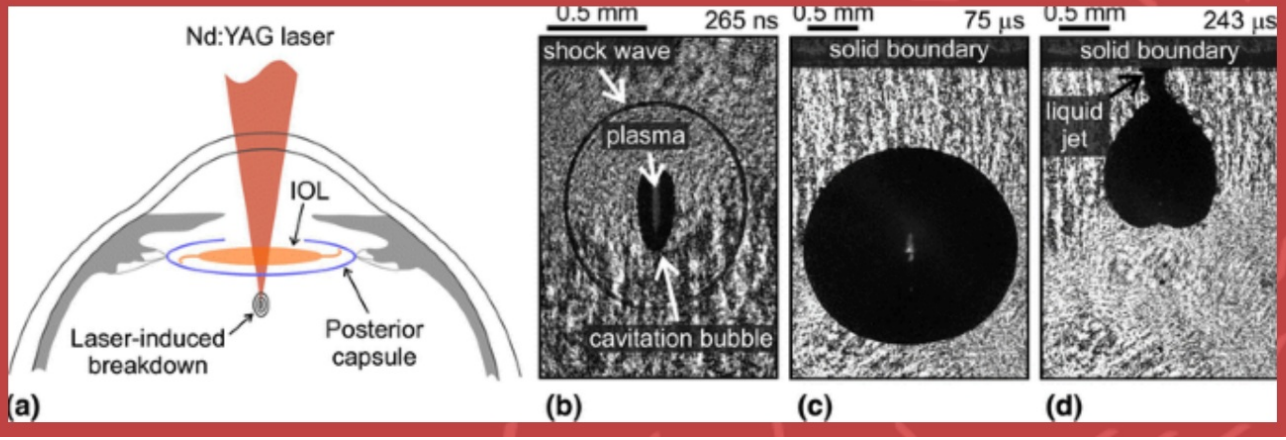
- Nd: YAG=Solid state laser
- 1064 nm output (infrared)
- 4 nanosecond pulse
- PHOTODISRUPTION

- Red Helium-Neon (HeNe) aiming beam (632nm)



Photodisruption

- Pigment independent
- High energy, small spot size, brief pulse duration 4 nanosecond, 15k degree celsius increase
- laser energy ---into plasma (optical breakdown)
- molecules are stripped of electrons = small "explosion": hydrodynamic waves and acoustic pulse TOWARD surgeon--NEEDS OFFSET



Laser Setup

Lens: Abraham Capsulotomy Lens (Center button, 66D)

- Concentrates laser energy
- Magnifies target tissue
- Controls blinking and eye movement

+ GenTeal Nighttime Gel, Systane Nighttime Gel
+ Goniovisc/Gonak (hypromellose) if the only option available
  -BAK, sticky, bubbles, blurry

YAG laser settings for (posterior) capsulotomy

-Spot Size: fixed
-Duration: fixed
-Offset: 250-500 microns POSTERIOR
  Personally prefer 300 microns
-Pulse/Burst: 1
-Energy: 1.5 mJ-3.0 mJ (0.3-10 mJ range)
  Personally prefer 2 mJ to start

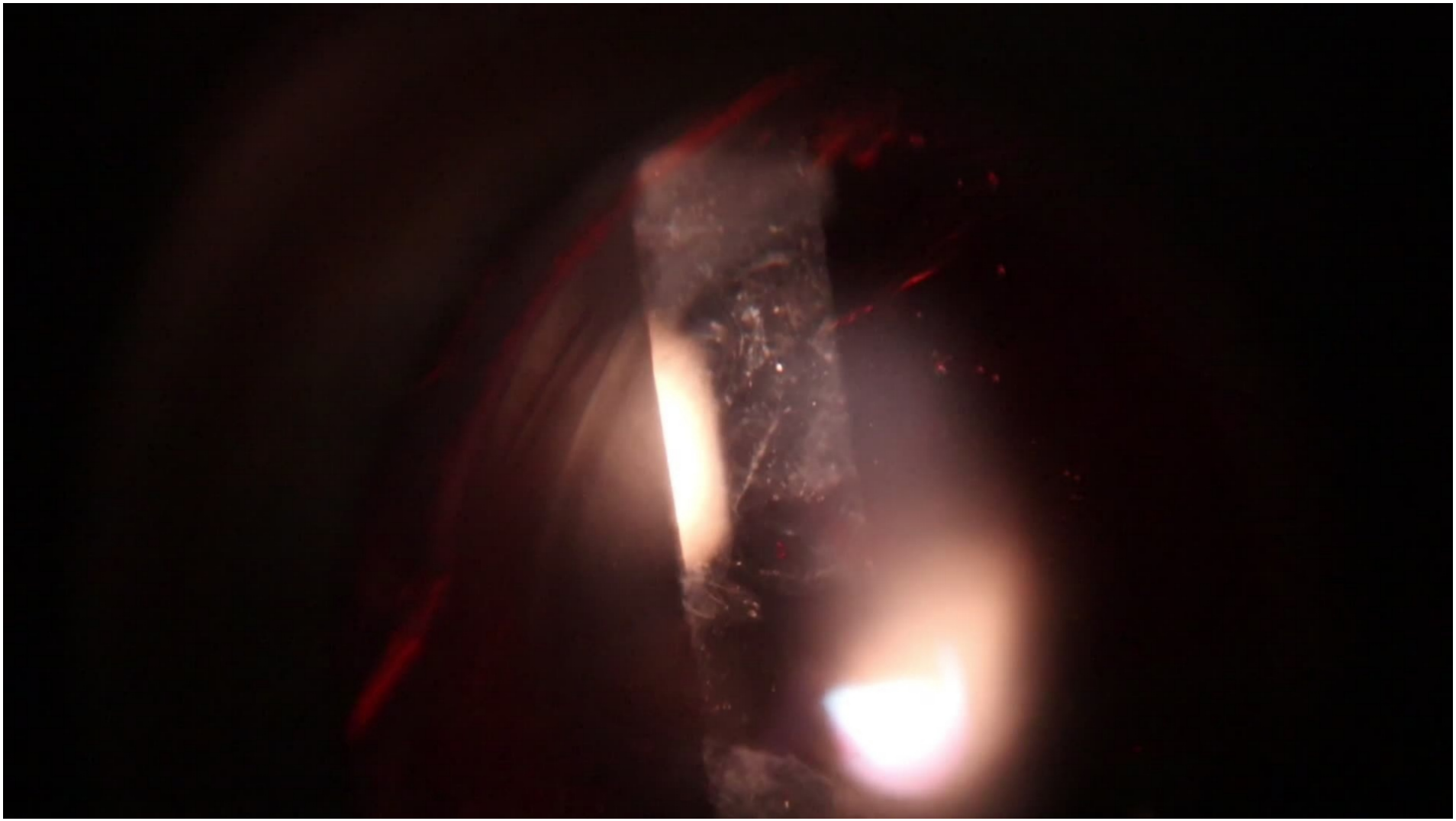
Posterior Capsulotomy

1. 30 minutes prior dilate patient with 1% tropicamide and 2.5% PE
2. Instill 1 drop proparacaine in BOTH EYES
3. Instill 1 drop of aproclonodine/brimonodine?
4. Position patient
    -ensure headrest adherence through entire procedure
    -alignment with guides
5. Surgeon position
    -oculars
    -arm rest
6. Place Abraham Lens
    -have patient look up, place in inferior fornix
    -have patient look at fixation target (green light)


300
21

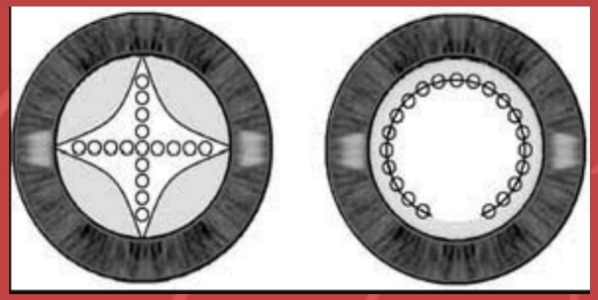
Posterior Capsulotomy

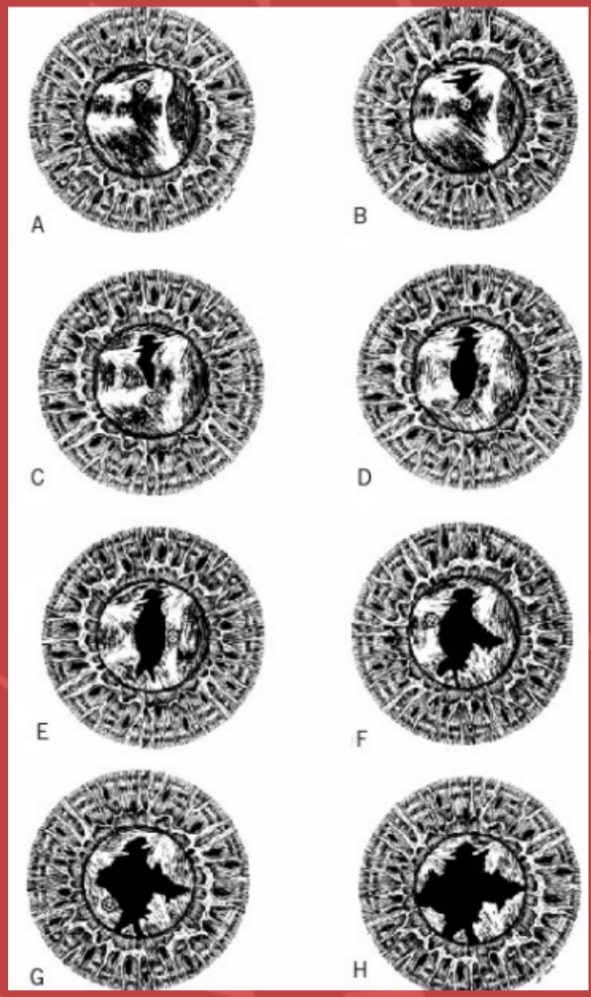
1. Focus HeNe beams carefully on capsule (if visible)
    - Avoid IOL, anterior hyloid
    - More challenging with MF lens
2. Switch laser to "ready" mode
3. Fire initial shot
    - 12 or 6?
    - Increase energy?
4. Follow desired pattern, eg. cruciate
    - Aim shots such that each break is continuous with the previous one
    - Rule of Thumb: Use lowest energy level and least number of shots possible to achieve desired tissue effect
5. Remove lens



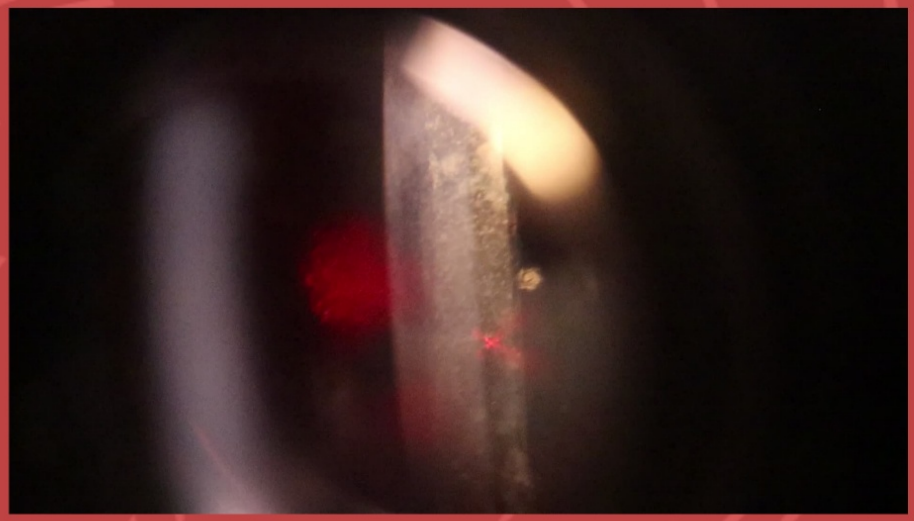
Patterns

- Cruciate
- Circular/Hinged
- Star/Hexagonal
- Combination
  - Start at 6
  - Cruciate pattern
  - Clean up edges

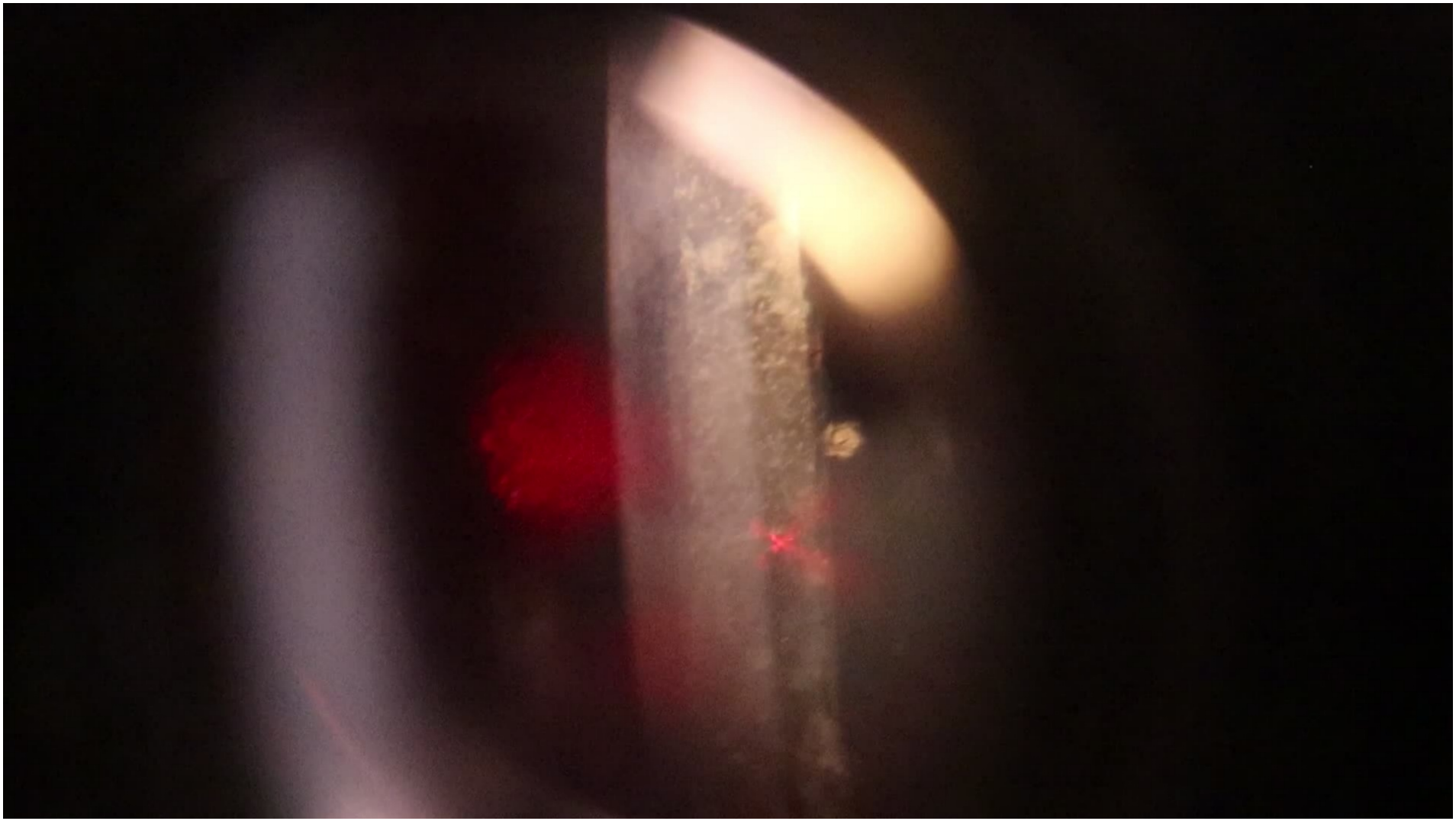




Pearls

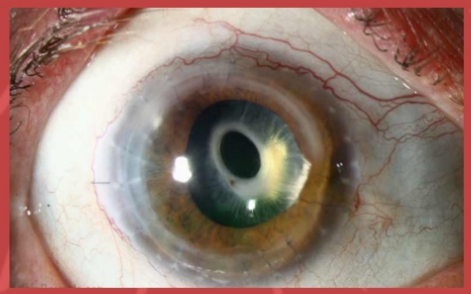


- Center Capsulotomy on Pupil, not IOL
- Avoid very dense fibrous tissue
- Open to at least undilated pupil size
- Clean edges, hanging capsule
- If turbid fluid present, first shot should be at 6
- Don't make capsulotomy larger than anterior capsulorhexis
- Don't treat passed edge of IOL, may cause vitreous prolapse
- TILT LENS! for better visibility and laser tissue interaction



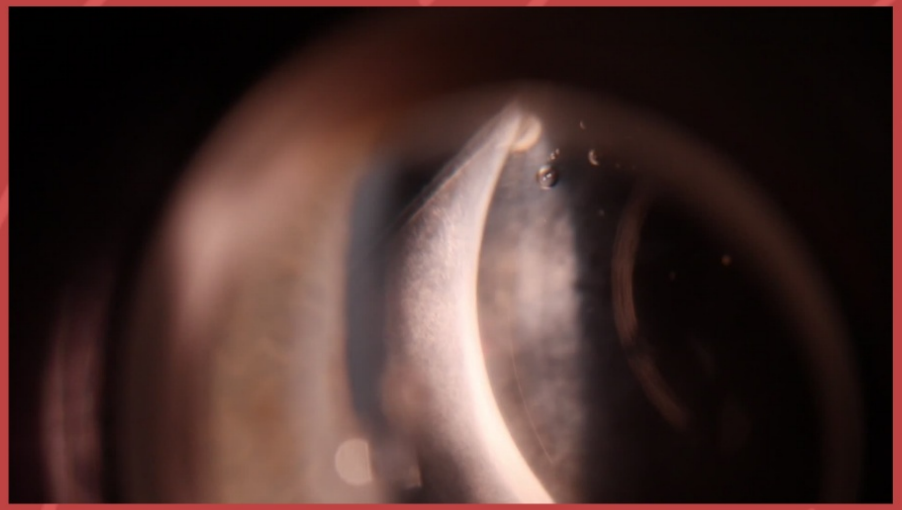
Anterior Capsulotomy

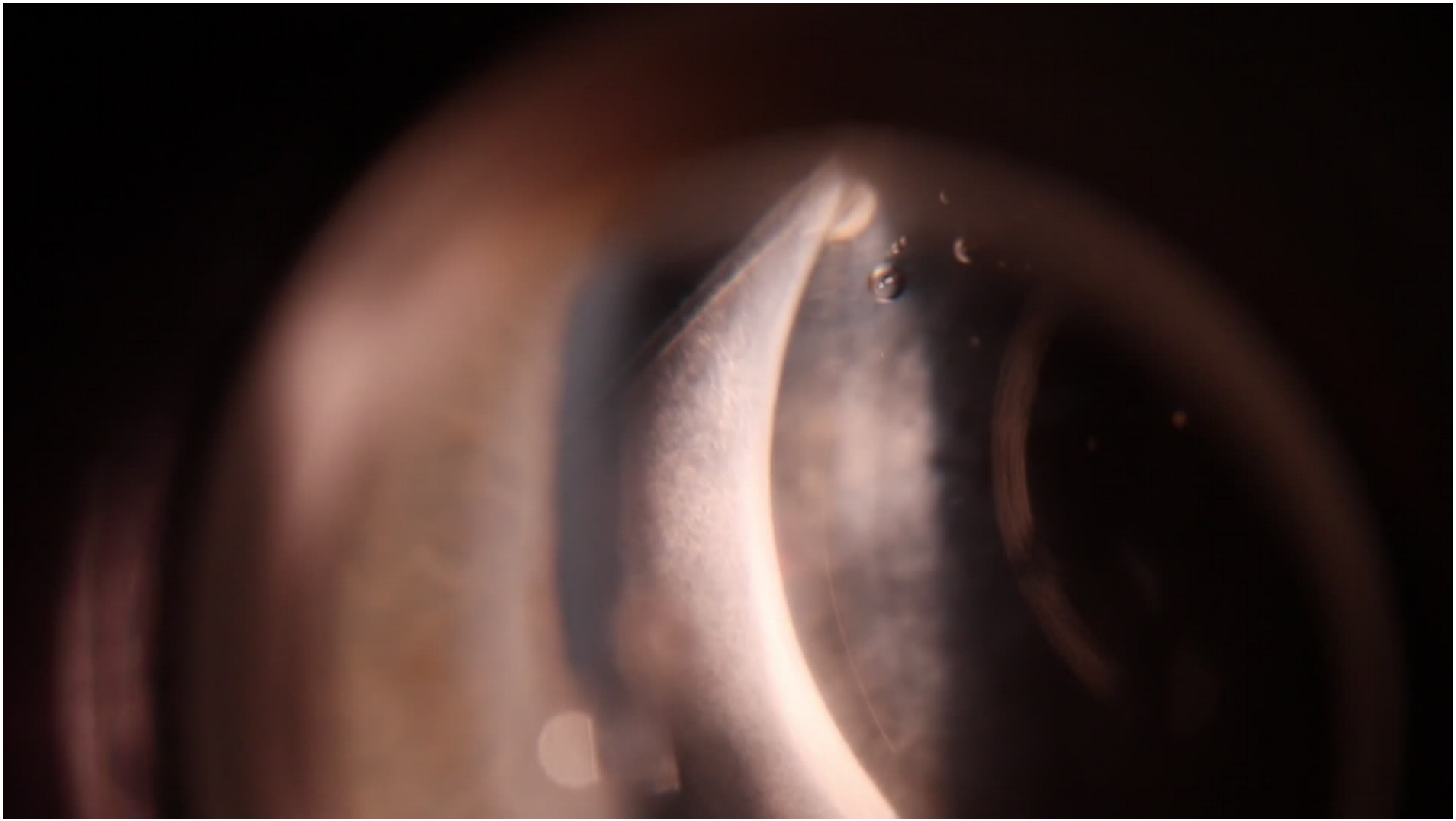
YAG laser settings for (anterior) capsulotomy
-Spot Size: fixed
-Duration: fixed
-Offset: 125 microns **ANTERIOR**
-Pulse/Burst: 1
-Energy: 1.5 mJ-3.0 mJ (0.3-10 mJ range)
Personally prefer 1.5 mJ to start

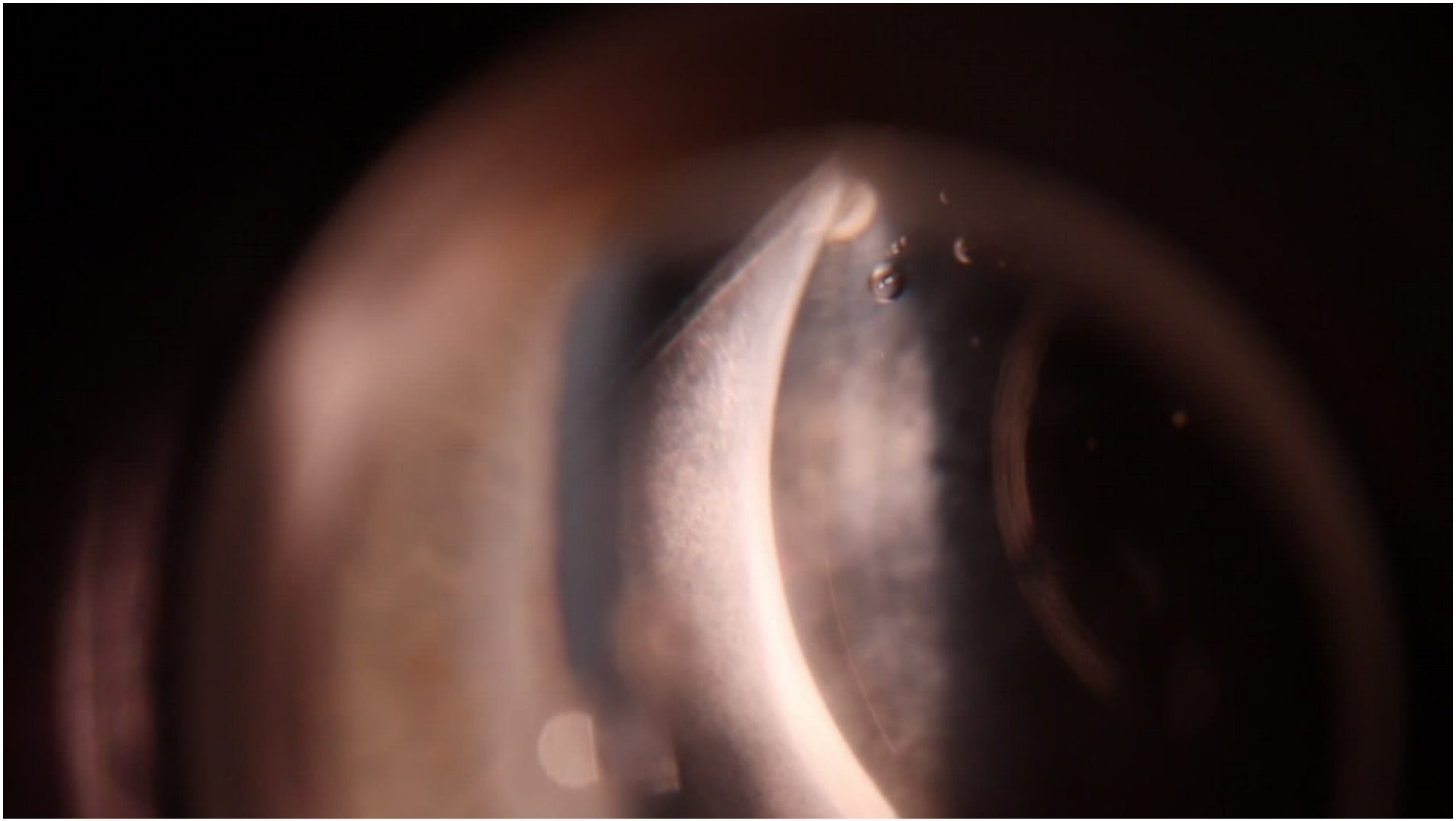


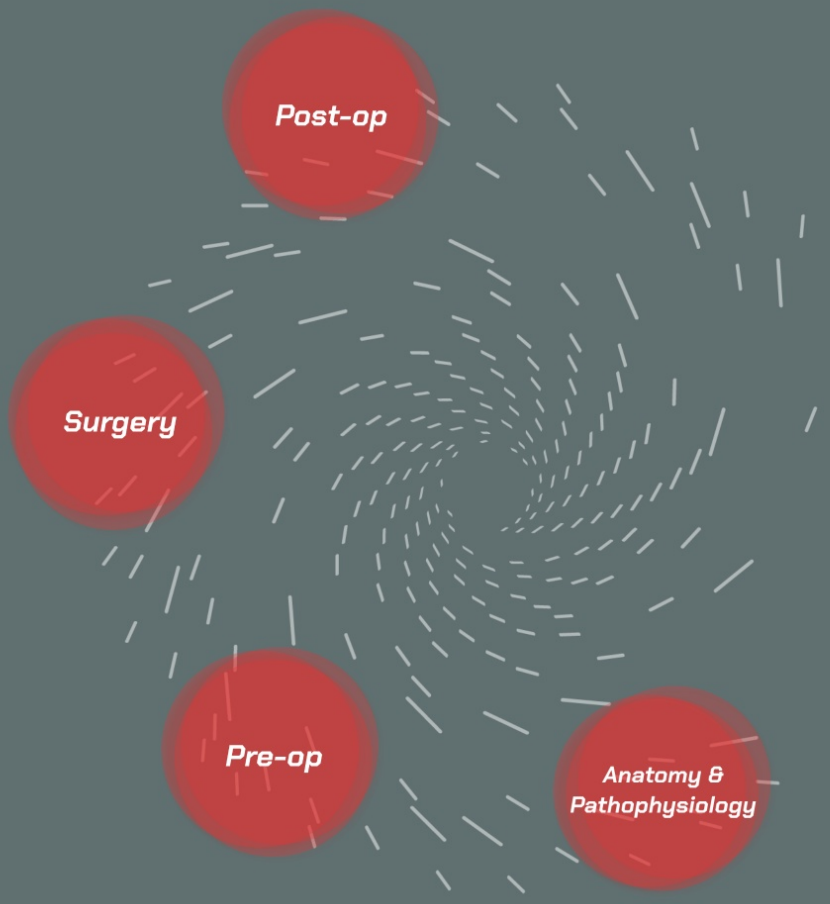
- Treat 12, 6, 3 and 9 clock hours so as to minimize lens dislocation
  eg. 1 shot at 12, next shot at 6. 1 shot at 3, next shot at 9.
- Cutting out a ring may deposit in the anterior chamber and increase IOP and inflammation
- Recommend that this be accomplished when phimosis has progressed to less than 4mm to prevent potential late zonular dehiscence.

Anterior Capsulotomy







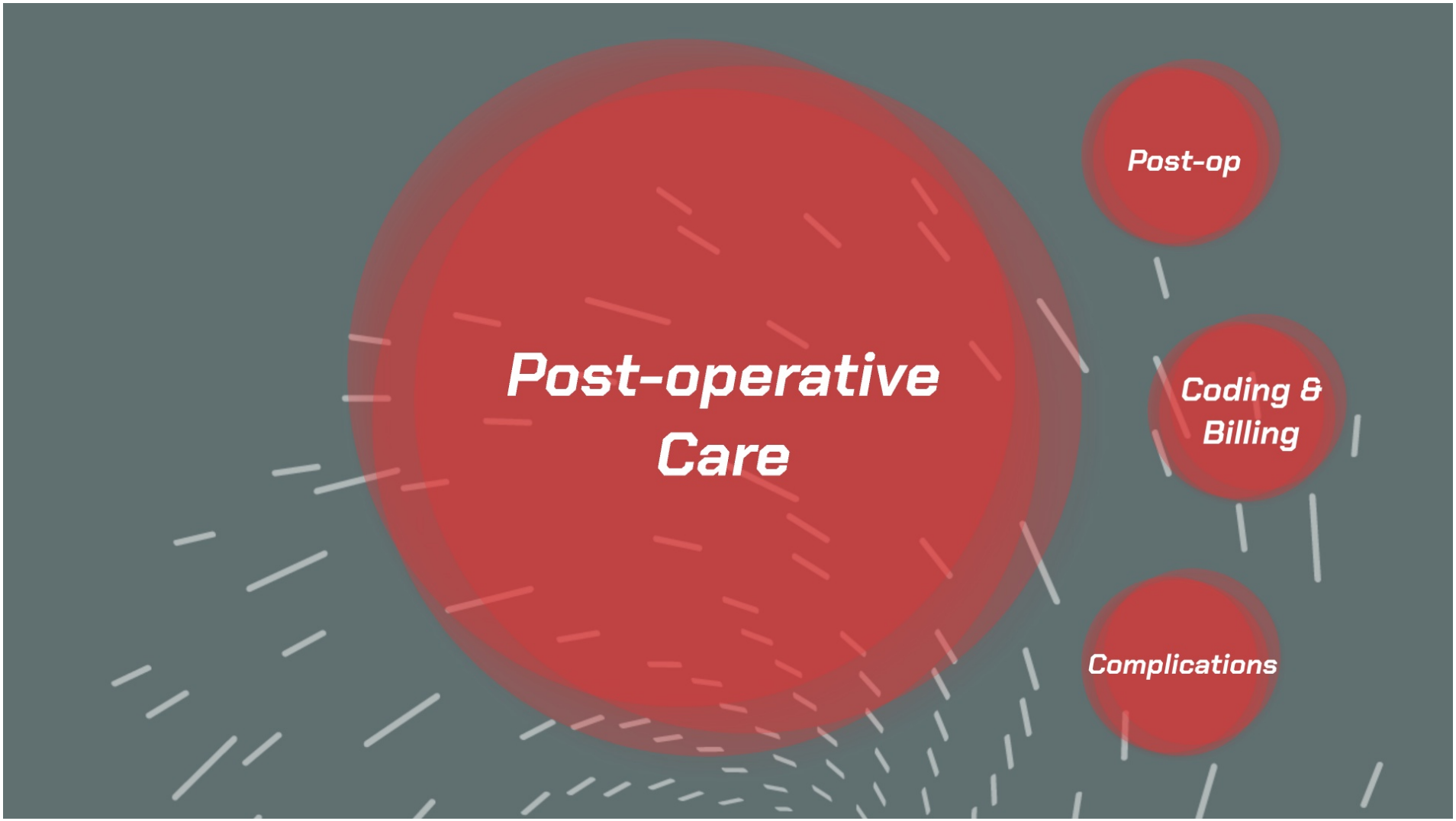


YAG Capsulotomy:

An Updated Introduction

COPE Course ID: 66712-LP
Qualified Credit: 1 hour(s)

Andrew J Steele, OD, FAAO
Bennett & Bloom Eye Centers


Post-operative Care
Post-op
Coding & Billing
Complications

Immediate post-operative care

1. Apply a drop of brimonodine 0.2%
2. Consider checking IOP 30-60 minutes later*
3. Post-operative instructions:
   -blurry, possibly scratchy today
   -floaters
   -symptoms of inflammation, IOP rise, retinal tear/RD
   -Drops:
      - Prednisolone QID x 1 week (prone to inflammation)
      - NSAID (ketorolac) TID x 3 days
   -Post-operative DFE in 1 week
3. Create post-operative note
   Document 1) Number of shots 2) Energy per shot 3) Total energy 4) How patient tolerated procedure 5) Post-operative instructions

Coding & Billing

ICD-10

H26.491, Other secondary cataract, Right Eye
H26.492, Other secondary cataract, Left Eye

CPT

66821-RT, LT, Laser capsulotomy

Global Period

90 day

Modifiers

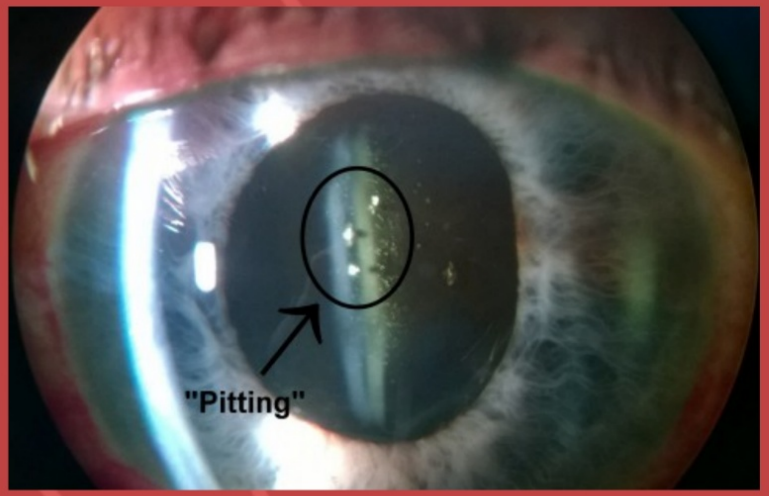
-57: Decision for surgery: an evaluation and management service made on day of or day before surgery
-79: Separate, unrelated E/M during post-operative period
e.g YAG cap on 2nd eye a week after the first

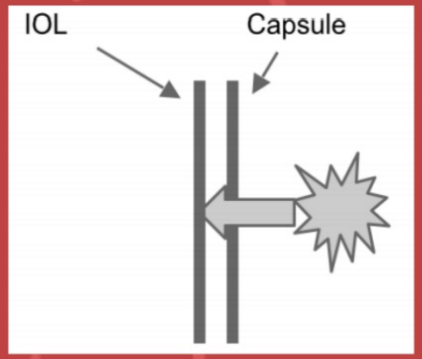
Co-management

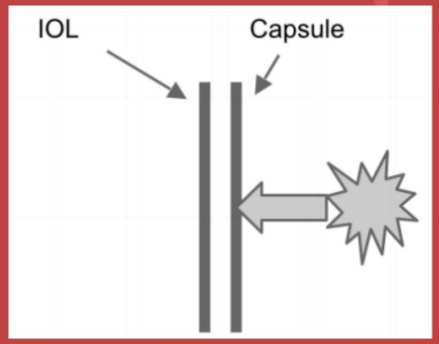
-54: Surgeon is billing for the procedure only
- 55: Post-operative care only
- Co-management fee is 20%

Complications

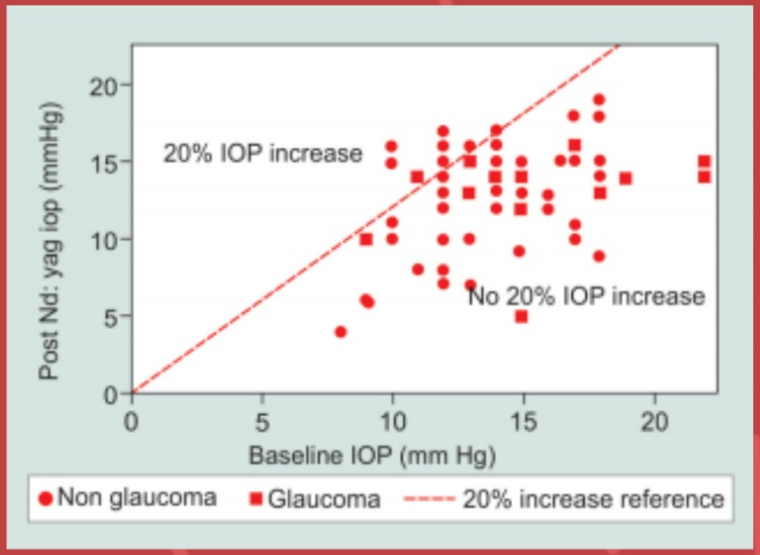
- Lens Pits
  - rarely visually significant
  - poor focus/offset/HEADREST!
  - worse in silicone vs acrylic
- Elevated IOP*
- Residual PCO
- Uvetis*
- Cystoid macular edema*
- Vitreous prolapse
  - when opening is too large
- Retinal tear or detachment*
- Propionibacterium acnes endophthalmitis*







Increase in IOP



Elevated IOP

- FDA cohort of 213 patients
- 39% had IOP spike (>5mmHg) 1-6 hrs postop
- None treated with prophylactic hypotensives
-1985!

- ***Intraocular Pressure Spikes following Neodymium-doped Yttrium Aluminum Garnet Laser Capsulotomy: Current Prevalence and Management in Israel, 2017***
  - 87 eyes (75 patients)
  -All patients had prophylactic apraclonidine
  -No patient reached IOP values above 21 mmHg
  "Perhaps routine measurement of IOP following primary Nd:YAG laser may be reserved for high-risk patients only."

Uveitis

Uveitis

- low incidence
- energy dependent
- prone individuals, realtive contraindication

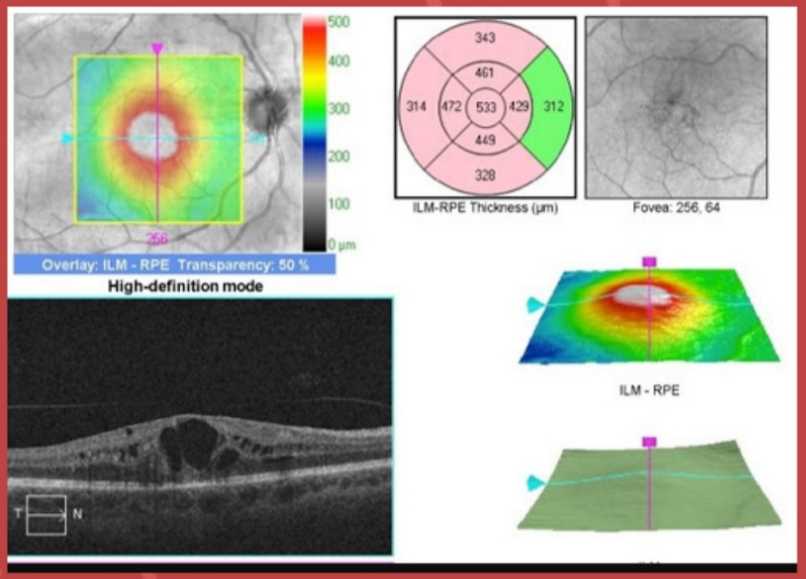
The Incidence of Iritis and the Use of Topical Anti-inflammatory Drops after Nd:YAG Posterior Capsulotomy, 2002

- Retrospective chart review of 73 eyes
- Only 1 had induced uveitis
- Conclusion: use of topical anti-inflammatories routinely not warranted unless previous evidence of intraocular inflammation or greater than 100 mJ of total energy

Cystoid Macular Edema

- Retrospective chart review, 1991
  - 897 Nd:YAG laser posterior capsulotomies
  - 11 patients (1.23%; 95% confidence interval, 0.51% to 1.95%) developed cystoid macular edema

- AAO reports CME develops in 0.55% to 2.5% of eyes following Nd:YAG laser posterior capsulotomy. CME may occur between 3 weeks and 11 months after the capsulotomy.



Retinal tear or detachment

- Possibly leading risk factor considered when deciding to perform YAG capsulotomy
- Historically quote patients: "2% risk"

Rate of retinal tear and detachment after neodymium:YAG capsulotomy.

2017

0.87% retinal detachment rate

Does Nd: YAG Capsulotomy Increase the Risk of Retinal Detahcment?

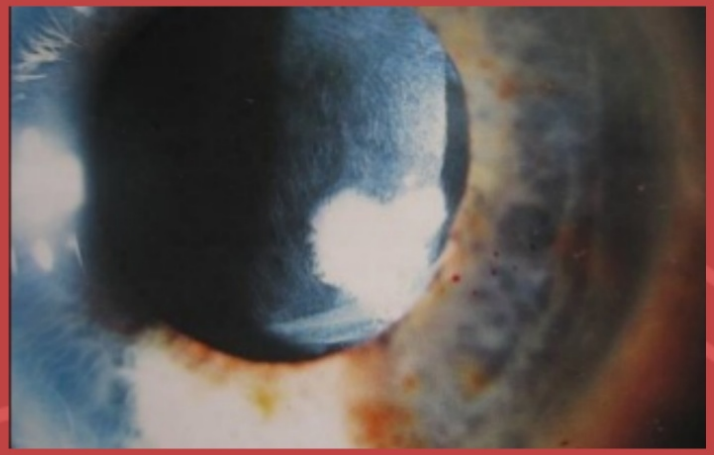
2018, comprehensive literature analysis

"Myopic pateints should be treated with caution, as it cannot be concluded that Nd: YAG capsulotomy does not increae RD rate in this cohort."

"...no convincing evidence supporting the association between Nd:YAG capsulotomy and increased risk for developing RD."

“Rather, coincidence with the natural history of retinal detachment plays a bigger role than stresses induced at the time of capsulotomy”

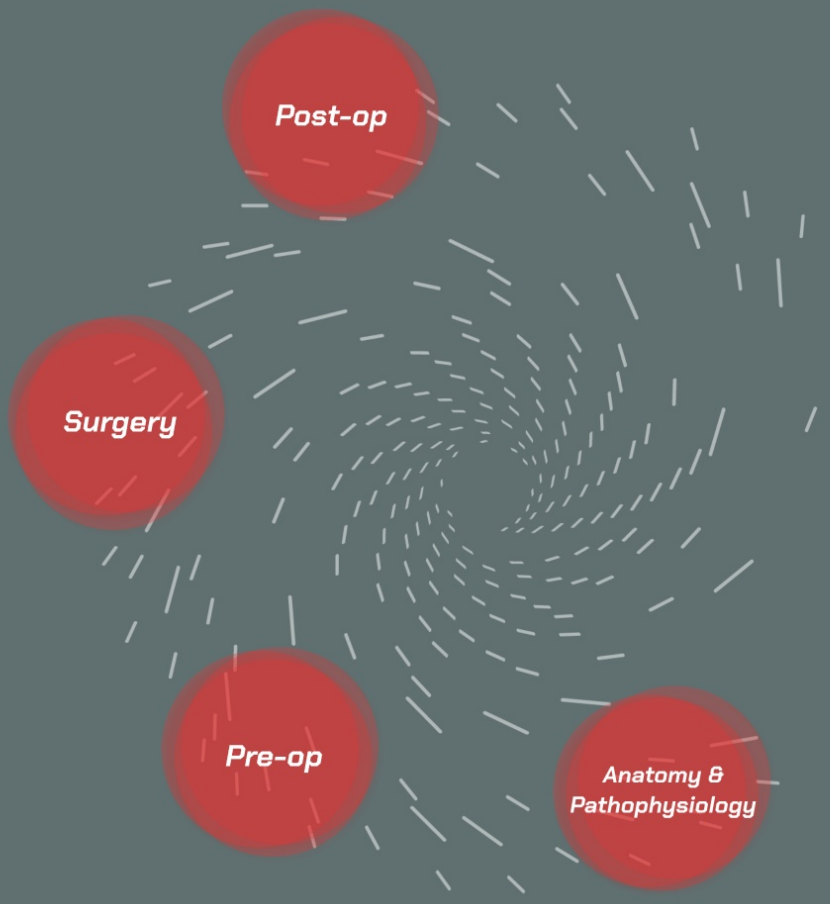
Enophthalmitis?!



- Extremely rare, incidence?
- Endophthalmitis caused from Propionibacterium acnes
- Suspected to be held within or on capsule as a "cheesy appearing plaque"
- The capsulotomy is presumed to have created opportunity for organisms within the capsule to reach the vitreous and develop into endophthalmitis.
- Cases have been reported to response with steroids and fortified injected antibiotics without vitrectomy, achieving 20/25 VA.

Questions?

Andrew J Steele, OD, FAAO
Bennett & Bloom Eye Centers
andrewjosephsteele@gmail.com



YAG Capsulotomy:

An Updated Introduction

COPE Course ID: 66712-LP
Qualified Credit: 1 hour(s)

Andrew J Steele, OD, FAAO
Bennett & Bloom Eye Centers