Anterior Segment Lasers in Optometric Practice

BRAD SUTTON, OD, FAAO

CLINICAL PROFESSOR, INDIANA UNIVERSITY SCHOOL OF OPTOMETRY

SERVICE CHIEF, INDIANAPOLIS EYE CARE CENTER

Disclosures

- No financial disclosures

Laser basics

- LASER stands for…….
- Light
- Amplification by
- Stimulated
- Emission of
- Radiation

- Typically collimated, monochromatic and coherent light
- In eye care, we mostly use Argon (front and back of the eye), Excimer (cornea), and Neodymium YAG (front of the eye) lasers. Others too.

Laser basics

- Four classes of laser hazard level

- Class 1: safe regardless of exposure
- Class 2: low risk and safe to the eye as long as a normal aversion response exists
- Class 3: Moderate risk and can damage eyes with an aversion response
- Class 4: burns eyes and skin

Laser basics

- When laser light encounters tissue, it can either be……..
  - Reflected
  - Transmitted
  - Scattered
  - Absorbed

- Photons must be absorbed to have an effect on the tissue
- Wavelength of laser light determines penetration in to the eye
- Visible light and near infrared (A) make it to the retina

YAG capsulotomy, LPI, and SLT commonalities

- Quality informed consent is very important for all procedures
- It should contain…….
- The condition involved and the nature of the procedure
- The expected benefits
- The expected risks
- The alternatives
- Should have:
- Name of the practitioner performing the procedure
- A date and time
- A witness with a date and time

Laser procedure commonalities

- Mini-physical

- Document allergies and medications: likely already in record
- Blood pressure
- Pulse
- Possibly respiration and temperature

- Bring a driver for all anterior segment laser procedures

Documentation

- Pre-op

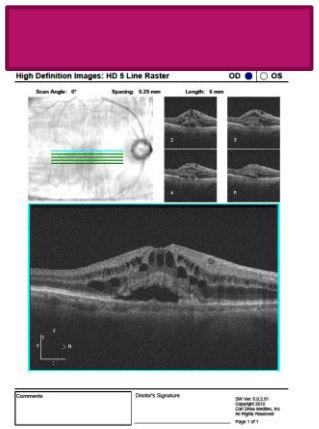
- Appropriate examination with all findings and any appropriate pre-tests. Be sure to document well any co-morbidities that could affect success (PCO with concomitant AMD, for example)

- Post-op

- Power level used
- Total number of shots
- Energy delivered (power x # of shots)
- How tolerated / any complications
- Peri-procedure drops instilled
- For SLT, also area of angle treated (360, superior 180, etc)

YAG posterior capsulotomy

- Posterior capsular opacification after cataract surgery
- Rate of about 14-18% with modern cataract surgery techniques (most common post-operative complication)
- Much higher rate in younger patients, essentially 100% in the very young (can consider primary surgical posterior capsulotomy)
- Rate decreases with age

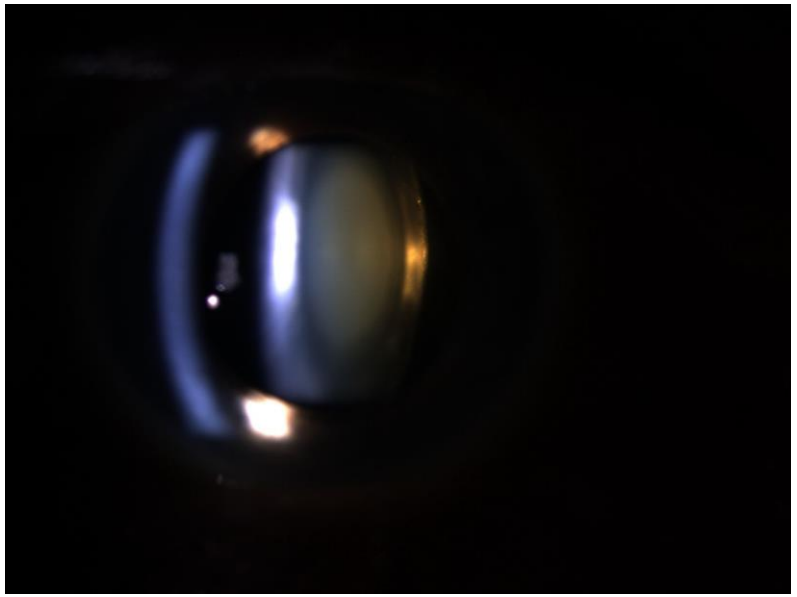


- Why not perform primary posterior surgical capsulotomy in everyone?

- Increased risk of RD
- Increased risk of CME
- Increased risk of vitreal prolapse

PCO

- So what decreases the risk of PCO formation other than advancing age?



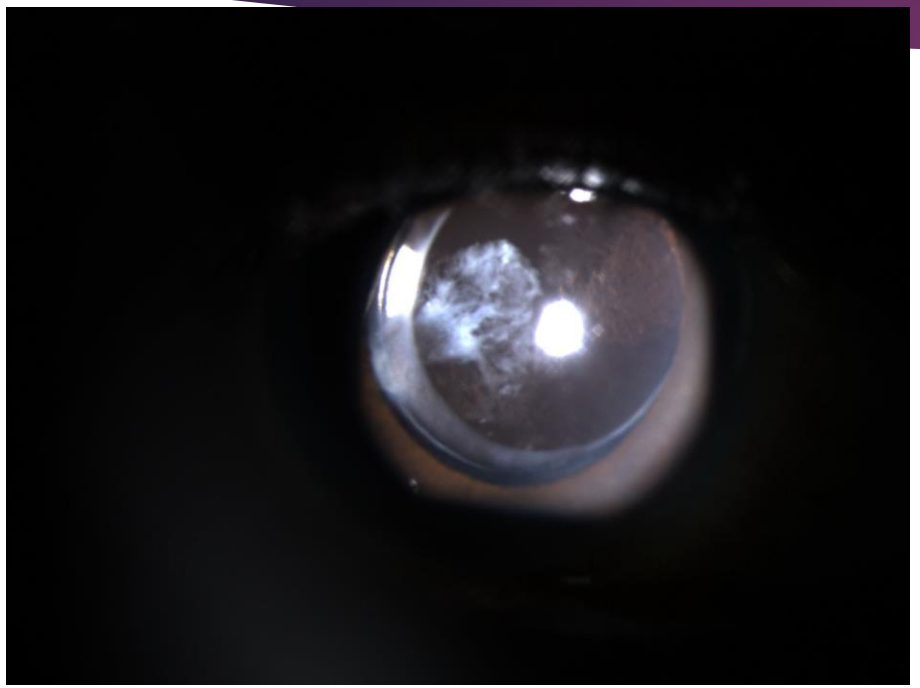
- IOL's with square, truncated edges
- In the bag IOL fixation
- Anterior capsulorhexis diameter just slightly smaller than the IOL optic
- Well performed cortical clean up and posterior capsule polish (some studies dispute the effect of capsule polishing)
- Hydrogel IOL's have the highest rate of PCO, then PMMA, then Acrylic IOL's have the lowest rate
- Diabetes may reduce the rate

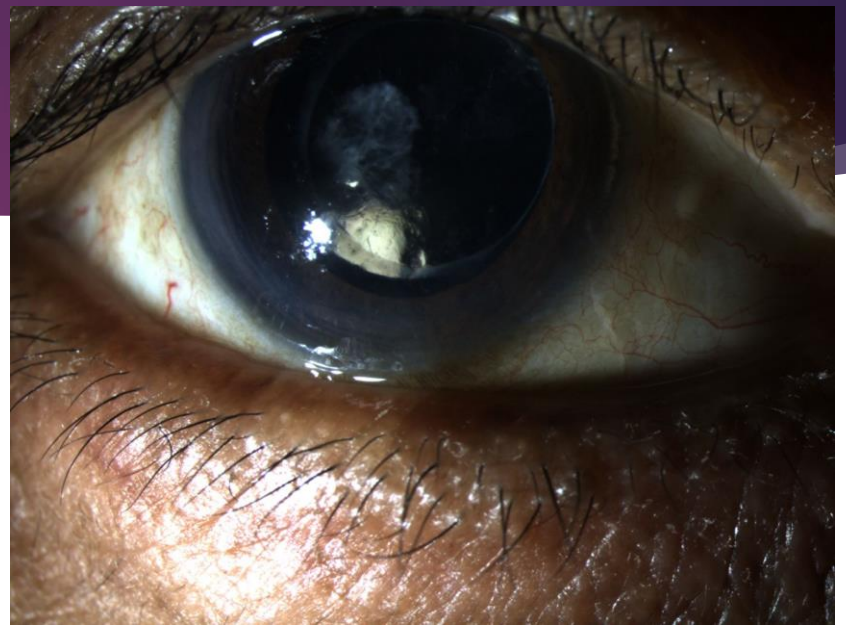
PCO

- Lens epithelial cells left behind on the anterior capsule edges and the equatorial regions migrate and cause opacification

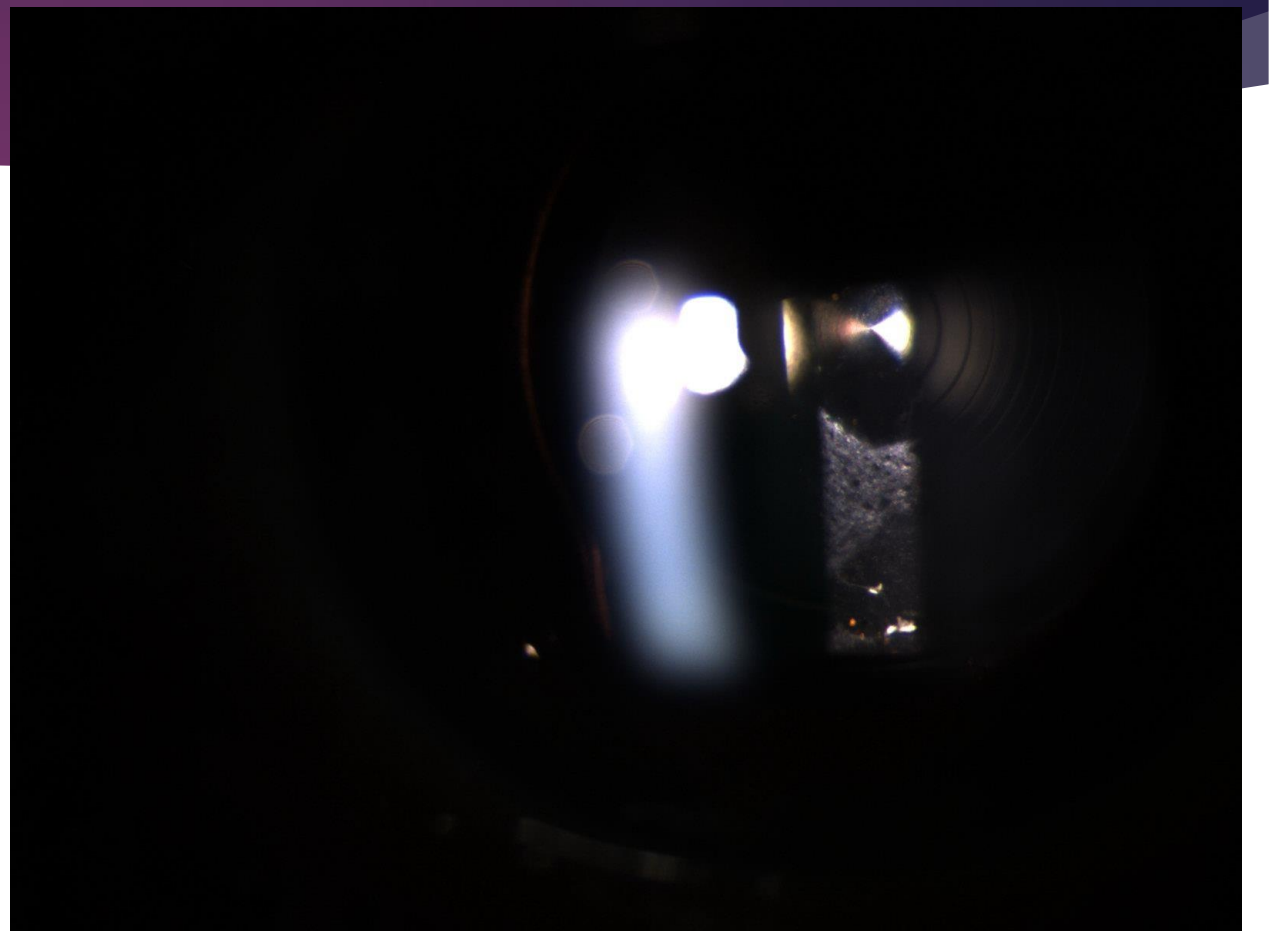
- Form membranes
- Transform in to fibroblasts and contract, leading to wrinkles
- Proliferate, leading to pearls
- Collagen deposition

PCO





PCO



PCO

- PCO leads to……
- Decreased vision
- Decreased contrast sensitivity
- Glare
- Major problems with premium multifocal lenses, even with minor amounts of PCO: YAG often built in to the out of pocket cost of premium IOL's
- Often reported as a film or fog over vision
- Often stated as "it is like my cataract has come back"
- No alternative therapy (drops, pills, etc.)

YAG indications

- Consider YAG capsulotomy when glare or decreased vision impacts daily activities
- Much like cataracts themselves, some of the earliest issues tend to be with night driving, reading small print, fine detail vision, etc.
- Complaint driven
- Consider insurance situation / guidelines

YAG laser basics

- What does YAG stand for?
- Neodymium: Yttrium Aluminum Garnet laser
- Solid state
- 1064 nm infrared wavelength. Can not be seen, so utilizes two HeNe (Helium / Neon) aiming beams
- Delivers extremely high light energy in a single pulse to a very small space, for a very short time
- Reduces tissue to plasma
- Temperature rise causes expansion, resulting in a shock wave going forward from the focal point
- Greatest power is just in front of the focal point

YAG laser basics

- Photodisruptive laser
- No pigment needed for effect
- No thermal reaction
- No photocoagulation of blood vessels

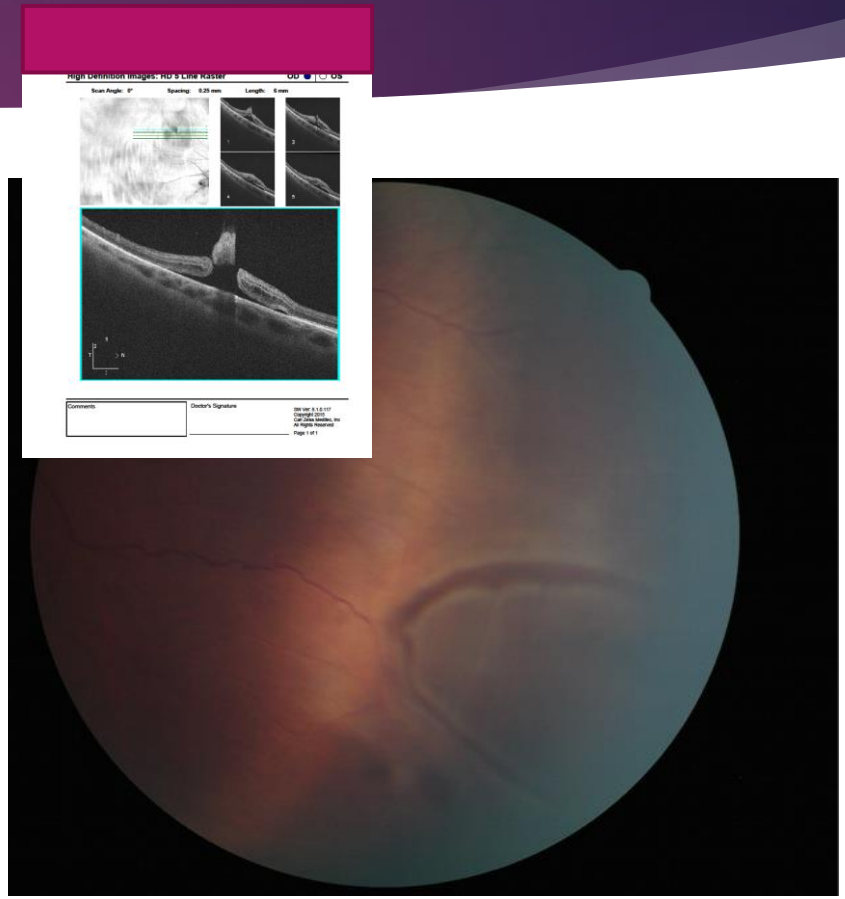
YAG laser controls / readouts

- On / off switch
- Standard slit lamp controls
- Anterior or posterior offset of zero, 125, or 250 microns
- Number of shots
- Pulses per “firing”
- Brightness of HeNe aiming beam
- Power setting in Mj
- Spot size is fixed

Nidek YAG laser

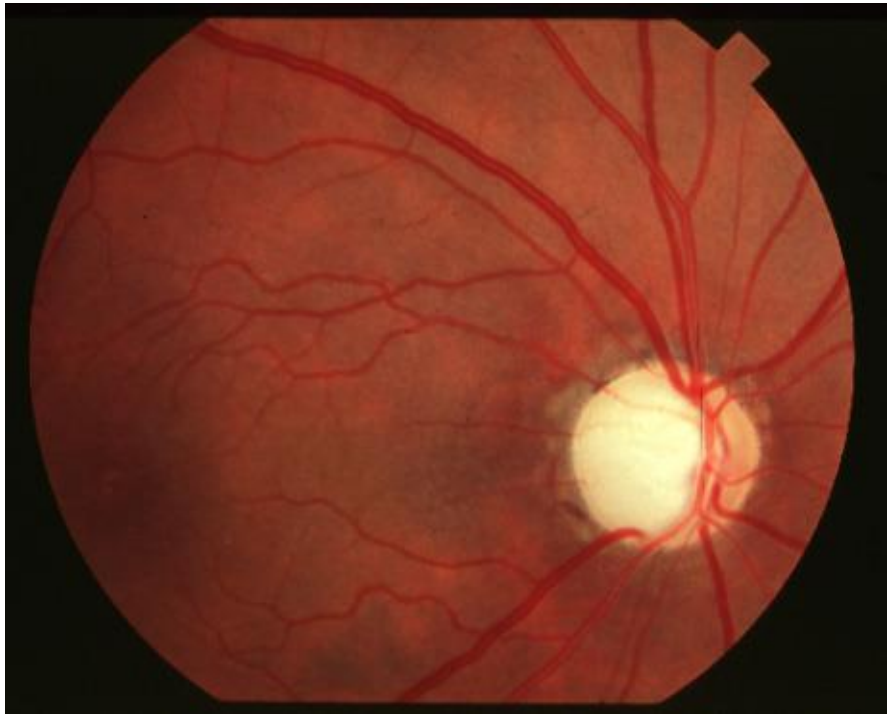
Contraindications / relative contraindications to YAG

- Corneal scars / opacities
- Corneal edema
- Current ocular inflammation / "hot" eye
- Current or history of CME
- Excessive RD risk (very high myope, history of RD in fellow eye, lattice and / or atrophic holes, etc.)
- Inability to fixate / hold still or get in the instrument



YAG procedure after pre-op exam and informed consent

- Dilate with 2.5 phenylephrine and 1% Tropicamide
- Instill Proparacaine in both eyes right beforehand to decrease blink reflex (and allow use of contact lens if desired)
- Instill Iopidine or Brimonidine about one hour before the treatment to help lessen chance of significant IOP spike. Especially important in fragile glaucoma



YAG procedure

- Seat the patient comfortably and inform them…….

- They will need to fixate and remain still
- They will see lights or sparks
- They will hear clicks / snaps / pops
- The procedure is painless
- The procedure takes only a few minutes
- They will experience floaters afterward, and should expect visual improvement by the next day
- Do one eye, then the other later if applicable

YAG procedure

- Recommend pulse of one (push the button, and the laser fires once). Higher pulse numbers are sometimes utilized with LPI (push the button, and the laser fires multiple times)
- Spot size is fixed
- Duration is fixed

- Power needed ranges from about .8 to 2.0 mj
- Extensive posterior offset in to the vitreous usually requires higher power, typically at least 2.0
- Average is about 1.5 to 1.8 mJ for most capsules
- Start low and go up as necessary
- Goal is to deliver the least total energy in to the eye that is needed to do the job (energy in = power X number of shots)
- Those in the room do not need to wear protective goggles

YAG procedure: Lens or no lens

- Advantages of contact lens……

- Stabilizes the eye and fixation
- Controls the lid
- Eliminates dry eye issues
- Magnifies the target
- Increases the convergence cone angle from 16 degrees to 24 degrees

YAG procedure: Lens or no lens

- Disadvantages of contact lens……
  - Bubbles
  - Reflections
  - Slows the procedure

YAG procedure

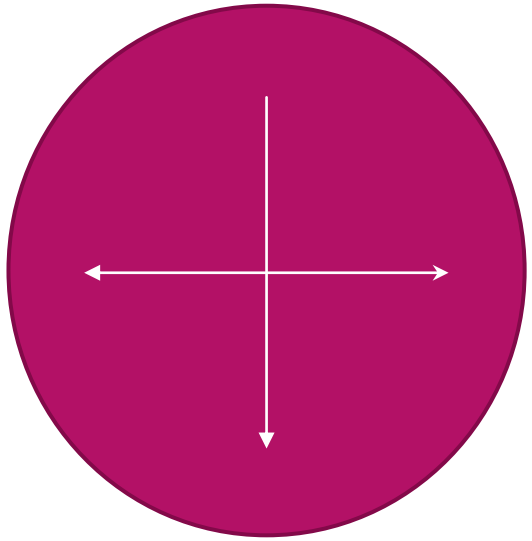
- Different patterns……

- Cruciate (most common)
- Postage stamp
- Christmas tree
- Round

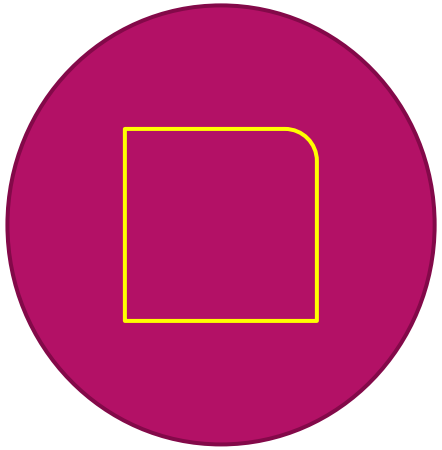
- With cruciate……

- Start at the top (12:00) with one shot to assess affect. If lens is pitted, will be out of line of sight
- Adjust power and offset as needed
- Go down vertically, then across the horizontal. Each shot adjacent to the last typically
- Edges will peel back, then remove flaps / tags
- Can try to hit tension lines…….lots of "bang for the buck"
- Alternate approach is to start with one shot in the middle then, work outward
- Goal is capsulotomy about the same size as the pupil in dark conditions. Problems with too large or too small

Cruciate pattern

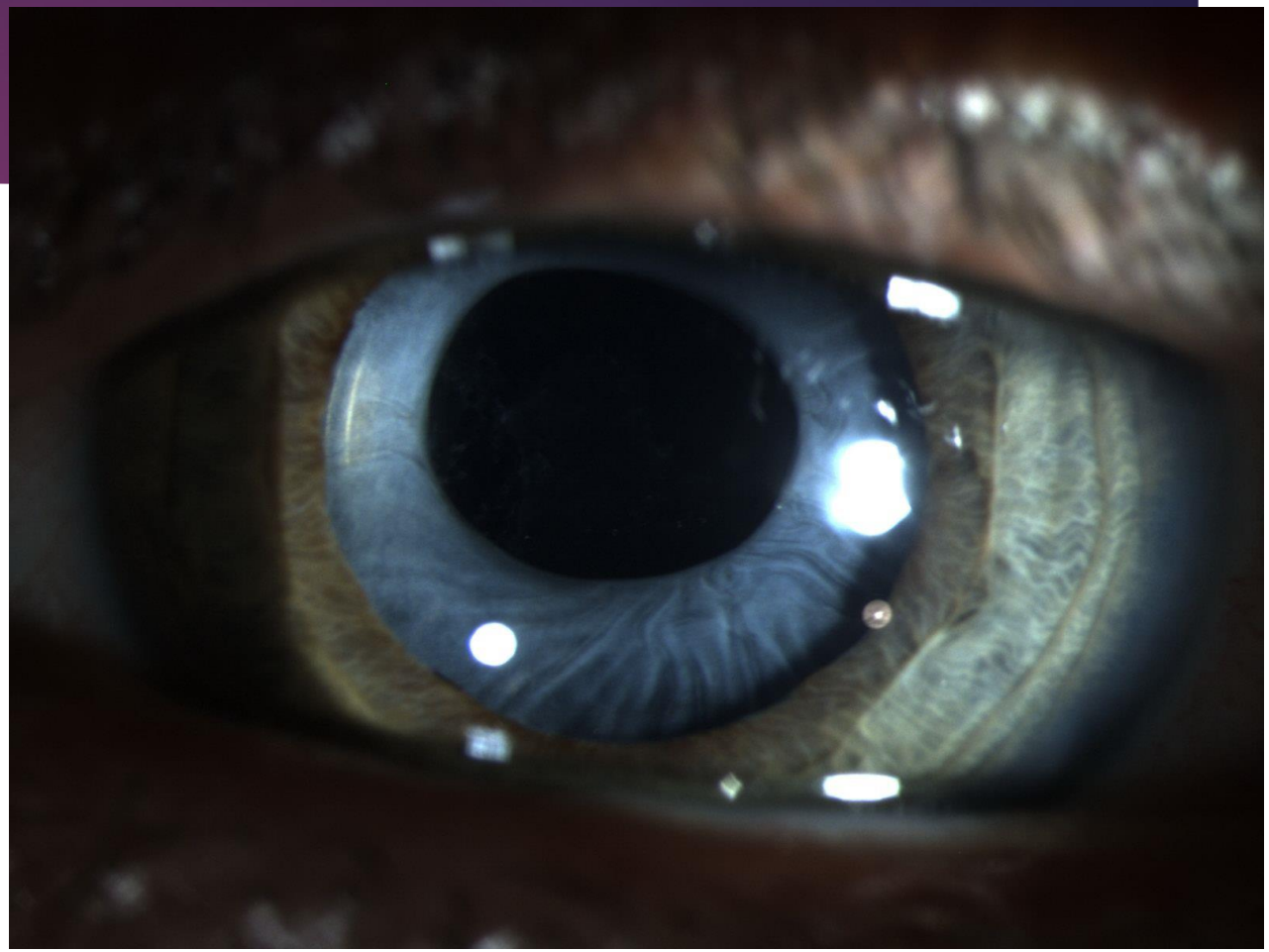


Postage stamp pattern



Anterior YAG

- Can also use to reduce tension from anterior capsule contraction (phimosis)
- Phimosis can reduce peripheral vision and can make visualization of the peripheral fundus very difficult
- Phimosis can shift the plane of the IOL leading to refractive error changes.



Anterior capsular contraction syndrome with complete occlusion

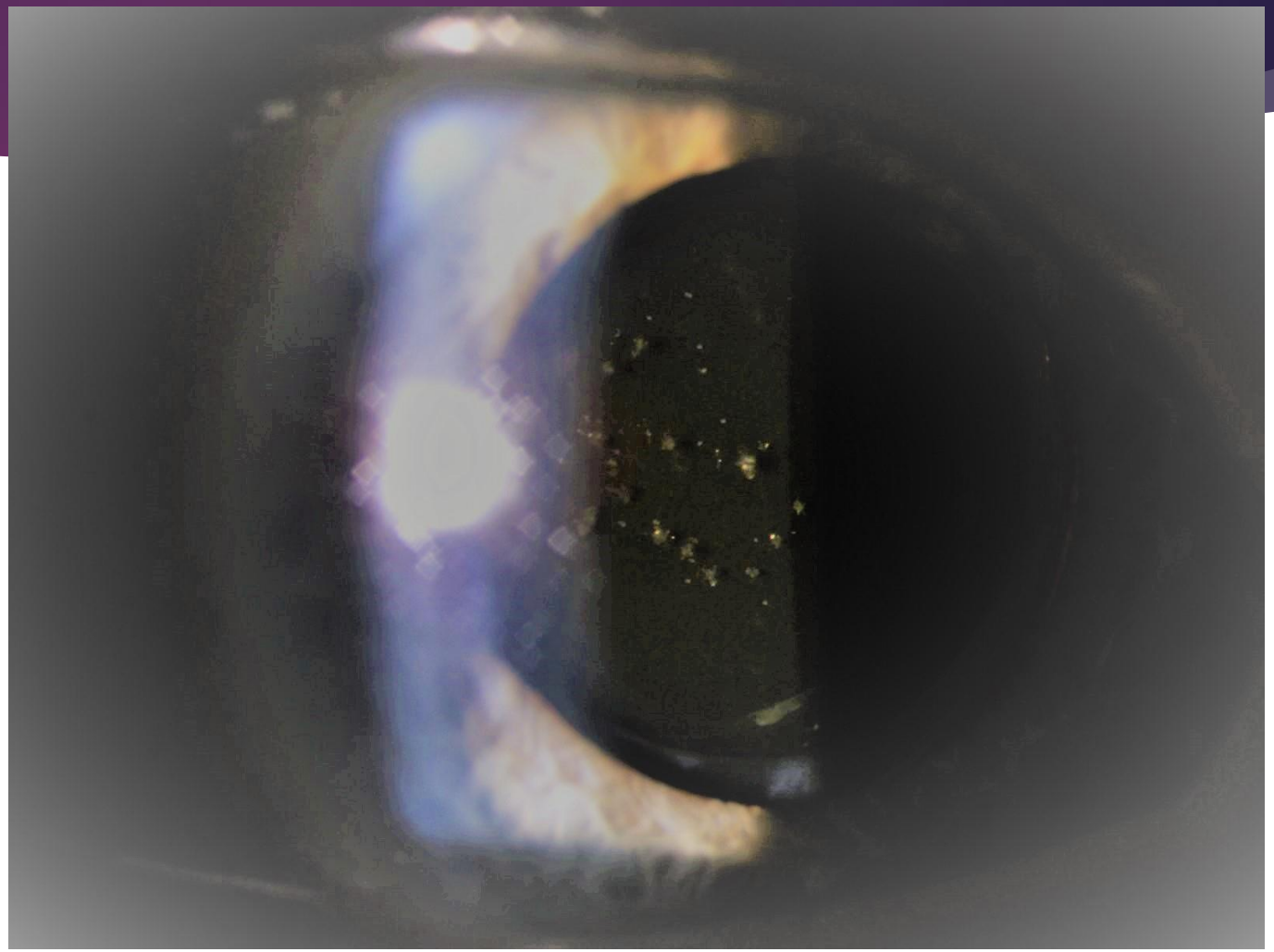
YAG procedure

- Instill another drop of Iopidine or Brimonidine after the procedure
- Check IOP around one hour later
- Peak IOP rise at about 3-4 hours later, typically back to normal in 24 hours even with elevation
- Treat IOP spikes in office if needed
- Pred Forte QID for one week
- Continue any chronic eye drops
- Educate to report any decreased vision / flashes / new floaters after the first day / pain, etc.
- RTC in about one week for VA check / IOP check /DFE

Potential complications

- **Increased IOP** (most common, but rarely persistent), increases with more total energy delivered
- **Vitreal prolapse**: Increases risk of CME, RD, macular hole
- **Corneal or iris damage:** rare
- **Lens pitting:** silicone IOL's are the easiest to pit, followed by PMMA, then Acrylic are the hardest to pit
- **Iritis:** typically minimal
- **CME:** rate of .55-2.5 %
- **RD:** 1-2%. Extra risk with high myopes, males, lattice, holes, long eyes, RD history, increased number of shots
- **Dislocation or capture of the IOL:** More risk with oversized capsultomies
- **Endophthalmitis:** very specific situation with propriniobacterium acnes plaques

Lens pitting



YAG Billing

- CPT code 66821 for the procedure with 90 day global period. Includes day of or day before evaluation
- Reimbursement around $340 (full global) if not in a "facility", and about $320 to the surgeon / post-op provider if in a facility (facility gets a fee too)
- Can co-manage with modifiers like cataract surgery

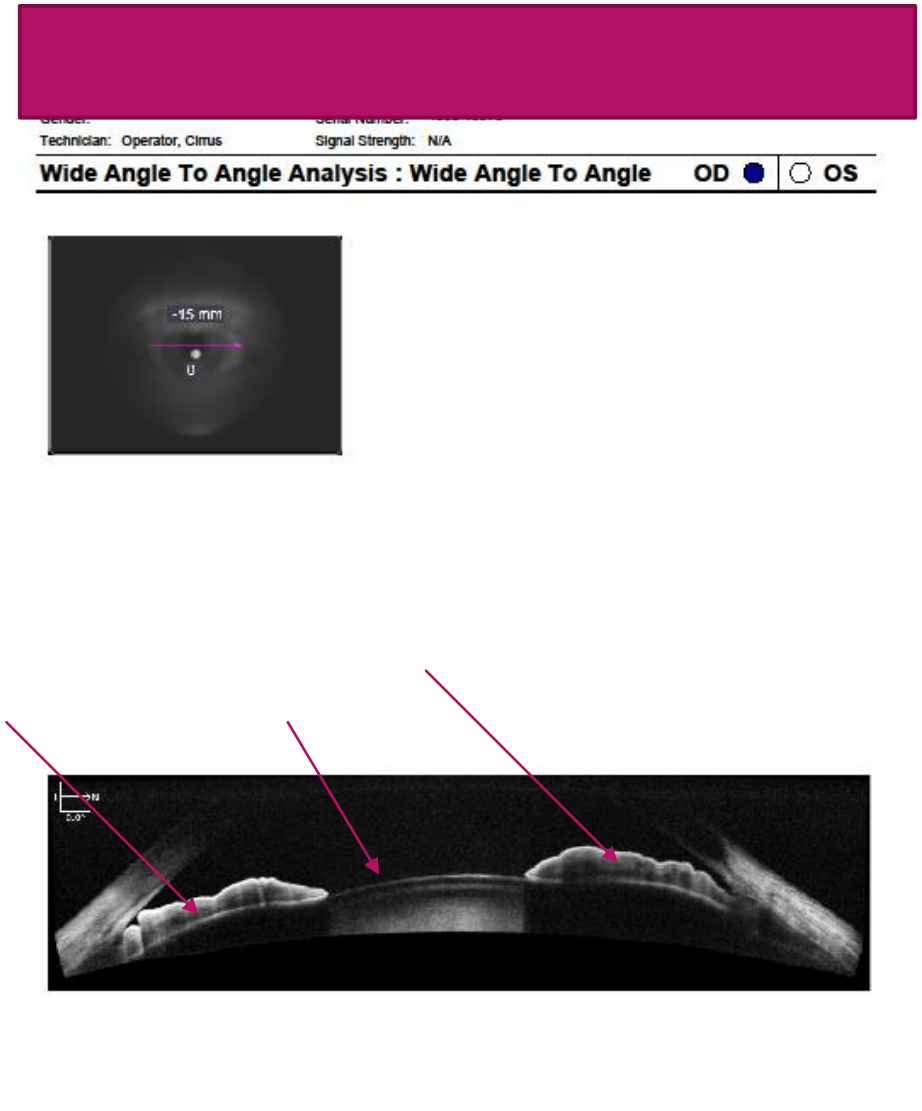
- Diagnosis codes:
- H26.491 : other secondary cataract, right eye
- H26.492 : other secondary cataract, left eye
- H26.493 : other secondary cataract, bilateral

YAG laser peripheral iridotomy

- Uses the YAG laser to make an opening in the peripheral iris to create communication between the anterior and posterior chambers
- Can also use Argon laser, but less commonly done
- YAG less likely to close, not pigment dependent
- Less bleeding with Argon due to photocoagulation
- Indicated in acute angle closure, chronic / creeping angle closure, and sometimes for prophylaxis in narrow angles. Can also help sometimes in plateau iris syndrome / configuration
- Contraindicated with substantial corneal edema, flat AC, inflammation, neovascular / inflammatory glaucoma, inability to sit and fixate
- Is it just better to remove the lens? Often yes. Considerations include age, presence of cataract, and insurance constraints

LPI predictive sign

- "triple hump"
- May predict success of LPI in prophylactic narrow angle cases with no glaucoma
- Indicates that there is a pupil block component, instead of just phacomorphic "pushing"



YAG LPI procedure

- After pre-op evaluation and informed consent…….
- Instill 1-2% pilocarpine, topical anesthetic, and Iopidine or Brimonidine
- Place an Abraham lens or Wise lens on the eye
- Locate a crypt at either 11:00 / 1:00 o'clock, or 3:00 / 9:00 o'clock. Some feel that 3/9 decreases the risk of diplopia / dysphotopsia due to not being behind a tear prism
- Older thought is that 11 / 1 is hidden by the upper lid

YAG LPI procedure

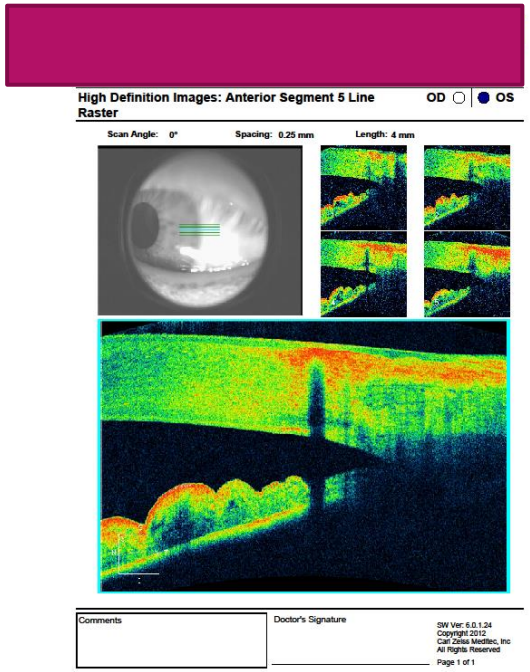
- Typical power setting needed is about 2.0-5.0 mj. Variable.
- Typically no offset
- Consider increased pulse if desired
- Focus aiming beam on crypt location and treat until a plume of pigment is seen rushing into the AC. Enlarge as needed.
- Limit total energy per session to no more than about 150 mj. RTC for separate session to complete if needed

YAG LPI Procedure

- Instill another drop of Iopidine or Brimonidine
- Check IOP about an hour afterward
- Pred Forte QID
- RTC one week
- Coding 66761
- 10 day global period, so no real "comanagement" as such with fee division

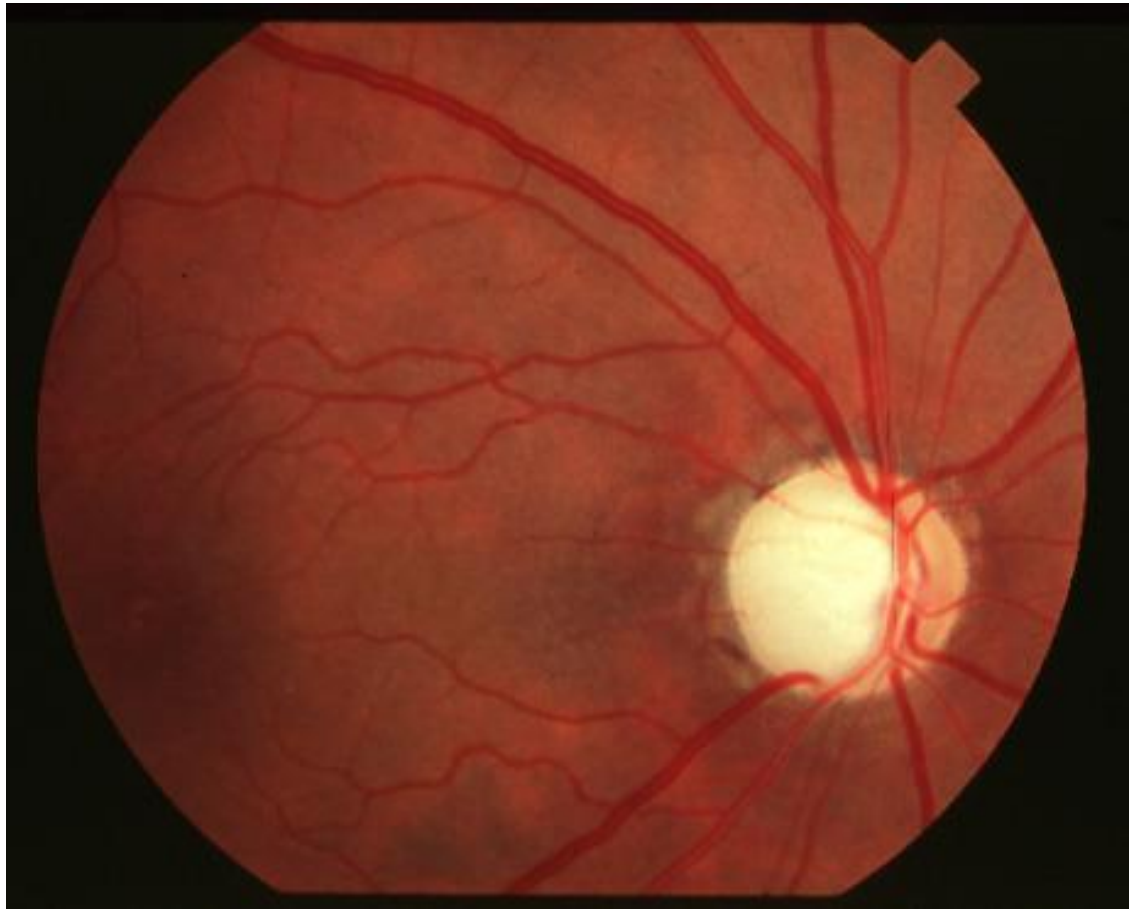
YAG LPI complications / risks

- Hyphema (push on lens to tamponade)
- IOP spike
- Diplopia / dysphotopsia (may be less at 3 / 9)
- Unsuccessful opening or later closure
- Corneal edema / damage



SLT (Selective laser trabeculoplasty)

- Laser trabeculoplasty of the TM to increase drainage outflow
- ALT
- SLT
- Micropulse Laser trabeculoplasty
- Pattern Scanning Laser Trabeculoplasty
- Diode laser trabeculoplasty
- Others



SLT

- Indications:

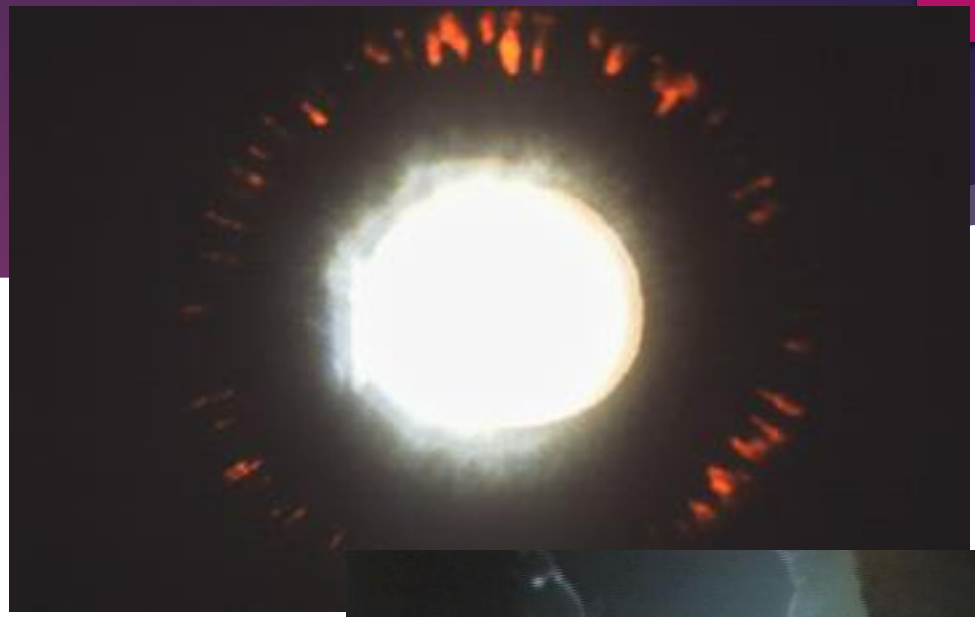
- IOP not well controlled
- Initial primary treatment
- Drop compliance issues
- Drop cost issues
- Drop side effect issues
- Insurance coverage issues
- Dexterity issues

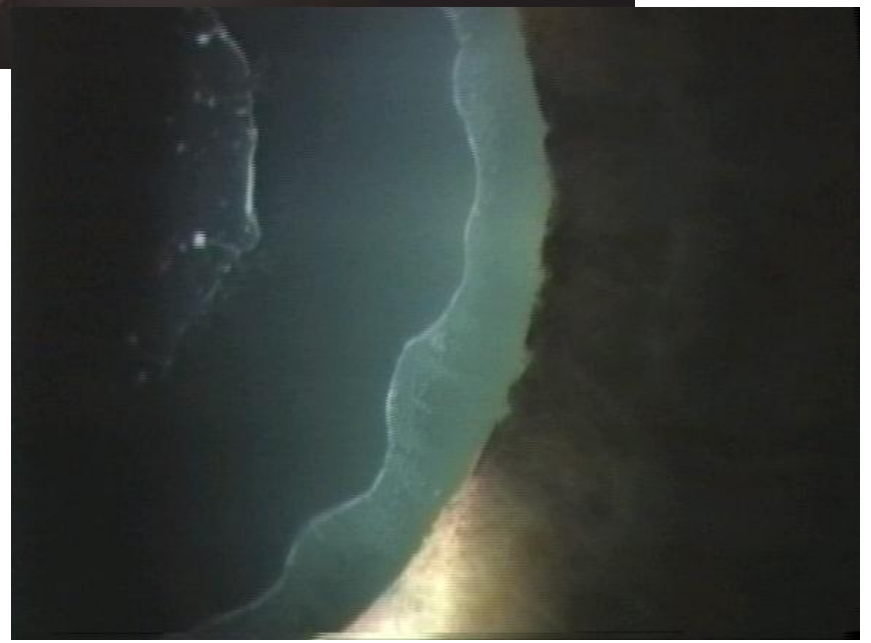
- Contraindications:

- Hazy cornea
- Very severe disease
- Inflammatory / neovascular / angle closure glaucoma
- Developmental / congenital glaucoma

SLT good for….

- POAG
- PXF
- PDS (much higher risk of IOP spike, use caution)
- NTG (less absolute drop in IOP, but similar percentage)
- Ocular hypertension





SLT laser

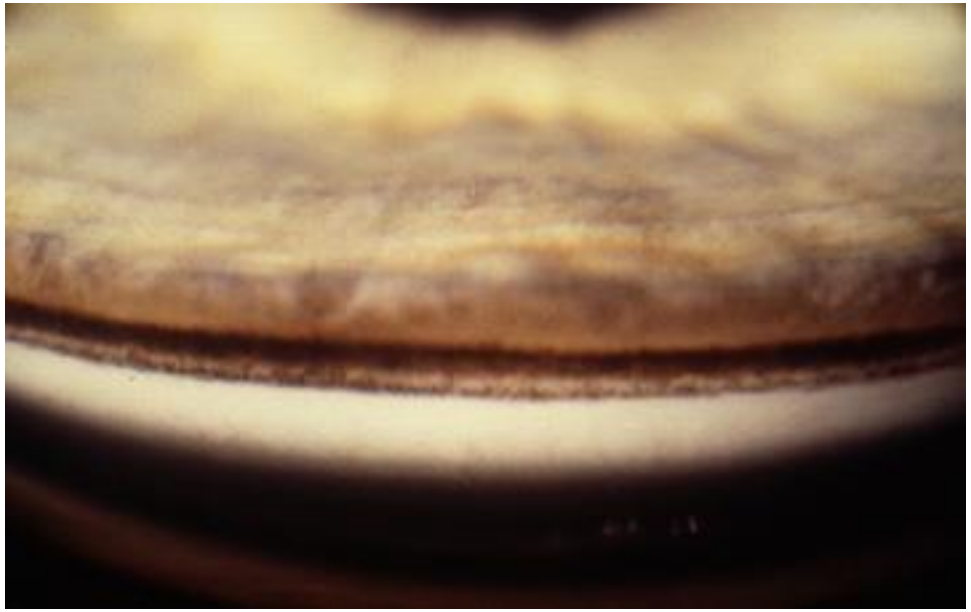
- Q-switched, frequency doubled 532 nm green ND YAG laser
- No thermal / heat damage because the pulse duration is so short. Non-coagulative
- Unlike ALT, can be effectively repeated
- Expect IOP drop of 25-35%. May be slightly more effective in brown eyes (Lawrence Jindra, MD)
- MOA not entirely known, but believed to be biological: laser energy may "recruit" phagocytes and macrophages that clean out the TM
- SLT may not be very additive to prostaglandins, but success with prostaglandins may predict success with SLT

SLT procedure

- After appropriate pre-op examination and obtaining informed consent….
- Instill pre-op drop of Iopidone / Brimonidine
- Instill topical anesthetic and apply laser gonio lens (Latina, others)
- Laser settings
- .8 to 1.0 mj on average. Can go up to 2.0 mj. Start about .8 and assess effect
- Pulse of 1 (one burst per firing)
- Spot size fixed at 400 microns
- Duration is fixed at 3-4 nanoseconds

SLT procedure

- Aiming beam is large and covers entire TM, so aim at TM
- Aiming beam may be out of focus, so focus on TM
- Place spots contiguous to each other and treat either 180 or 360 degrees
- Treat less with substantial PDS due to IOP spikes
- Do not want to see blanching. Want to see a cavitation / champagne bubble every few shots
- If blanching, decrease power, if no bubbles, increase power
- 45-60 spots per 180 degrees



SLT procedure

- Instill another drop of Iopidine / Brimonidine and check IOP about an hour afterward
- Some use steroid or NSAID QID for one week, some don't (don't want to limit response)
- RTC 7-10 for FU, again at about 6 weeks (typical time to full effect)
- Continue all glaucoma drops, consider D/C over time based on effect

- Complications / risks
- IOP spike (watch PDS)
- Inflammation / iritis
- Very rare PAS (much more common with ALT), very rare corneal edema

SLT procedure

- Effect wanes over time
  - 80% effective at 1 year
  - 50% effective at 5 years
  - 30% effective at 10 years
- Can repeat

SLT billing

- 65855
- Reimbursement around $300 + / -
- 10-day global period, so typically no "co-management" with split fee

- The end!