

laser peripheral iridotomy

COPE Course ID: 66713-LP
Qualified Credit: 1 hour(s)

who

what

how

where

why

when

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

who performs an Ipi?

**answer: one who understands
angle anatomy**

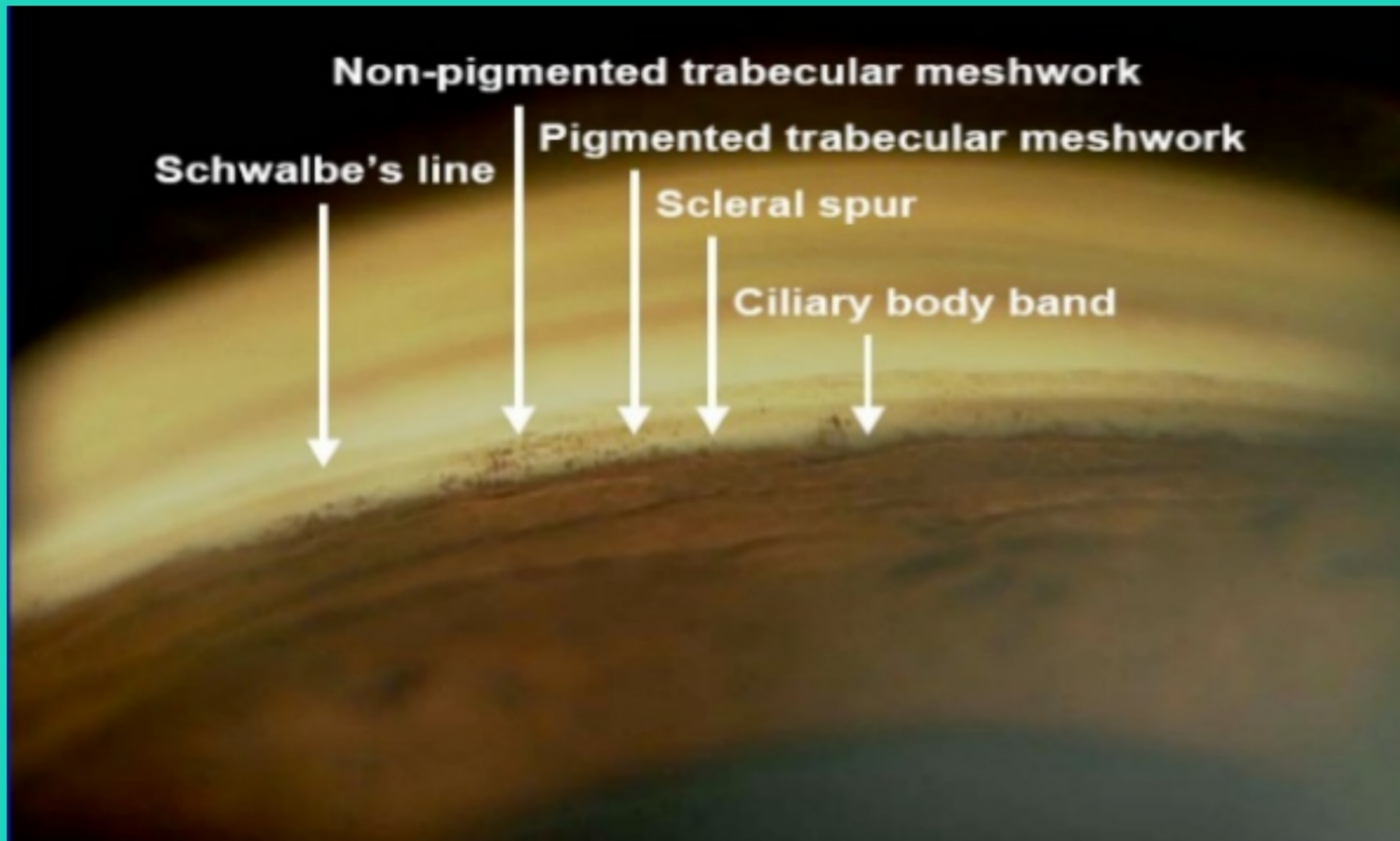
ANGLE

INDENTATION

GRADING

PAS





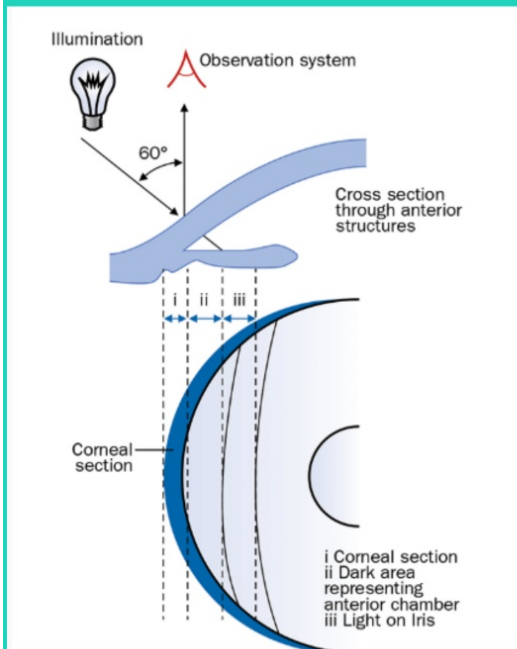
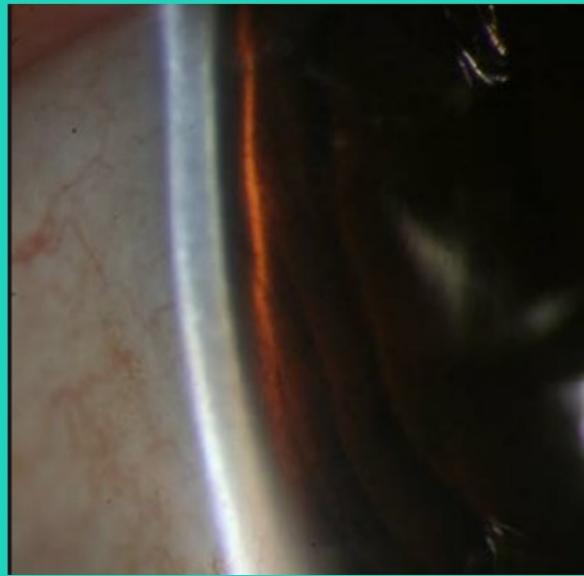


Table 1: Grading According to Van Herick

Grade	Relation between corneal Thickness & Ant. Chamber Depth	Interpretation
4	1 : 1 or higher	Angle closure very unlikely Angle approx. 35 ... 45 degrees
3	1 : ½ (or higher)	Angle closure unlikely Angle approx. 20 – 35 degrees
2	1 : ¼ (or higher)	Angle closure possible, Angle approx. 20 degrees
1	1 : less than ¼	Angle closure very likely, Angle approx. 10 degrees
0	Closed	Angle closure, Angle approx. 0 degrees

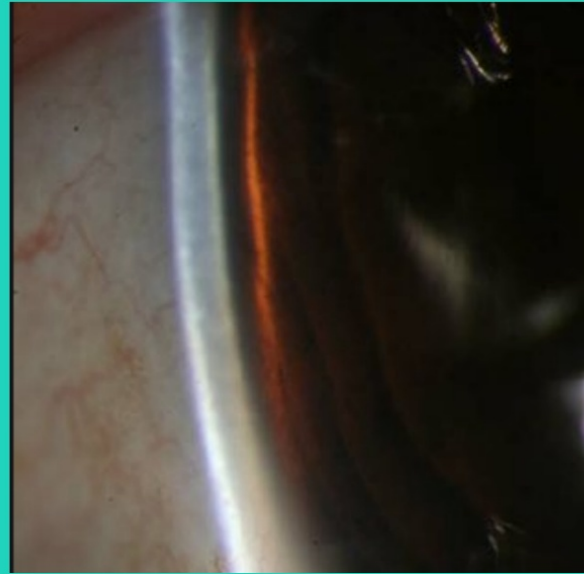
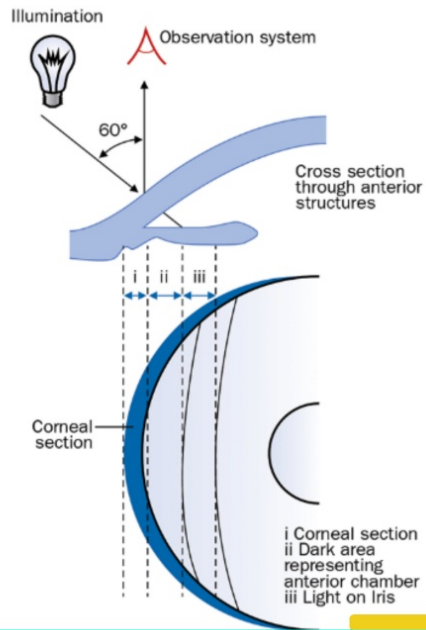


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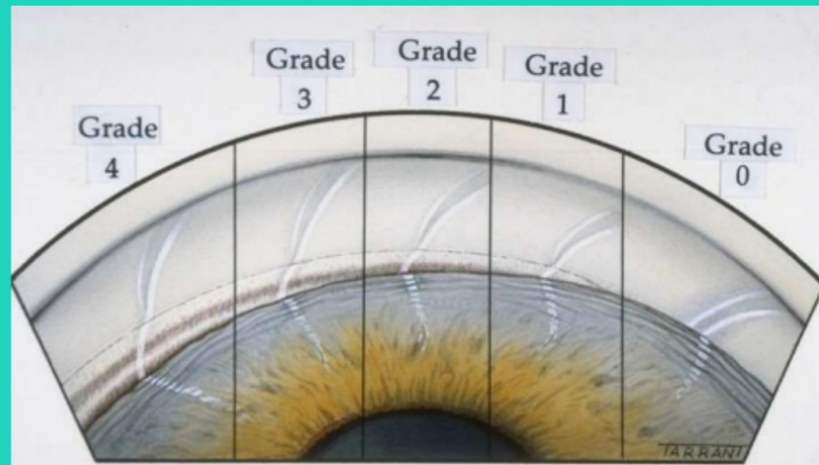
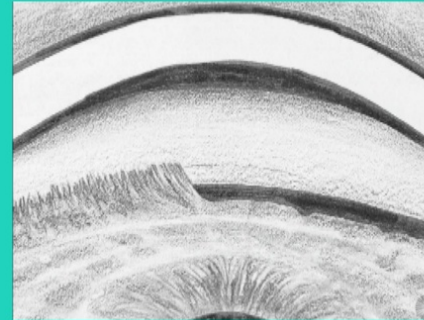
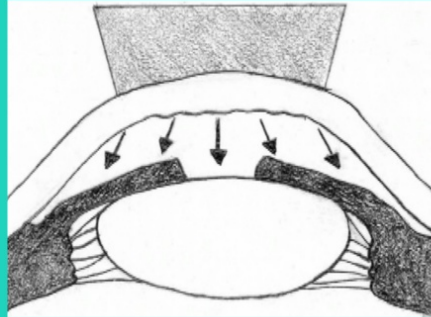


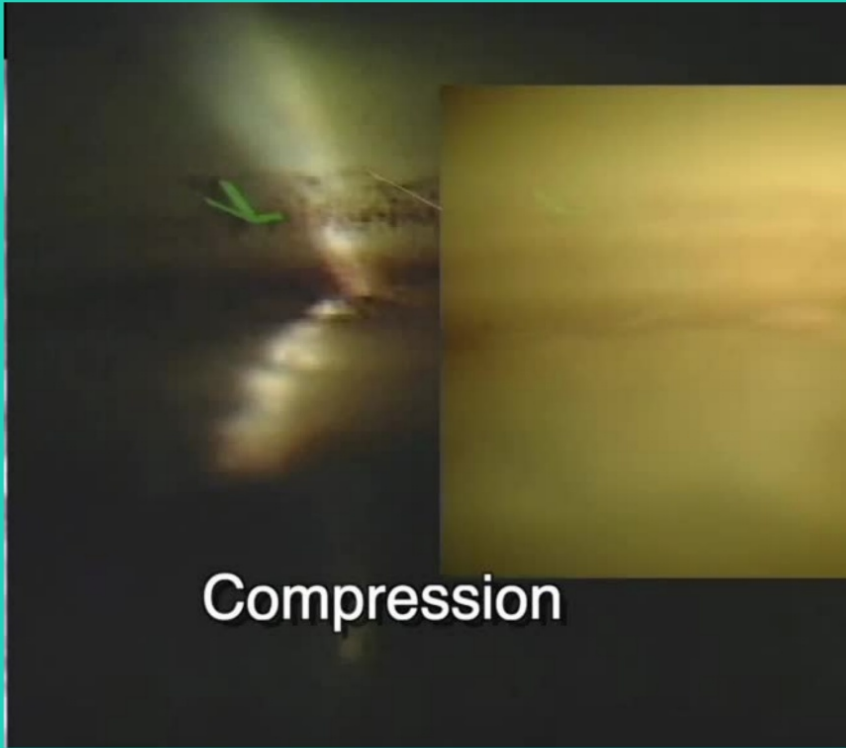
Table 2: Angle Classification on Gonioscopy (Shaffer)


Grading	Angle Width	Findings	Angle Closure Risk
0	0	No angular structures are visible	Closed
1	10	Schwalbe's line is visible, Even the most anterior portion of the trabecular meshwork may be visible	High Risk
2	20	Trabecular meshwork is entirely visible	Possible
3	20-35	Scleral spur is visible	Impossible
4	35-45	Ciliary body is clearly visible	Impossible

indentation/ compression gonioscopy

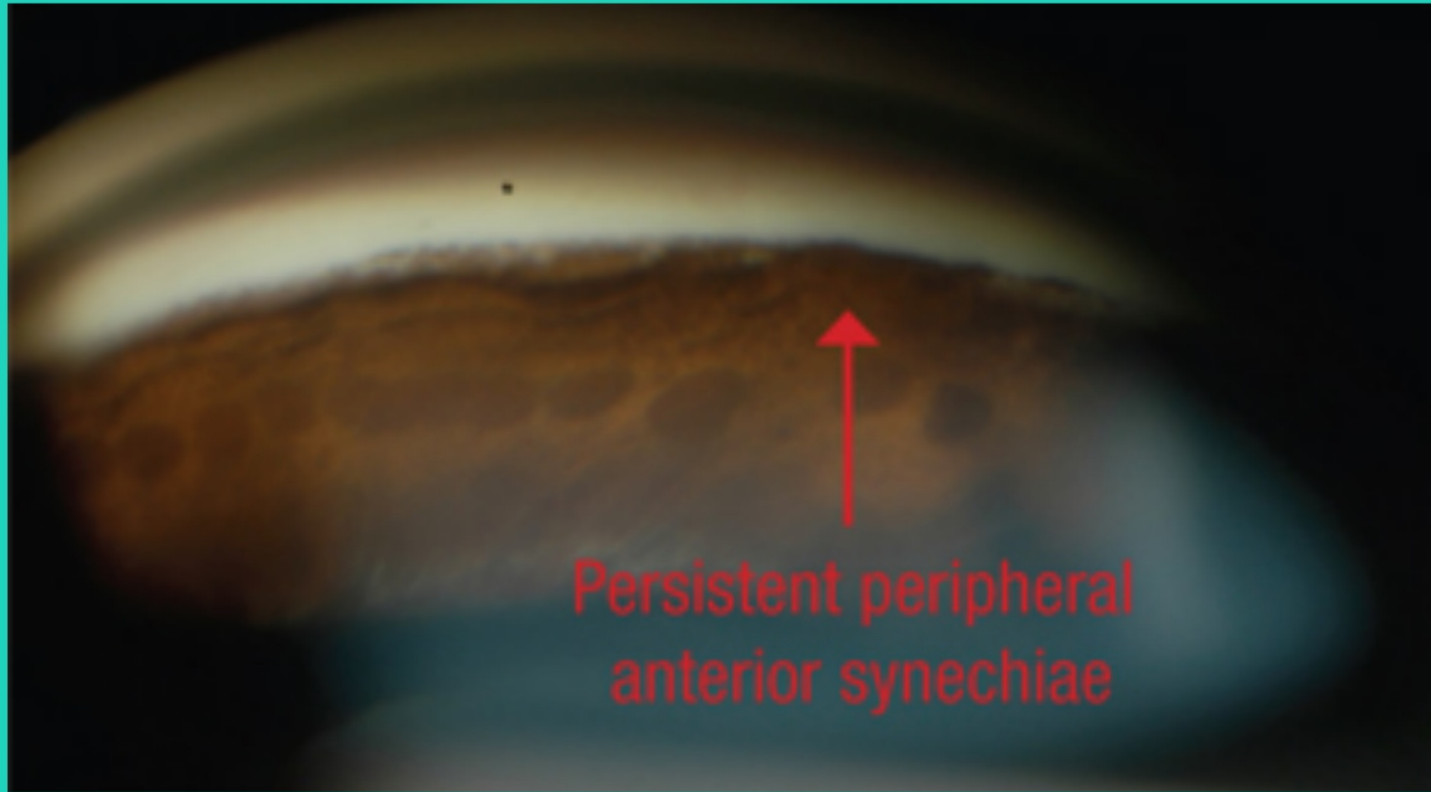


video





Compression





nd: yag

argon

**what does a
laser do?**

nd: yag

Q-switched neodymium-doped yttrium-aluminum-garnet laser



Solid state laser

Output: 1064 nm infrared
wavelength and tissue interaction

Crystals can be placed to half wavelength and double frequency
(double frequency of 532 nm)

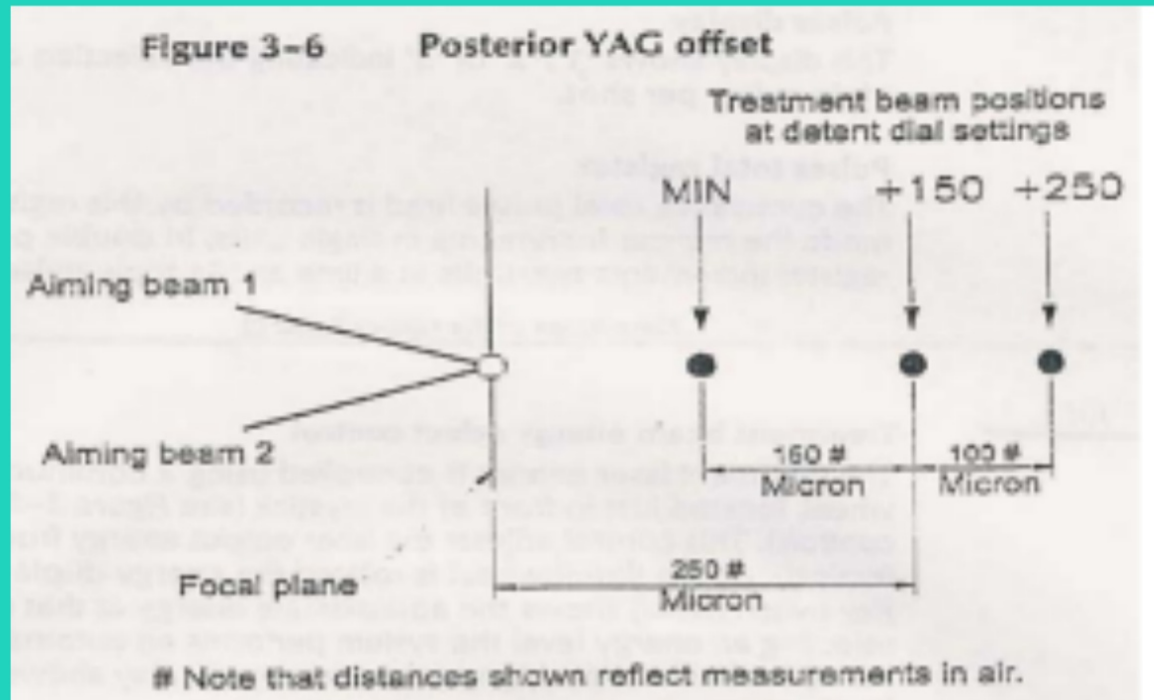
High infrared energy, small spot size=high fluence

PHOTODISRUPTION

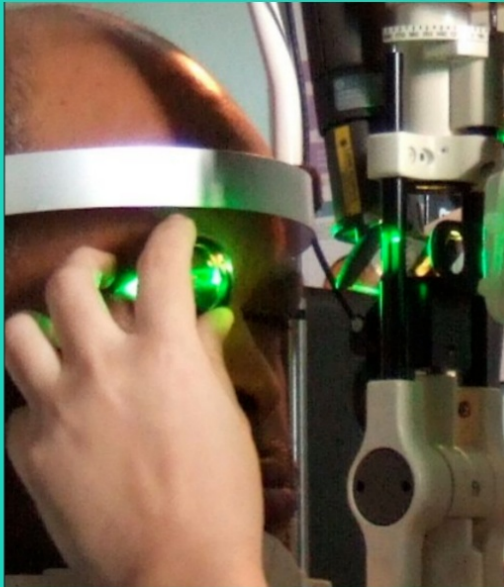
photodisruption

- Pigment **independent**
- High energy, small spot size, brief pulse duration
- laser energy ---into plasma (optical breakdown)
- molecules are stripped of electrons = small "explosion": hydrodynamic waves and acoustic pulse TOWARD surgeon--OFFSET

photodisruption: offset



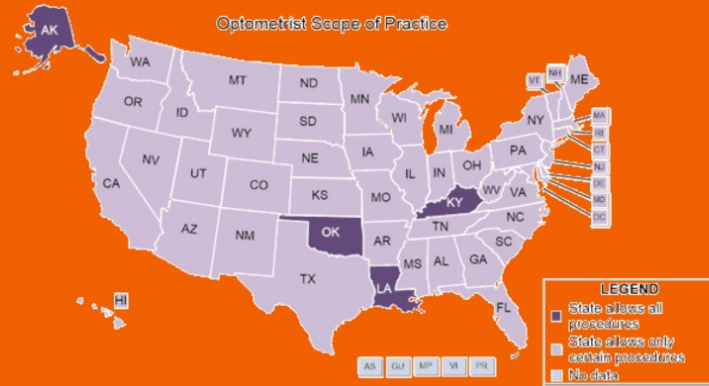
photocoagulation



- argon laser (green) causes photocoagulation
- pigment **dependent**
- pigment absorbs light, converts to heat="thermal" laser
- targets melanin and hb
- proteins denature, blood coagulates, collagen contracts, tissue inflammation

- Argon LPI: coagulates vessel, thins stroma
- Argon Iridoplasty: contracts collagen

where can optometrists perform an Ipi?



Source: American Optometric Association

Oklahoma Kentucky
Alaska Louisiana
(Not Arkansas)

Billing & Coding

Billing and Coding

66761

CPT CODE

10

Days for Global Period

H40.2--

ICD-10 for angle closure

when should an Ipi be performed?

1. Primary angle closure
2. Plateau iris configuration?
3. Pigment dispersion syndrome?
4. Corneal transplantation prophylaxis
5. Occludable angle
*most common reason

1.

2.

3.

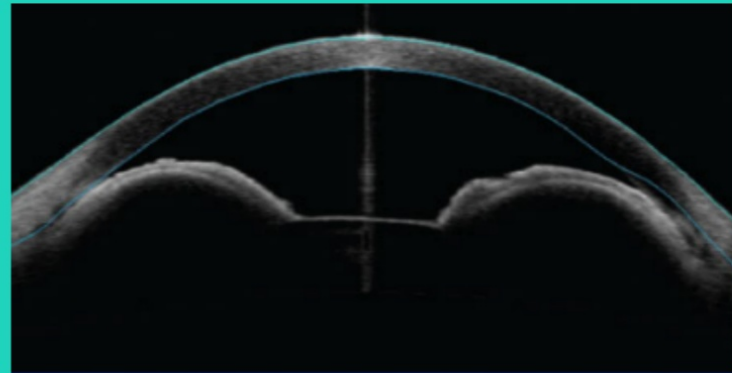
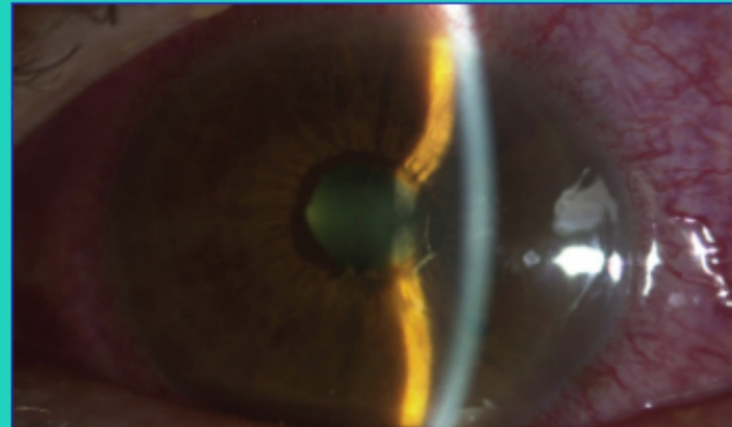
4.

5.

primary angle closure

Acute (apac)

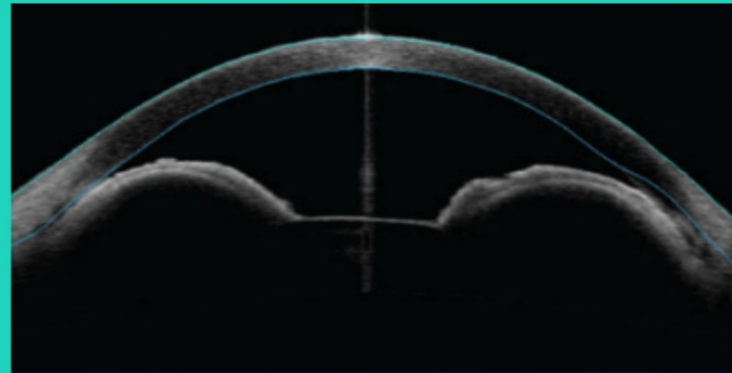
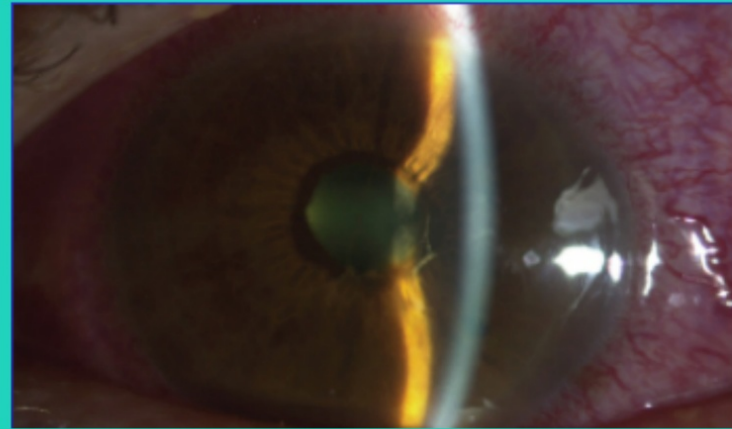
- Shallow, closed chamber
- Elevated IOP
- Sluggish pupil
mid-dilated
- Conjunctival Injection
- Pain
 - why?
- Nausea
- Blurry vision
 - halos
- corneal edema (microcystic edema)
- THIS PATIENT REQUIRES AN LPI ASAP!



primary angle closure

Acute (apac)

- Shallow, closed chamber
- Elevated IOP
- Sluggish pupil
mid-dilated
- Conjunctival Injection
- Pain
 - why? IRIS ISCHEMIA!
- Nausea
- Blurry vision
 - halos
- corneal edema (microcystic edema)
- THIS PATIENT REQUIRES AN LPI ASAP!



acute primary angle closure

anterior chamber paracentesis?

Often poor visibility d/t MCE complicates immediately performing an LPI

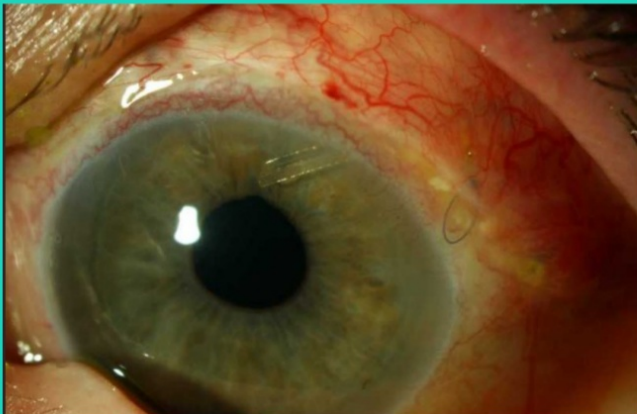
If space visible, consider a anterior chamber paracentesis for an immediate drop in IOP, allowing MCE clearance and improved visibility for LPI placement

1. Drop of proparacaine or tetracaine
2. Drop of betadine 5%
3. Position patient at slit lamp with assistant immobilizing lid and holding head or speculum
4. 30G needle with or without syringe (no plunger)
5. Insertion at paralimbal cornea, bevel facing forward
6. Avoid all internal structures, keep bevel facing forward
7. Remove carefully and quickly
8. Chase with topical antibiotic (Vigamox)
9. Add a drop of betadine 5%
10. Recheck IOP--> LPI

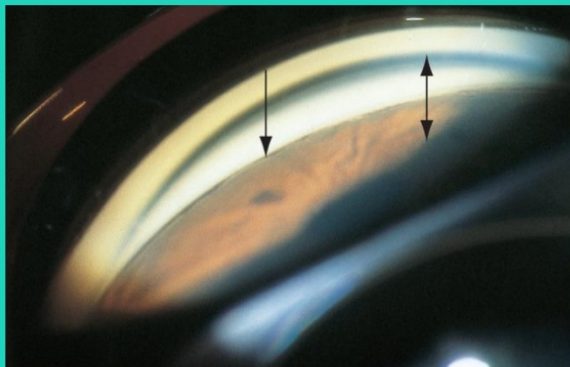
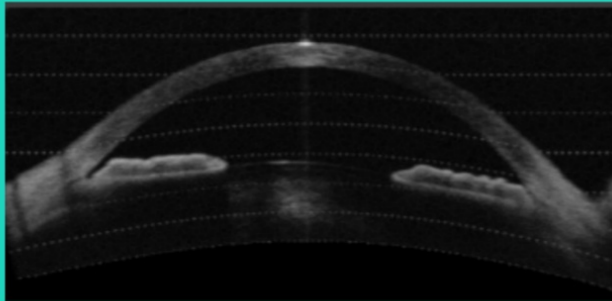


primary and chronic angle closure

- Elevated IOP from chronic compromise of aqueous outflow
- Will inevitably have areas of PAS when chronic
 - If less than 50%/180 degrees, an LPI may suffice
 - indentation gonioscopy!
 - If greater than 50%, especially with elevated IOP and glaucomatous damage, a more aggressive, surgical approach is likely indicated, possibly a tube



plateau iris configuration (PIC)



- Tend to occur in younger patients, females, caucasian
 - genetic component?
- Flat iris configuration, "normal" chamber
- Due to abnormal anterior position of ciliary body
- Can be triggered by mydriatics or even scotopic conditions
- Since PIC patients have an element to pupillary block, an LPI is the first surgical intervention performed
- Failed to control IOP??? = PIS: plateau iris syndrome

plateau iris syndrome

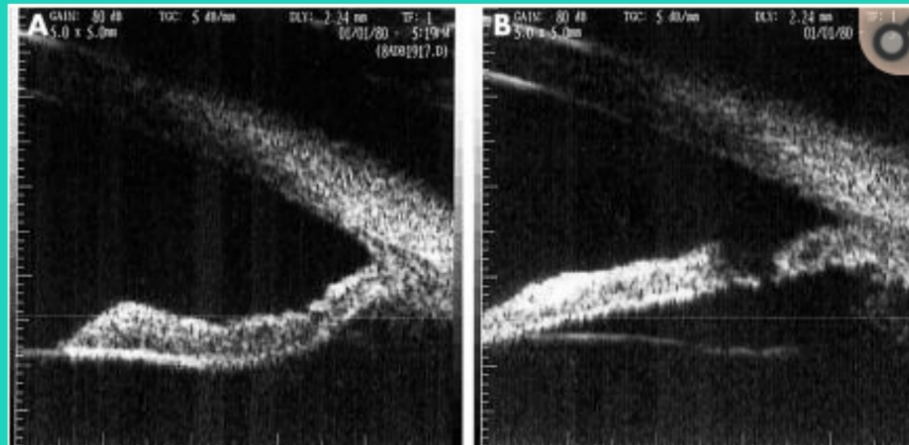
- Failed LPI requires argon laser peripheral iridoplasty (ALPI)
- In an ALPI, shots are placed at the peripheral iris causing contraction at the iris root and widens the chamber
- argon laser settings:
 - energy: 400 mw
 - spot size: 400 micron
 - duration: 0.5 seconds (500 ms)
- aim for peripheral iris and look for visible iris contraction and chamber deepening
- 24 spots per 360 degrees (6 per quadrant)





pigment dispersion syndrome and concave iris approach

- Posterior bowing of iris can result in contact between iris and zonules = pigment dispersion
- "Reverse pupillary block"
- LPI theoretically can flatten iris/reduce concavity and further pigment release.
- Inconclusive



Review > J Fr Ophthalmol. 2017 Nov;40(9):e315-e321. doi: 10.1016/j.jfo.2017.09.002.
Epub 2017 Oct 4.

Role of laser peripheral iridotomy in pigmentary glaucoma and pigment dispersion syndrome: A review of the literature

J Buffault¹, B Leray², A Bouillot², C Baudouin², A Labbé³

Affiliations + expand

PMID: 28987446 DOI: 10.1016/j.jfo.2017.09.002

Conclusion: PI decreases the biomechanical factor causing contact between the iris and zonular fibers and may lower IOP over the long-term. Nevertheless, the effects of PI on visual field changes or progression have not been established in PG and PDS. There is no scientific evidence as of yet to advocate PI as a treatment for PDS or PG.

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, MD¹; Nicola Ungaro, MD¹; Maria Grazia Tardini, AO¹; et al

> Author Affiliations | Article Information

JAMA Ophthalmol. 2014;132(12):1433-1438. doi:10.1001/jamaophthalmol.2014.3291

Conclusions and Relevance At the end of the 10-year follow-up, (1) approximately one-third of the whole PDS patient population showed an IOP increase of 5 mm Hg or higher in at least 1 eye; (2) phenylephrine testing identified eyes at high risk for developing IOP elevation; and (3) LPI, when performed on high-risk eyes, reduced the rate of IOP elevation to the same level as the low-risk eyes.

Br J Ophthalmol. 2002 Dec; 86(12): 1443-1444.
doi: 10.1136/bjo.86.12.1443-a

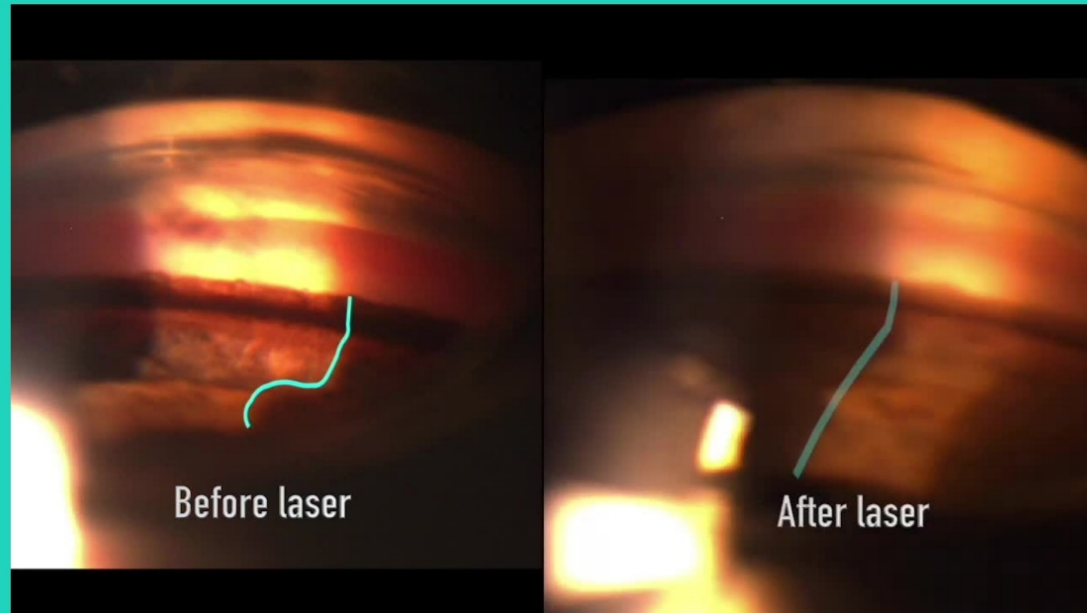
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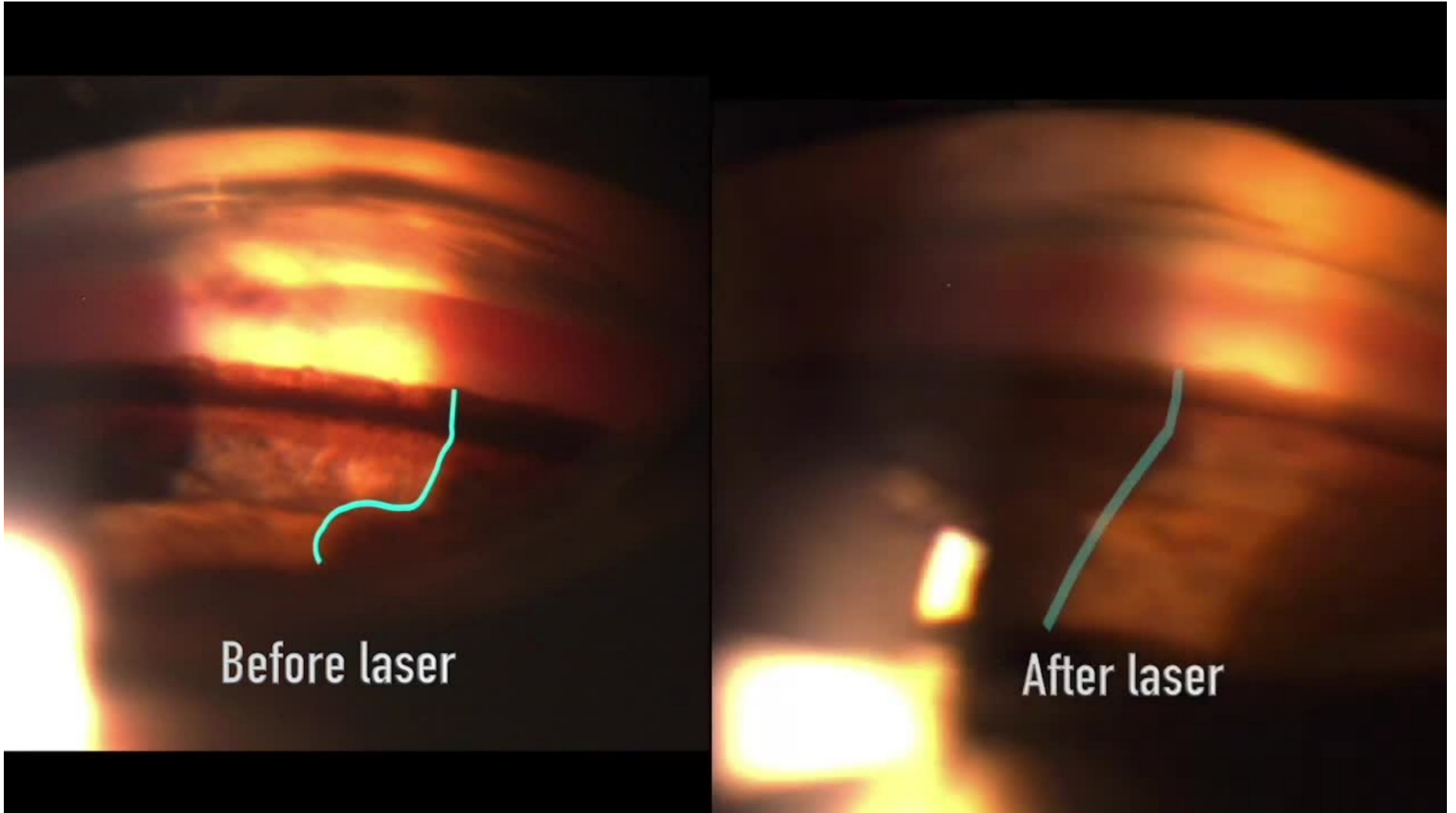
Effect of a YAG laser iridotomy on intraocular pressure in pigmentary glaucoma

M.J.Chen,¹ S.C.Lin,¹ and M.J.Chen²

"In young patients who show constant active pigment release, laser iridotomy seems to have an effect on the short term IOP control and may have possible long term benefits."

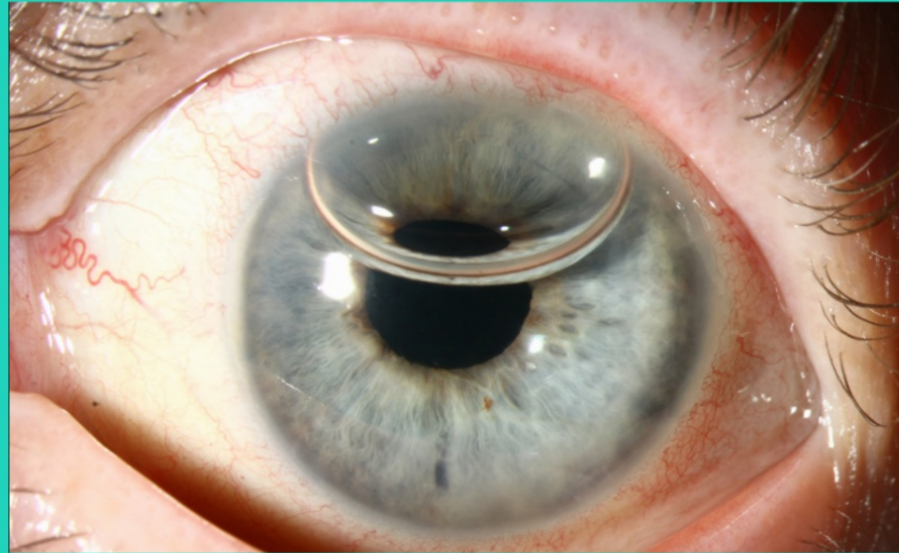
before & after





pre-operatively for corneal transplant

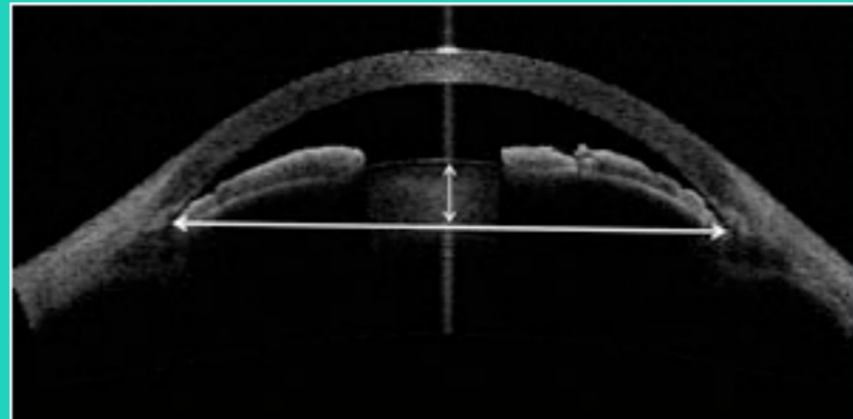
- SF6 or air fills the A/C intraoperatively for DMEK, DSAEK and occasionally DALK
- To prevent pupillary block, one or more PIs are placed INFERIOR
- preferred over surgical PI due to bleeding risk
- ideally performed pre-operatively (not day of surgery due to hyphema risk)
- can't bill for it



occludable angle

how narrow is too narrow?

- At least 2 quadrants of iridocorneal/iridotrabecular contact
- Minimal PAS
- Contralateral eye in acute angle closure is considered an "occludable angle"
- On AS-OCT, less than 10 degrees



when to recommend prophylactic Ipi...

- +Narrow angle
- +Presence of PAS
- +Elevated IOP
- +Family history
- +ONH damage

-Educate patient on R/B/A

-Make the decision together

Table 1. Shaffer system for grading angle widths.

Grade number	Angle width	Description	Risk of closure
4	45°–35°	Wide open	Impossible
3	35°–20°	Wide open	Impossible
2	20°	Narrow	Possible
1	≤ 10°	Extremely narrow	Probable
Slit	Slit	Narrowed to slit	Probable
0	0°	Closed	Closed

ACA* in degrees	ACA grade	Angle status	Visible structures
0	0	Closed	No structures visible
≤10	1	Extremely narrow	Schwalbe's line
11 - 19	2	Narrow	Trabecular meshwork
20 - 34	3	Open	Scleral spur
35 - 45	4	Wide open	Ciliary body

*ACA = Anterior Chamber Angle.

contraindications

why not a peripheral laser iridotomy?

**surgical
pi**

**cataract
extraction**

contraindications (or relative)

- PAS greater than 180 degrees
- secondary closure due to aqueous misdirection*
 - a diagnosis of exclusion, often LPI is performed to rule out closure
- neovascular glaucoma
- completely flat chamber
- active uveitis/cme
- poor visibility
 - mce? paracentesis!
- uncooperative patient....see alternatives.

alternatives: surgical iridectomy

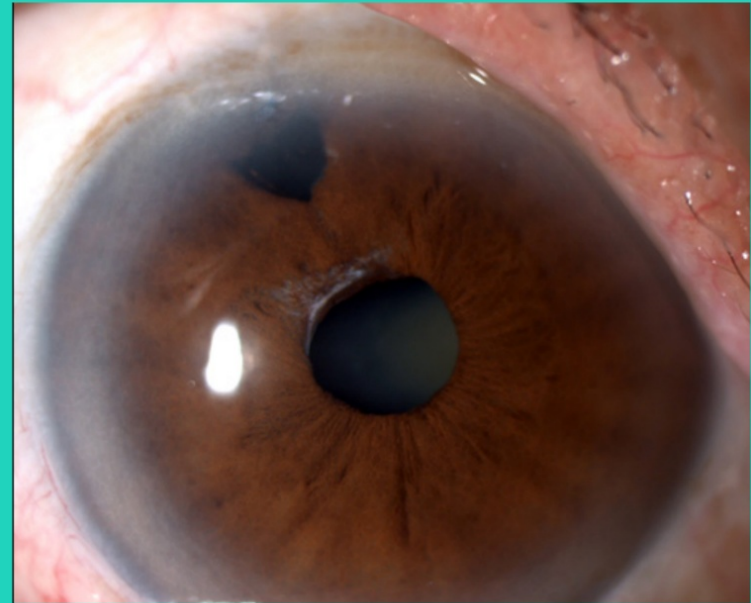
surgical iridectomy vs yag pi

- patient cooperation
- challenging views
- "pigment storm" concerns

" No significant difference between the two treatments was found regarding visual acuity or intraocular pressure. The peripheral anterior chamber increased in depth following both methods...The subjective acceptance by the patients was better in the group treated with laser iridotomy"

disadvantages to surgical PI

- iris trauma, TIDs
- infections risk
- endothelial cell count decrease
- convenience/cost



alternatives: cataract extraction

- cataract extraction will deepen chamber and eliminate an often, phacomorphic component to the narrowing of the angle.
- LPI may only prevent attack. Minimal deepening of the chamber.
- Higher risks with cataract surgery
- cataract extraction option not for patients who are narrow with mild cataracts and controlled IOP
- If significant synechiae present, may be combined with goniosynechialysis

goniosynechiaelysis

- If greater than 180 degrees of PAS
 - Compression/Indentation Gonioscopy!
- Failed LPI
- Cataract must be removed first





eagle study

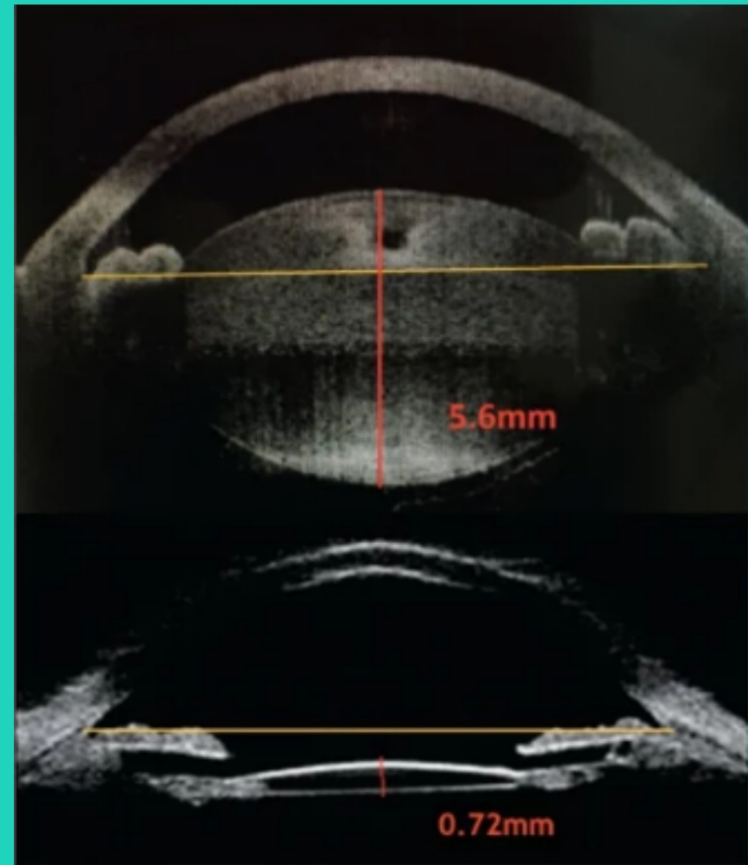
Effectiveness of early lens extraction with intraocular lens implantation for the treatment of primary angle-closure glaucoma

- January 2009 and December 2011
- 419 patients randomized to CE or LPI and topical meds
 - +50 yo+
 - +pacg, IOP > 30 mmHg

Conclusion: CE was more effective and more cost-effective than laser peripheral iridotomy and should be considered as an option for first-line treatment.

eagle study

They are typically older and are going to need cataract surgery in the next decade in the majority of cases. By operating earlier, the surgeon is just moving the process forward for the patient, removing the need for medications in many cases, and reducing the risk of further surgery to control IOP. The EAGLE Study showed that, if the lens was removed, there were far fewer additional surgeries needed, fewer medications and better control of pressure.





How is an LPI performed successfully ?

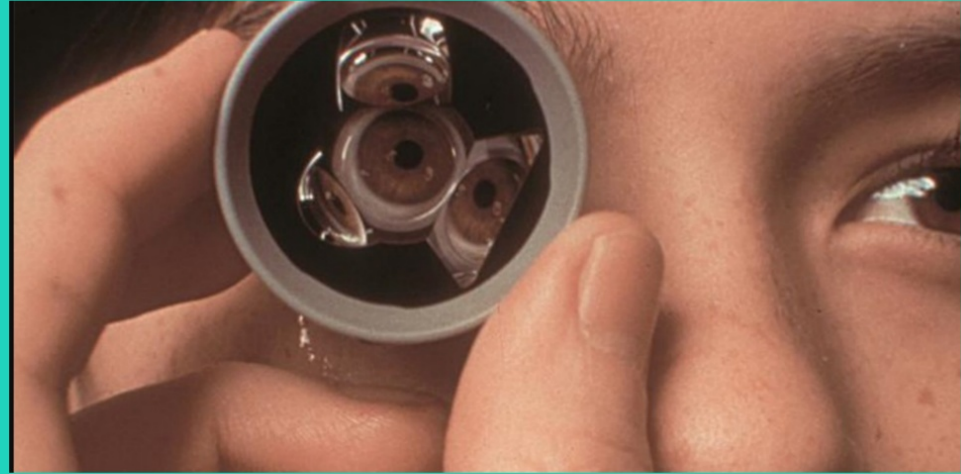
Pre-op

Operation

post-op

pre-operative exam

1. Visual Acuity
2. SLE
 - Lid position
 - Corneal Clarity
 - A/C depth
 - Iris Crypts--choose LPI location
3. IOP
4. Gonioscopy
 - most posterior structure upon indentation
 - amount of pigment
5. Undilated view of ONH
6. Education and Consent



operation

Lens: Abraham Iridotomy Lens

- + GenTeal Nighttime Gel, Systane Nighttime Gel
- + Not OINTMENT
- + Goniovisc/Gonak (hypromellose) if the only option available
 - BAK, sticky, bubbles, blurry

YAG laser settings for PI

- Spot Size: fixed
- Duration: fixed
- Offset: 0 microns
- Pulse/Burst: 1, 2 or 3 (personally preferred)
- Energy: 2.0 mJ-6.0 mJ





operation

1. 10-20 minutes prior consider instillation of pilocarpine 1-2%
2. Instill 1 drop proparacaine in BOTH EYES
3. Instill 1 drop of aproclonidine/brimonidine
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, position lower vs YAG capsulotomy
 - position button
 - locate crypt (already determined in pre-op exam)

operation

7. Focus He Ne beams on location
8. Turn off standby to "ready"
9. Initiate shots
 - consider starting with lower energy (2.0-2.5)--desensitizing iris
 - continue shots, look for tissue interaction
 - if heavily pigmented, may have to wait longer between shots
 - Consider changing positions little effect or INCREASE energy--warn patient
10. Fire until pigment plume noted (endpoint)
 - Consider widening a bit more, about 1 mm
 - If hyphema, put some pressure on it
11. Remove lens





argon/yag combo

- less bleeding
- less debris
- better for pre-tx of thick, brown iris

Argon green laser (529 nm)

- Power: 600 - 1200 mw
- Spot size: 50 um
- Duration: .1 second

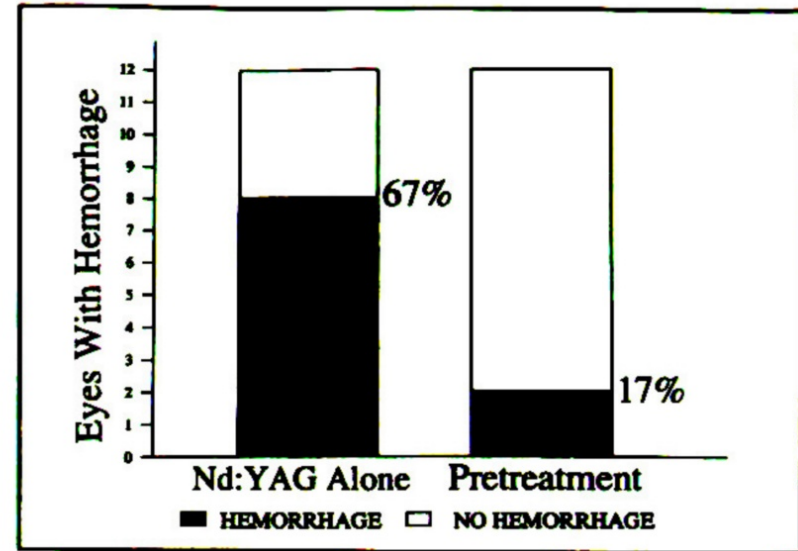
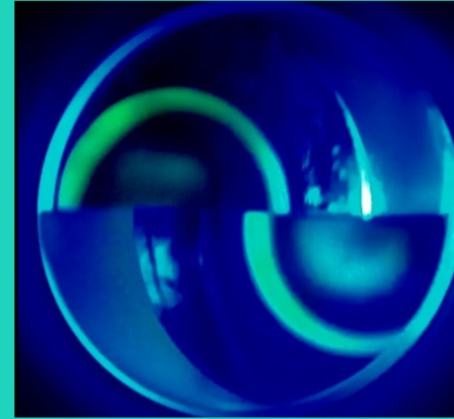


FIGURE 1: Hemorrhage incidence during laser iridotomy.

post-operative

1. wash out coupling gel
2. 1 drop of aproclonidine/brimonidine
3. IOP check 30-60 minutes later
4. Some suggest a SLE
patency
hyphema

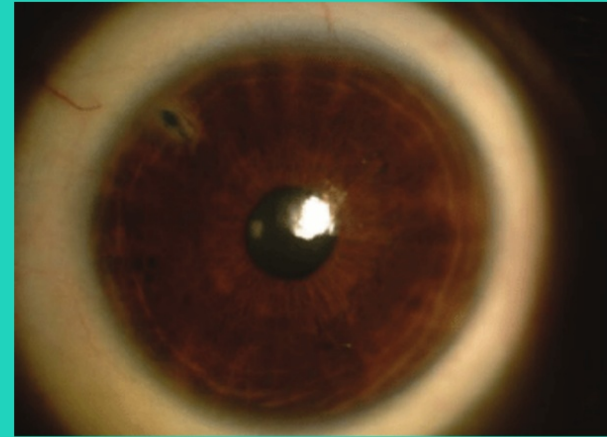


- post-operative drops
 - usually recommend adding Prednisolone Acetate 1% q1h 1-2 days , then QID x 6 days or f/u
 - continue all IOP-lowering medications
- instructions
 - no "restrictions"
 - use drops faithfully
 - symptoms of pain, HA, nausea
- follow up: 1-2 weeks typically (global period is 10 days)
 - gonioscopy
 - tropicamide challenge



complications

- blurred vision?
 - should be temporary
- uveitis
- IOP elevation
 - heavy pigment, PG higher risk
- hyphema
- aqueous misdirection
- non-penetration
 - may need repeat procedure
 - tropicamide challenge!
- dysphotopsias
 - maddox rod effect
- peaked pupil

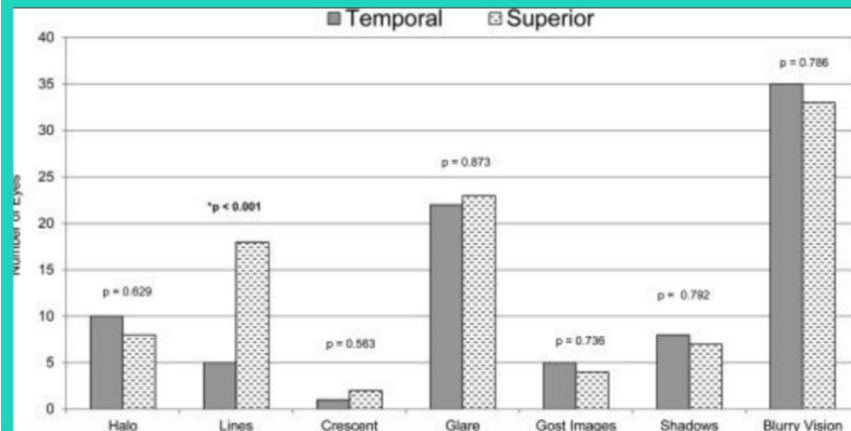


placement

11, 12, 1, 3 or 9?

(Personally I prefer 1 for the right eye and 11 for the left eye)

Dysphotopsia after Temporal versus Superior Laser Peripheral Iridotomy: A Prospective Randomized Paired Eye Trial

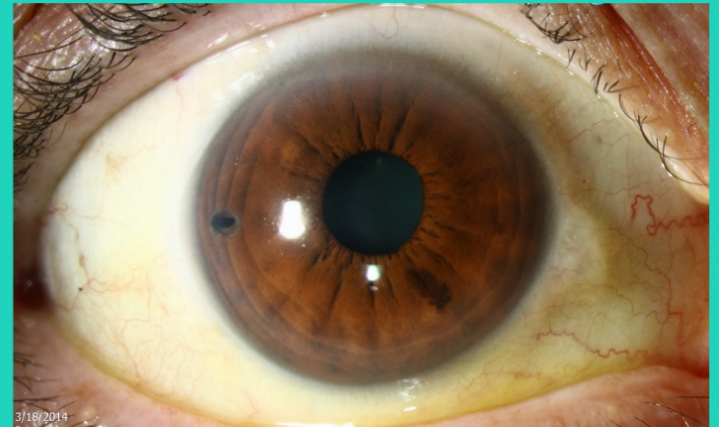


- 169 completed study, 2014
- randomized to lpi superior in 1 eye and temporal in the other
- evaluated incidence of linear dysphotopsia
- linear dysphotopsia
 - 10.2% superior
 - 2.4% temporal

placement

Comparison of New Visual Disturbances after Superior versus Nasal/Temporal Laser Peripheral Iridotomy: A Prospective Randomized Trial

- 2018
- 559 patients
- randomized into 285 superior, 274 temporal LPI
- linear dysphotopsia
 - 8.4% superior vs. 9.5% temporal
- more shots superior (more energy)



questions?

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