Endoscopic Cyclophotocoagulation

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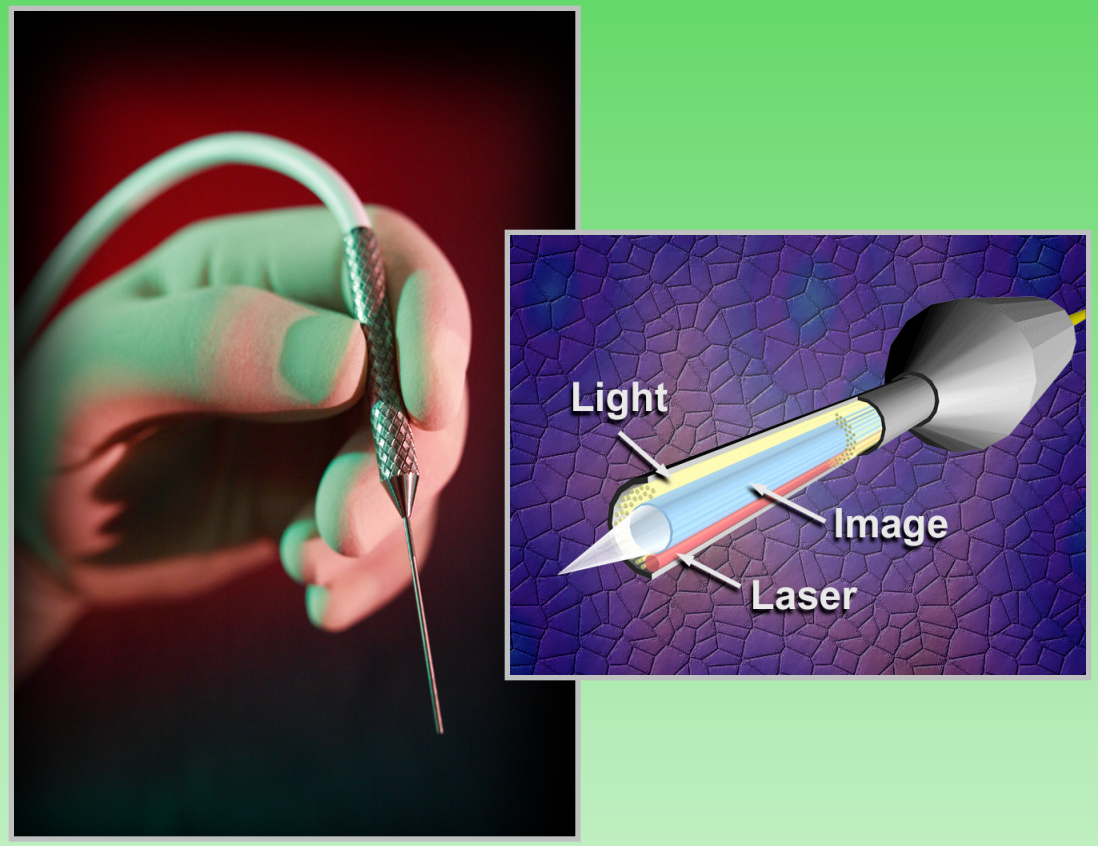
Laser Endoscope



ENDOSCOPIC CYCLOPHOTOCOAGULATION

Martin Uram, M.D., M.P.H.

E2 Laser and Endoscopy System

ENDOSCOPIC CYCLOPHOTOCOAGULATION

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4 Skills for ECP

- ⇒ Watching Video Monitor
- ⇒ Accessing ciliary proceses given approach and lens status
- ⇒ Inflating ciliary sulcus
- ⇒ Controlling long duration, invisible wavelength laser

When to do ECP?

- Replacement medical therapy
- Eyes with previous outflow procedures
- Eyes at risk for hypotony i.e. Vitrectomized Eyes
- Poor conjuncitva/sclera
- Plateau iris cases

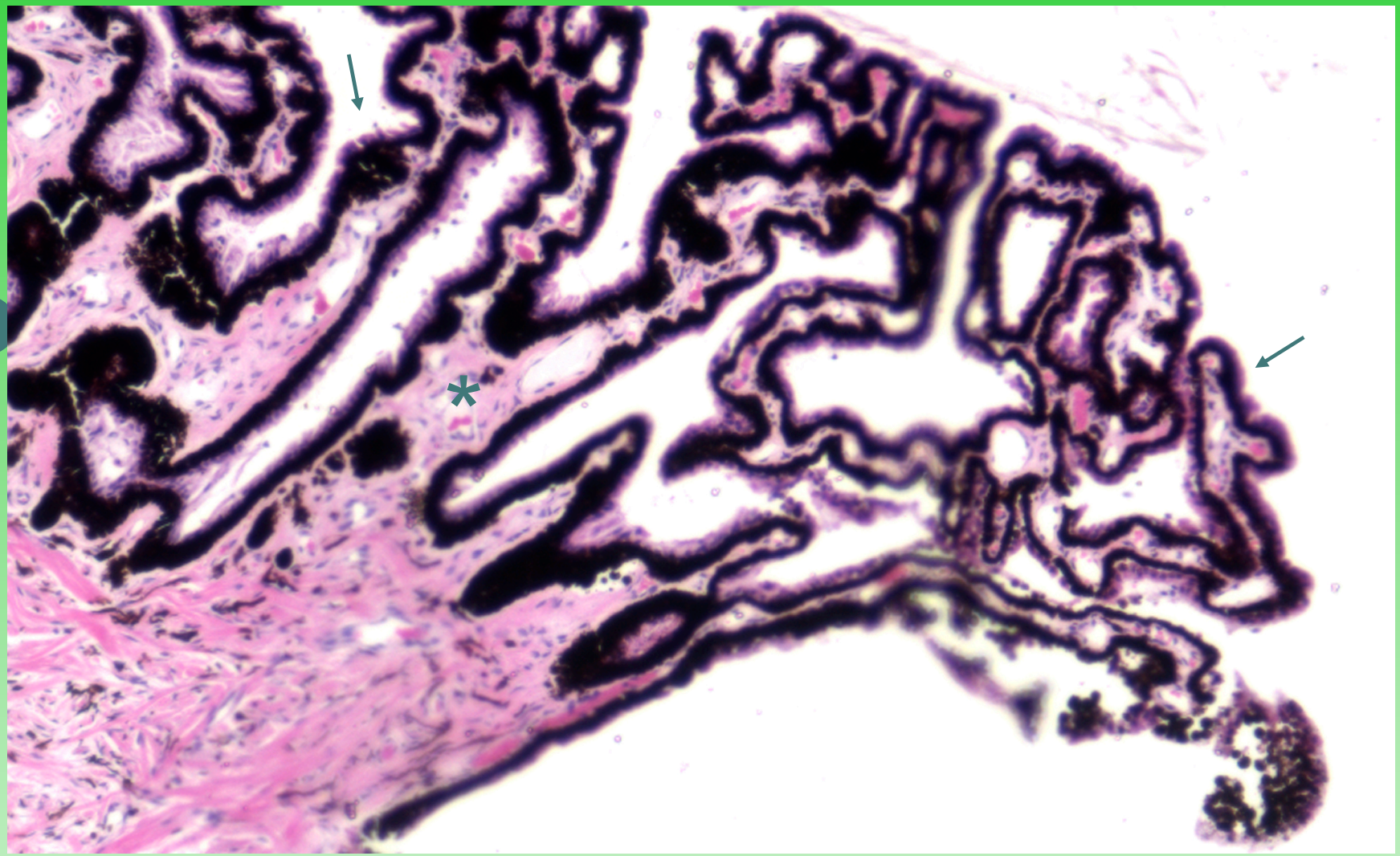

Fig. 1. Light microscopy of normal ciliary processes showing their lacy contour with normal appearing stroma, pigmented and non-pigmented ciliary epithelium.

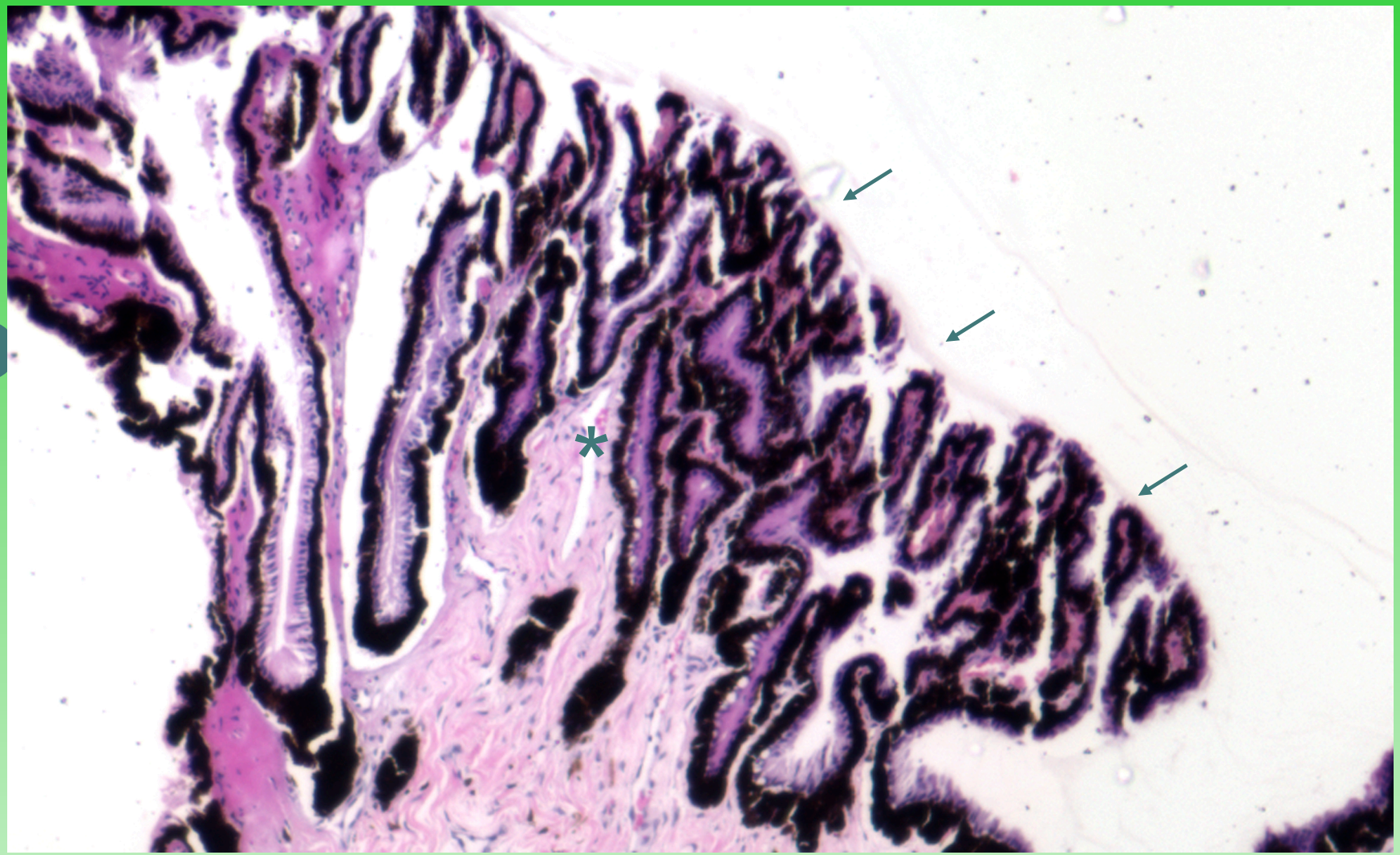

Fig. 2. Light microscopy of ECP treated tissue showing loss of the lacy appearance and shrinking of the ciliary processes with destruction of the non-pigmented epithelium and clumping of the pigmented epithelium.

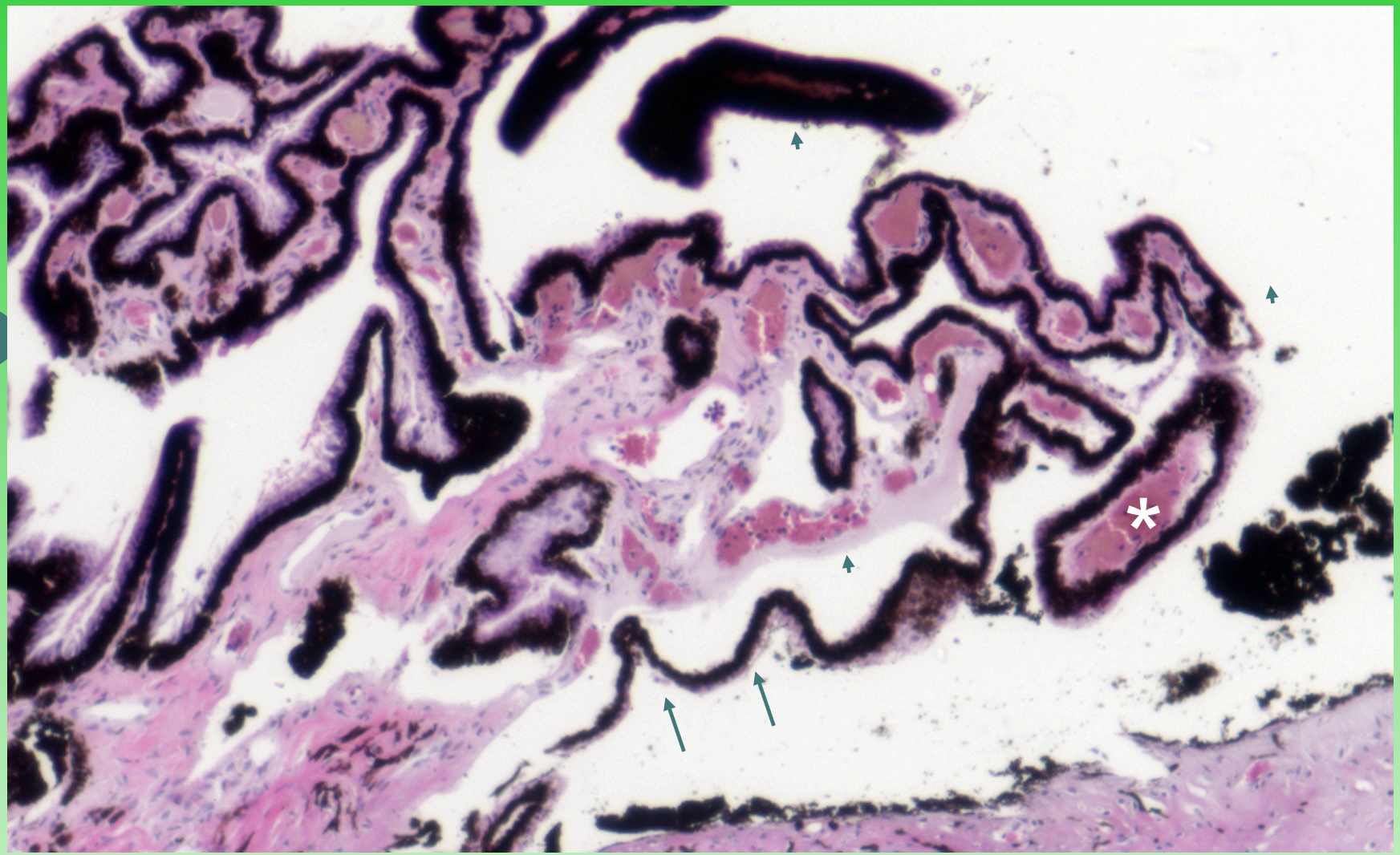

Fig.3. Light microscopy of TCP treated tissue showing separation of the non-pigmented and pigmented ciliary epithelium, coagulative necrosis of the underlying ciliary stroma (asterisk), and architectural destruction of the treated tissue.

ECP Treatment Principle

- ⇒ **Lens Behind Iris: VISCOELASTIC**
- ⇒ **Single Chamber Eye: INFUSION**

AVOID HYPOTONY

Inflating the Ciliary Sulcus

ENDOSCOPIC CYCLOPHOTOCOAGULATION
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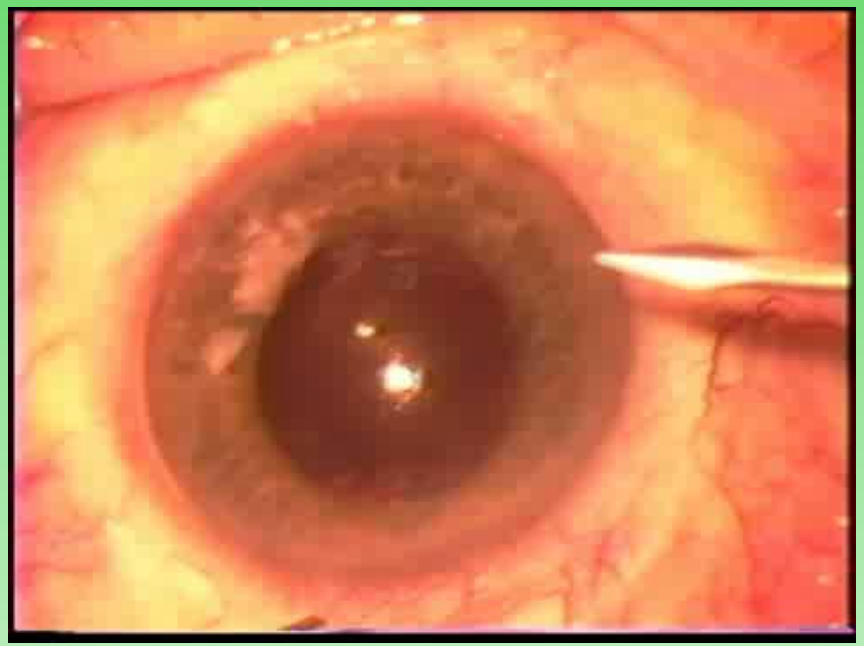
Sulcus Inflation



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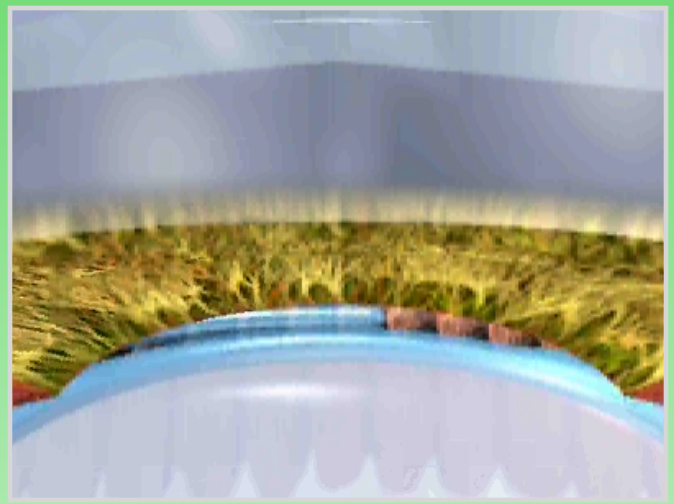
Combined Procedures:

Limbal, Over Bag / PC-IOL



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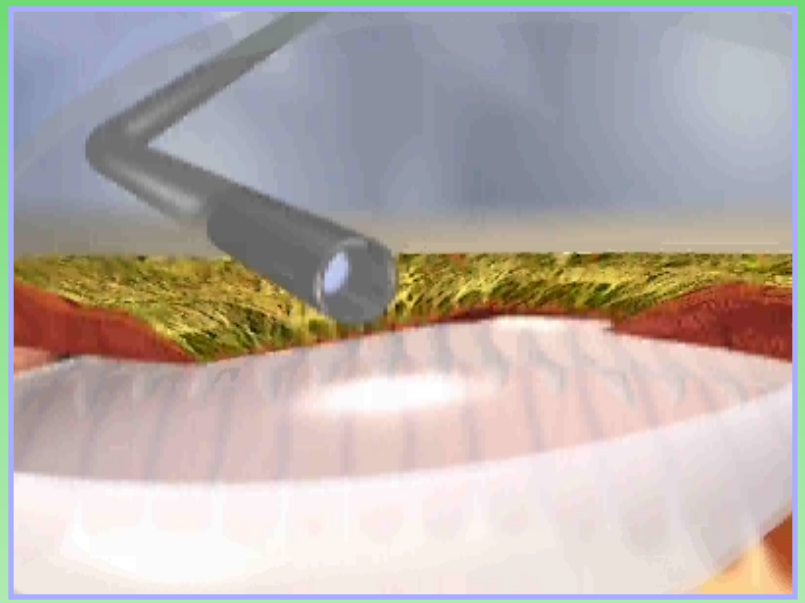
Through The Bag



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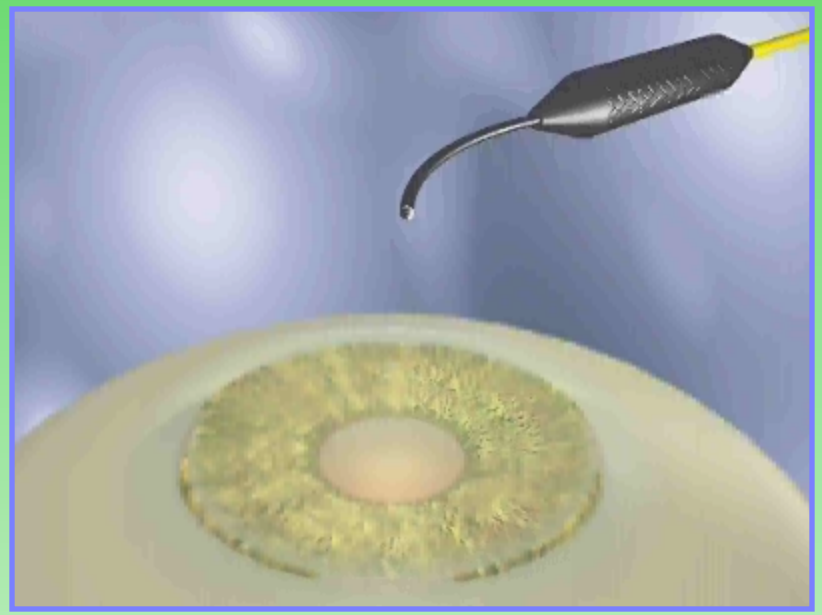
Curved Probe, Limbal



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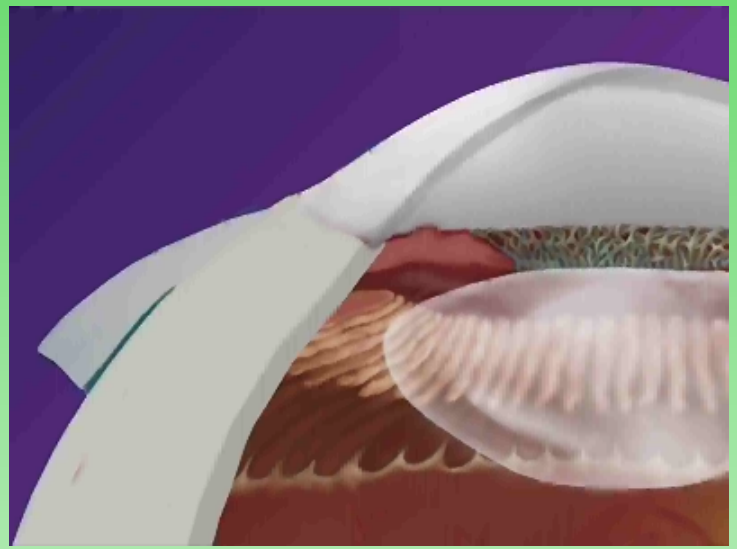
No PPL for Phakic Eyes



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Desired Tissue Effect

⇒ Whiten ciliary processes

⇒ Shrink ciliary processes

⇒ Treat entire ciliary process

Inflating the Ciliary Sulcus

Complete Treatment

INADEQUATE TREATMENT RESULTS IN:

- ⇒ **POOR IOP CONTROL**
- ⇒ **ONLY TEMPORARY "GOOD" RESULT**

Treatment Zone

- Light
- Standard
- Plus

ENDOSCOPIC CYCLOPHOTOCOAGULATION
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ECP: Post-Op Meds

- ⇒ SAME AS PHACO ALONE
- ⇒ IOP SPIKE PROPHYLAXIS
- ⇒ PARACENTESIS

Intraocular Decadron

A. Formulation: 4mg/cc

B. Dosage: 0.1cc to 1.0cc

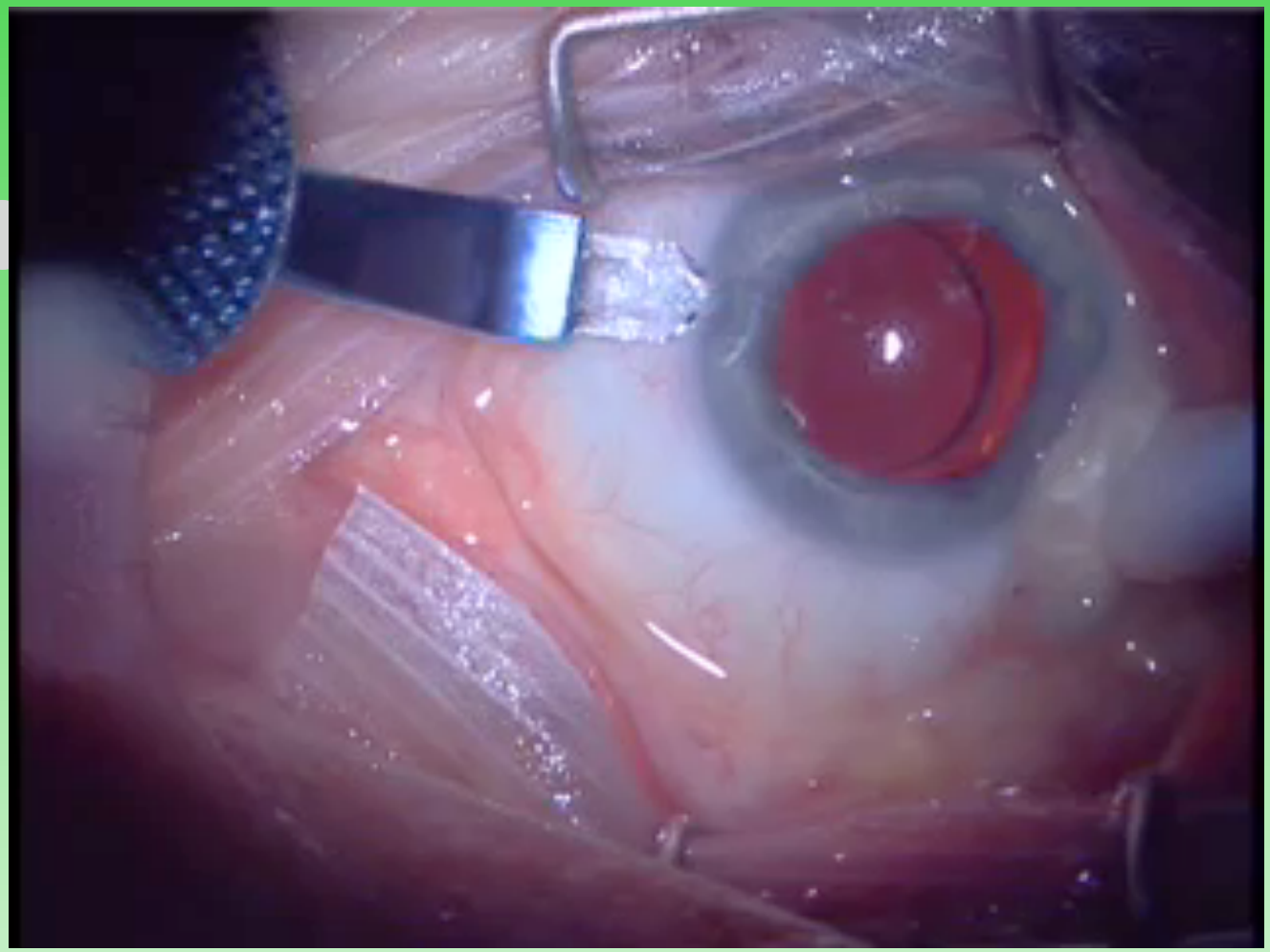
C. Site: AC or VIT

Pre-op Regimen

- Same as for Cataract Procedure
  - Phenylephrine
  - Cyclogyl
  - NSAID
  - 4th Generation Fluoroquinolone
  - Lidocaine Gel 2%
  - +/- Block

Treatment Steps

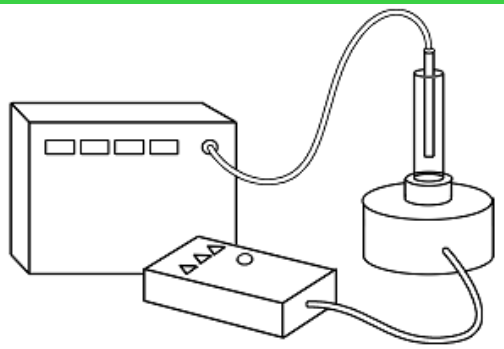
- Temporal Clear Cornea Incision 2.6 mm
- If topical, 1% intracameral lidocaine
- Inflate Sulcus with Healon GV
- If Aphakic or Pediatric Eye, use anterior chamber maintainer with continuous BSS Irrigation
- +/- Superonasal Clear Cornea Incision

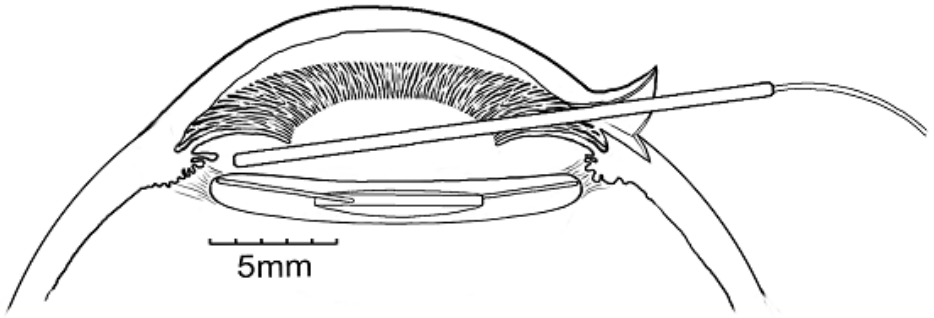


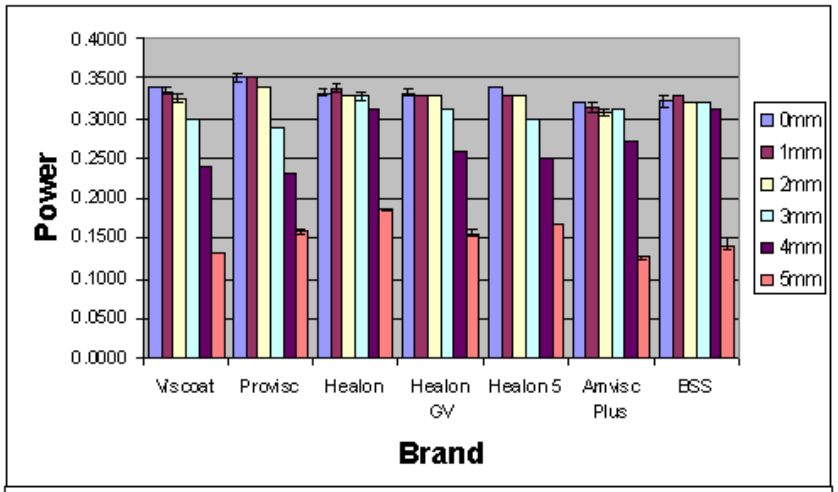
ECP Technique

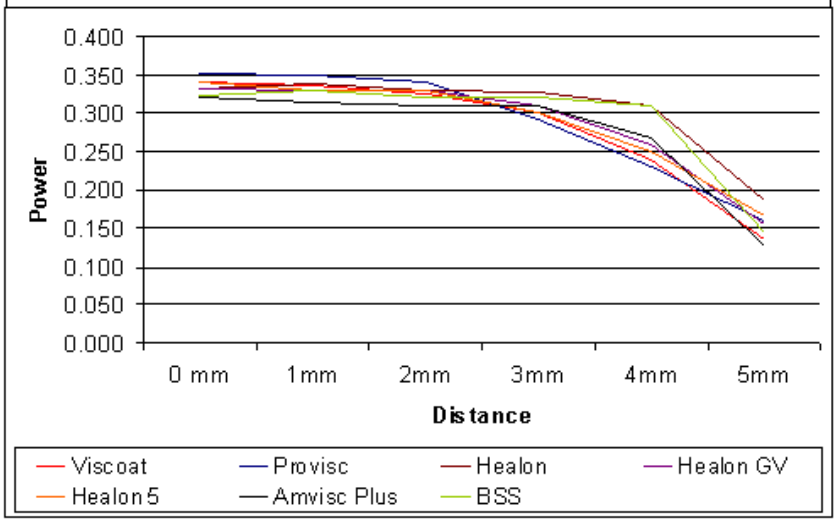
Laser Settings

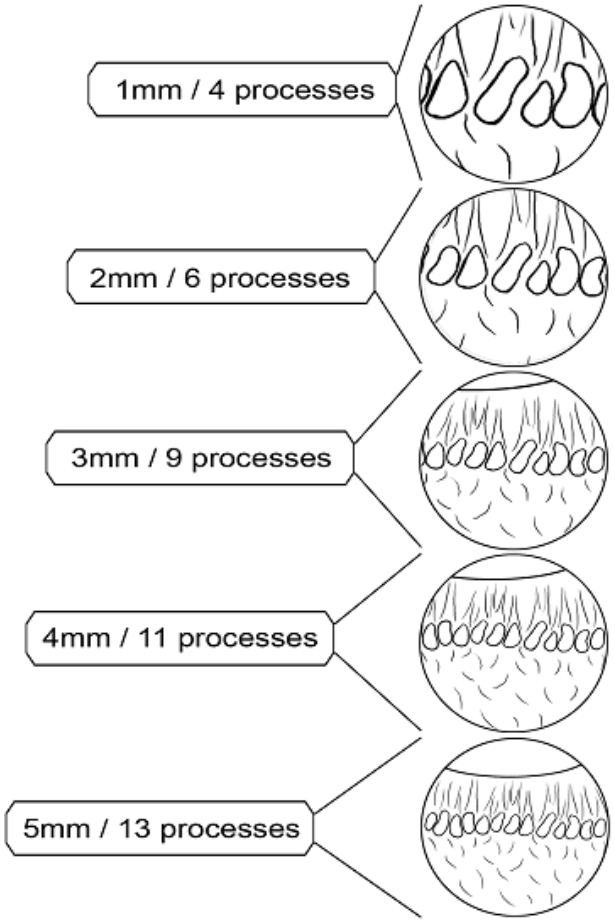
- .25 Watts
- Continuous Mode
- Adjust Illumination to visualize aiming beam
- Endpoint is whitening and shrinkage of ciliary process
- “Paint” over 270 to 360 degrees
- “Pop” is over treatment



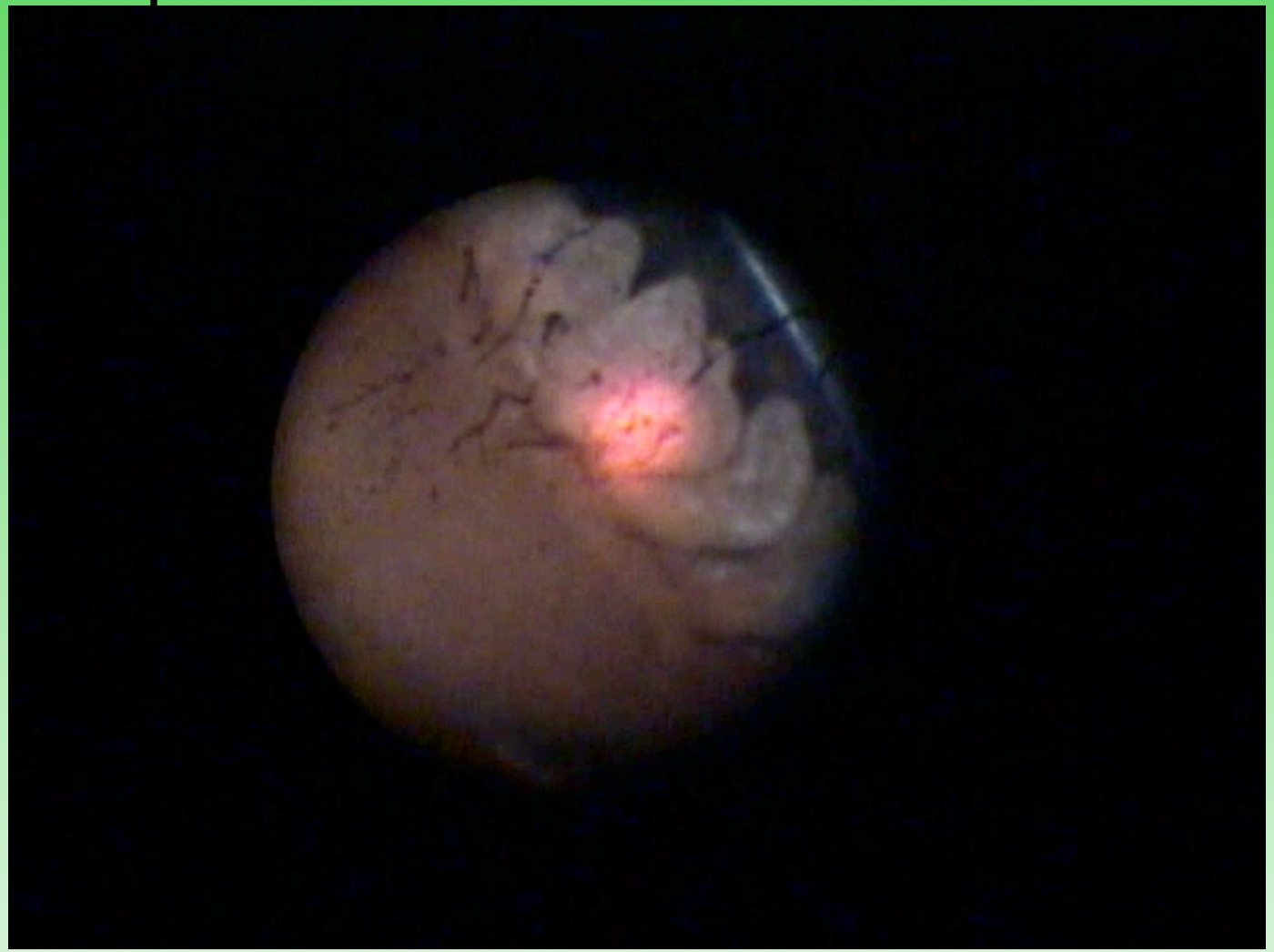

5mm


0.4000
0.3500
0.3000
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
Power
0mm
1mm
2mm
3mm
4mm
5mm
Viscoat
Provisc
Healon
Healon GV
Healon 5
Amvisc Plus
BSS
Brand


0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Power
0 mm
1mm
2mm
3mm
4mm
5mm
Distance
Viscoat
Provisc
Healon
Healon GV
Healon 5
Amvisc Plus
BSS


1mm / 4 processes
2mm / 6 processes
3mm / 9 processes
4mm / 11 processes
5mm / 13 processes

Plateau iris -sp angle closure



Post-Procedure

- Thorough viscoelastic removal is important
- Intracameral decadron (0.1cc)
- Post –op drops
  - Prednisolone QID
  - NSAID QID
  - 4th Generation fluoroqunolone QID

ECP Post-op and Follow-up

- Routine post-op protocol is followed when ECP is combined with cataract surgery
- Glaucoma meds are restarted and then discontinued as needed
- IOP will not drop immediately as it does with Trabs. IOP may fluctuate during the first 2 weeks
- The ultimate post-ECP pressure will be identified between the 2nd and 8th week
- Retreatment may then be considered

Commonly Seen Complications

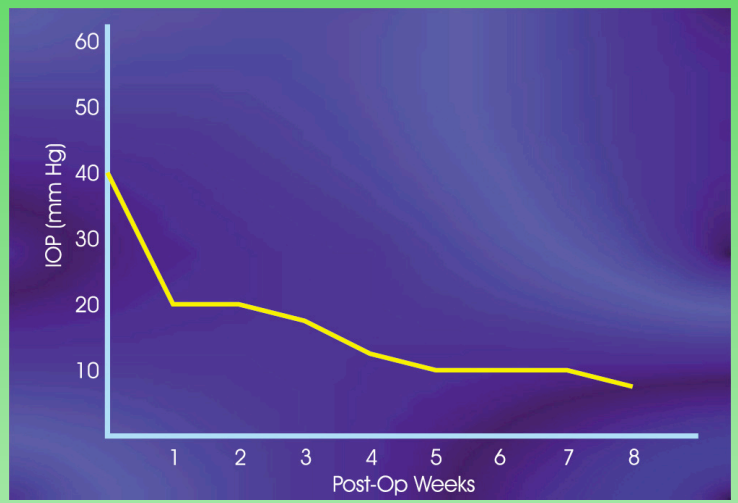
- IOP spike (retained viscoelastic)
- Transient Hemorrhage
- Inflammation
- Pupil Irregularity (anterior burns)
- Vitreous Prolapse into AC (in eyes with open capsule)
- Any complication associated with anterior segment surgery

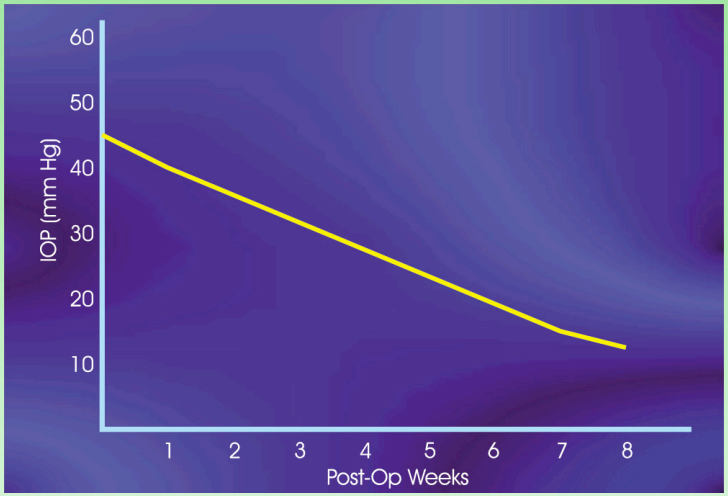
Take away points

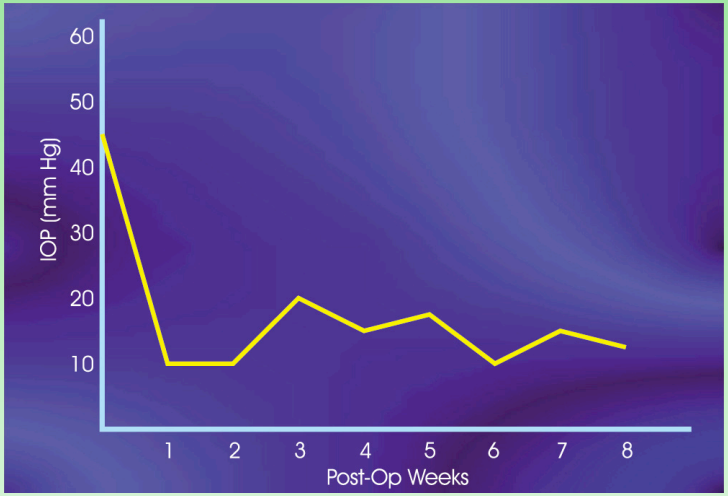
- ECP is safe, effective and easy when done correctly
- It is minimally destructive and more targeted to ciliary body epithelium
- Mode of delivery of laser energy is trade off between efficacy, safety, and side effects

Adequate IOP Response

IOP response curves to ECP

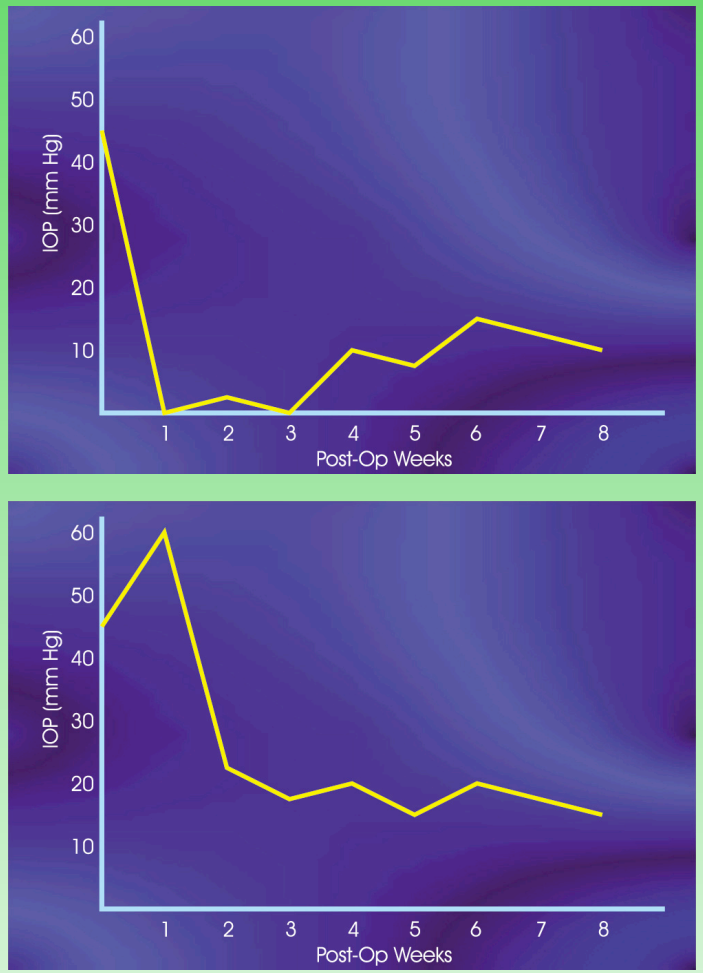






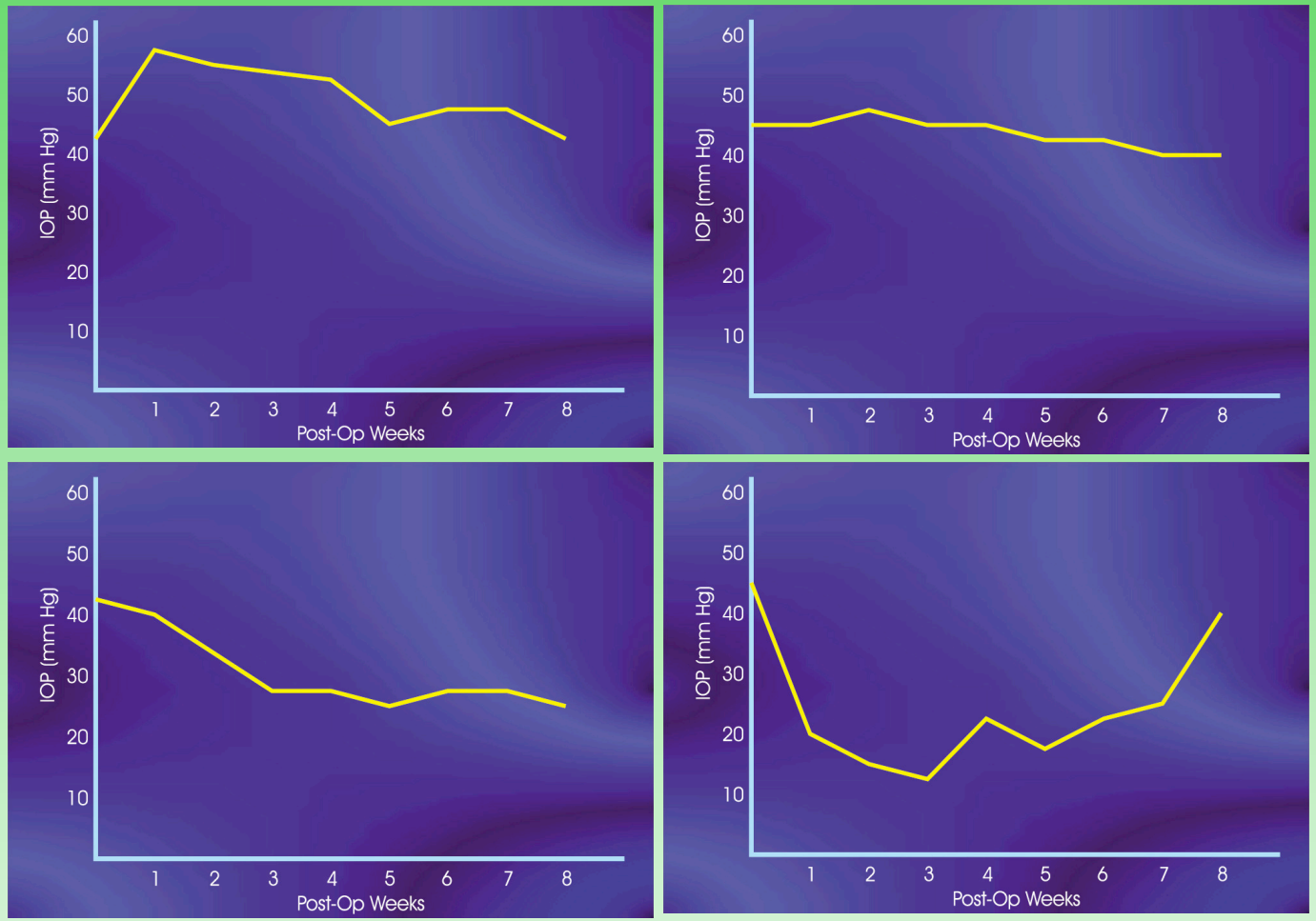
Adequate IOP Response

IOP response curves to ECP

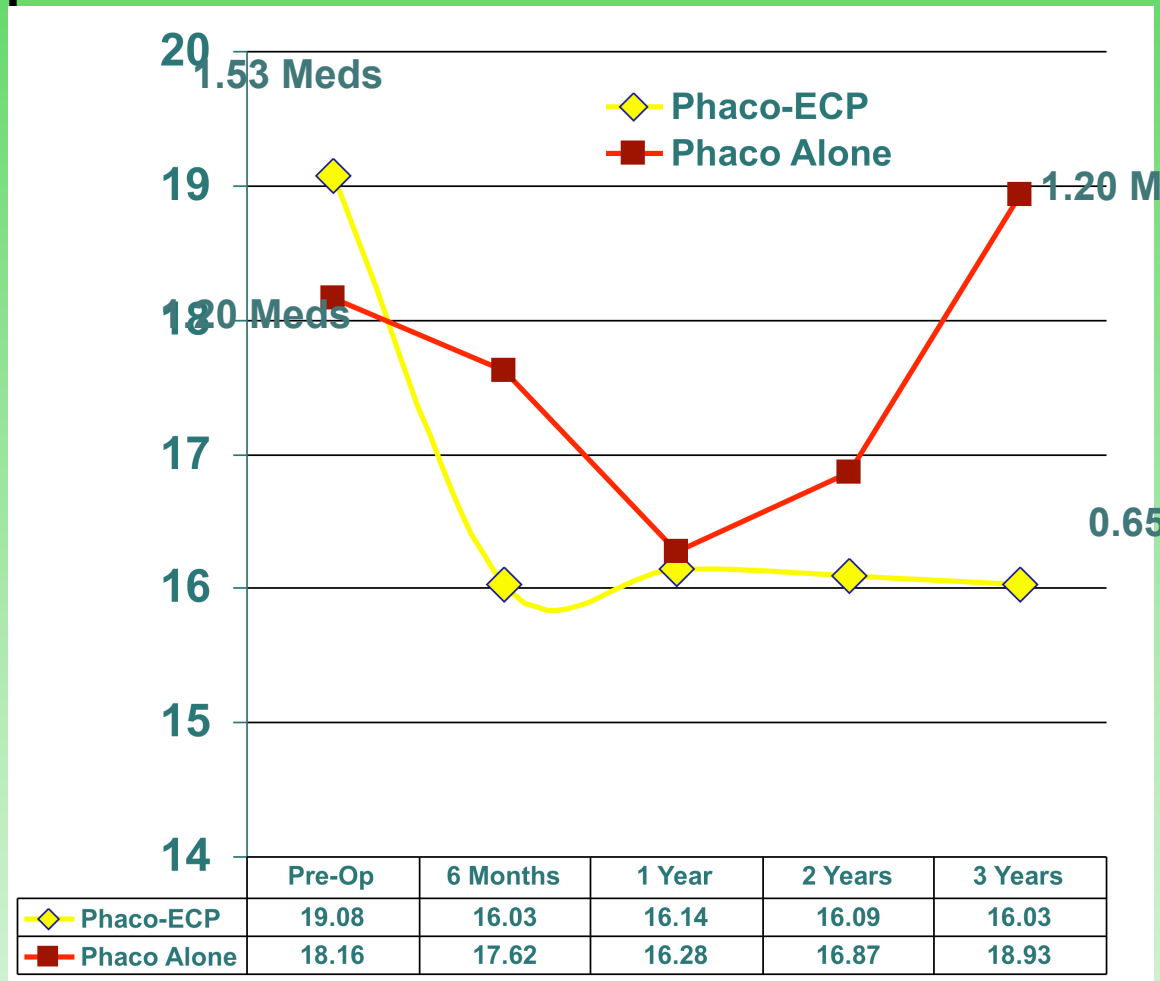


Inadequate IOP Response

You didn't laser enough of the ciliary epithelium
DO MORE

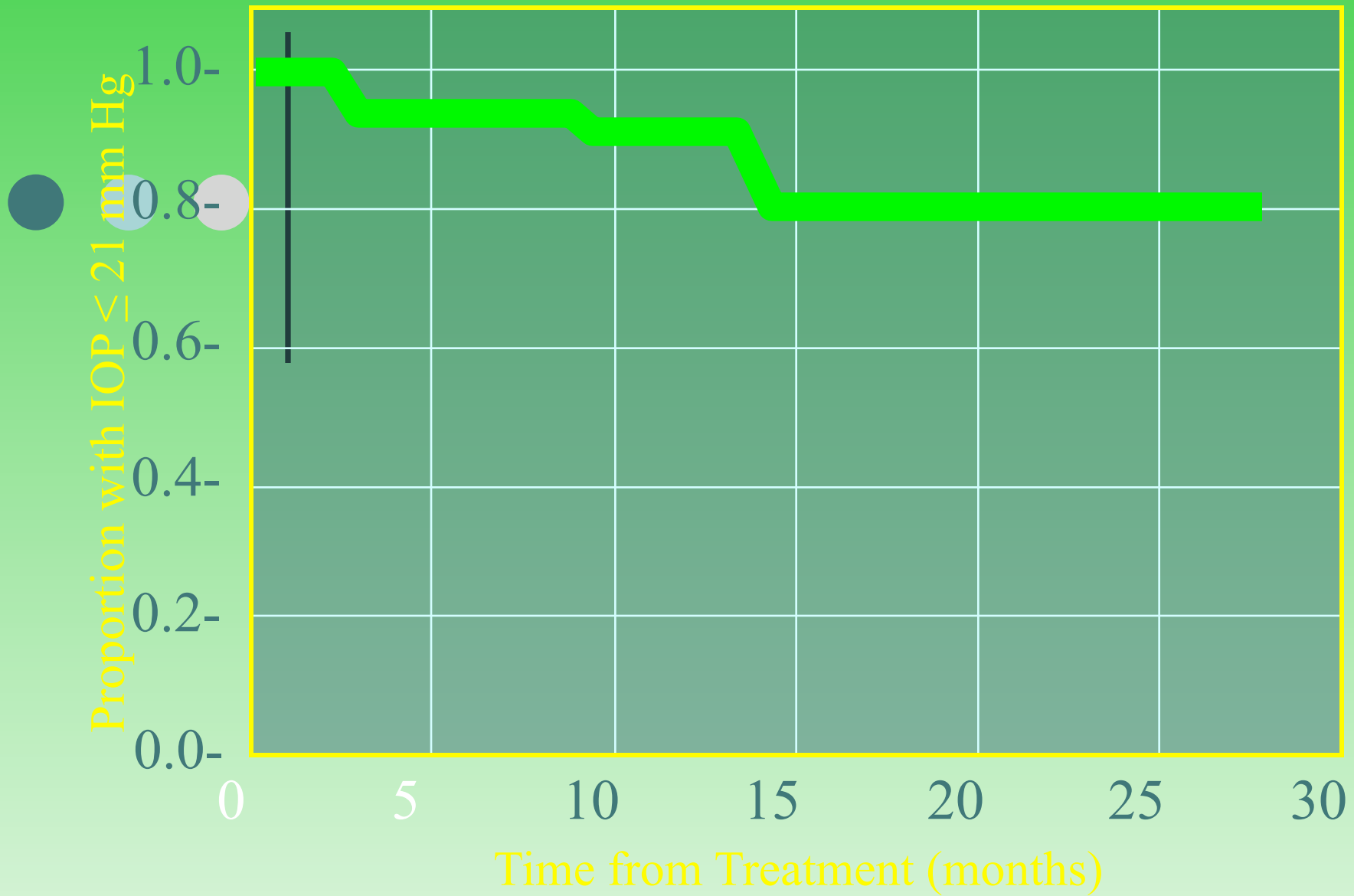


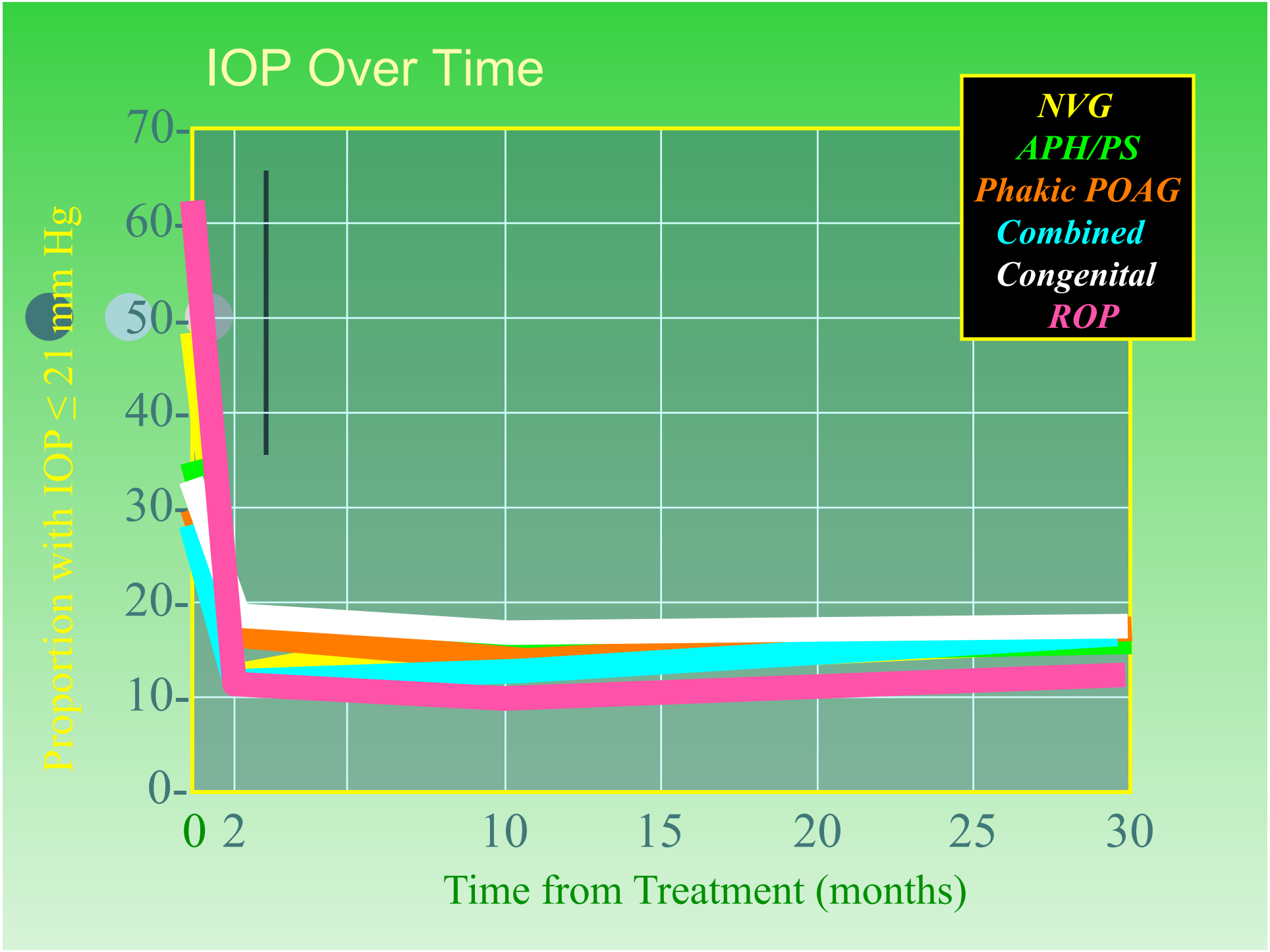
Phaco-ECP vs Phaco Alone:
Mean IOP Over Time



	Pre-Op	6 Months	1 Year	2 Years	3 Years
Phaco-ECP	19.08	16.03	16.14	16.09	16.03
Phaco Alone	18.16	17.62	16.28	16.87	18.93

ECP in Refractory Glaucoma




IOP Over Time
NVG
APH/PS
Phakic POAG
Combined
Congenital
ROP
Proportion with IOP ≤ 21 mm Hg
70
60
50
40
30
20
10
0
0 2
10
15
20
25
30
Time from Treatment (months)

Post PK Glaucoma and ECP

	N	Tube IOP Success %	ECP IOP Success %	Tube Chronic PK Rejection %	ECP Chronic PK Rejection%	F/U (mo)
Chen Alvarado (AJO 1994 124;787-796)	16	-------	90	----------	0	13
Lima (J Glaucoma 2004;13:233-237)	18	71	74	40	12	22
ECP Study Group (ASCRS 2008)	57	_____	_____	_____	0	62
Uram (ASCRS 2009)	68	46	94	54	3	73

ECP COLLABORATIVE STUDY GROUP COMPLICATIONS

5824 PATIENTS

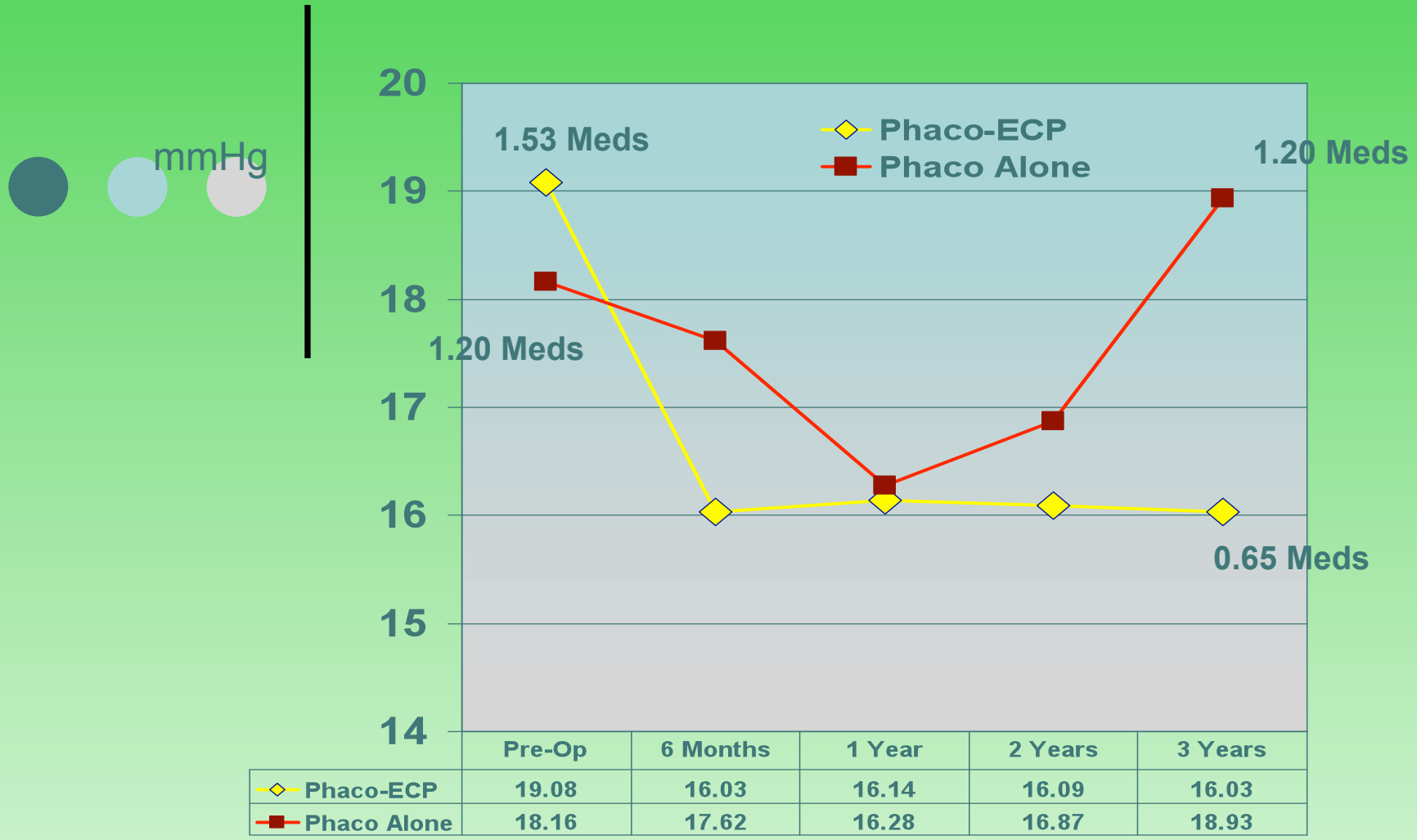
IOP Spike	14.5%
Hemorrhage	3.8%
Serous Choroidal Effusion	0.36%
IOL Dislocation	0.36%
CME	1.03%
RD	0.27%
Massive Choroidal Hemorrhage	0.09%
Hypotony or Phthisis	0.12%
NLP Vision	0.12%
Cataract	24.5%
Acute Graft Rejection	5.3%
Chronic Graft Rejection	0
Chronic Inflammation	0
Flat AC	0
Endophthalmitis	0
Diplopia	0
Wound Leak	0
Bleb Complications	0

Phaco-ECP vs Phaco Alone

Stanley J. Berke, M.D., FACS, et. al..

- 707 Patients
- 626 Randomized to Phaco-ECP Group
- 81 Randomized to Phaco Alone
- 5 Surgeons
- Parameters such as VA, IOP, Meds, & complications were followed
- Mean follow-up was 3.2 years (0.5 to 5.8 years)

Phaco-ECP vs Phaco Alone: **Mean IOP Over Time**



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A prospective, comparative study between endoscopic cyclophotocoagulation and the Ahmed drainage implant in refractory glaucoma (Lima, J Glaucoma)

- 68 patients
- Mean Follow-up 20 months
- Mean Pre-IOP 41 both groups
- Mean Post-IOP 14 both groups at 24 months
- Complication Rates
  - Choroidal Effusion 18 vs 3%
  - Shallow AC 18 vs 0%
  - Hyphema 15 vs 18%
- Clinical success similar; higher complication rate with Ahmed

J Glaucoma July, 2004

A prospective, comparative study between endoscopic cyclophotocoagulation and the Ahmed drainage implant in refractory glaucoma (Lima, J Glaucoma)

- Success rate of initial procedure last follow-up was 34%
- 9 eyes (25%) retreated at least once
- Cumulative success rate after all procedures 43%
- Mean arc of treatment was 260 degrees +/- 58 degrees of ciliary processes
- Postoperative complications
  - 2 retinal detachment
  - 1 hypotony
  - 1 progression of vision loss from HM to NLP
  - All 4 complications occurred in aphakic patients

Endoscopic photocoagulation of the ciliary body for treatment of refractory glaucomas Alvarado, AJO, 1997

- 68 eyes of 68 patients underwent ECP
  - 180 to 360 degrees of the ciliary body
  - limbal incision (56 eyes, 12 concurrent cataract extraction)
  - pars plana incision (12 eyes)
- Second treatment required in 5 eyes (7%)
- Mean follow-up 12.9 months
- IOP decreased from 27.7 +/- 10.3 mm Hg preoperatively to 17.0 +/- 6.7 mm Hg
- Mean reduction 10.7 mm Hg, (34%)

Endoscopic photocoagulation of the ciliary body for treatment of refractory glaucomas (Alvarado; Am J Ophthalmol. 1997 Dec;124(6):787-96)

- 61 eyes (90%) achieved IOP <= 21 mm Hg
- Kaplan-Meier successful outcome in 94% of patients after 1 year and 82% after 2 years
- Mean number of medications reduced from 3.0 +/- 1.3 preop to 2.0 +/- 1.3 postop (P < .0001)
- BCVA was stable or improved in 64 eyes (94%), with 4 (6%) losing 2 or more lines of acuity
- No case of hypotony (IOP < 5 mm Hg) or phthisis observed

Phaco-ECP vs Phaco Alone

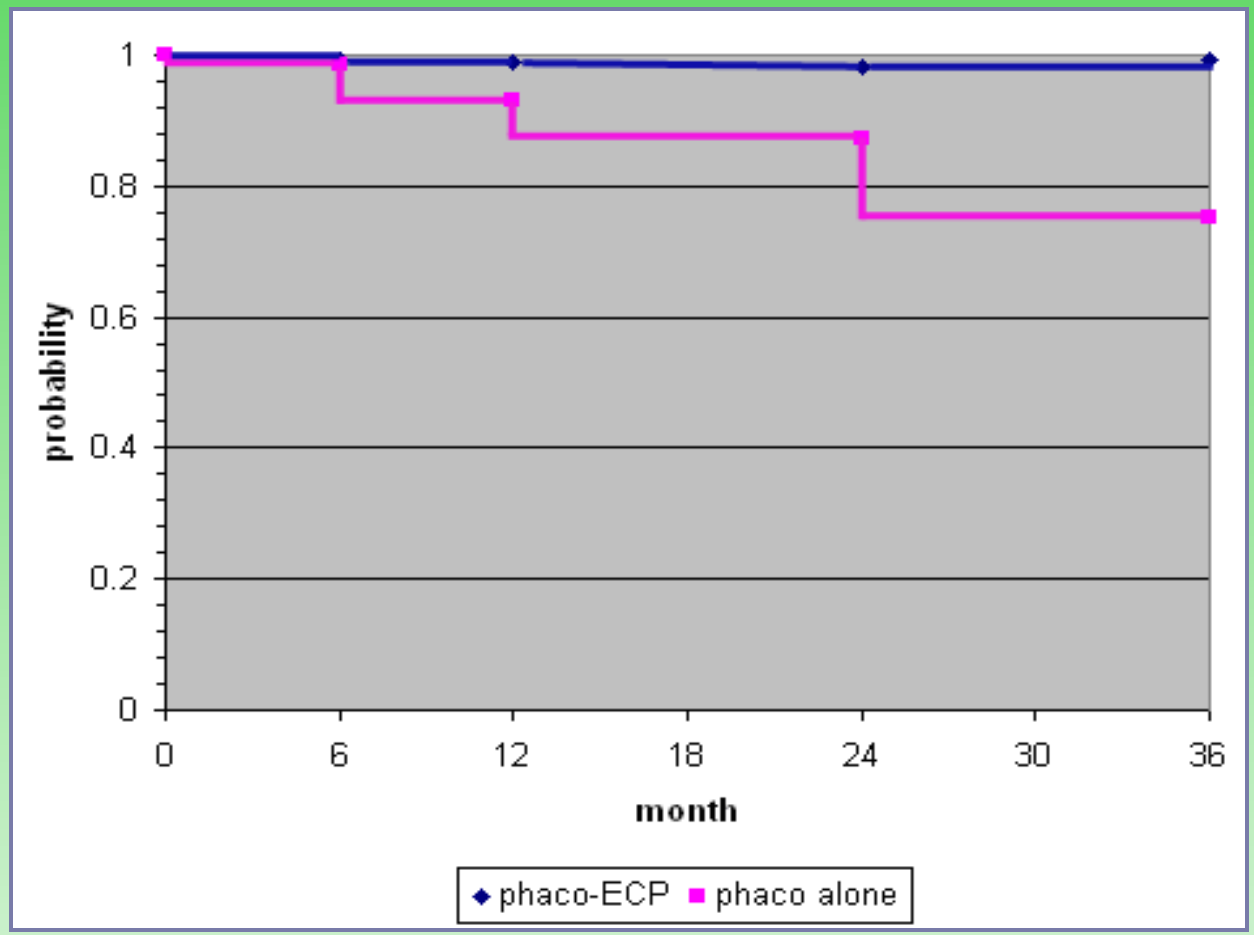
Glaucoma Medication Cost Analysis

	Pre-Op	Post-Op	Savings/Loss
Phaco-ECP monthly patient cost	**$220.08**	**$94.78**	**$125.30**
Phaco-ECP annual patient cost	**$2,640.92**	**$1,137.35**	**$1,503.57**
Phaco Alone monthly patient cost	**$144.45**	**$160.28**	**($15.83)**
Phaco Alone annual patient cost	**$1,733.40**	**$1,923.36**	**($189.96)**
Estimated US annual savings*			**$846,765,000**

* 2.5 million cataract procedures annually. 20% of cataract surgery patients concurrently treated with glaucoma medications.

Kaplan Meier Survival Analysis:

Phaco-ECP vs Phaco alone in medically controlled glaucoma



Spaeth study: Ultra-refractory glaucoma

Patient profile

17 eyes of 12 patients

Mean age 40.5 yrs (31-74)

Mechanism of Glaucoma

Open angle	8
CACG	4
Pigmentary	2
Uveitic	2
Congenital	1

Spaeth study: Ultra-refractory glaucoma

• Uncontrolled IOP on MMT	100% (17/17)
• Surgery needed in better eye	71% (12/17)
• Prior RD or PK surgery in ECP eye	35% (6/17)
• Blind fellow eye (one-eyed patient)	41% (7/17)
• Mean # previous gl surgeries	3.0

Spaeth study: Ultra-refractory glaucoma

IOP

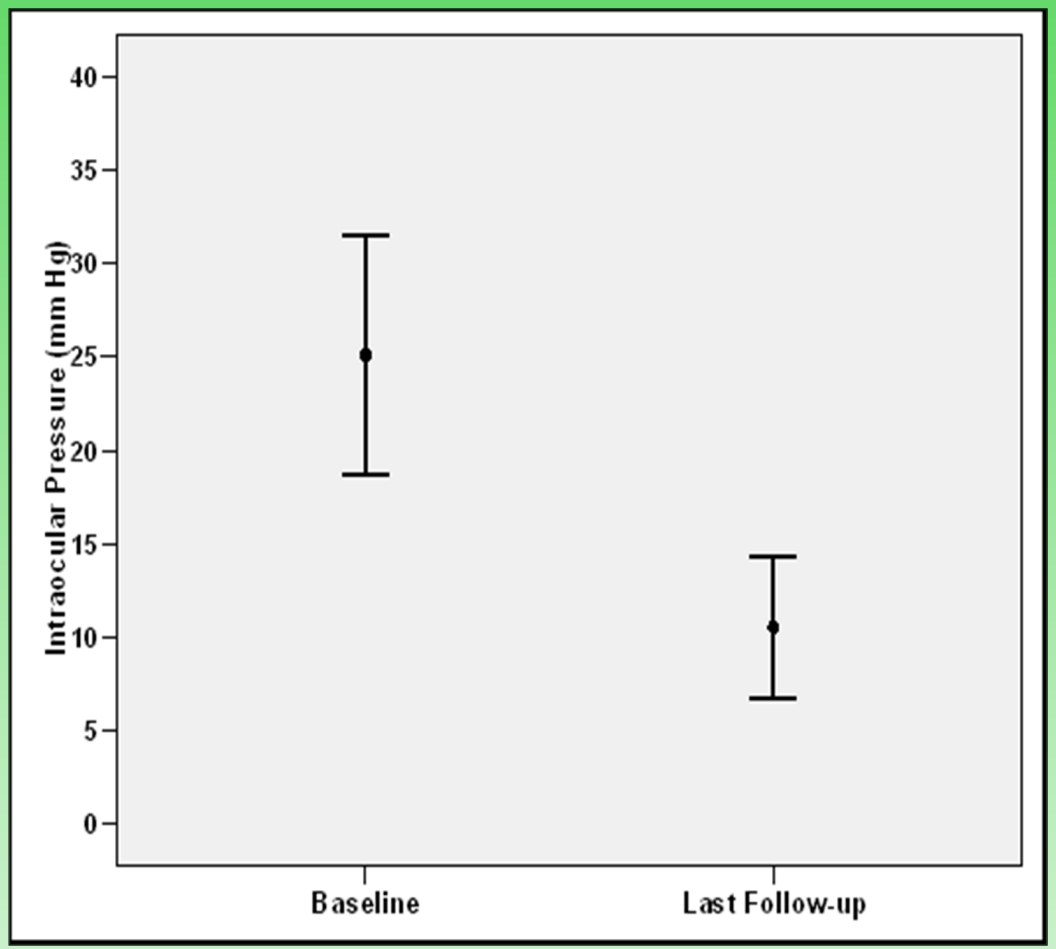
- Mean pre-op IOP 25.1 ± 6.4 mmHg
- Mean post-op IOP 10.5 ± 3.8 mmHg

P= .0000000006

Decreased IOP 100%

No eyes increased IOP

Spaeth study:
Ultra-refractory glaucoma



Spaeth study: Ultra-refractory glaucoma

MEDS

- Pre-op 3.8 ± 1.3
- Post-op 0.9 ± 1.1

P= .0000006

Decreased Meds 82%

Unchanged 18%

Spaeth study: Ultra-refractory glaucoma

Visual acuity improved	12%
Unchanged	82%
Decreased	6%

Spaeth study: Ultra-refractory glaucoma

Transient serous choroidal	1
Dislocated old cortex with vitrectomy	1
Development of cataract in the only phakic eye treated	1

Results follow-up
17.5 months (range 2-46)

Spaeth study: Ultra-refractory glaucoma

CONCLUSION

- Satisfactory level of safety and efficacy.
- Consider as reasonable alternative in the setting of uncontrolled glaucoma w/ previously failed surgery.

Thank You

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