Lasers by Optometrists: The Next Frontier

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Gus Gazzard ~
Declaration of Competing Interests

- I am supported by an NIHR HTA grant to investigate Cost Effectiveness and Health Related Quality of Life in SLT.
- In the last 5 years I have been in receipt of research funding, honoraria, travel or related support from:
  - UCL Moorfields NIHR Biomedical Research Centre
  - Alcon, Allergan, Lumenis, Merck/MSD, Pfizer
  - NIHR, MRC (EAGLE trial), City University
- Neither I, nor my family, have no financial interest in any ophthalmic product.

Why *should* Optometrists wield lasers?

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- More people, more disease, more treatments !
  - demographic time bomb & an exponential rise in glaucoma diagnosis with age
  - increasingly successful diagnosis of all glaucomas
  - increasing use of /requirement for laser treatments
- & doctors are expensive to train & maintain…

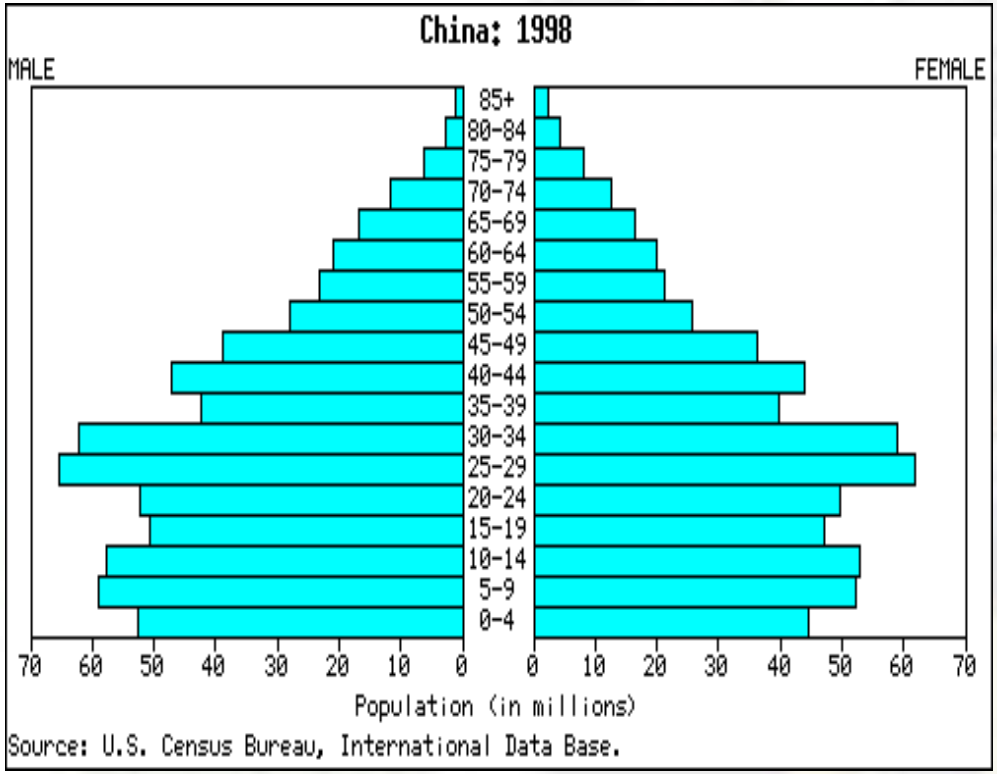
World Populations are aging

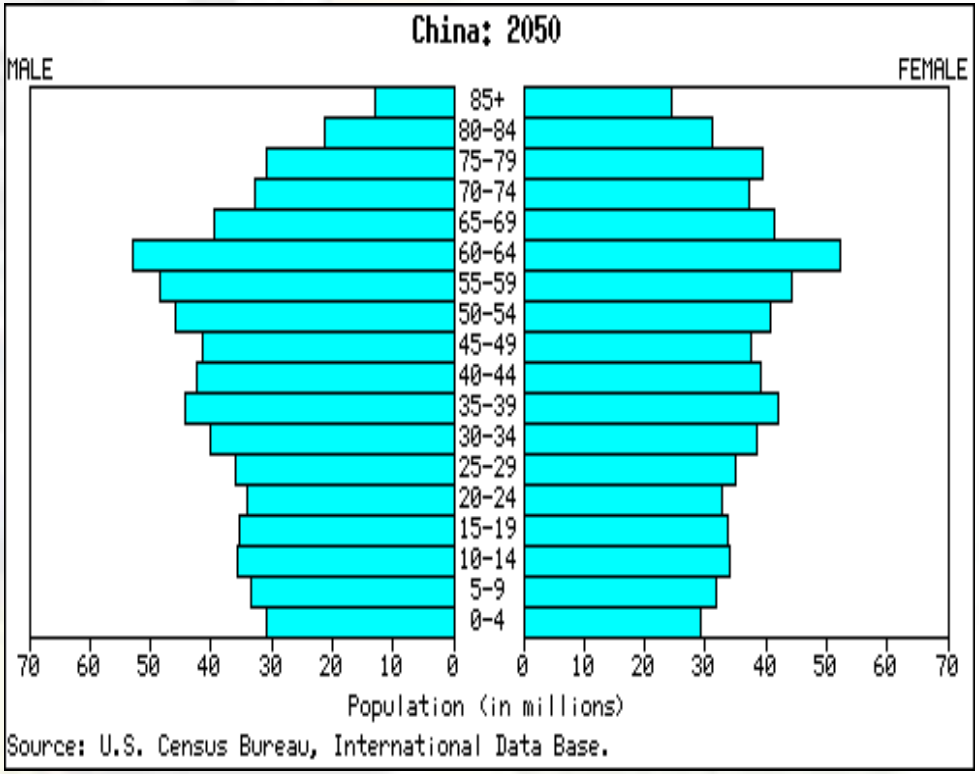
*US Population Estimates (millions)**

	≥65 Years	*≥85 Years*
2000	34.8	4.3
2020	53.7	6.7
2050	81.9	19.3

*U.S. Census Bureau, Washington

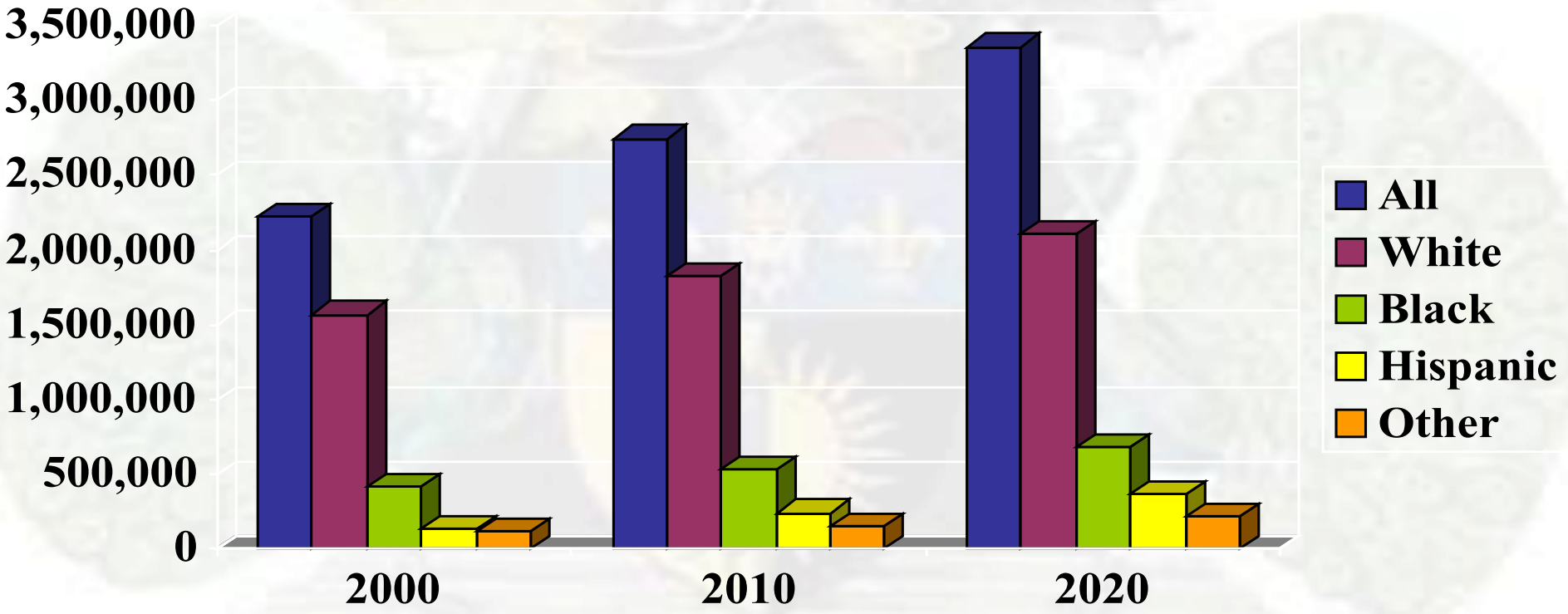
Asia is aging





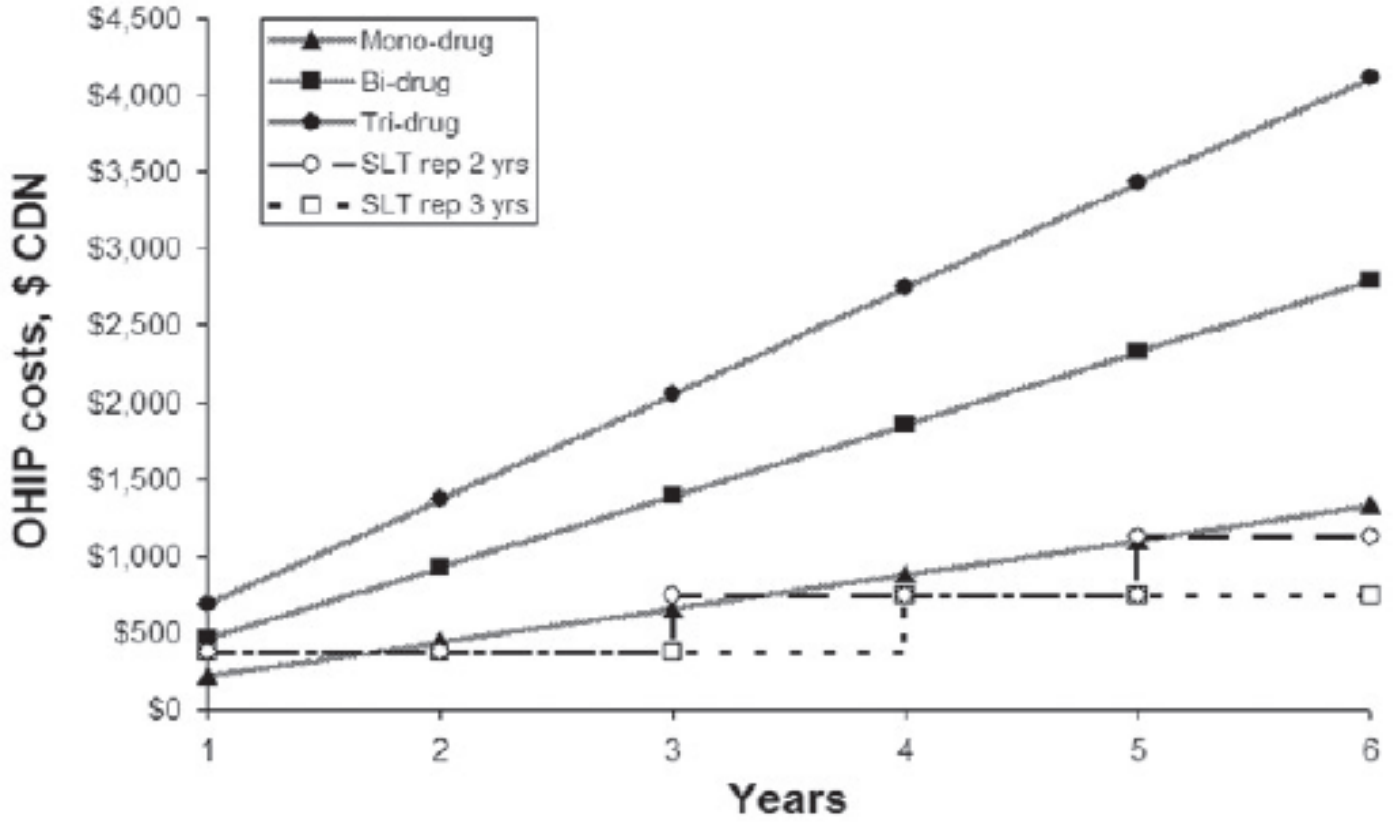
*U.S. Census Bureau, Washington

Increasing Glaucoma Prevalence (US figures)



Projected cost comparison of selective laser trabeculoplasty versus glaucoma medication in the Ontario Health Insurance Plan

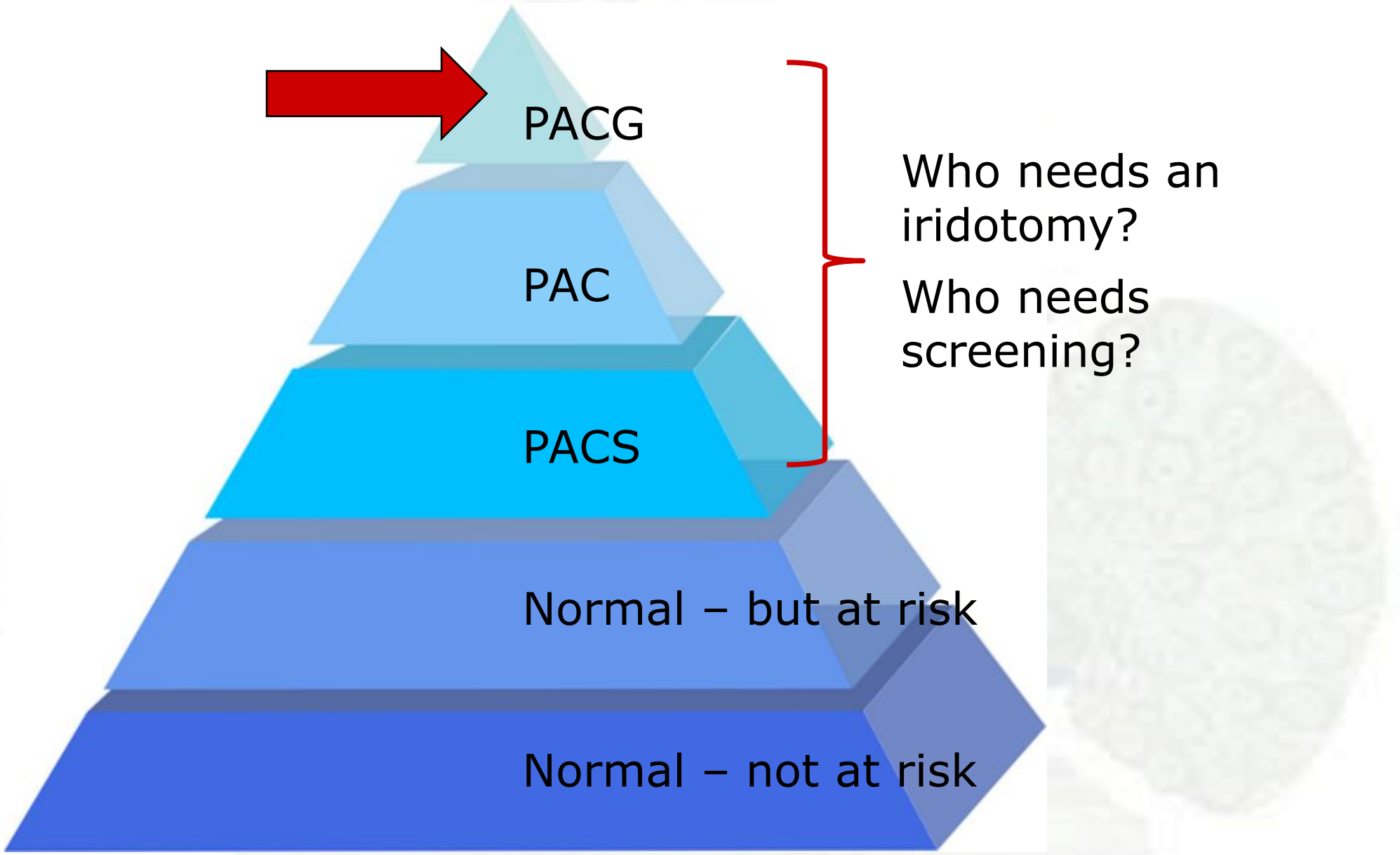
Richard Lee,* BSc; Cindy M.L. Hutnik,† MD, PhD



PAC ***Glaucoma*** Prevalence in European Populations

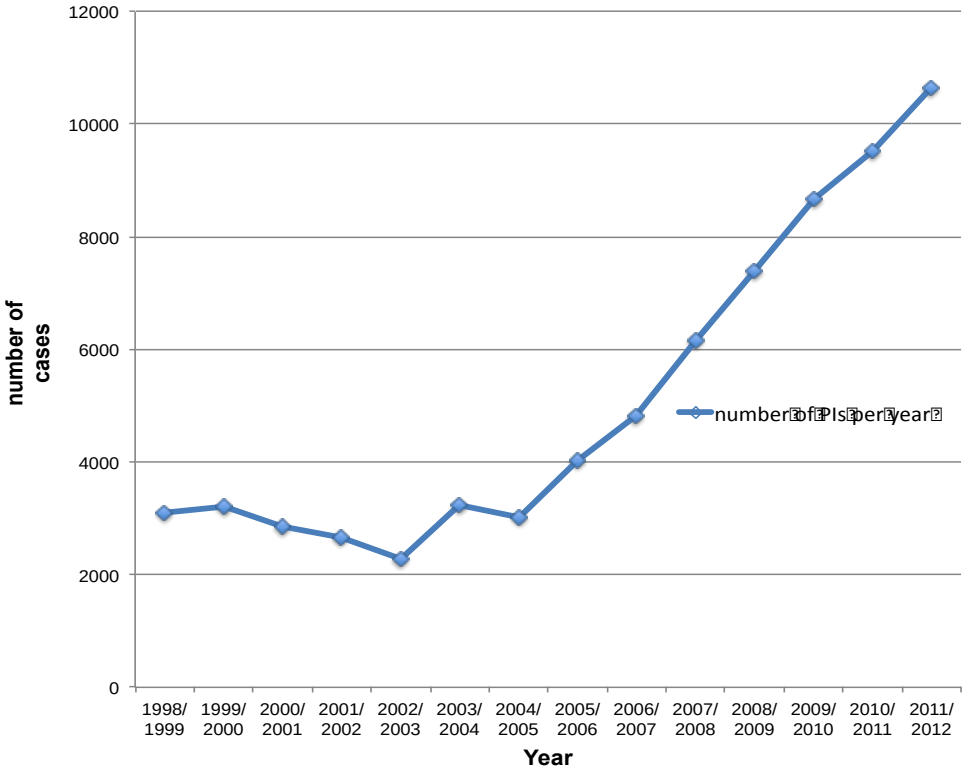
- *Absolute* numbers:
  - UK = 130,000
  - Europe = 1.6 million
  - US = 581,000
- *Increase* over 10 years:
  - 19% UK
  - 9% Europe
  - 18% US

BJO In Press - Alexander Day, Gianluca Baio, Gus Gazzard, *et al*

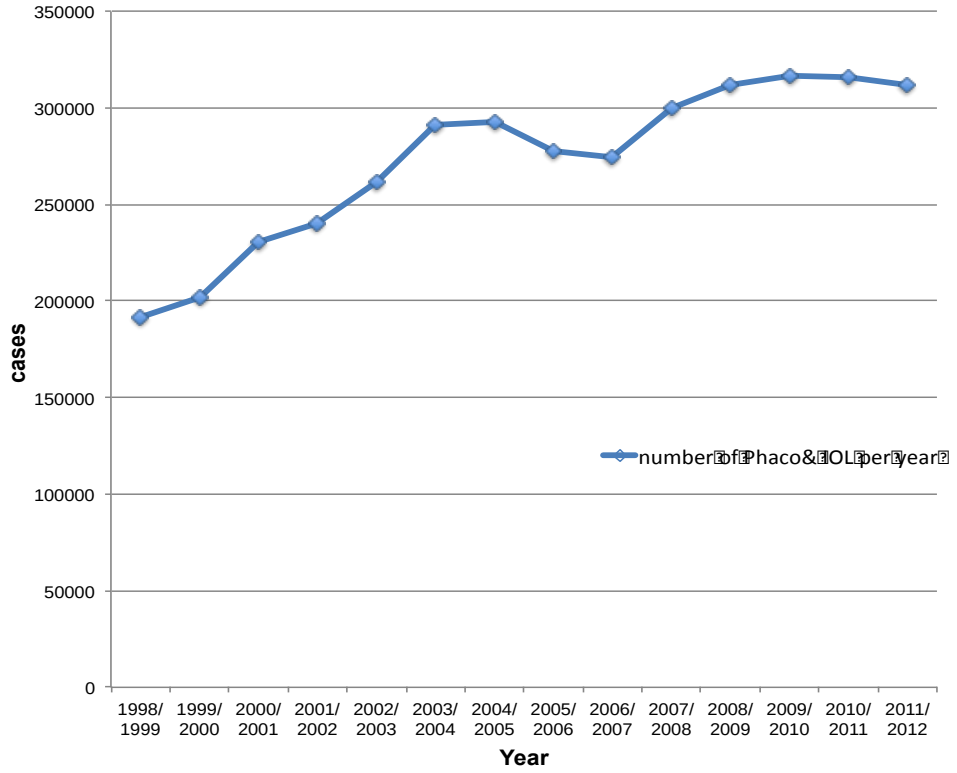

PACG
PAC
PACS
Normal – but at risk
Normal – not at risk
Who needs an iridotomy?
Who needs screening?

UK Hospital data

Laser PI *c* 62.3k per year;



Phaco & IOL *c* 75.1k per year



What lasers are being done by optometrists?

- YAG laser capusolotomy
- YAG & sequential Argon/YAG iridotomy (PI)
- selective laser trabeculoplasty (SLT)
- argon iridoplasty

What is required for an optometry laser service?

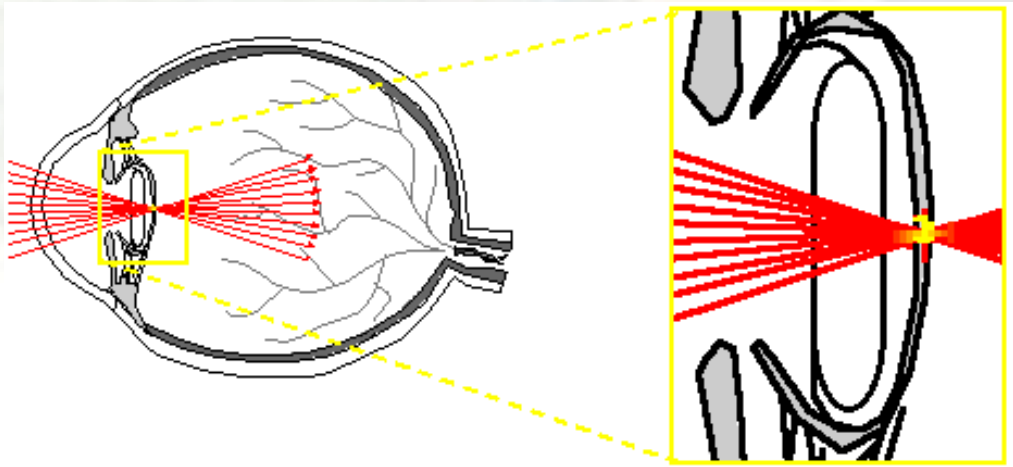
- Robust Clinical Governance & oversight =
- Detailed protocols + Regular audit
- Adequate training, supervision and sign off by experienced clinician in *technique* and in *consent procedure*
- Are there risks from 'extended roles' ?

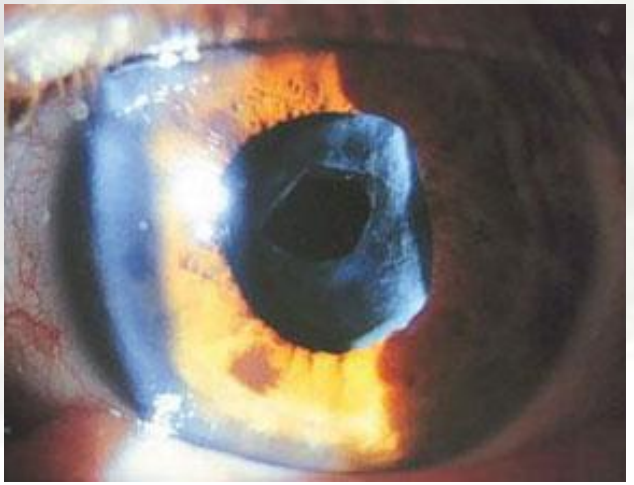
Barriers to setting up an optometric laser service (& how to over-come them)

- Obstructive medical colleagues… *reassurance & protocols*
- Fear from optometrists - *reassurance & protocols*
- Complexity of training imposed by hospital – explanation to management
- Availability of suitable patients: competition for cases with medical trainees
- Difficult to directly observe treatments; lack of 2nd eye-pieces on lasers
- NOT ability!!

Capsulotomy

- Iopidine & Tropicamide
- Capsulotomy lens
- 0.5-1.2mJ shots
- Complete circle (not cross / inverted U)



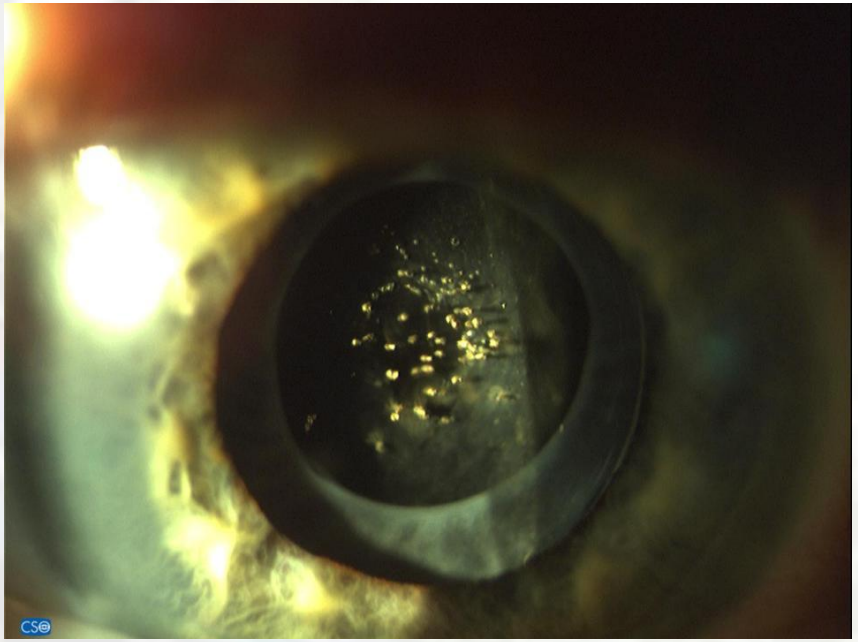


Risks vs Benefits

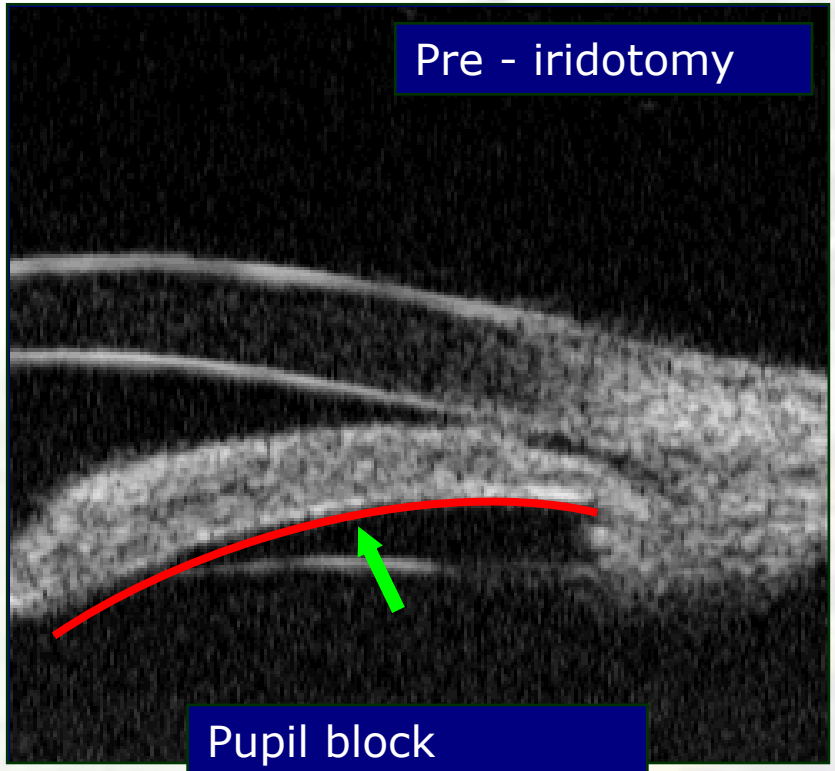
Capsulotomy

Complications

- Floaters
- Re-treatment
- Loss of vision
  - Lens pitting
  - Dislocation of IOL
  - Increased risk of RhRD, FTMH from PVD
- Pressure spikes
- Inflammation



Iridotomy

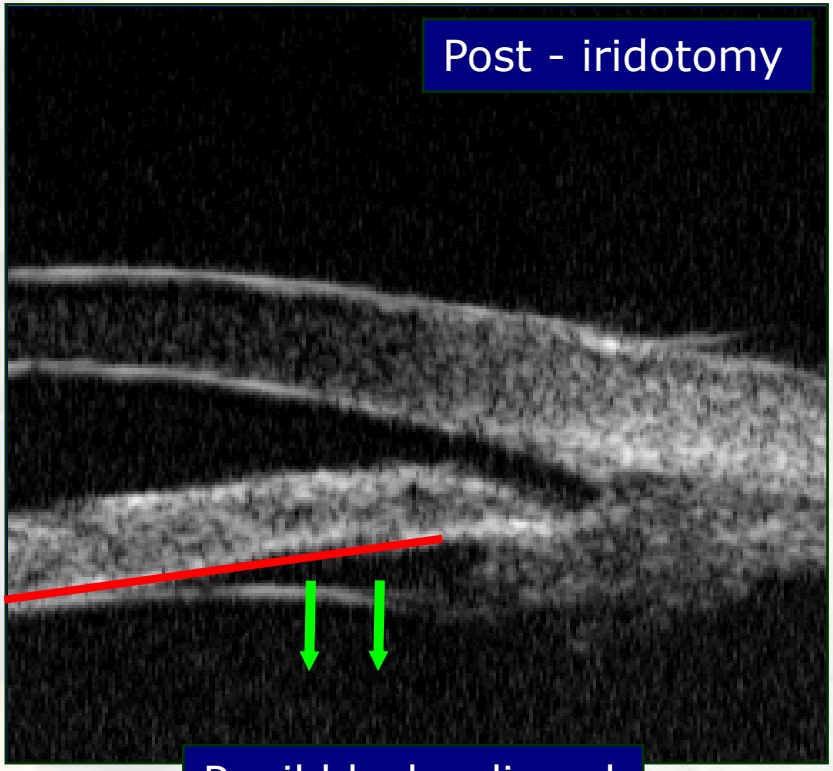


Pupil block

Pressure differential

Convex / Bombé

Angle closure : ITC



Pupil block relieved

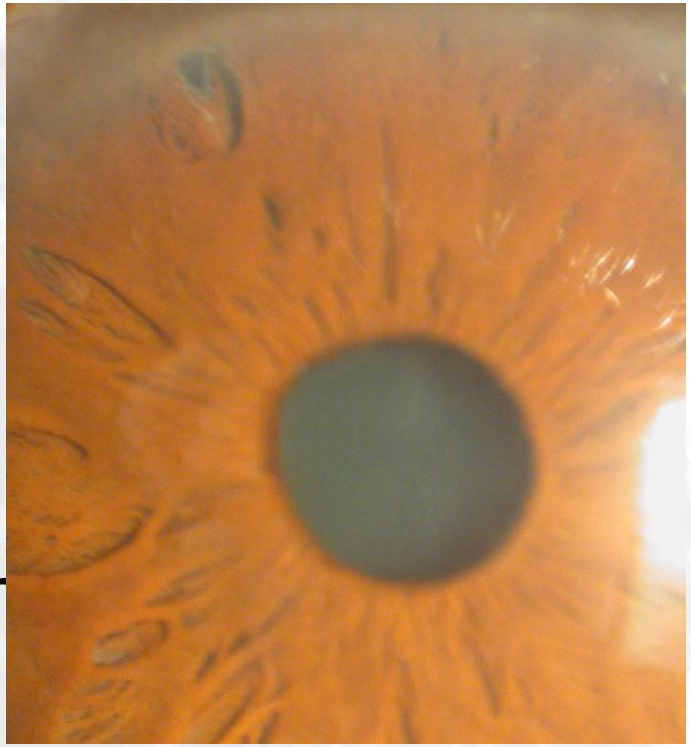
Flat iris plane

↑ iris-lens contact

Angle opens

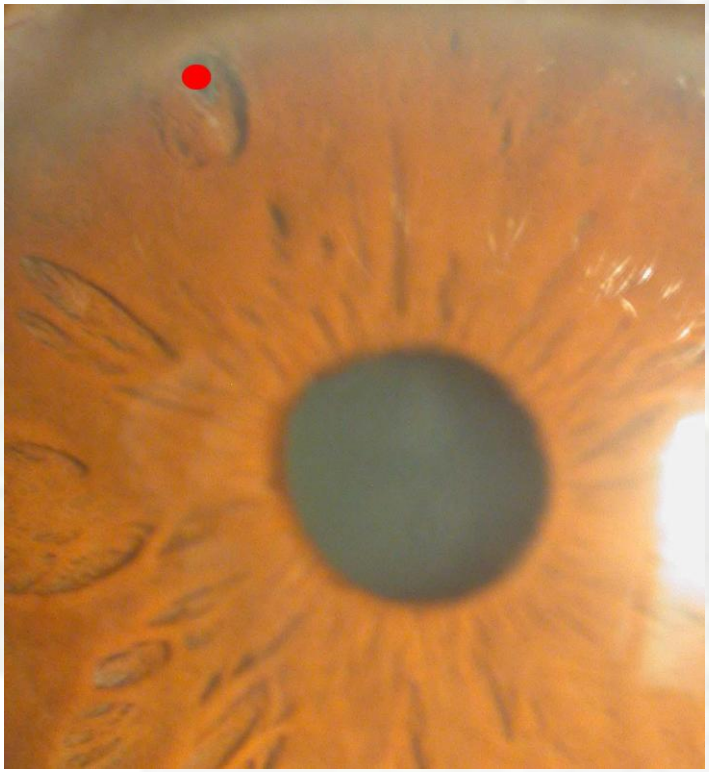
Iridotomy

- Iopidine
- Pilocarpine 2-4%
- Contact lens
- 1 to 3 mJ shots
- Peripheral: 11-1 o-clock
- Aim for 200 micron PI minim

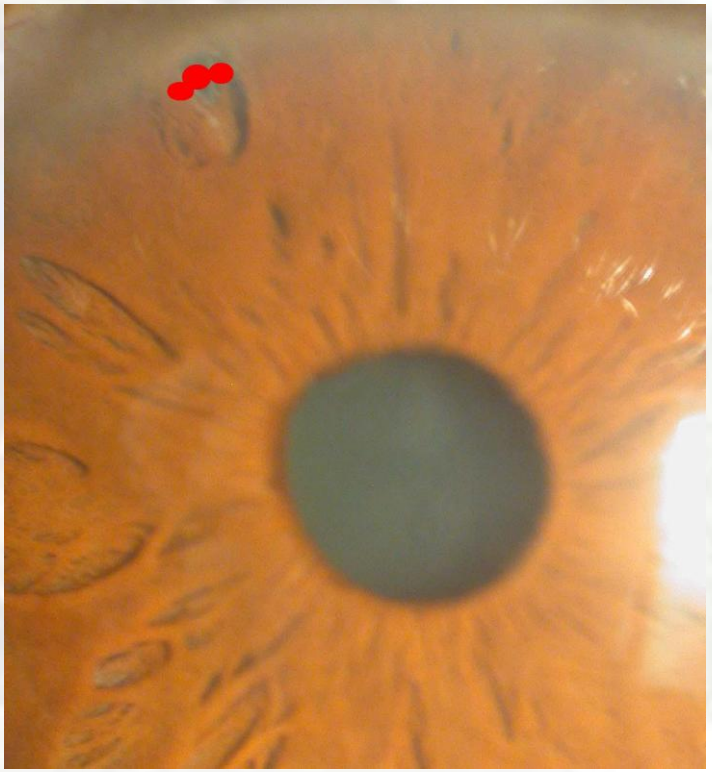


Iridotomy

Initial shot



Circumferential enlargement



Perils and pitfalls

- Check- zero defocus
- Never in central 2/3 of iris
- Avoid the tear meniscus
  - Care with high resting lid position
- Bleeding
  - Stop, gentle pressure
- Consider surgical iridectomy

Iridotomy: argon pre-treatment

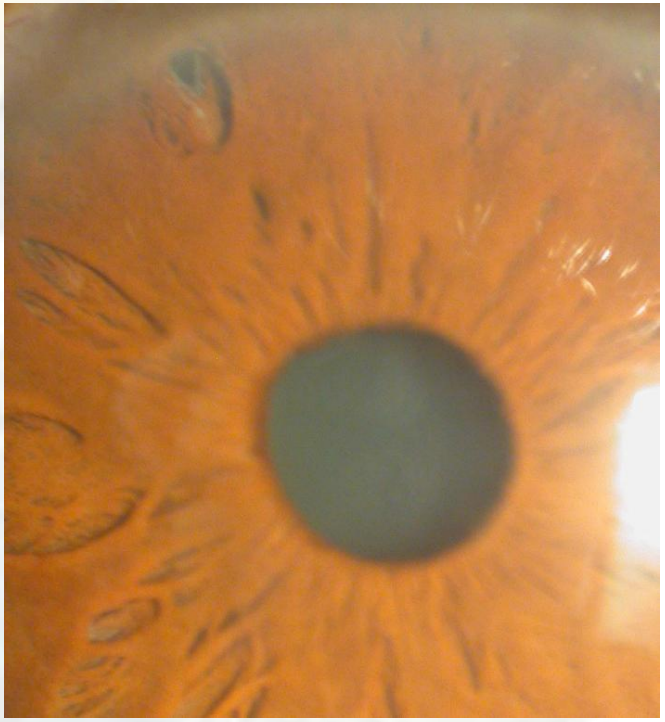
- All Asians & Africans
- Wise/Abrahams lens
- 50 microns spot
- Bubbles float up!
- Do not char iris
- Aim to form crater

Stage 1~ 100 mW, 0.05 s
Stage 2~ 500-750 mW, 0.1s

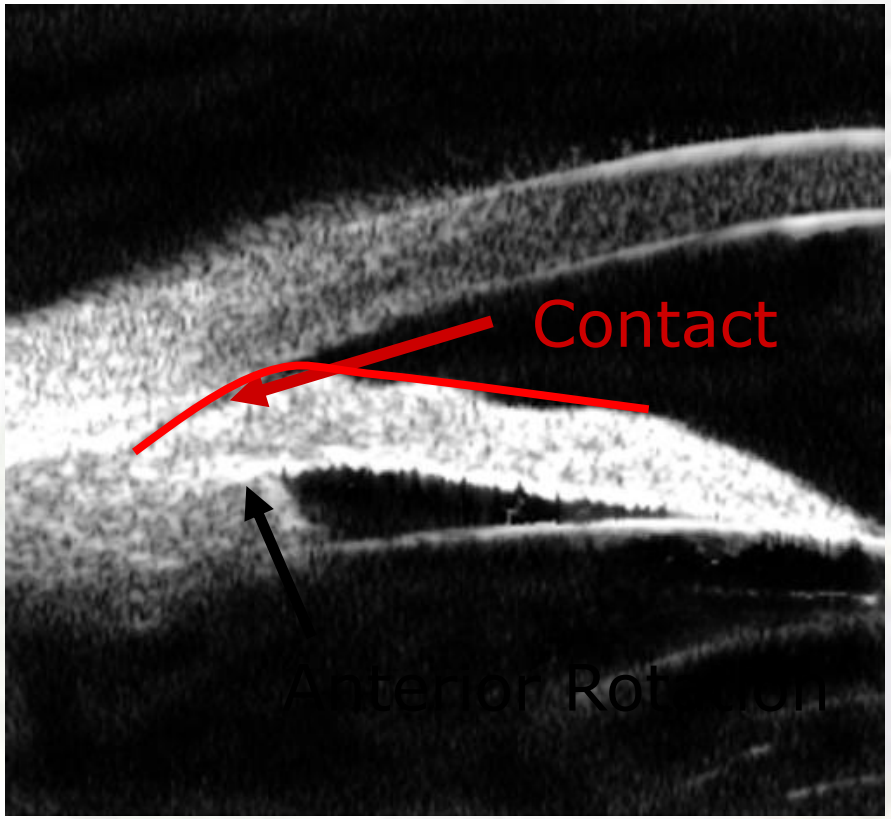
Risks vs Benefits

Complications

- Pressure rises
  - Typically transient
  - May be prolonged in advanced disease
- Bleeding & blurring (transient 24hrs)
- Increased near add dependence
- Need for more Rx
- *Persistent* visual disturbance (~ 1%)
- Macular burns reported with Argon



Mechanism of “plateau” configuration:

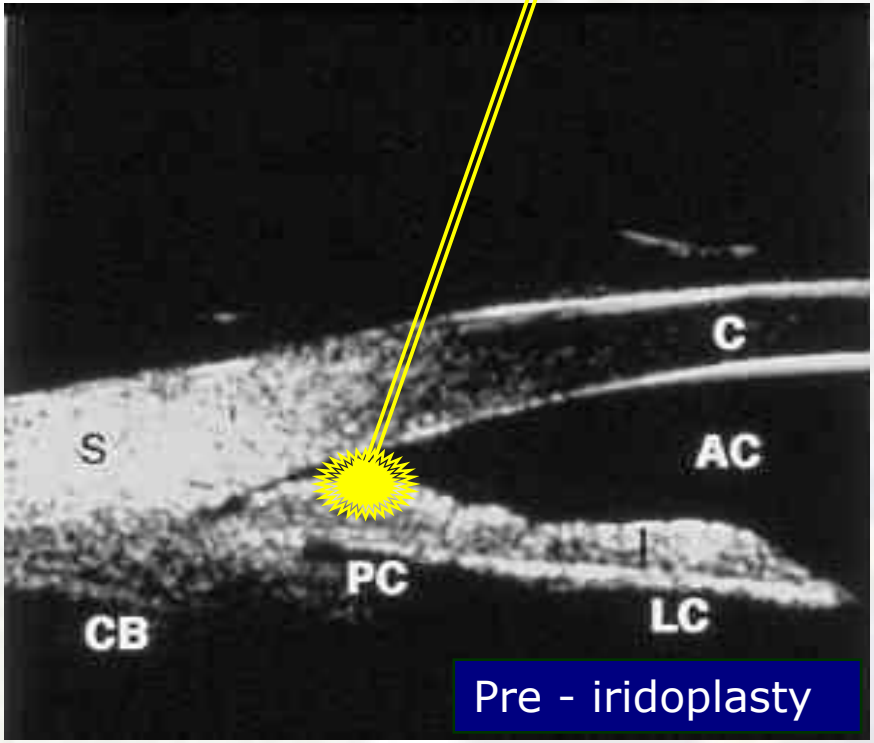


“Classic” plateau

- Angulated peripheral iris profile: “plateau”
- Supported by anterior ciliary processes
- +/- irido-trabecular contact

UBM image:Prof He Mingguang, China

Iridoplasty



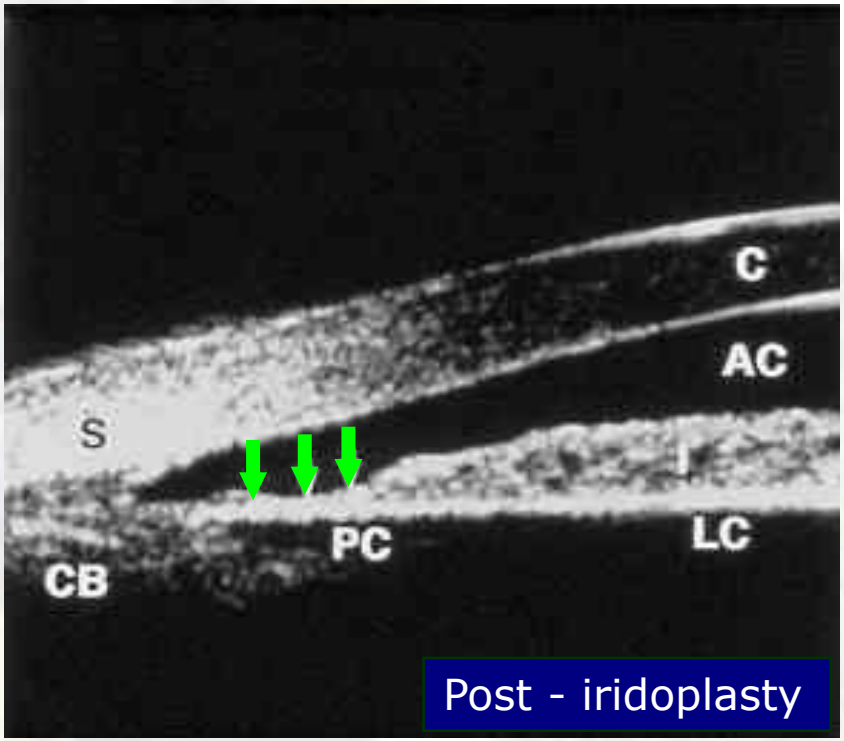


Image: Prof Bob Ritch, New York Eye & Ear

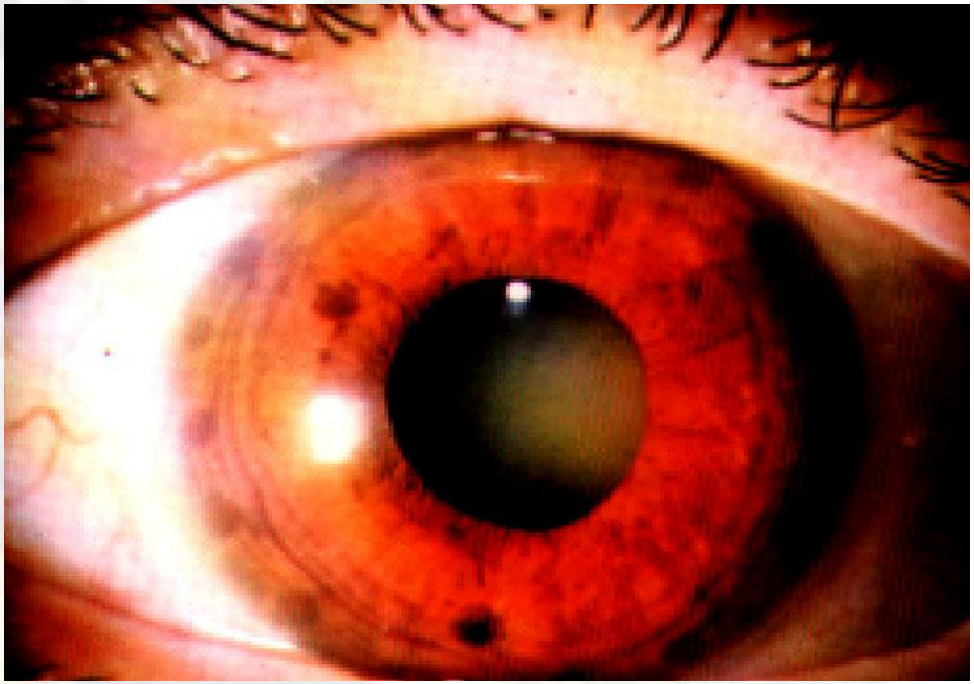
Audit of Iridoplasties (MEH 2004-5)

- 104 eyes, 39-90 years (90% 40-70 yrs)
- Mean angle width widened
  - Pre-iridoplasty I/N/S/T 10/0/0/0
  - Post-iridoplasty I/N/S/T 20/10/10/10
- Median IOP reduced
  - Pre-iridoplasty 20 mmHg
  - Post-iridoplasty 12 mm Hg
- 24% of eyes had increase in PAS
  - 10% in eyes without PAS pre-iridoplasty
  - 52% in eyes with PAS pre-iridoplasty

MEH Audit: Jones, Sivagnanavel, Foster 2006

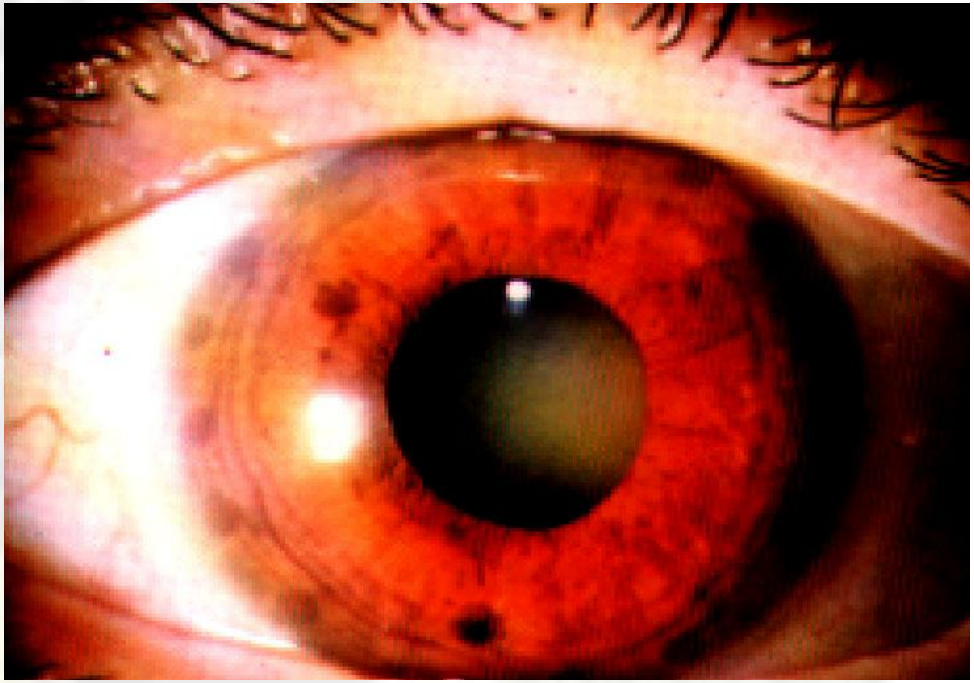
Laser Iridoplasty

- Iopidine & pilocarpine pre-Rx
- Wise or Abraham's lens
- Settings: 500 µm, 0.5 sec 80-800 mW
- End point: brisk contraction without charring
- Total of 20 – 30 burns



Laser Iridoplasty Complications

- Pain during procedure
- Inflammation and discomfort
- 'Alteration' in vision
- Pupil changes: size/shape
- Corneal/limbal burns
- Limited duration of action
- Increase in PAS

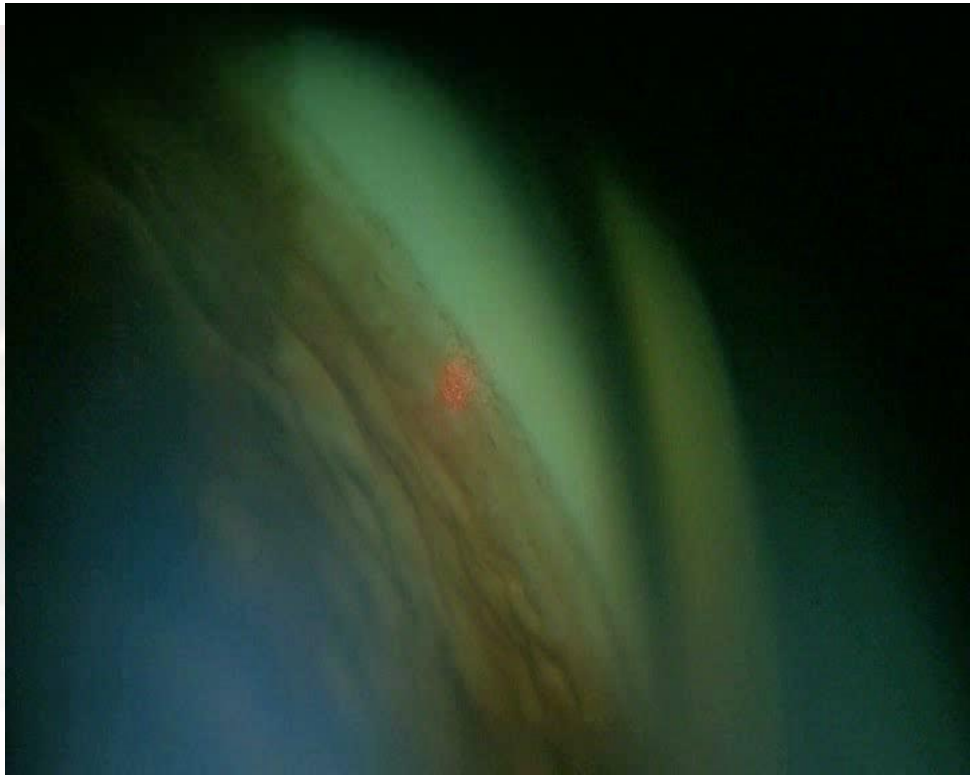


Q-switched 532-nm Nd:YAG Laser Trabeculoplasty (Selective Laser Trabeculoplasty)

A Multicenter, Pilot, Clinical Study

Mark A. Latina, MD,[1] Santiago A. Sibayan, MD,[1] Dong H. Shin, MD, PhD,[2] Robert J. Noecker, MD,[3] George Marcellino, PhD[4]

- Frequency doubled Nd:YAG
- Q-switched: 3 nsec pulse
- 532-nm, 400 micron
- Variable energy (0.8mJ+)
- Fine bubbles as endpoint

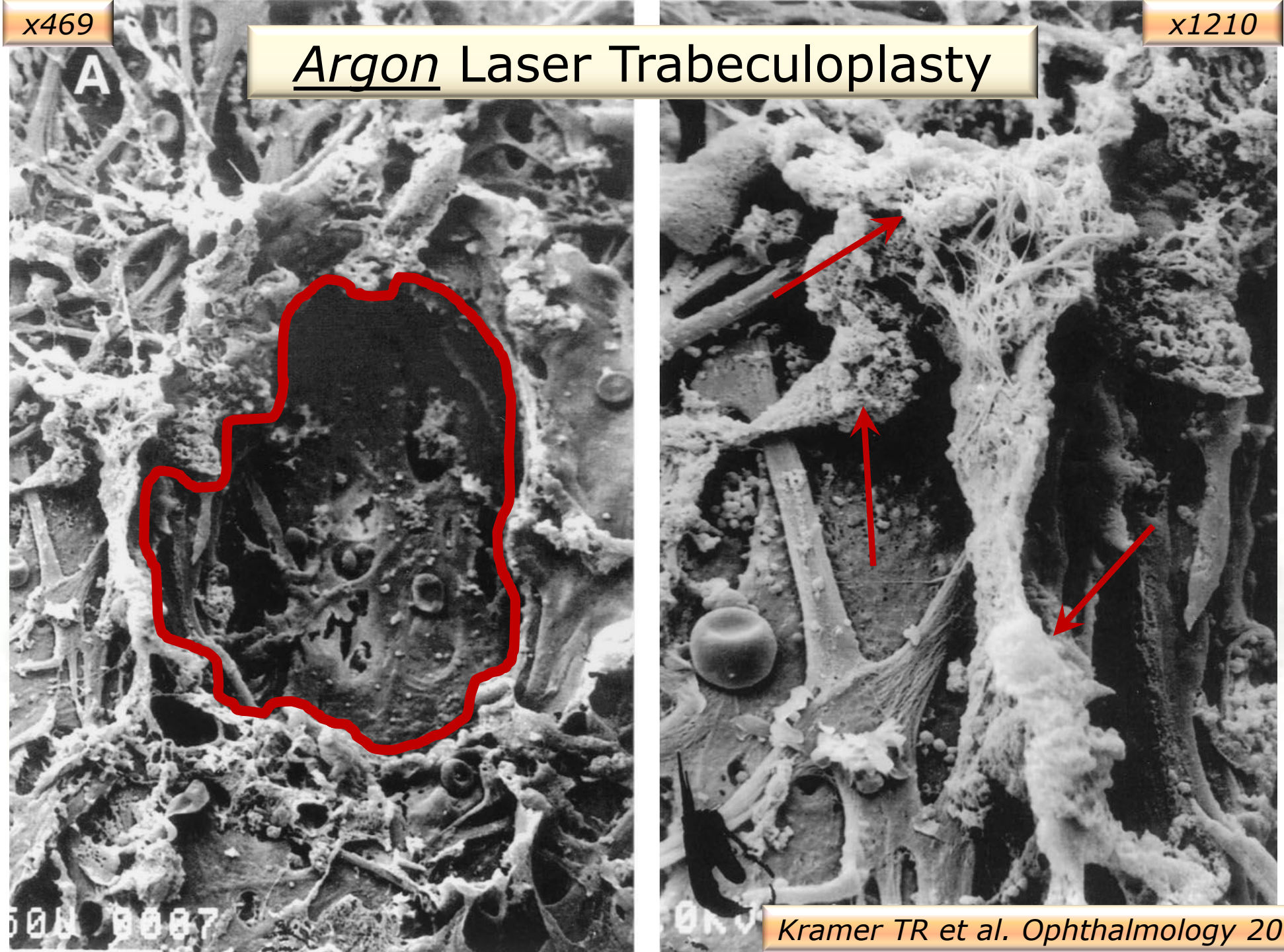


Why trabeculoplasty?

- Limitations of medical treatments:
  - Side effects: local, systemic, reduced surgical success
  - Non-response rates
  - Compliance poor: in first year 33% discontinue or change medication & only 56% days *could* have been treated with dispensed medication (Reardon *et al* 2011)
- Laser trabeculoplasty has 100% compliance

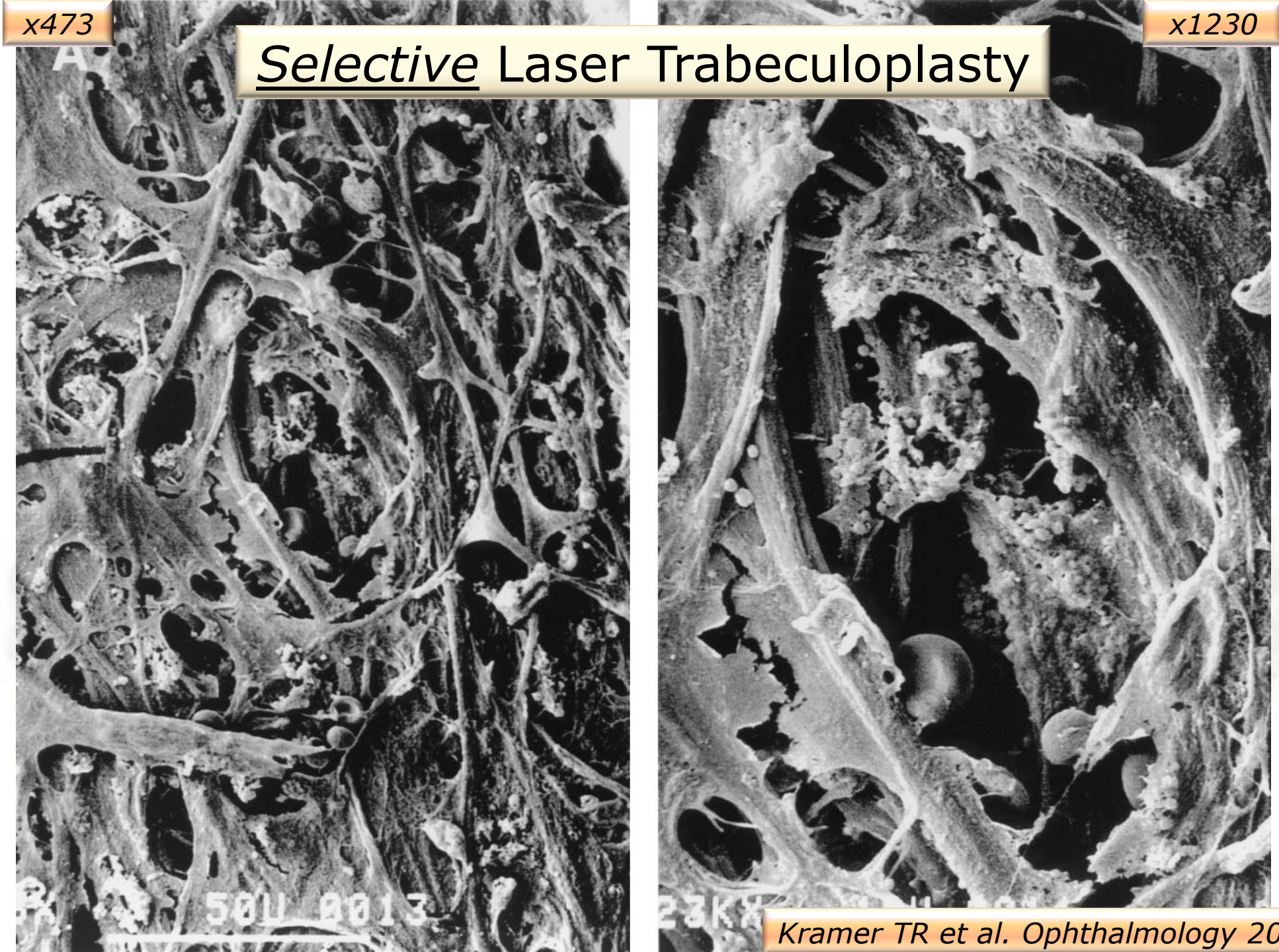
  (albeit <100% response rate)

Argon Laser Trabeculoplasty



Kramer TR et al. Ophthalmology 2001

Selective Laser Trabeculoplasty



Kramer TR et al. Ophthalmology 2001

SCIENTIFIC REPORT

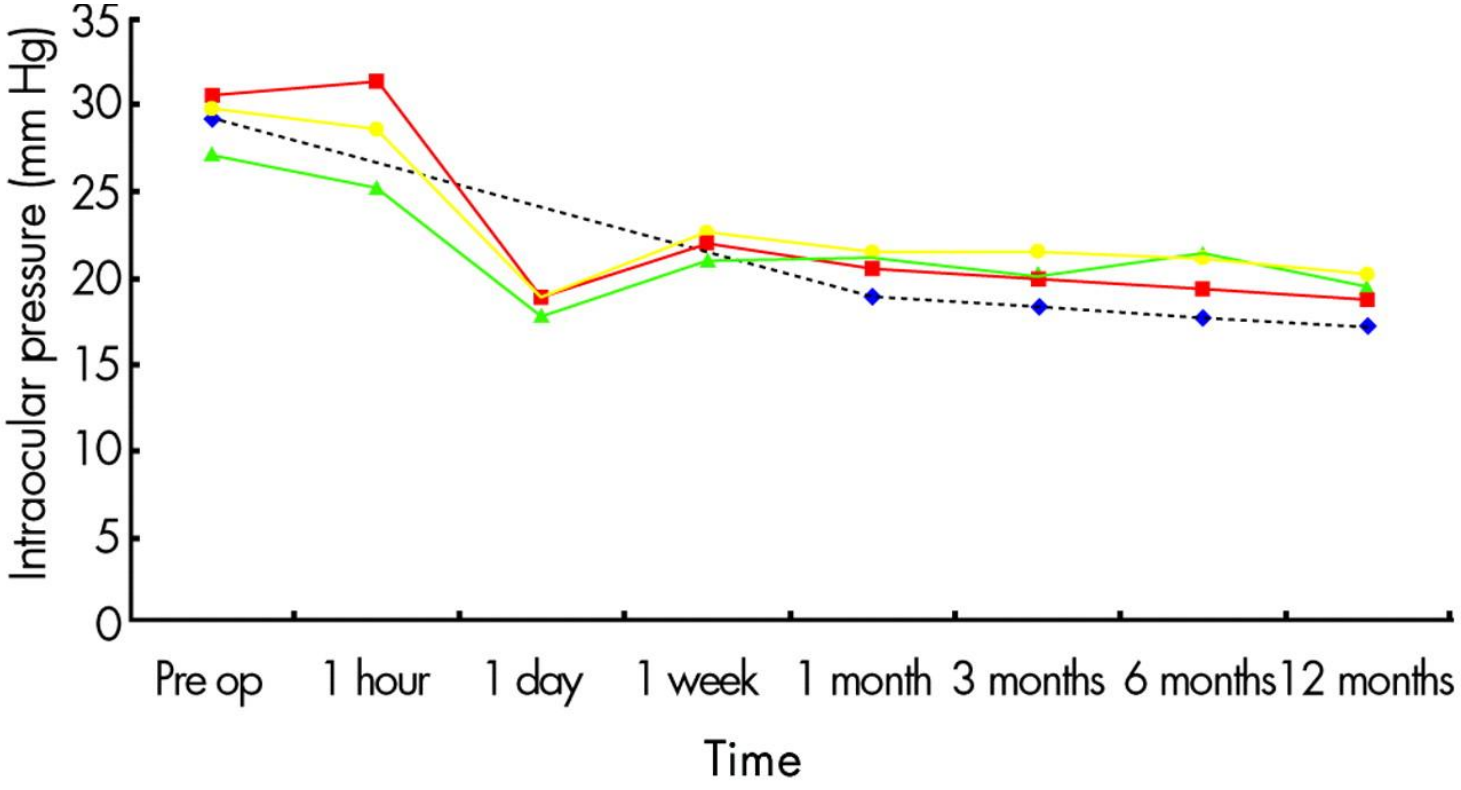
A randomised, prospective study comparing selective laser trabeculoplasty with latanoprost for the control of intraocular pressure in ocular hypertension and open angle glaucoma

M Nagar, A Ogunyomade, D P S O'Brart, F Howes, J Marshall

167 eyes of 167 patients

10 month f/up

360 degree Rx better than less



Risks vs Benefits

Risks of SLT: frequent

- Mild inflammation
  - appearing 1 hr after SLT, decreasing by 24 hrs, resolving in all cases within 5 days
- Ocular discomfort
  - in 15%-39%, resolving in 24 hrs
- IOP spike: 3 - 25% 1 hr after treatment
  - related to pigmented TM even with lower power
  - 25% >5mmHg & 9% >8mmHg (Latina)
  - 11% >5mmHg (Melamed)
  - … *usually resolves but not always*

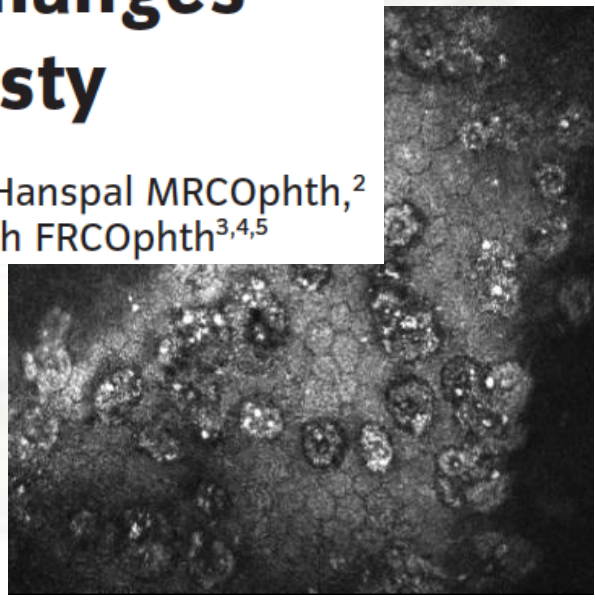
Latina 1998; Nagar 2005; Damji 1999; Lai 2004

Risks of SLT: rare

- Case reports:
  - CMO: with other risk factors (DM, RVO, PC rupture)
  - Hyphaema
  - Rare permanent corneal damage: 2 case reports of 4 cases; ?endothelialitis

Acute transient corneal endothelial changes following selective laser trabeculoplasty

Andrew JR White FRANZCO PhD,[1,2] Achyut Mukherjee MRCOphth,[2] Inderraj Hanspal MRCOphth,[2] Nicholas J Sarkies FRCOphth,[2] Keith R Martin DM FRCOphth[1,2] and Peter Shah FRCOphth[3,4,5]

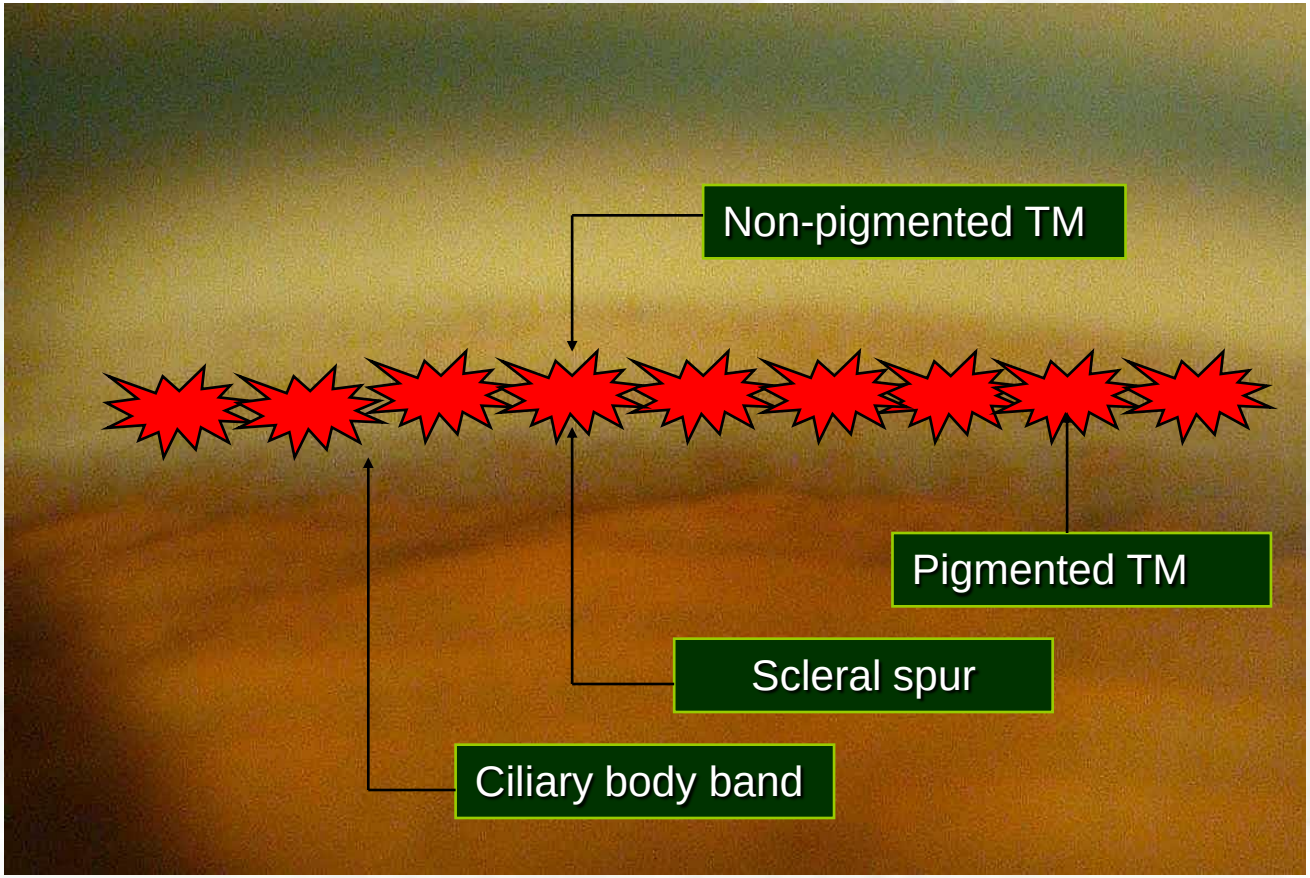


Latina 1998; Nagar 2005; Damji 1999; Lai 2004

Selective Laser Trabeculoplasty

- Iopidine pre-treatment
- Latina lens for SLT
- 100 for SLT
- Fixed Duration
- Fixed Spot size
- Power: 0.6 – 1.4mJ for SLT

SLT


Non-pigmented TM
Pigmented TM
Scleral spur
Ciliary body band

Medication post-laser

- Current glaucoma Rx
- Topical steroids / NSAIDS
  - Iridotomy or Iridoplasty: Pred Forte hourly 24 hrs then qds 1 week
  - Capsulotomy: Predsol 0.5% qds 5 days
  - SLT: Acular tds 3 days *if needed*

If SLT does work, should we use it?

Time Costs Ganglion Cells!

Are we merely delaying reaching Target IOP?

or

Preserving vulnerable conjunctiva by minimising drug exposure?

Laser trabeculoplasty for open angle glaucoma (Review)

Rolim de Moura CR, Paranhos Jr A, Wormald R

THE COCHRANE COLLABORATION®

...as of Jan 2009

19 trials, 2137 participants: only 5 of good methodology

All included trials used older medications

No difference in health-related quality of life

More evidence needed…!

- ‘LiGHT’ study
  - *L*aser *i*n *G*laucoma and Ocular *H*yper*t*ension
  - National Institute Health Research, health technology assessment (NIHR HTA) funded
  - 5 year, 5 centre, 718 patients RCT looking at health-related quality of life in 2 treatment *pathways*: Laser-1st vs. Medications-1st

NHS National Institute for Health Research

UCL

Priment™ Clinical Trials Unit

"From inability to let well alone; from too much zeal for the new and contempt for what is old; from putting knowledge before wisdom, science before art, and cleverness before common sense; from treating patients as cases, and from making the cure of the disease more grievous than the endurance of the same, Good Lord, deliver us."

Sir Robert Hutchison (1871-1960)