

# Laser Treatment in Glaucoma



# I. Overview of laser treatment

Trabeculoplasty

Iridotomy

Iridoplasty

Hyaloidotomy

Cyclophotocoagulation

Laser suture lysis

Laser Goniopuncture

Additional Useful Information



# I Overview of Laser Treatment

## Outflow enhancement

### Open-Angle Glaucoma:

- Laser trabeculoplasty
  - Argon Laser Trabeculoplasty (ALT)
  - Selective Laser Trabeculoplasty (SLT)

### Angle Closure Glaucoma:

- Modification of iris contour in ACG secondary to plateau iris
  - Laser peripheral iridoplasty (ALPI)



## Reestablishing postero-anterior flow

- Angle Closure  $\pm$  Glaucoma
  - Peripheral Laser iridotomy (PI) for relief of pupillary block
- Malignant Glaucoma
  - Laser hyaloidotomy/posterior capsulotomy

## Inflow reduction:

### Cyclophotocoagulation

- trans-scleral, endoscopic & micro-pulse
- used in open angle glaucoma and angle closure
- usually for refractory disease

## Laser Post surgery:

- Laser suture lysis<sup>1</sup>
  - Adjunct to trabeculectomy
- Laser sclerostomy<sup>2-</sup>
- Laser goniopuncture<sup>5</sup>
  - Adjunct to non-penetrating surgery

# Abbreviations used

Primary Open Angle Glaucoma - POAG

Ocular Hypertension - OHT

Primary Angle Closure - PAC

Angle Closure Glaucoma - ACG

Trabecular meshwork - TM



# I Laser trabeculoplasty



# IV Laser trabeculoplasty - Indication

## Indication:

- used as primary treatment, adjunct therapy to medication or in medication failure for treatment of POAG and OHT
- not only lowers the IOP but also slows down the visual field progression, as per several multicenter randomized trials, notably the Early Manifest Glaucoma Trial and the Advanced Glaucoma Intervention Study, Glaucoma Laser Trial (GLT)



# IV Laser trabeculoplasty - Indication

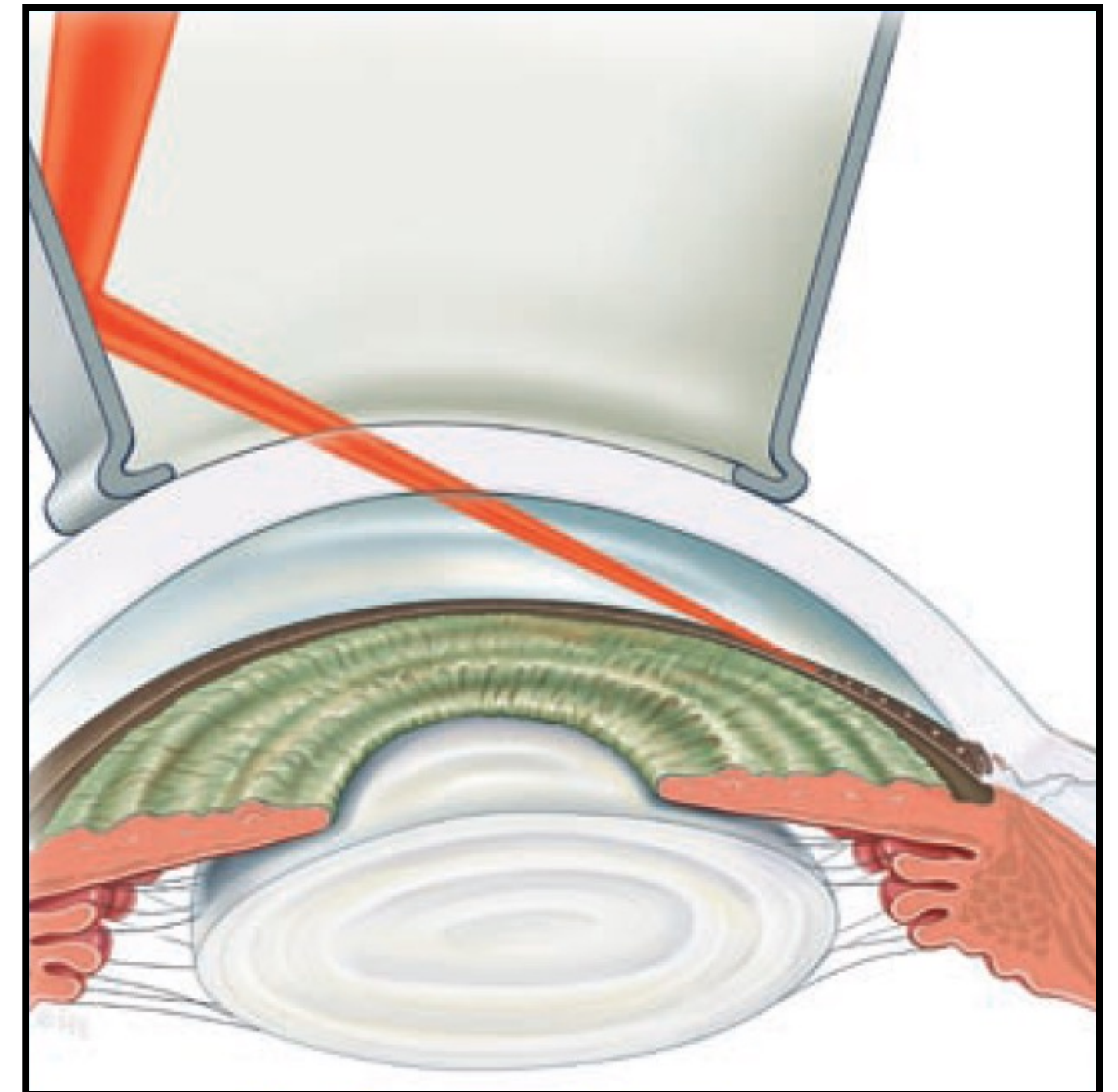
## Indication:

- Usually if noncompliant  
intolerant to medicines  
reduce number of topical medications  
pregnant women  
patient preference  
not fit for filtering surgery
- Other indications are secondary OAG such as  
pseudophakic glaucoma, pseudoexfoliation, pigmentary  
glaucoma and even in PAC disease after an iridotomy has  
opened the angles

# IV Laser trabeculoplasty - Mechanism

## Mechanism:

- laser to Trabecular Meshwork results in collagen shrinkage or modification which opens up inter-trabecular spaces and increases outflow



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# IV Laser trabeculoplasty - Types

- **Argon Laser Trabeculoplasty (ALT)**
  - original laser application from 1979, largely now superseded
- **Selective Laser Trabeculoplasty (SLT)**
  - electively targets pigmented TM due to low power which is only 1% of total energy used by ALT and short duration (3 ns) sparing adjacent cells and tissues from collateral thermal damage

# IV Laser trabeculoplasty- Procedure

- **Pre-laser Management:**
  - Explain the procedure and obtain informed consent
  - To reduce post-treatment IOP spike or inflammation, consider pre-treatment with:
    - apraclonidine 1% or brimonidine 0.15–0.2%
    - and/or pilocarpine 1–2%
    - and/or  $\beta$ -block
    - and/or steroid drops (may reduce IOP response)
  - Topical Anaesthesia



# IV Laser trabeculoplasty- Procedure

- **Specifications**

Laser management

ALT: argon green or blue-green

Diode

SLT: frequency-doubled Nd:YAG (532 green)

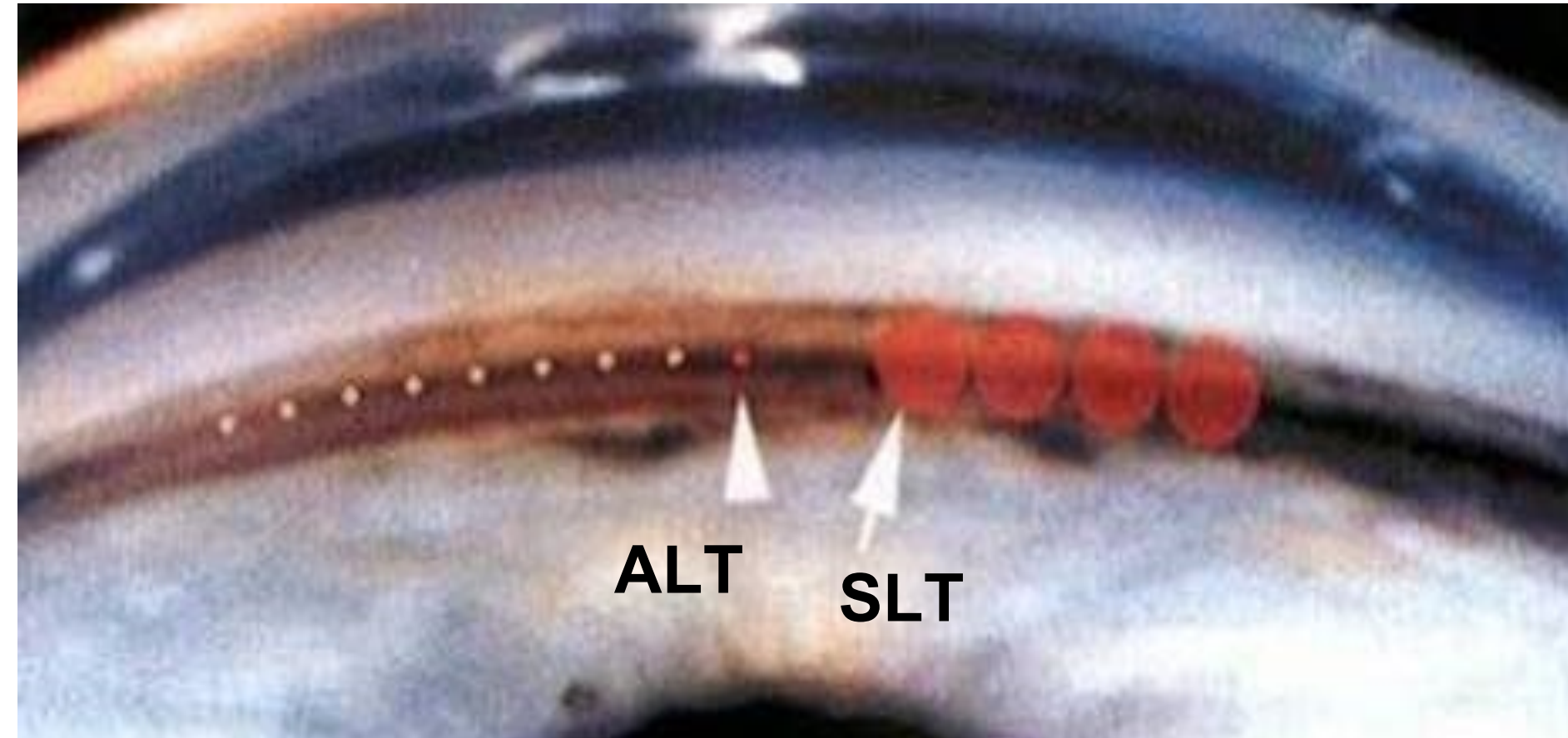
Lens

- Without magnification (e.g. Goldmann-style 3-mirror lens)
- With magnification (e.g. Ritch trabeculoplasty lens)
- Other lenses

Placement of laser spots

- Between pigmented and non-pigmented TM

# IV Laser trabeculoplasty- Procedure



## Spot size comparison

ALT  $50\ \mu\text{m}$

SLT

$400\ \mu\text{m}$

	ALT and diode	SLT
Power	300–1200 mW	0.4–1.8 mJ
Spot size	50 $\mu\text{m}$ (ALT) / 75 $\mu\text{m}$ (diode)	400 $\mu\text{m}$
Duration	0.1 sec (ALT and diode)	3 nsec
Number of burns	30–50 spots evenly spaced over 180° sequentially the remaining 180°	50–100 spots evenly spaced over 180–360°
Endpoint	Blanching	Minimal Bubble (every 2nd - 3rd)



# IV Laser trabeculoplasty- Procedure

- **Tips for performing SLT:**

- Calibrate prior to use
- Do not use the aiming beam spot to focus
- Set the laser at 0.8 mJ initially
  - Asian eyes – start at 0.6 mJ
  - Heavily pigmented angles – 0.3–0.4 mJ
- Titrate power in 0.1 mJ steps until “champagne bubbles” are just observed
  - Adjust as needed for pigment variation
- First 180° – treat the nasal or inferior half

# IV Laser trabeculoplasty - Video



1. Francis BA. Procedural treatments: laser trabeculoplasty. In: Giaconi JA, Law SK, Caprioli J (eds.) *Pearls of Glaucoma Management*. Berlin: Springer-Verlag; 2010. p. 247–255;
2. Ellex. SLT treatment guidelines – Asia. Available at: [www.slt-ellex.com/resources/treatment\\_protocol.php](http://www.slt-ellex.com/resources/treatment_protocol.php).



# IV Laser trabeculoplasty- Procedure

- **Complications**

- Temporary blurring of vision
- transient redness, discomfort, iritis
- IOP spike
- Endothelial burns and decompensation if treatment is too anterior
- Chronic increase in IOP
- Rarely: stromal keratitis, hypopyon, choroidal effusion

# IV Laser trabeculoplasty- Procedure

- **Post-procedure Management**

- Continue current medical treatment
- Re-check IOP, especially if IOP spike prevention treatment is not available
- Topical steroid 4×/day, Steroids after Laser Trabeculoplasty (SALT) Trial reported improved outcome of SLT in terms of IOP reduction with short-term postoperative use of NSAID or steroid drops
- Closer monitoring is suggested for:
  - advanced glaucoma with severe field loss
  - one-eyed patients
  - high pre-laser IOP



# IV Laser trabeculoplasty- Outcome

## Outcome

- SLT can lower IOP by 20-30%
- treatment successful in ~70% of patients at 6 months
- it may take up to 2months for full effect
- treatment fails with time; duration may vary from 2-5+ years
- average time to failure after SLT was 18 months
- strongest predictor of success is
  - outcome in fellow eye
  - baseline IOP >18mmHg
- repeat SLT treatment can be repeated up to 3 times with equivalent success rate

# IV Laser trabeculoplasty- References

- Ayala M, Chen E. Long-Term Outcomes of Selective Laser Trabeculoplasty (SLT) Treatment. [Open Ophthalmology Journal](#) 2011;5:32-4
- Hirabayashi M, Ponnusamy V & An J. Predictive Factors for Outcomes of Selective Laser Trabeculoplasty. [Scientific Reports](#). 2020, volume 10, Article number: 9428
- Khawaja A *et al*. Real-World Outcomes of Selective Laser Trabeculoplasty in the United Kingdom. *Ophthalmology* 2020 Volume 127 (6). Pages 748 - 757
- Garg A *et al* ; Laser in Glaucoma and Ocular Hypertension Trial Study Group. Efficacy of Repeat Selective Laser Trabeculoplasty in Medication-Naive Open-Angle Glaucoma and Ocular Hypertension during the LiGHT Trial. *Ophthalmology*. 2020 Apr;127(4):467-476.
- Francis, B.A., Loewen, N., Hong, B. *et al*. Repeatability of selective laser trabeculoplasty for open-angle glaucoma. *BMC Ophthalmol* 16, 128 (2016)



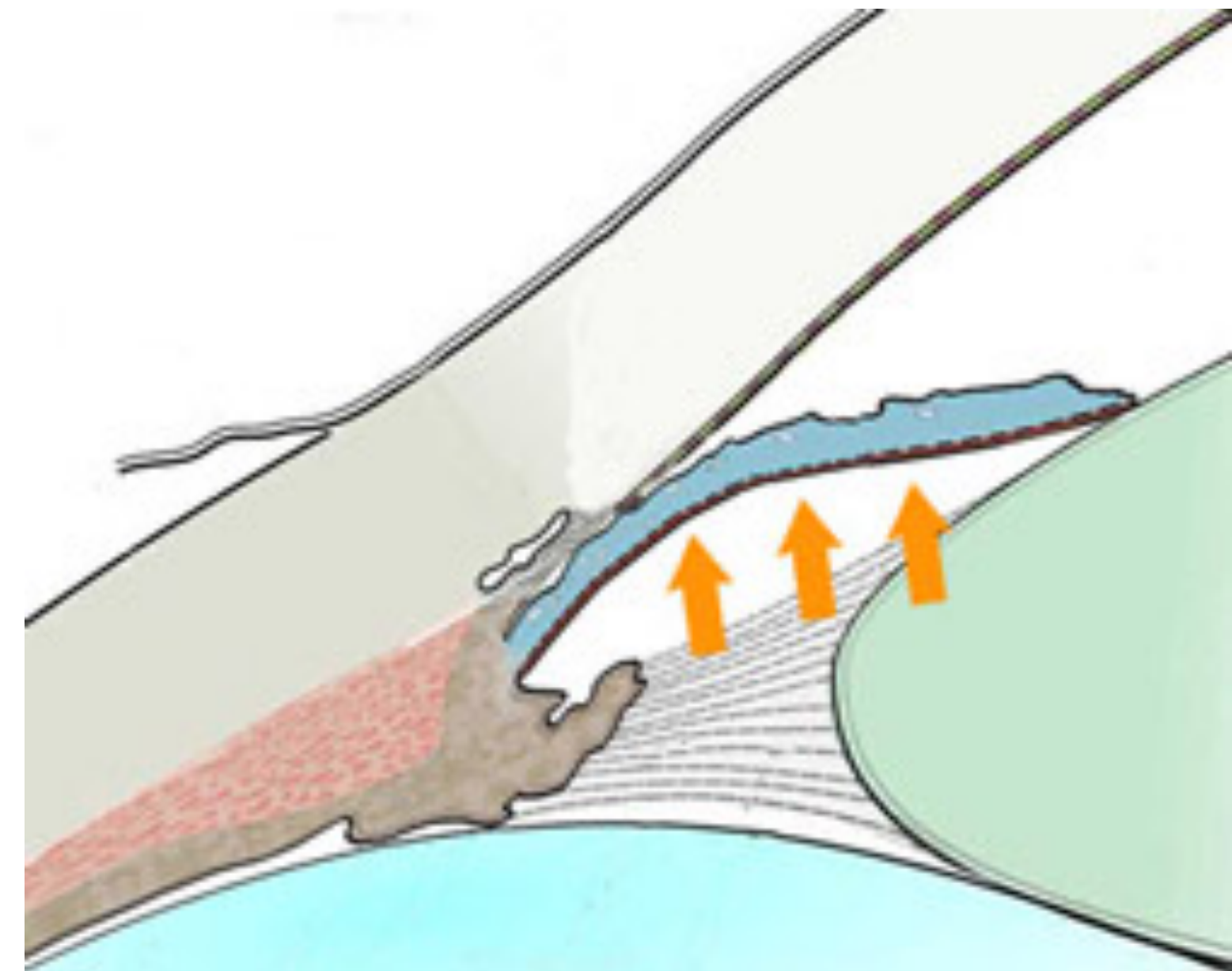
# II Iridotomy



# II Iridotomy - Indication

## Indication:

- Laser treatment to connect the anterior and posterior chambers to relieve pupillary block)
- now considered temporising treatment prior to Phaco/IOL for definite treatment



Picture courtesy of Murali Ariga



# II Iridotomy - Indication

## Indication:

### -Absolute indications

1) Presence or likelihood of significant pupillary block

Primary angle closure

Primary angle-closure glaucoma

2) Primary angle closure suspect

Primary angle closure in fellow eye

### - Relative indications

Primary angle closure suspect

Need for repeated dilated examinations

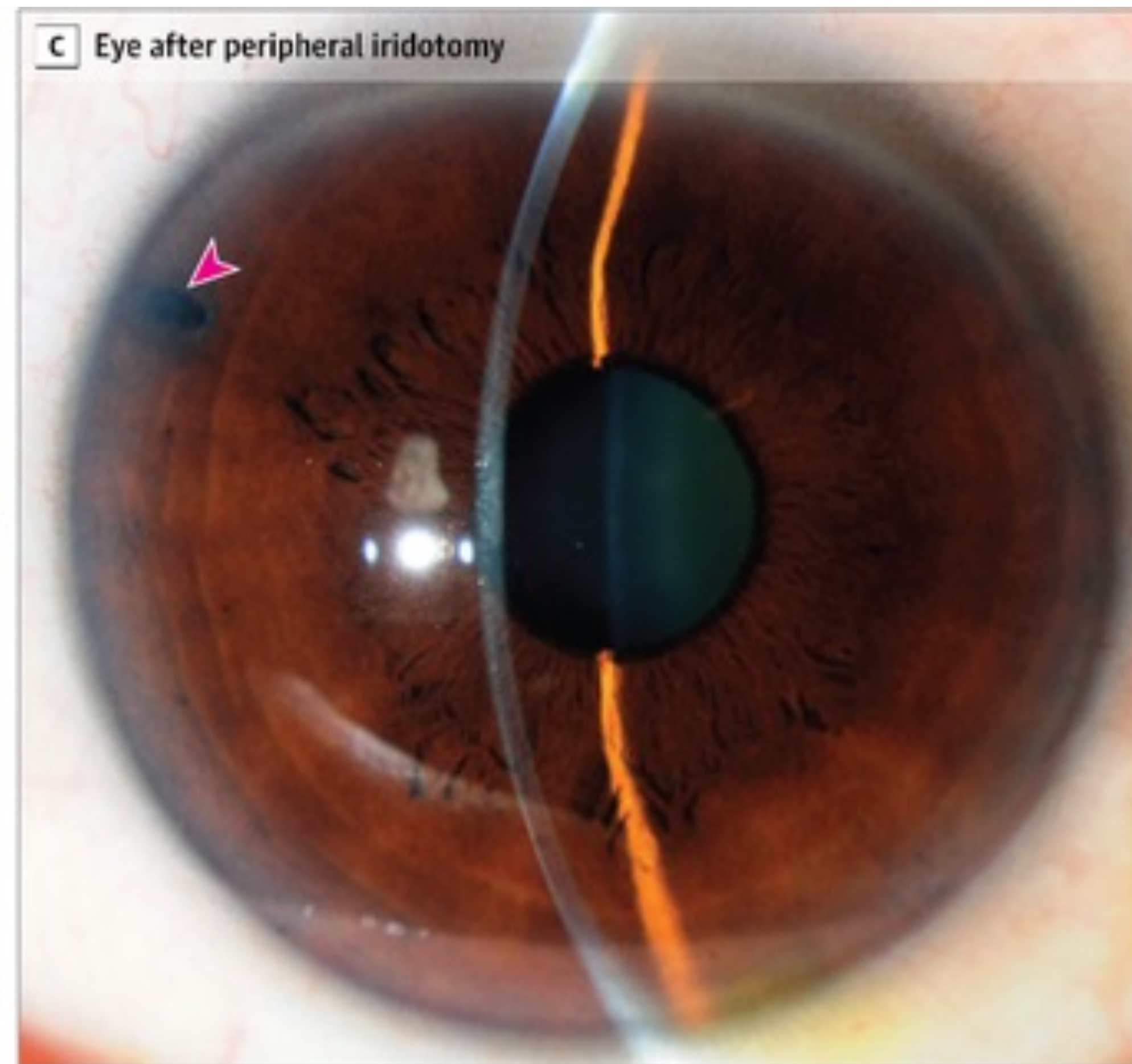
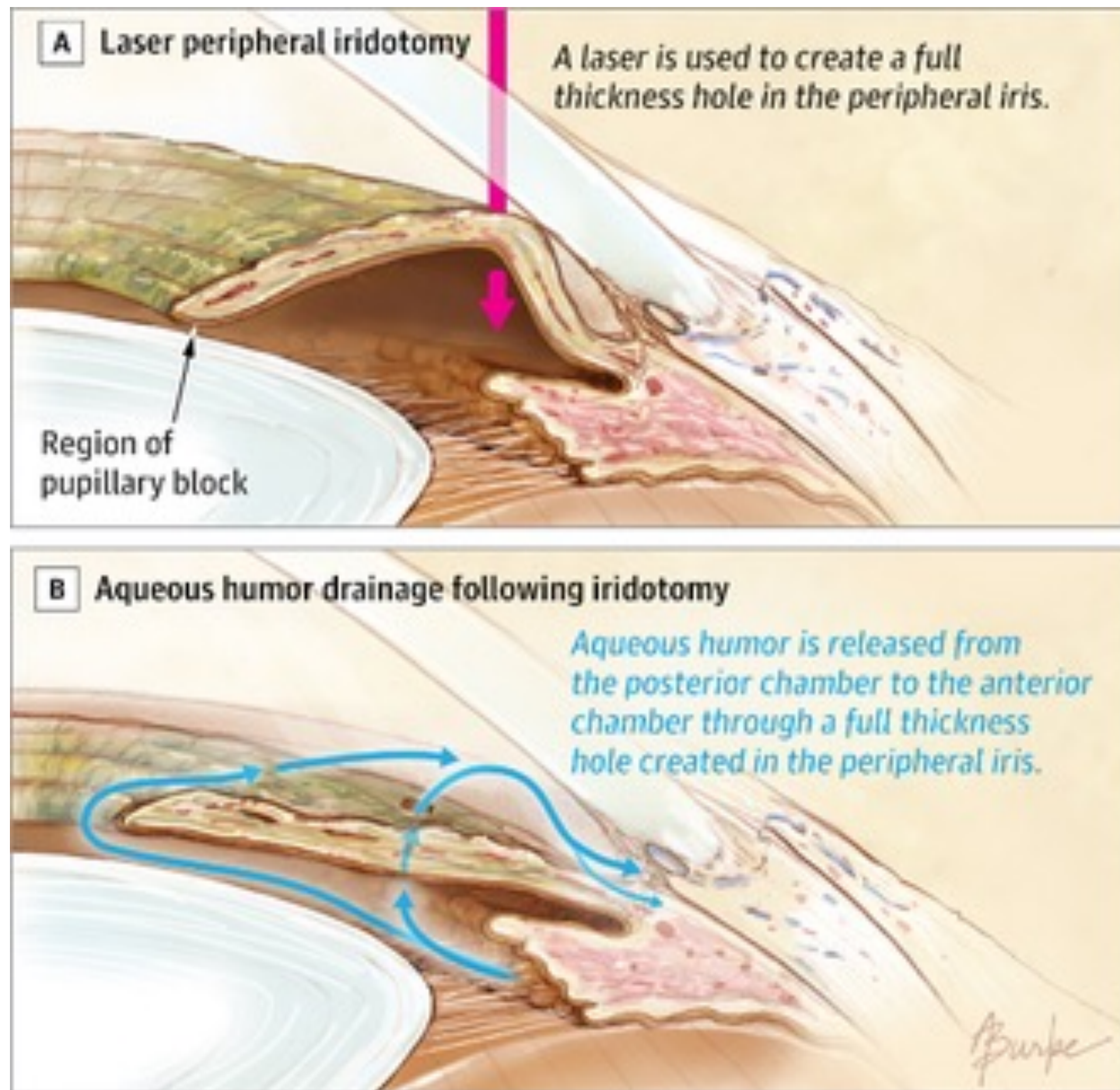
Limited access to regular ophthalmic care

Confirmed family history of angle-closure glaucoma



# II Iridotomy - Mechanism

## Mechanism





# II Iridotomy - Procedure

## Pre-procedure Management:

- Explain the procedure and obtain informed consent
- Instil pilocarpine 1–2% (aim for miosis)
- To reduce post-treatment IOP spike or inflammation, consider

pre-treatment with:

- apraclonidine 1% or brimonidine 0.15–0.2%, and/or  $\beta$ -blocker, and/or oral carbonic anhydrase inhibitor, and/or steroid drops
- Topical anaesthesia
- Topical glycerine if the cornea is oedematous

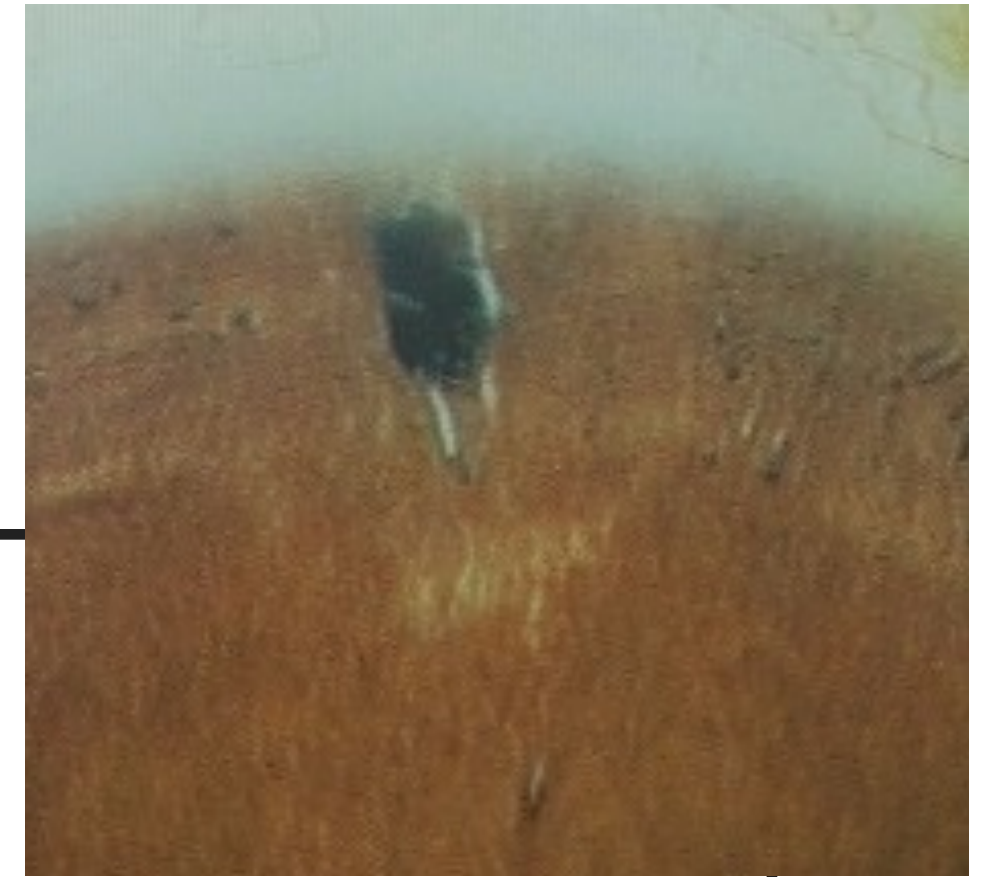
# II Iridotomy - Procedure

## Procedural Considerations:

- Superior one-third of the peripheral iris (beneath upper lids) is desirable
- Choose an iris crypt or an area of thin iris- Focus the beam within the iris stroma, rather than on the surface of the iris and defocus posteriorly
- Laser management
  - Nd:YAG alone
  - Use of Nd:YAG – alone or in combination with argon, krypton or diode – is preferred



# II Iridotomy - Procedure



Parameter	Preparatory stretch burns	Penetration laser burns*	
		Argon (“Chipping”)	Nd:Yag (“Punching”)
Type of Laser	Argon (“stretch”)	Argon (“Chipping”)	Nd:Yag (“Punching”)
Power	500–900 mW	800–1000 mW	3-8 mJ
Spot size	200–500 $\mu\text{m}$	50 $\mu\text{m}$	400 $\mu\text{m}$
Exposure time	0.2–0.5 sec	0.02 sec–0.09**	3 nsec
No of Spots	10-15	5-10	2-5 spots

\* Parameters suitable for intermediate iris colours.

\*\* Darker iris colours

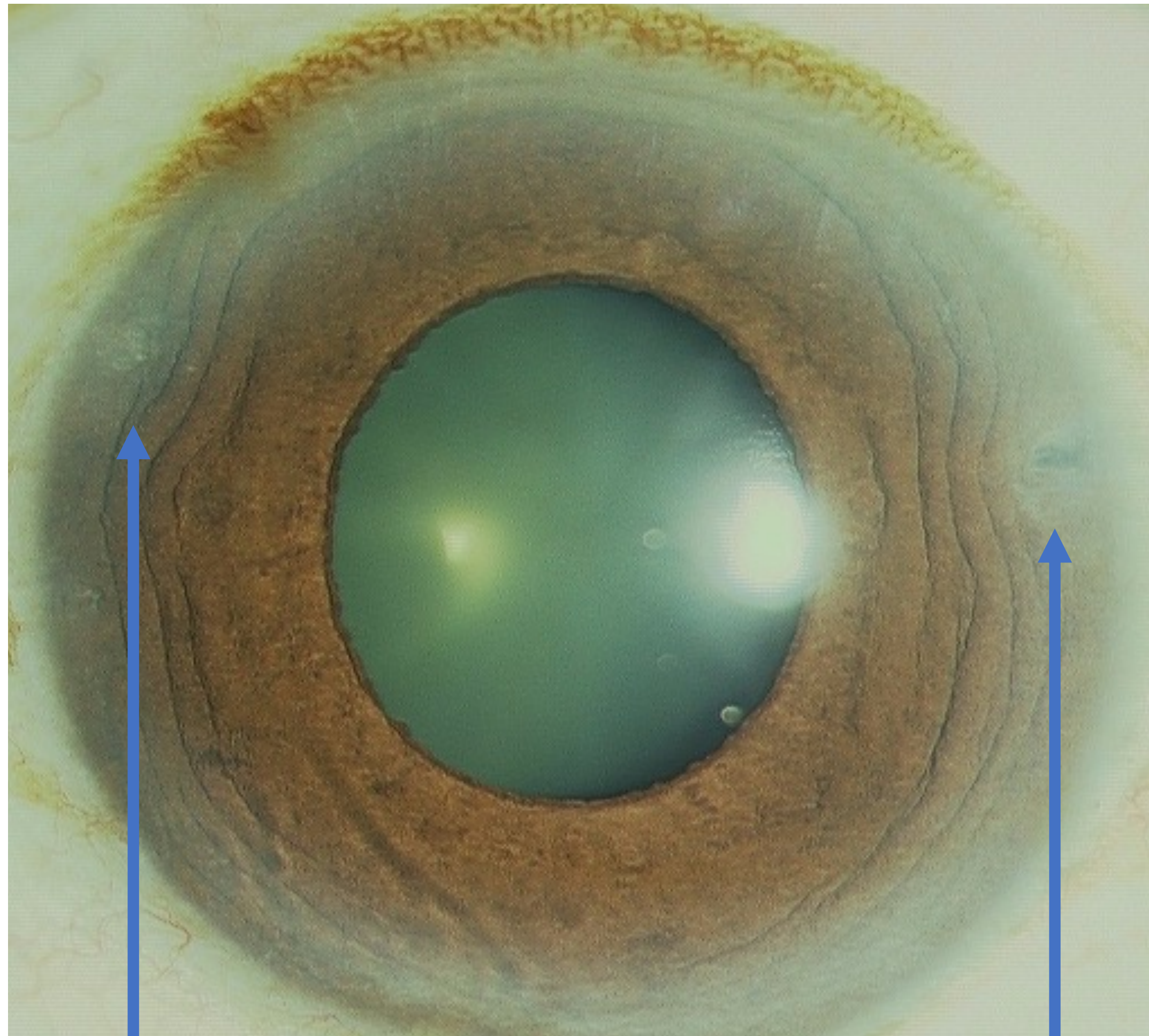
## Procedural Specification

- Aim for Fluid/pigment puff
- Verify the patency of the peripheral iridotomy  
Use direct visualization,  
not retro-illumination alone
- Ensure the size of the peripheral iridotomy is  
adequate ( $\geq 150 \mu\text{m}$ )



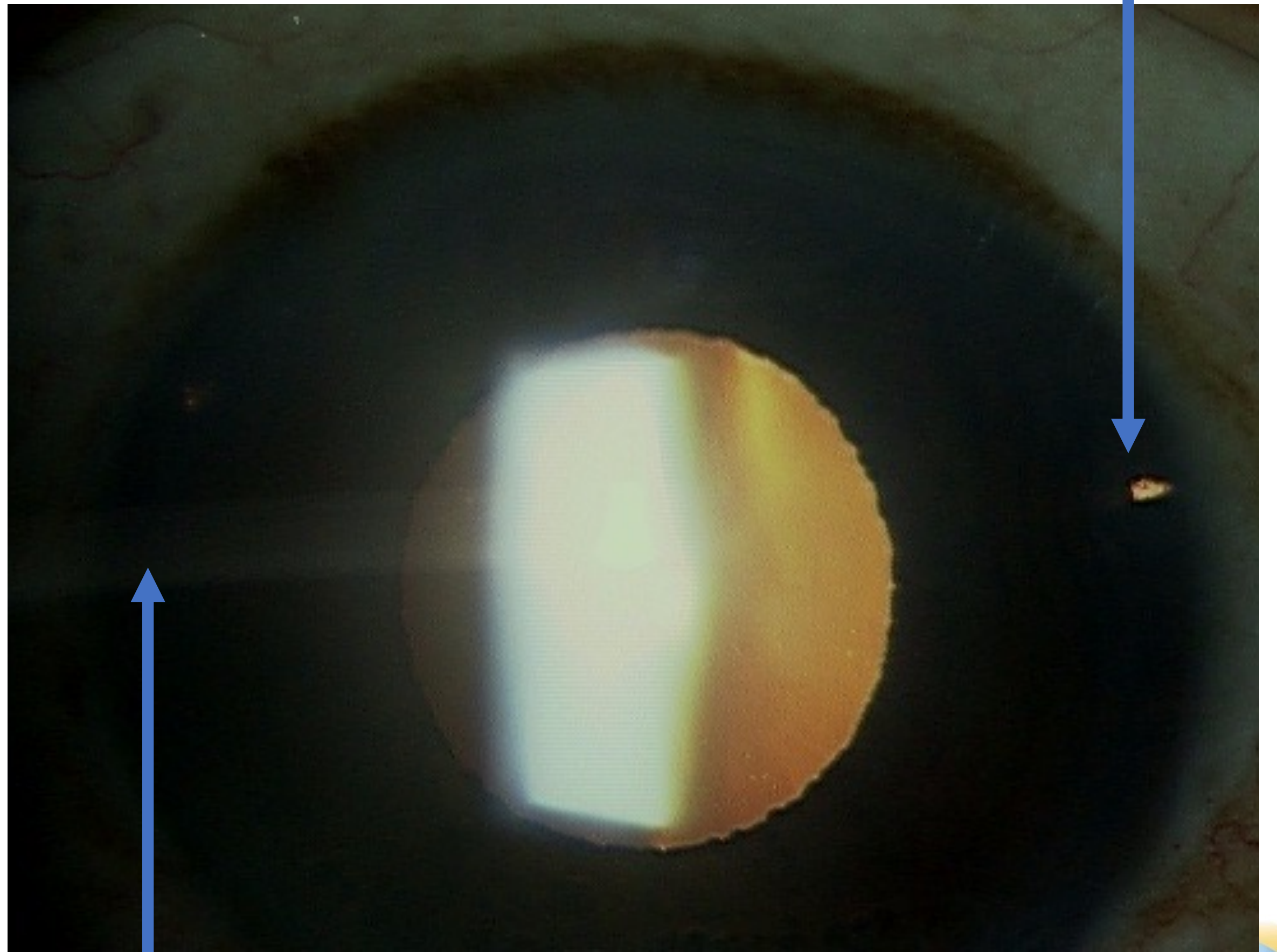
# II Iridotomy - Procedure

Internal use



2x Iridotomy sites

Only temporal iridotomy patent on transillumination



Attempted iridotomy nasally with failure to penetrate



# II Iridotomy - Procedure

## Tips for performing PI:

- Pale blue and dark brown irides are difficult to penetrate with the argon laser<sup>1</sup>
- Blue irides
  - Increase power and duration<sup>1,2</sup>
  - Nd:YAG “punching” is a better option<sup>1</sup>
- Dark brown irides
  - Increase power and reduce duration
  - Argon “chipping technique”<sup>2</sup> useful or else Nd:YAG or sequential iridotomy is preferred<sup>1,2</sup>



## Tips for performing PI:

- Use minimum energy: lens damage is possible above 2 mJ per pulse
- Asian patients have thick and heavily pigmented irides,
- some surgeons may prefer using the Nd:YAG laser alone, or argon laser pre-treatment followed by Nd:YAG laser
- In cases of Uveitis more than one iridotomy may be preferable and a larger iridotomy size (e.g. 400  $\mu\text{m}$ ) is required

# II Iridotomy - Procedure

Internal use



Video courtesy of Professor Paul Chew



# II Iridotomy - Complications

## Complications:

- Temporary blurring of vision
- Corneal epithelial / endothelial burns with argon laser
- Intra-operative bleeding /Hyphaema
- IOP spikes
- Postoperative inflammation
- Posterior synechiae
- Iridotomy closure
- Failure to penetrate
- Localised lens opacities or cataract progression

## Post-Procedure Management:

- Iopidine 1% stat
- Recheck the IOP at 1-6hour post treatment and again at 24-48hours (especially if prevention not available)
- Topical steroid q1H for 1 day and then QID x 4-6 days (reduce inflammation which can worsen PAS)
- stop pilocarpine and Post-procedure gonioscopy looking for expected deepening in the angle and to exclude residual narrowing due to phacomorphic or plateau iris components or significant PAS.
- Follow-up based on indication for YAG PI but generally 1 week to check IOP and patency, and laser the other eye if required



## Outcome

- LPI has good IOP lowering effect if deep angle anatomy re-established but there is a risk of repeat pressure spike
- Angle-closure suspects that underwent LPI did have a 47% reduction in the risk of developing primary angle-closure or an acute attack
- modest benefit of prophylactic LPI though risk of angle closure extremely low
- early phacoemulsification appeared to be more effective in preventing IOP rise than LPI as per EAGLE study with
  - less IOP spikes
  - fewer medication required
  - deeper angles following the procedure

# II Iridotomy - References

- He M, Jiang Y, Huang S, et al. Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial. *Lancet*. 2019;393(10181):1609-18
- Radhakrishnan S, Chen PP, Junk AK, et al. Laser peripheral iridotomy in primary angle closure: a report by the American Academy of Ophthalmology. *Ophthalmology*. 2018;125(7):1110-20.
- Su WW, Chen PY, Hsiao CH, Chen HS. Primary phacoemulsification and intraocular lens implantation for acute primary angle-closure. *PLoS One*. 2011;6(5):e20056.
- Azuara-Blanco A, Burr JM, Cochran C, et al. Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomized controlled trial. *Lancet*. 2016;388(10052):1389-97.



# III Iridoplasty



# III Iridoplasty - Indications

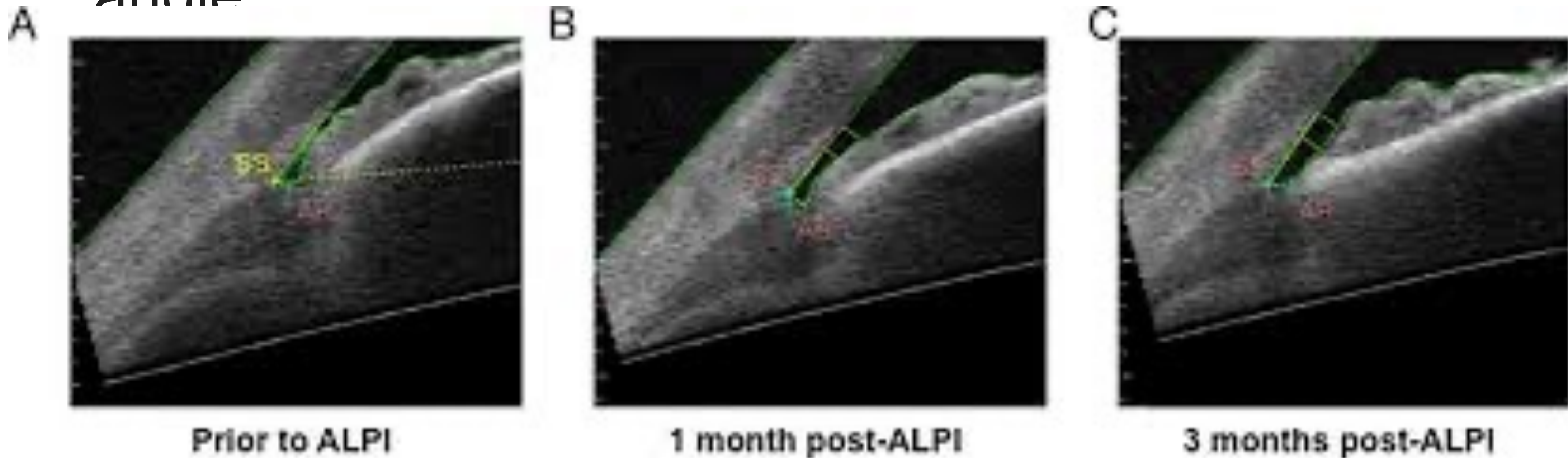
## Indication:

- Argon Laser peripheral iridoplasty (ALPI) is indicated post peripheral iridotomy if there is persistent angle closure i.e plateau iris
- Break an attack of acute angle closure
- Minimize the risk of corneal endothelial damage during iridotomy
- Facilitate access to the trabecular meshwork for laser trabeculoplasty in small eyes i.e. nanophthalmos
- Adjunct to goniosynechialysis
- Contraindicated in areas with PAS



# III Iridoplasty - Method

- aim is to flatten the peripheral iris through 360degree Laser burns and widen the inlet of the anterior chamber angle



IMPACT Study: Bourne BJO 2016

# III Iridoplasty - Procedure

## Pre-Laser Management:

- Argon Laser peripheral iridoplasty (ALPI) is indicated post peripheral iridotomy if there is persistent angle closure i.e plateau ir
- Explain procedure and get informed consent
- Instil pilocarpine 1–2% (aim for miosis)
- To reduce post-treatment IOP spike or inflammation, consider pre-treatment with one or more of:
  - apraclonidine 1% or brimonidine 0.15–0.2%
  - $\beta$ -blocker
  - oral carbonic anhydrase inhibitor
  - steroid drops
- Topical anaesthesia
- Topical glycerine, if the cornea is oedematous



# III Iridoplasty - Procedure

## Procedure specifications:

- Laser
  - Argon green or blue-green
  - Diode laser
- Lens
  - Any laser iridotomy contact lens
  - Goldmann three-mirror lens
- Spot placement
  - As peripheral as possible
  - Aiming beam may have to straddle the limbus

# III Iridoplasty- Procedure

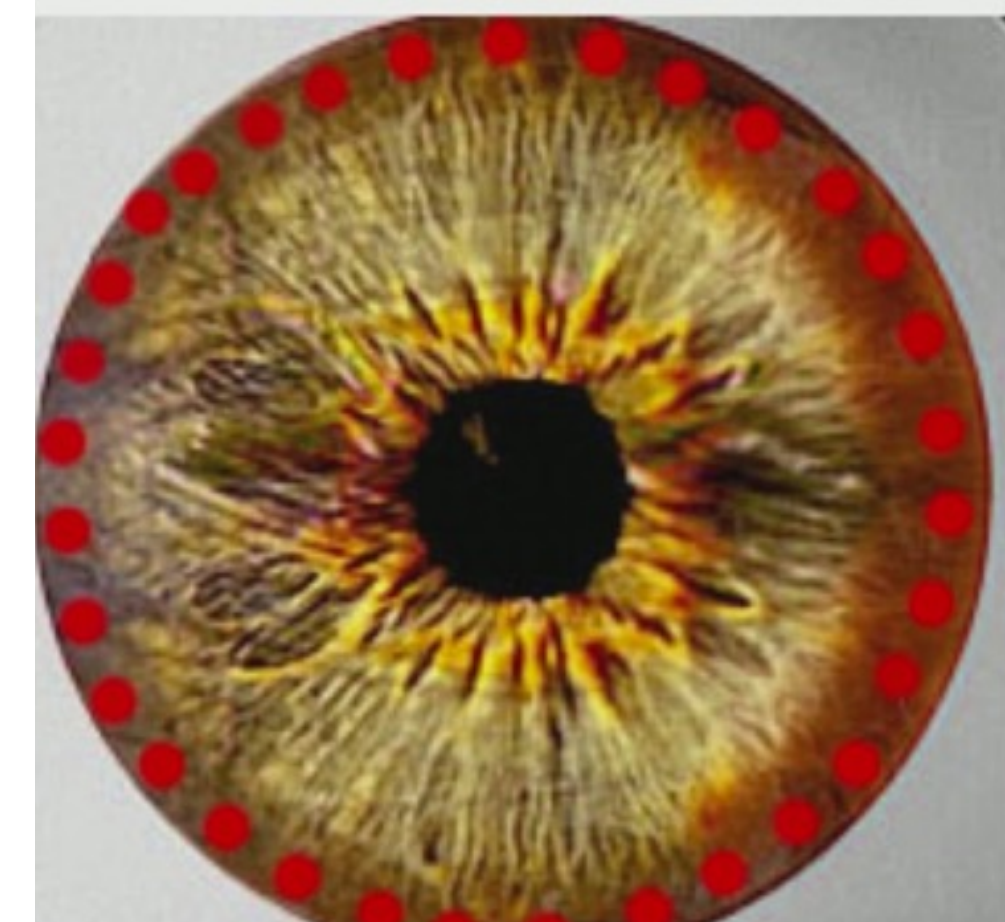
Parameter	Preparatory stretch burns
Type of Laser	Argon
Power	150 -400 mW (depending on iris contraction)
Spot size	200–500 $\mu\text{m}$
Exposure time	0.2–0.5 sec
No of Spots	10–40 applications over 360° Leave at least 1–2 spot diameters between spots 180° treatment may be effective – do not overtreat



# III Iridoplasty - Procedure

## Procedure specifications:

- Aim for iris contraction with peripheral anterior chamber deepening
- Charring of the iris, or a 'pop' sound or bubble, signifies too much power, reduce power accordingly



# III Iridoplasty - Video

## Argon Laser Peripheral Iridoplasty (ALPI)

Abraham Lens  
Power: 260 mW  
Spot Size: 500  $\mu$ m  
Duration: 0.5 sec

Robert Ritch, MD

Video courtesy of Dr Robert Ritch



# III Iridoplasty - Complications

## Complications

- Mild iritis
- Iris atrophy
- Mydriasis
- Corneal endothelial burns
- IOP spikes
- PAS and/or posterior synechiae

## Post-Procedure Management

- If treatment to prevent an IOP spike is not available, check IOP within 1–6 hours and at 24–48 hours, depending on the status of the patient
- Topical steroid 4–6×/day for 7 days or more, depending on inflammation
- Repeat gonioscopy after withdrawal of pilocarpine:
  - evaluate the anterior chamber angle
  - Identify other mechanism(s) of angle closure that might necessitate further intervention
- Pupillary dilatation to break posterior synechiae when suspected



## Outcomes

- the beneficial effects of ALPI last for <4 years, with the majority of patients (77%) requiring surgery
- Phacoemulsification alone can be a successful treatment for plateau iris in our patient population
- ALPI should be considered a temporising measure if phaco is not available

# III Iridoplasty - References

- Peterson JR, Anderson JW, Blieden LS, Chuang AZ, Feldman RM, Bell NP. Long-term Outcome of Argon Laser Peripheral Iridoplasty in the Management of Plateau Iris Syndrome Eyes. *J Glaucoma*. 2017 Sep;26(9):780-786
- Bourdon H, Aragno V, Baudouin C, et al Iridoplasty for plateau iris syndrome: a systematic review *BMJ Open Ophthalmology* 2019;4:e000340
- Tham, C., Lai, J., Poon, A. *et al*. Immediate argon laser peripheral iridoplasty (ALPI) as initial treatment for acute phacomorphic angle-closure (phacomorphic glaucoma) before cataract extraction: a preliminary study. *Eye* **19**, 778–783 (2005)





# V Hyaloidotomy



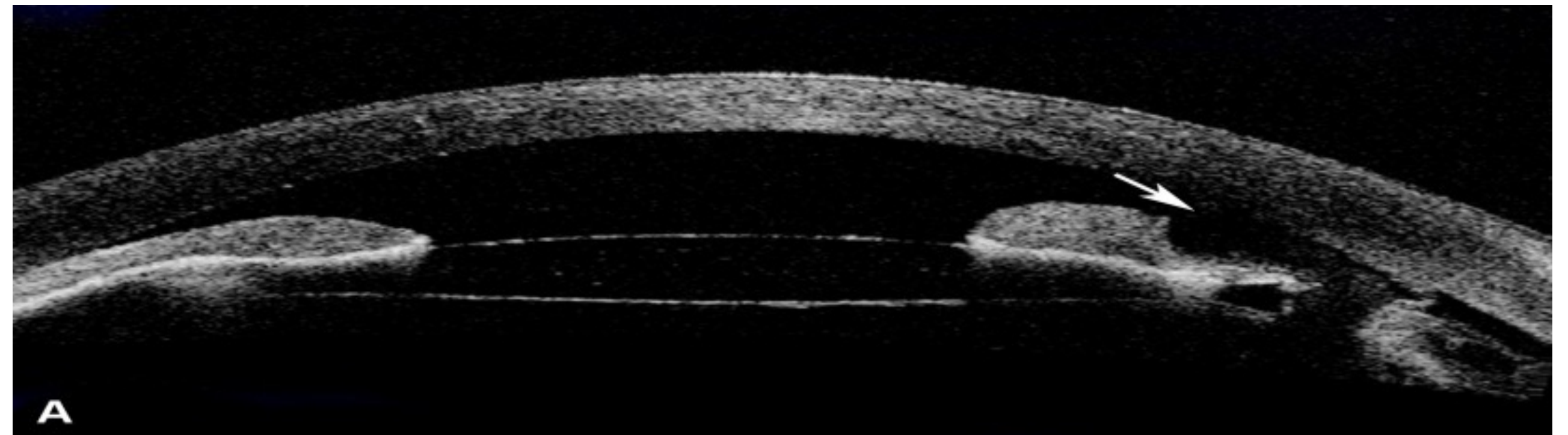
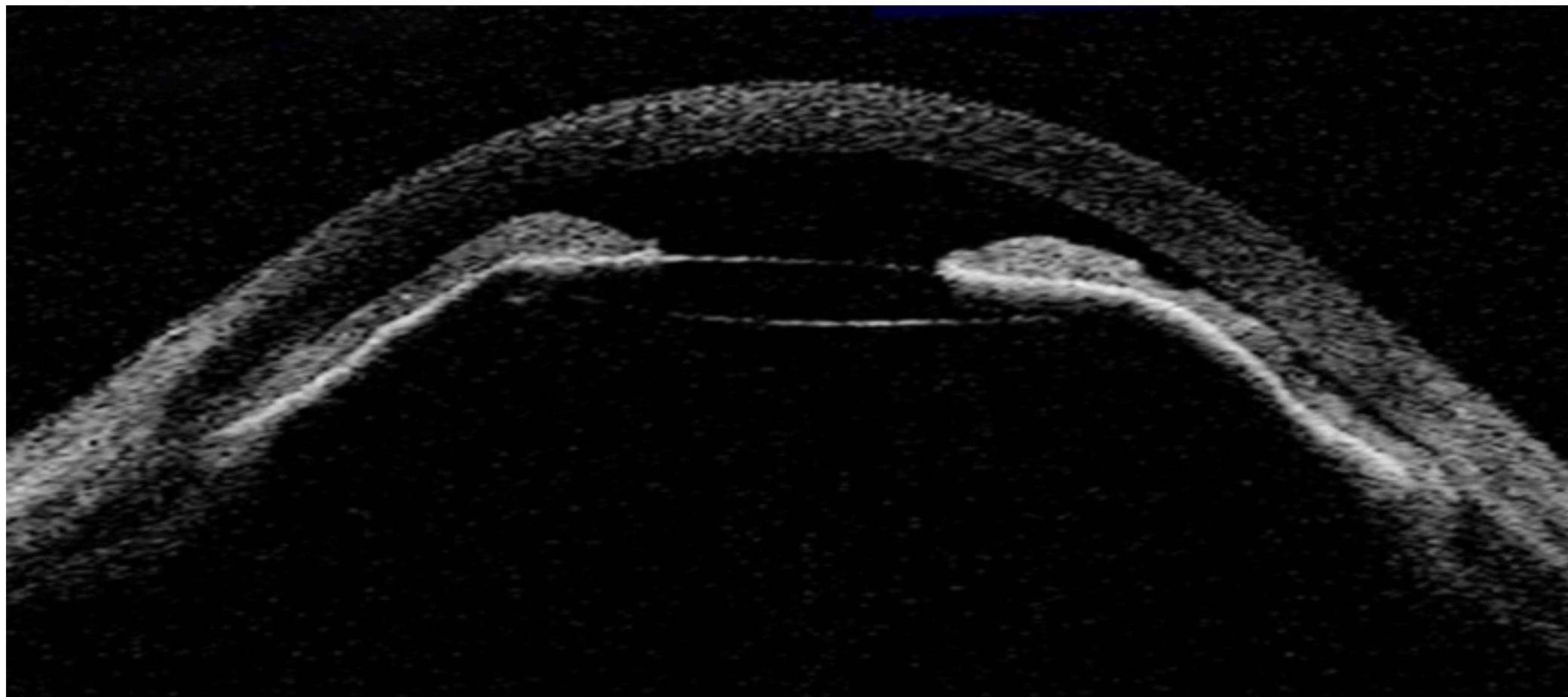
## Indications

- Laser treatment to manage malignant Glaucoma i.e. Aqueous misdirection that is rare but occurs most commonly after glaucoma filtration surgery in eyes with prior chronic angle closure and small eyes with anatomically narrow irido-corneal angle
- treatment aims to establish an anterior-posterior communication for aqueous



## Method

- Nd:Yag Laser treatment to posterior capsule/anterior hyaloid interface to re-establish anterior flow from posterior chamber



AS OCT of malignant Glaucoma before and after Laser treatment

# V Hyaloidotomy - Procedure

## Pre-Procedure management

- Laser treatment is used in conjunction with medical management so ensure patient has maximum medical therapy including
  - mydriatics/cyclopegic [atropine & phenylephrine]- to relax ciliary muscles **pulling** lens diaphragm posteriorly
  - osmotically active agents [oral glycerol or IV mannitol] - to dehydrate the vitreous
  - b-blocker & carbonic anhydrase inhibitor [timolol & acetazolaminde]- to decrease aqueous humour production
- ensure patent iridotomy present, or else add second one



# V Hyaloidotomy - Procedure

## Procedure

- aim is immediate depending of the anterior chamber

Parameter	Hyaloidotomy	Posterior Capsulotomy
Type of Laser	Nd:Yag	Nd:Yag
Power	3-8 mJ, posterior offset	1-4mJ, posterior offset
Spot size	400 $\mu$ m	400 $\mu$ m
Anatomical location	through iridotomy	peripheral to pupil edge
No of Spots	305 spots	5-15 bursts

## Post-Procedure management

- continue medical therapy
- add anti-inflammatory to reduce post-procedure inflammation
- review within 24h to ensure moderate deepening of AC is achieved and maintained
- if ineffective and persistent high IOP then next step is to book pars plana vitrectomy



## Outcomes

- the treatment of choice for malignant glaucoma is **Nd:YAG laser anterior hyaloidotomy** (through the pupil, in aphakic or pseudophakic eyes, after posterior capsulotomy, or through a peripheral iridectomy)
- this may be followed by Nd:YAG laser vitreolysis
- most patients require surgical management

# V Hyaloidotomy - References

- B. C. Little and R. A. Hitchings, “Pseudophakic malignant glaucoma: Nd:YAG capsulotomy as a primary treatment,” *Eye*, vol. 7, no. 1, pp. 102–104, 1993.
- Balekudaru, S., Choudhari, N., Rewri, P. *et al.* Surgical management of malignant glaucoma: a retrospective analysis of fifty eight eyes. *Eye* **31**, 947–955 (2017)





# V Cyclophotocoagulation



# V Cyclophotocoagulation- Indications

## Indications

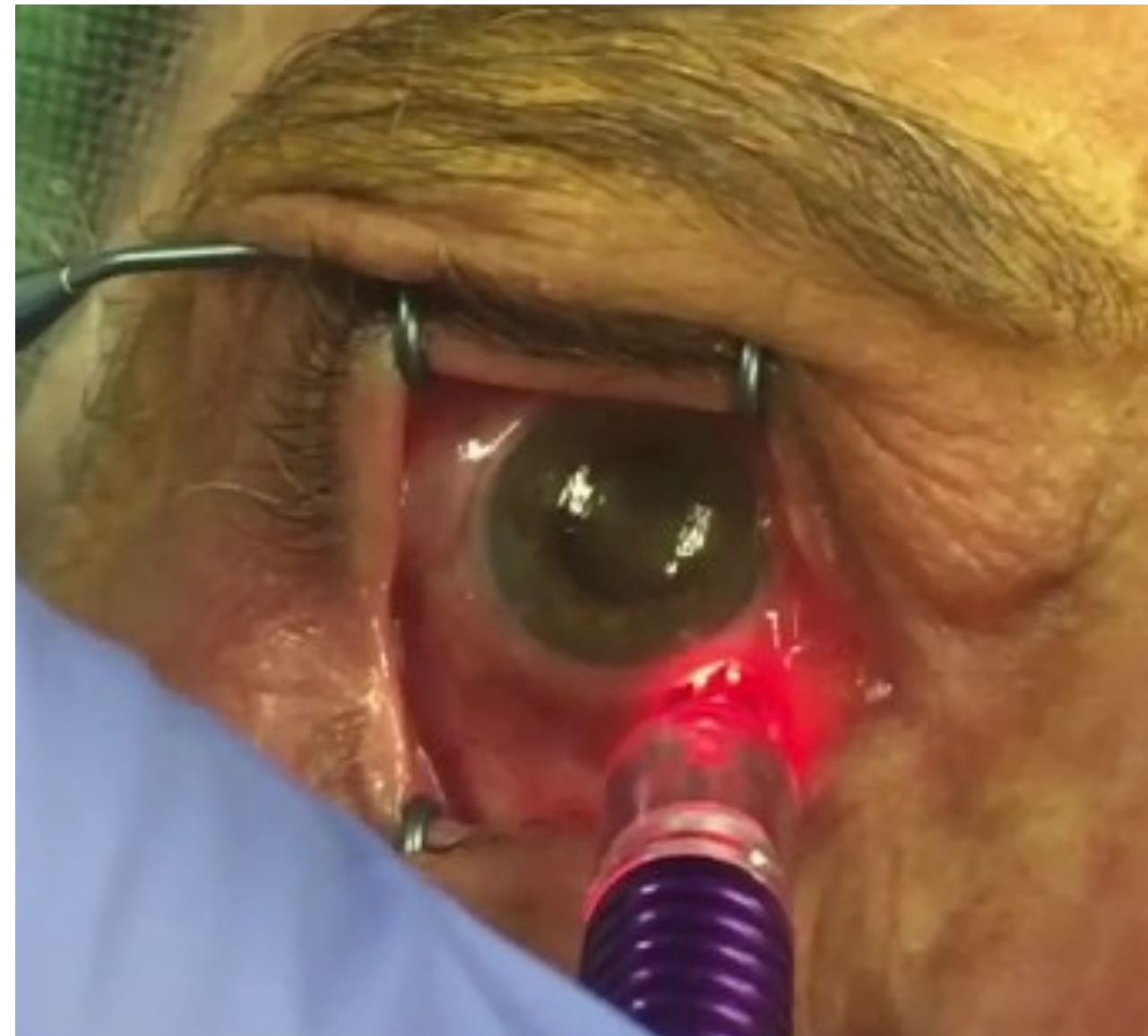
- Laser treatment to reduce aqueous production in end-stage glaucoma
- generally reserved for eyes where previous filtration surgery have failed or surgery is not indicated
- considered primary treatment for
  - neovascular glaucoma with poor visual potential
  - painful blind eye
- traditionally a cyclo-destructive procedure but recent micro-pulse cycle aims to reduce IOP with less destruction



## Method

- Continuous laser causes coagulative destruction of the ciliary epithelium thereby reducing capacity for aqueous production

Transscleral  
Cyclodiode



Dr Jed Lusthaus

# V Cyclophotocoagulation- Types

- transscleral cyclophotocoagulation exists as continuous wave (CW-CPC) or Micropulse (MP-CPC)
- is it thought that both procedures are cyclodestructive but that the micro pulses allows the tissue to cool between pulses, with the aim of reducing collateral damage
- endoscopic photocoagulation (ECP) allows direct visualisation of the ciliary processes, improved safety measures and easy pairing with phacoemulsification
- post mortem histology has demonstrated destruction of the pigmented and nonpigmented epithelium, coagulative necrosis and destruction of the deeper ciliary stroma in CPC
- by contrast, ECP-treated eyes showed destruction of the nonpigmented epithelium with little effect outside of the ciliary processes



# V Cyclophotocoagulation- Procedure

## Pre-Procedure management

- Explain the procedure and obtain informed consent
- For trans-scleral technique, careful slit-lamp examination to identify suitable (or unsuitable) sites for laser application
- Topical, sub-Tenon's or retro-/peribulbar anaesthesia commonly used, General anaesthesia when indicated
- Techniques (Trans-scleral/ECP/Micro-pulse)
- Conservative, incremental applications avoiding 3 and 9 o'clock positions

## Procedure

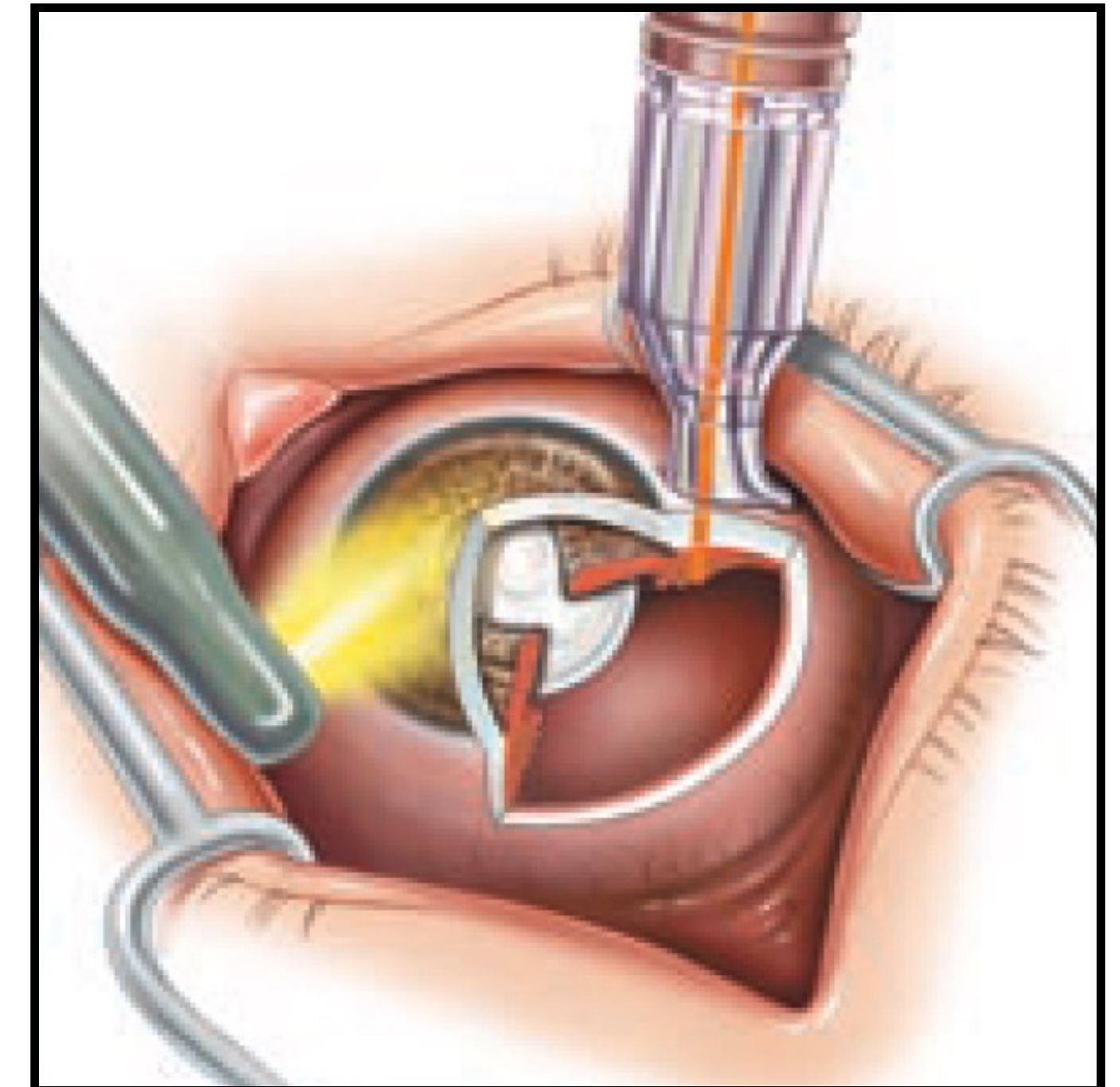
Parameter	Continuous Trans-scleral	ECP	Micropulse Transscleral
Type of Laser	Continuous wave Nd:Yag	Intermittent Nd:Yag	Diode Laser
Power (watts)	4-7J	0.2 - 0.4	1.0-2.5W
Duration	0.5 - 0.7 sec	Continuous	
Anatomical location	1-2mm from limbus	endoscopic under direct visualisation	1-2mm from limbus
No of Spots	30-40 over 360°	20-40 over 180 -360°	



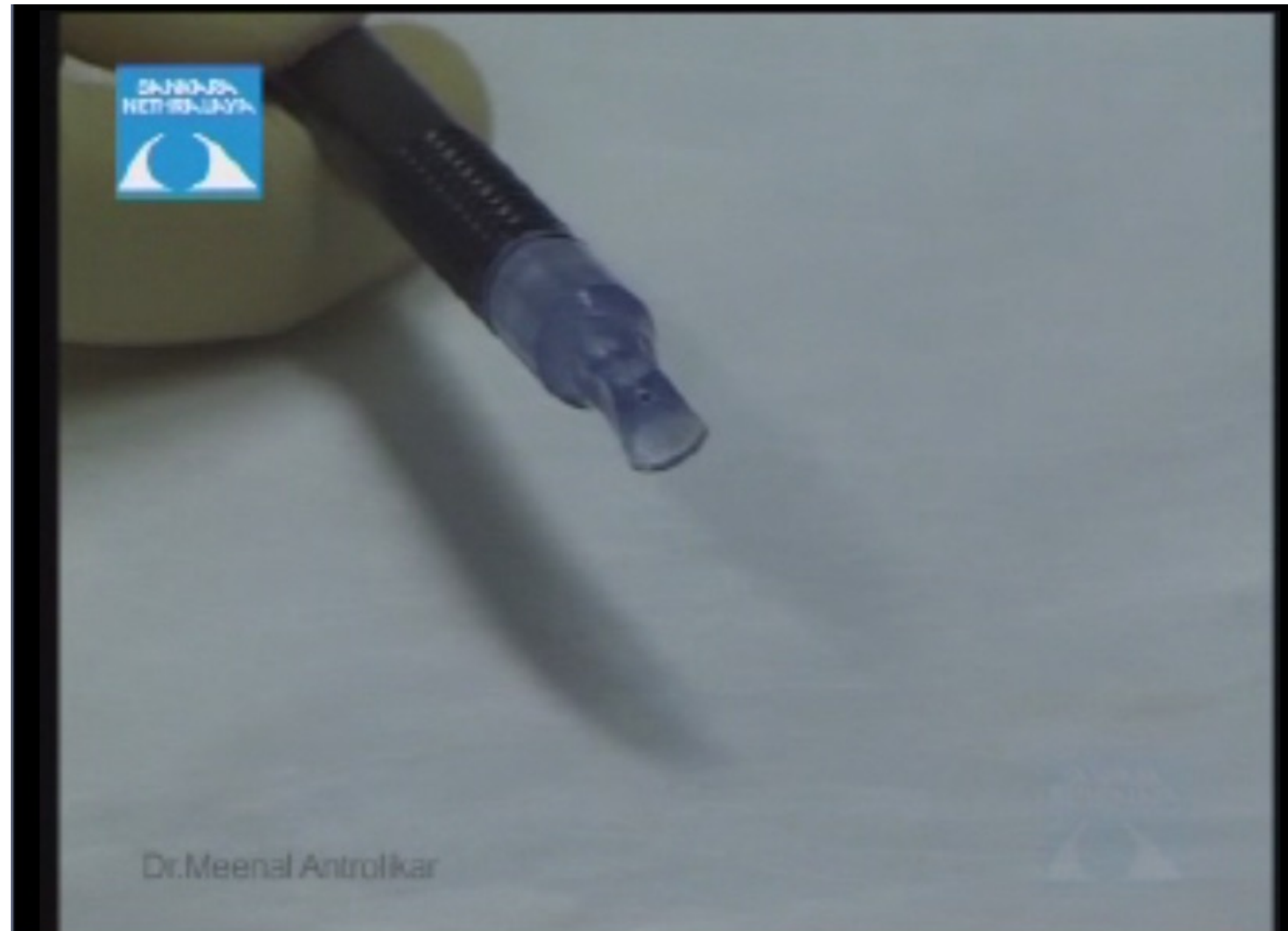
# V Cyclophotocoagulation- Procedure

## Procedure management - Trans-scleral

- check and clean the probe before each use
- place the laser tip over the ciliary body
- the fibre-optic tip of the G-probe protrudes 0.7 mm
- Indentation improves energy delivery and blanches conjunctival blood vessels
- A relatively posterior ciliary body treatment (shown), may improve IOP reduction



## Video - Trans-scleral



Video courtesy of Dr Lingam Vijaya



# V Cyclophotocoagulation- Procedure

## Procedure management – Micropulse Transscleral Cyclophotocoagulation

- Probe orientation: which side towards limbus / lid
- Probe positioning 1-2mm back from limbus
- Don't go too anterior, stay on target.
- Treat with slow sweeps; 4-5 passes per hemisphere/quadrant
- Adequate pressure, like a pen to paper
- Don't tilt the probe
- Don't press too hard or float the top

# V Cyclophotocoagulation- Procedure

## Micropulse Transscleral Cyclophotocoagulation



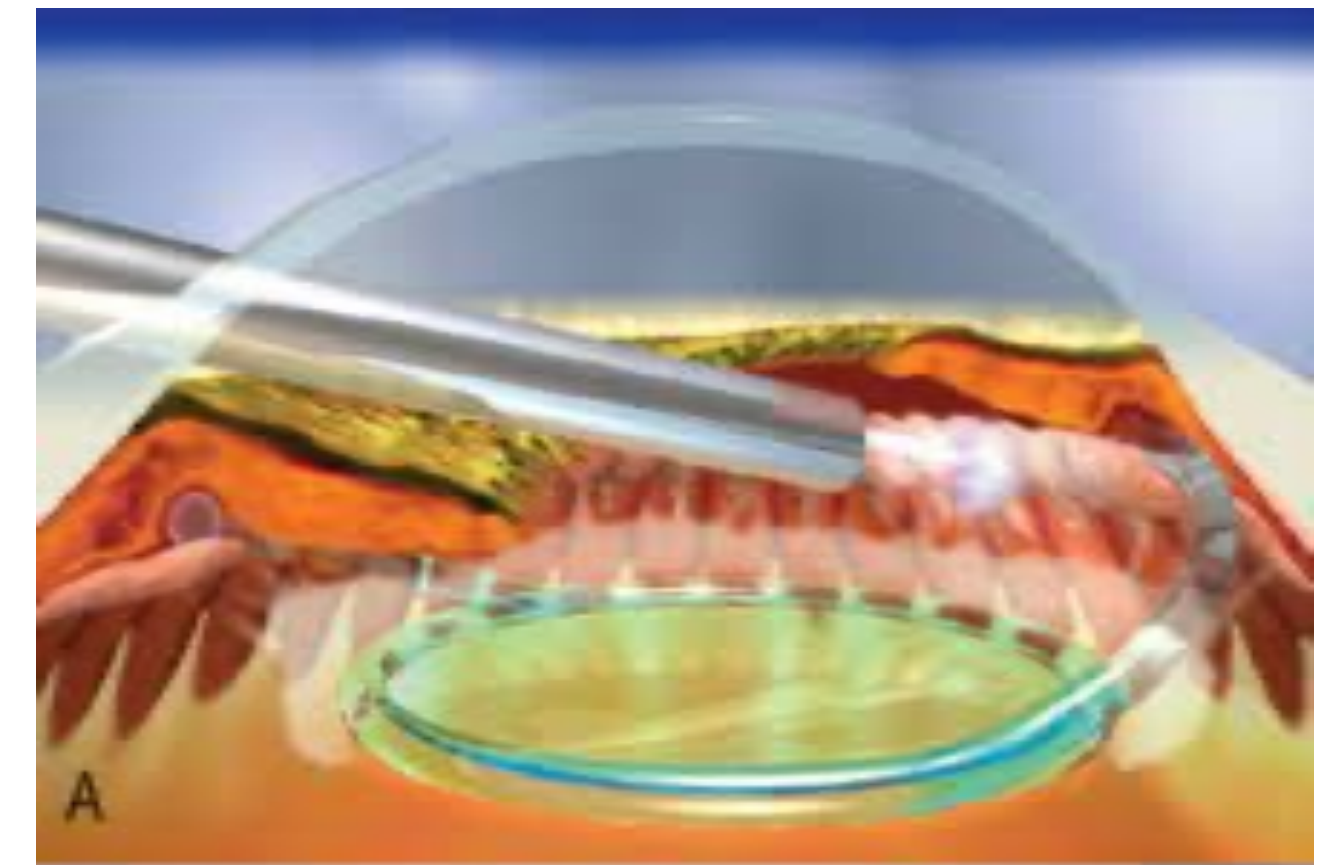
Video courtesy of Professor Paul Chew



# V Cyclophotocoagulation- Procedure

## Procedure management - ECP

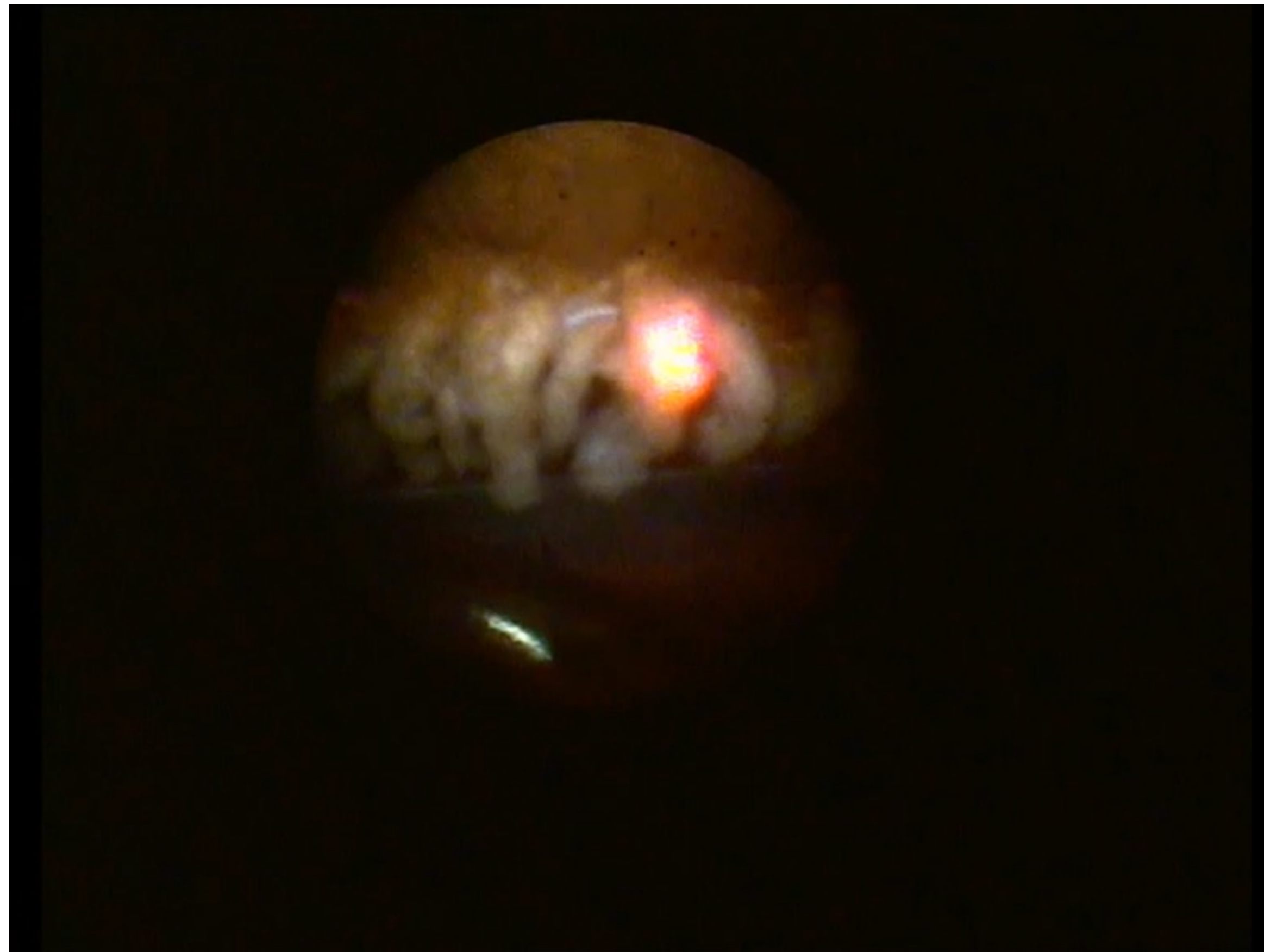
- ensure camera focused with desired illumination and focus
- laser set to continuous and initial power of 0.25W with aiming beam 20-30
- temporal or superior clear corneal incision
- deepening of sulcus with visco-elastic to improve visualisation of the ciliary processes
- ensure 6-7 ciliary processes in view at all times
- deliver continuous laser with aim of whitening and shrinking ciliary processes
- avoiding rupture or popping of processes



Seibold 2015

# V Cyclophotocoagulation- Procedure

## Video - Endoscopic Cyclophotocoagulation (ECP)



Video courtesy of Dr. Colin Clement



## Complications

- Pain
- Persistent inflammation
- Loss of visual acuity
- Hypotony
- Scleral thinning or rupture
- Pupillary distortion
- Macular oedema
- Retinal detachment
- Aqueous misdirection syndrome
- Phthisis
- Sympathetic ophthalmia
- Failure to control IOP – multiple procedures may be needed

## Post-Procedure management

- PO Analgesia
- Topical steroid 4–6×/day for 14 days or more depending on inflammation
- Cycloplegia 2–4×/day for 7–14 days
- Continue any current IOP-lowering treatment; taper as indicated
- Check IOP after 24–48 hours



## Outcome

- transscleral cyclo is a safe and effective treatment for refractory glaucoma
- repeat treatment may be necessary to achieve the desired outcome
- in an RCT Micropulse showed 75% treatment success versus 29% in Continuous wave at 1 year
- Micropulse transscleral cyclophotocoagulation show stable results in lowering IOP and decreases the use of antiglaucoma medications for up to 18 months.

# V Cyclophotocoagulation- References

- Frezotti P *et al.* Longterm follow-up of diode laser transscleral cyclophotocoagulation in the treatment of refractory glaucoma. *Acta Ophthalmol.* 2010; 88: 150–155
- [Endoscopic cyclophotocoagulation.](#) Seibold LK, SooHoo JR, Kahook MY. *Middle East Afr J Ophthalmol.* 2015 Jan-Mar;22(1):18-24.
- Endoscopic and transscleral cyclophotocoagulation. Bloom PA, Dharmaraj S. *Br J Ophthalmol* 2006 Jun; 90(6):666-8.
- Cyclodestructive Procedures in Glaucoma: A Review of Current and Emerging Options. Dastiridou, A.I., Katsanos, A., Denis, P. *et al.* *Adv Ther* 2018. **35**, 2103–2127





# VI Laser suture lysis

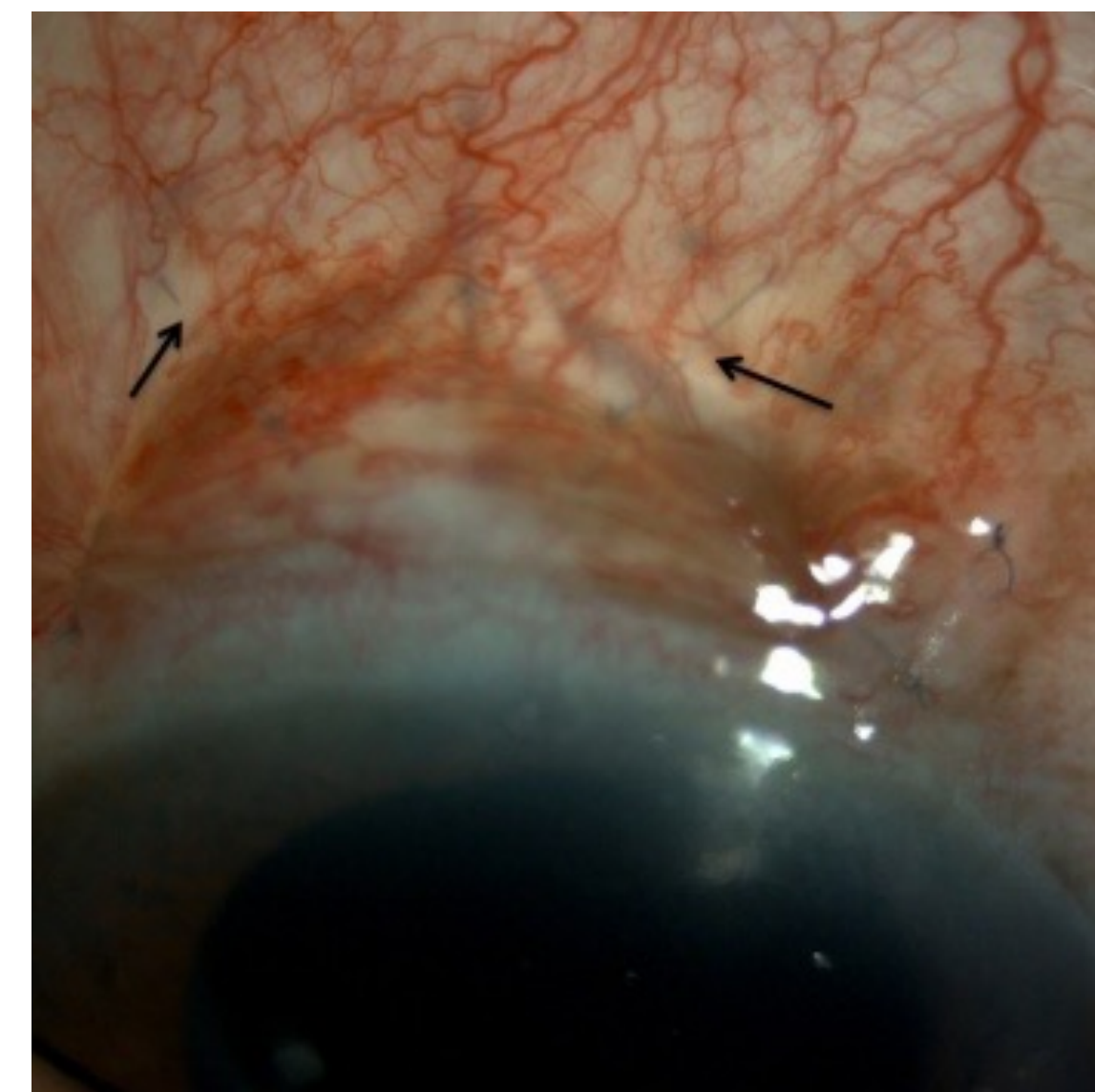
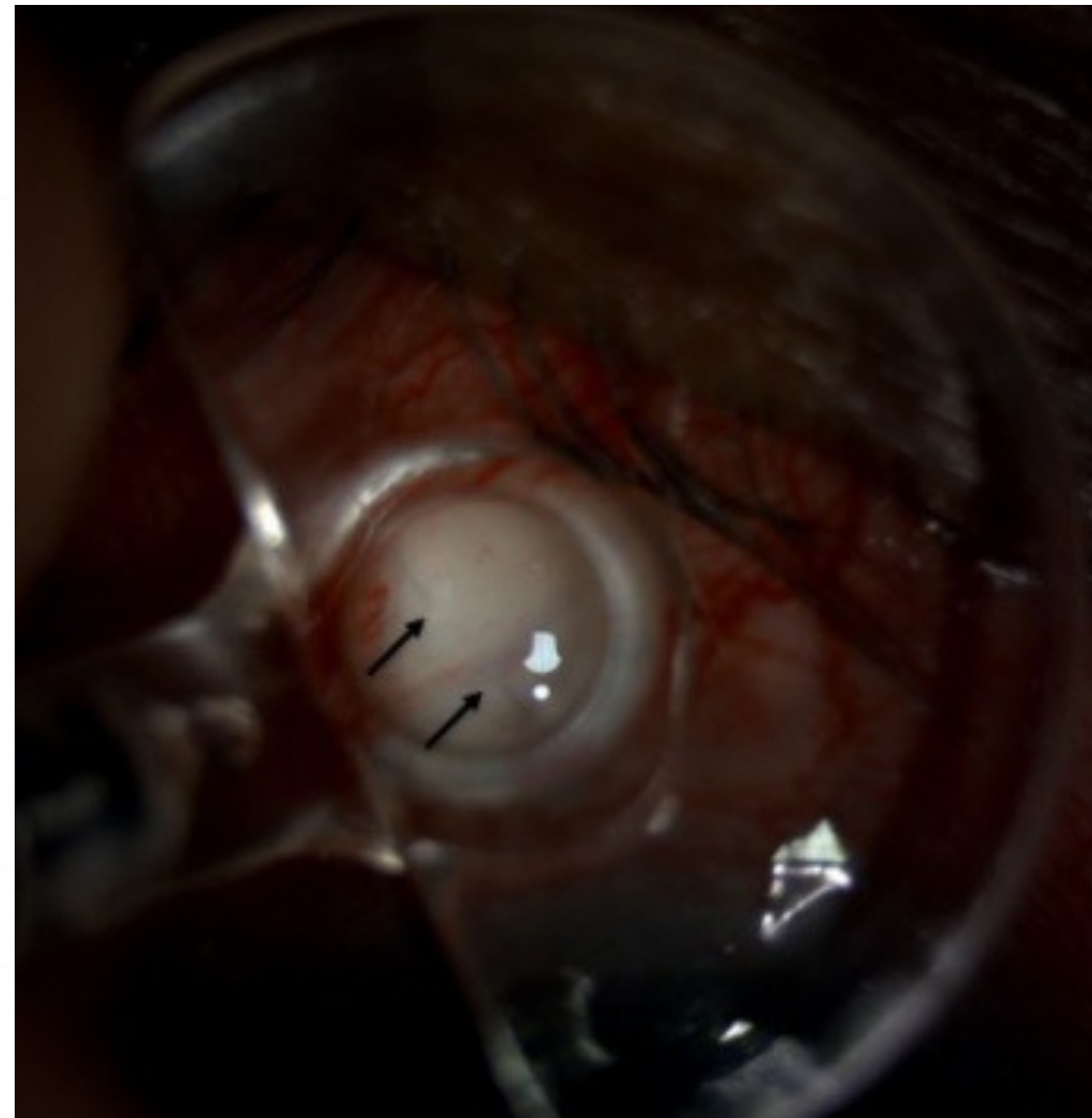
## Indications

- Laser treatment to achieve further lowering of IOP after trabeculectomy
- post-operative titration of IOP
  - for uncontrollable IOP despite digital massage
  - low non-filtering bleb



## Method

- Indicated way of breaking Nylon Scleral flaps sutures under direct visualisation to increase outflow



Ramakrishna 2016

## Pre-Procedure Management

- Explain the procedure and gain consent
- Instill a drop of topical anaesthetic
- Consider Pre-treatment drops to reduced IOP spikes
- Ask the patient to look down, lift lid and carefully assess the trabeculectomy site
- Place the lens directly on the scleral flap suture required to break compressing the conjunctiva



# VI Laser suture lysis- Procedure

## Procedure

- Cut one suture at a time close to the end

Parameter	Laser Suture Lysis	Lens Options
Type of Laser	Argon	Ritch Hoskin Mandelkorn Zeiss 4-mirror Glass rod
Power	300-800mW	
Spot size	50 $\mu\text{m}$	
Time	<0.1sec	
No of Spots	1 or more if needed	

## Complications

- Conjunctival Burn and secondary leak
- Hypotony
- Shallow anterior chamber
- Bleeding from Ostium
- Hyphaema



## Post-Procedure Management

- Continue current post- Trab regimen
- If bleb does not form spontaneously, apply pressure (e.g. around trapdoor)
- Re-check IOP and outflow 5 minutes after laser and within 1 week

## Tips for Performing LSL

- Consider pre-treatment drops to reduce any IOP spike
- Ensure proper sense placement to minimise complications; lens aims to
  - blanch the conjunctiva
  - focus on the suture
  - fix the globe
  - open the lids
- aim for suture under tension



# VI Laser suture lysis- Outcome

- laser suture lysis (LSL) significantly reduced the IOP (on average from  $20.5 \pm 5.3$  to  $14.9 \pm 6.4$  mm Hg) and the fluid cavity height increased (Cho 2015)
- When laser suture lysis was performed during 3<sup>rd</sup>–5<sup>th</sup> week posttrabeculectomy, 34 patients (73.9%) achieved the target IOP (Ramakrishna 2016)

# VI Laser suture lysis- References

- Ramakrishna S, Nelivigi S, Sadananda AM, Ganesh S. Study of efficacy and timing of laser suture lysis in reducing intraocular pressure after trabeculectomy with mitomycin-C. J Ophthalmol. 2016 Sep-Dec;9 (3):144-149.
- Cho, Hk., Kojima, S., Inoue, T. *et al.* Effect of laser suture lysis on filtration openings: a prospective three-dimensional anterior segment optical coherence tomography study. Eye **29**, 1220–1225 (2015).  
<https://doi.org/10.1038/eye.2015.129>





# VIII Goniopuncture



## Indications

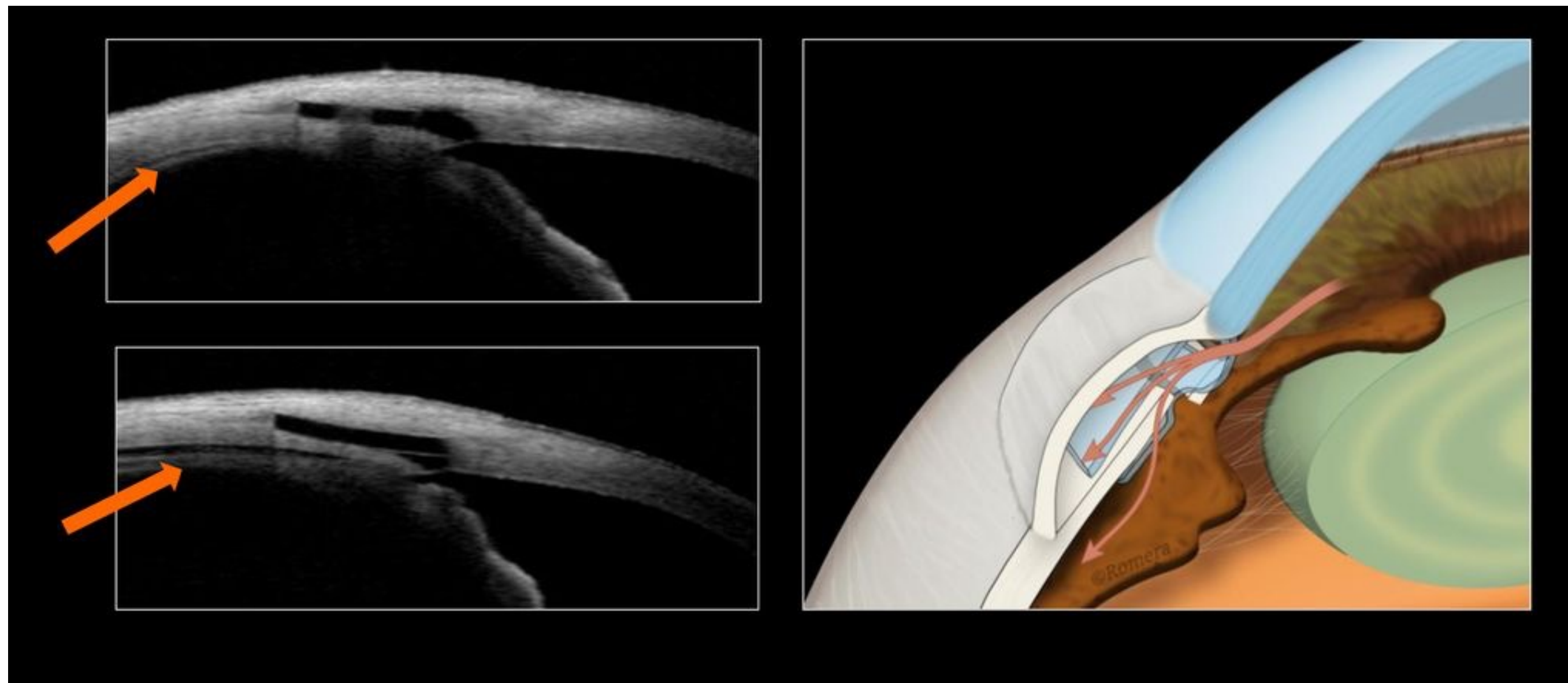
- Laser treatment to increasing outflow following non-penetrating Glaucoma surgery such as deep sclerectomy
- it can be performed at any stage but is generally done once initial pressure lowering effect has worn off and IOP rises above target pressure



# VIII Goniopuncture - Method

## Method

- Laser treatment to break descemet's membrane and allow direct flow of anterior chamber aqueous into deep sclerectomy site



JordiLoscós online

# VI Goniopuncture- Procedure

<b>Parameter</b>	<b>GonioPuncture</b>
Type of Laser	Nd:Yag
Setting	Capsulotomy
Power	3 mJ
No of Spots	4-15 shots
Lens	Latina SLT or equivalent



## Complications

- Hyphaema
- Iris Prolapse
- Peripheral synaechiae
- Elevated IOP
- Inflammation
- Choroidal detachment
- Hypotony
- Damage to Schlemm's canal or intraocular stent

## Outcome

- ND:YAG laser goniopuncture is an effective procedure to further lower IOP after DS with an IOP  $\leq$  15 mmHg achieved in 85 % at 6 months and 76% at 1year
- An IOP of <15mmHg is achieved and maintained for  $\geq$  2 years in about 50% of cases after a single LGP procedure
- the procedure can be repeated also
- Main complication is Iris prolapse into the trabeculo-descemetic window so regular follow-up with Gonioscopy is recommended



## Outcome

- Anand N & Pilling R. Nd:YAG laser goniopuncture after deep sclerectomy: outcomes. *Acta Ophthalmologica* 2010 Vol 88(1) pages 110-115
- Di Matteo, F., Bettin, P., Fiori, M. *et al.* Nd:Yag laser goniopuncture for deep sclerectomy: efficacy and outcomes. *Graefes Arch Clin Exp Ophthalmol* **254**, 535–539 (2016)



# IX

## Additional Useful Information





# VI Lens Magnificaton

- Laser lens laser spot mag factors

Lens	Magnification
Volk Superquad 160	2x
Volk QuadrAspheric	1.97x
Volk Trans Equator	1.44x
Ocular Mainster Widefield	1.5x
Volk Area Centralis	0.94x
Ocular Mainster High Mag	0.8x
28D	0.44x
20D	0.32 X

