


Glaucoma 2023: Evaluation, Treatment, and the Future


David B. Kay, M.D.

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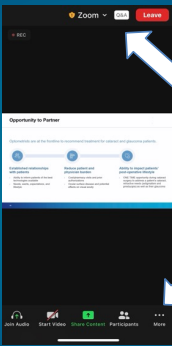
Host: Dr. Stephanie Woo

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Glaucoma 2023: Evaluation, Treatment, and the Future

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## Financial Disclosures

- Nothing to disclose

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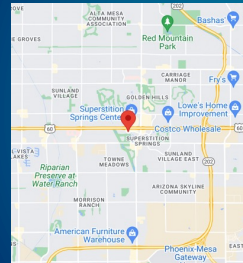
## Speaker Bio –

Dr. David Kay is a board-certified eye physician and surgeon practicing in the Mesa and Scottsdale areas of Phoenix. Originally from Tucson, Dr. Kay completed medical school in Milwaukee at the Medical College of Wisconsin. After completing a transitional year internship with the Tucson Hospital Medical Education Program, he spent the next 3 years in Texas completing his residency with UT Health San Antonio, where he served as chief resident during his senior year. He received his glaucoma fellowship training at the University of Southern California Roski Eye Institute prior to moving home to Arizona where he currently practices.

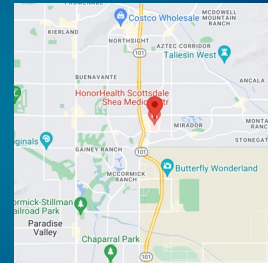


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## Arizona Glaucoma Specialists



Mesa



Scottsdale

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## Glaucoma 2023

- Evaluation of glaucoma
- Treatment of glaucoma
- Future of glaucoma

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## Glaucoma Worldwide

1-4

- The leading cause of irreversible blindness
- In adults over 50
  - 4 million with moderate/severe vision impairment
  - 11% of all global blindness
- Variable by nationality/region
  - African descent 6.5% to 7.3%
  - East Asian descent 2.59% to 3.54%
- By 2040 → 112 million affected

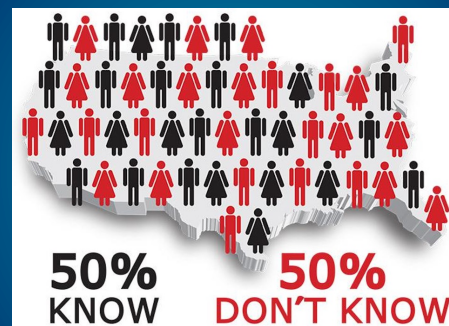
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## Glaucoma in the U.S.

5-8

- Approximately 3 million affected
  - 2.7 million OAG
- Costs the U.S. economy \$2.86 billion yearly
- Prevalence → 4x higher in African Americans and Hispanics

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5-8

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## Strong Risk Factors

9-15

- Elevated IOP
- Family history
- Optic nerve cupping
- Thin central cornea
- Older age
  - Age 40+ in African Americans
  - Age 60+ in general population (especially Hispanics)

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## Patient History

Three subjects ALWAYS

1. Family history?
  - Level of severity?
  - Surgery?
  - Blindness?
2. Steroid exposure?
  - Current AND historical
  - Nose sprays especially!
3. Blunt trauma?

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## Patient History

- Angle closure suspicion...
  - Headaches? Migraines?
  - Episodes of blurry vision, halos, pain, redness?
  - Ethnicity?
  - Medications?
    - Antidepressants, antihistamines, sulfonamides (e.g. topiramate)

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## Patient History

- Normal tension glaucoma suspicion...
  - Any blood pressure medications?
  - History of low blood pressure?
  - Dizziness with standing or change in position?

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## Vision

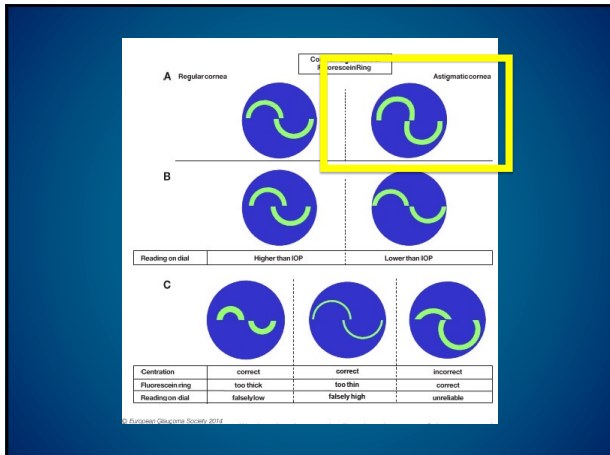
- 20/20 is possible in advanced disease
- High refractive error
  - Pay extra close attention!
  - Don't forget about patients s/p LASIK/PRK

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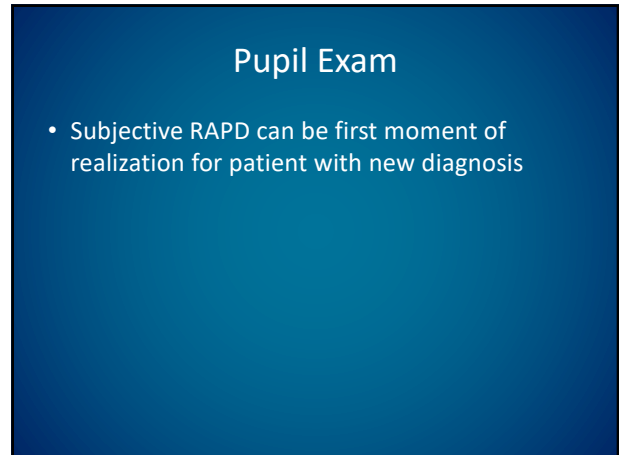
## Intraocular pressure (IOP)

- Goldmann applanation remains gold standard
- Pachymetry important to put IOP into context
- Hx of LASIK/PRK or high astigmatism will also affect measurement

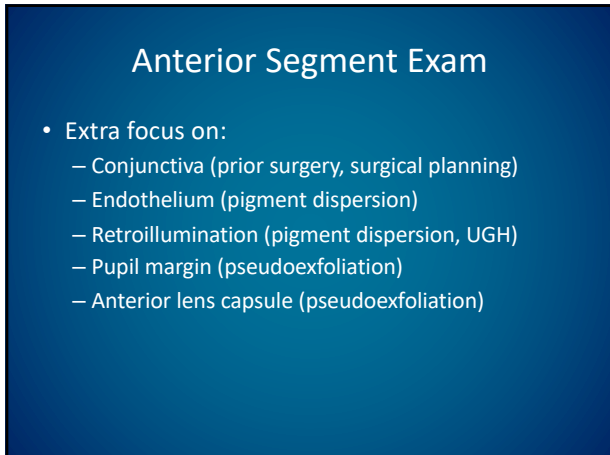
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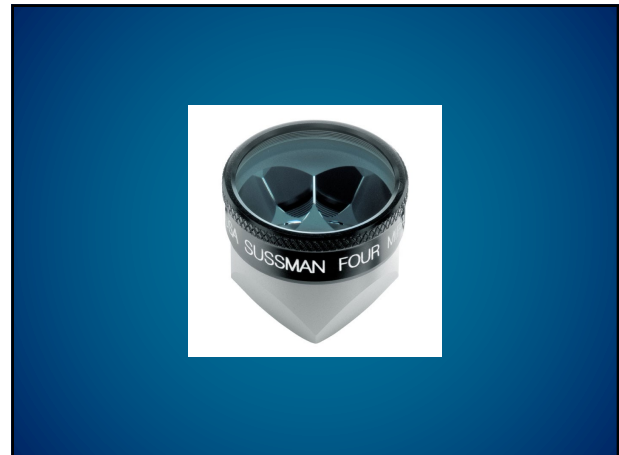
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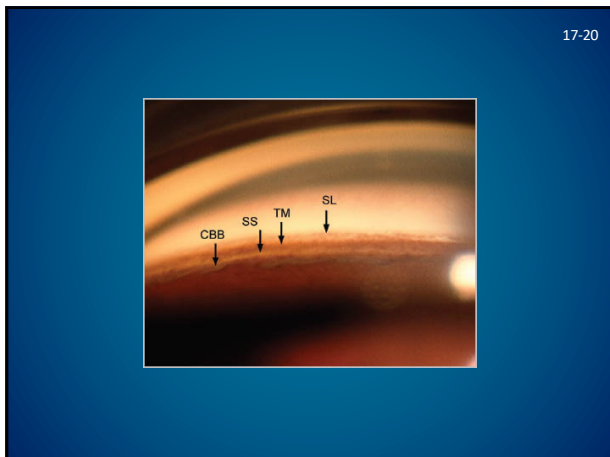
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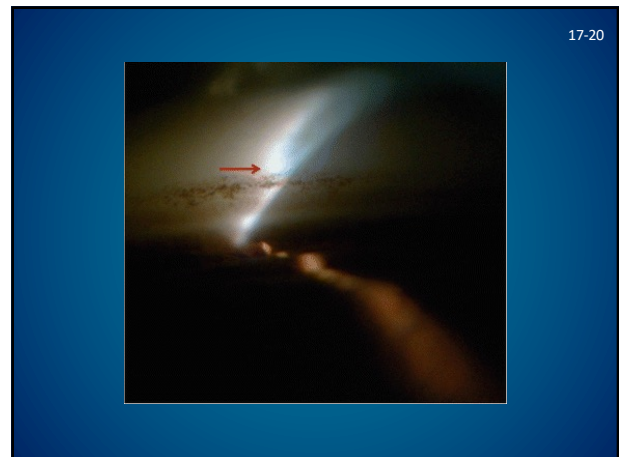
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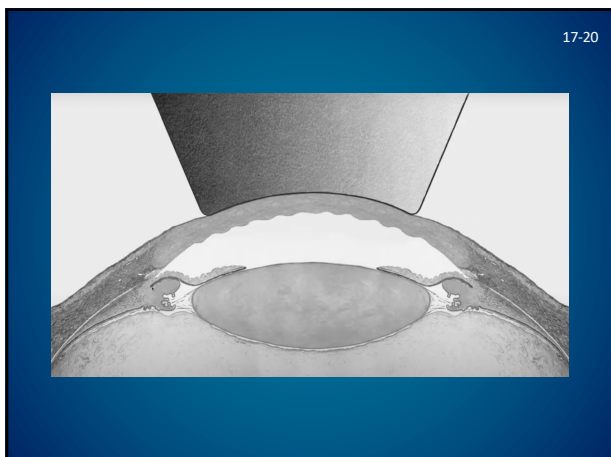
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## Gonioscopy

- Considerations
  - Is there risk for acute angle closure glaucoma?
  - Is there risk for chronic angle closure glaucoma?
  - Angle recession?
  - Neovascularization?
  - Heavy pigmentation?
  - Asymmetry?
  - Prior angle closure (pseudophakic patients)?
- Personally I don't favor any particular grading systems
- Don't be afraid to refer for a second opinion!

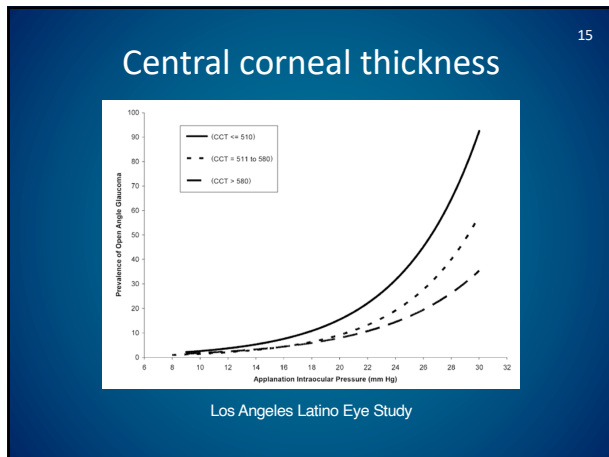
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## Central corneal thickness

13, 14

- In OHTS and European Glaucoma Prevention Study
  - Average CCT was 570  $\mu$ m
  - Risk of developing POAG was greater if <555  $\mu$ m
- Still no accepted correction formula for IOP based on CCT
- Future evaluation standards may include corneal hysteresis

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**Table 3-2 Ophthalmoscopic Signs of Glaucoma**

Generalized	Focal	Less Specific
Large optic cup	Notching of the rim	Exposed lamina cribrosa
Asymmetry of the cups	Vertical elongation of the cup	Nasal displacement of vessels
Progressive enlargement of the cup	Cupping to the rim margin	Baring of circumlinear vessels
	Nerve fiber layer hemorrhage	Peripapillary atrophy
	Nerve fiber layer loss	

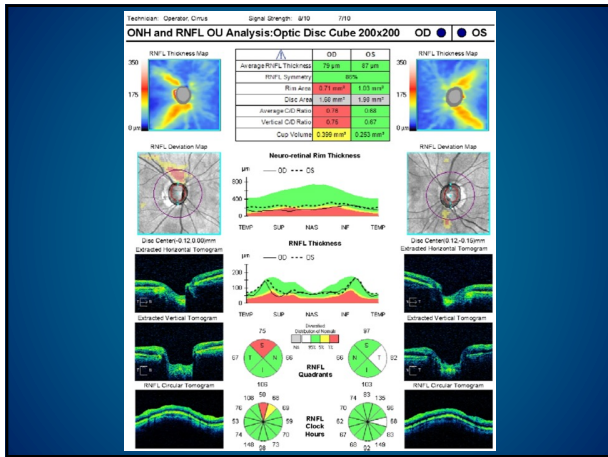
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## OCT RNFL

- Low-coherence interferometry
- Often precedes visual field loss (preperimetric disease)

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### Glaucoma

## Reproducibility of Peripapillary Retinal Nerve Fiber Layer Thickness and Optic Nerve Head Parameters Measured with Cirrus HD-OCT in Glaucomatous Eyes

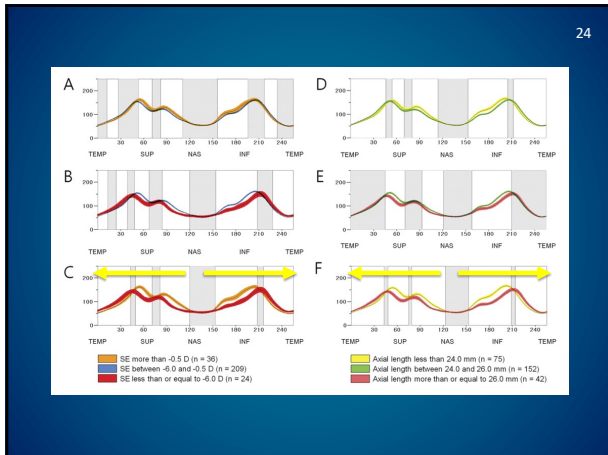
*Jean-Claude Mwanza,<sup>1</sup> Robert T. Chang,<sup>1,2</sup> Donald L. Budenz,<sup>1</sup> Mary K. Durbin,<sup>3</sup> Mohamed G. Gendy,<sup>1</sup> Wei Shi,<sup>1</sup> and William J. Feuer<sup>1</sup>*

IOVS, November 2010, Vol. 51, No. 11 Cirrus OCT Reproducibility 5727

TABLE 2. Intra-visit and Inter-visit Means and ICC, CV, and TRT SD for RNFL and ONH Parameters

Parameter	Mean	Intra-visit			Inter-visit			Tolerance Limit
		ICC (%)	CV (%)	TRT	ICC (%)	CV (%)	TRT	
Average RNFL	62.83	98.6 (96.7)	1.9	1.18	97.2 (93.4)	2.7	1.67	3.89
TP quadrant	47.05	96.1 (91.2)	4.6	2.16	92.9 (84.3)	6.3	2.97	6.91
SP quadrant	75.67	97.9 (95.1)	3.2	2.40	96.7 (92.4)	4.0	3.02	7.03
NS quadrant	58.92	87.9 (74.7)	4.8	2.84	82.8 (65.6)	5.9	3.49	8.13
IF quadrant	69.73	97.7 (96.4)	3.7	2.55	97.2 (93.5)	4.0	2.82	6.56

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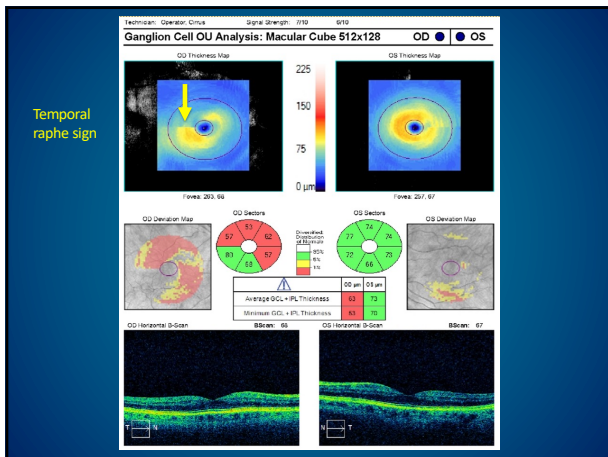


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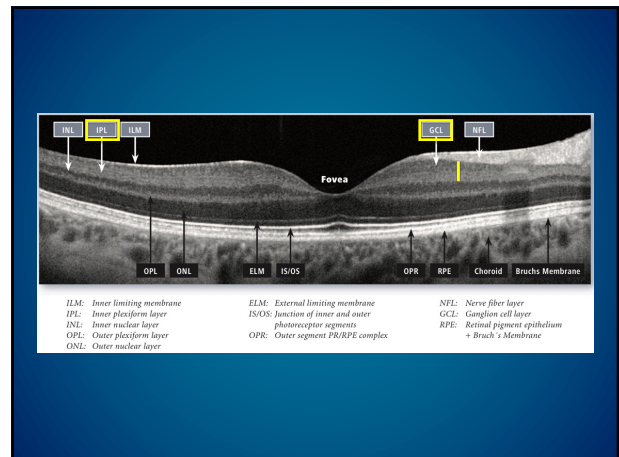
## Macular OCT

- Macula contains 50% of RGCs of the entire retina
- Benefits of macular OCT
  - Early detection
  - Evaluation for progression
  - Myopic/abnormal discs
  - Peripapillary atrophy

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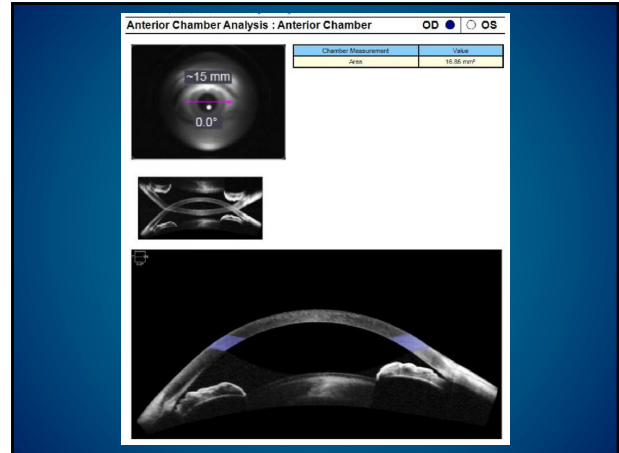


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## Anterior Segment OCT

- Helpful with...
  - Reinforcing gonioscopic findings
  - Corneal disease
  - Poor patient compliance with gonioscopy
  - Patient education
- Cons
  - In clinical practice, typically a cross section (3:00 and 9:00)
  - Not dynamic
  - Misses patchy pigment from iridotrabecular contact
  - Artificial pupil constriction from room lights
- NOT A SUBSTITUTION FOR GONIOSCOPY

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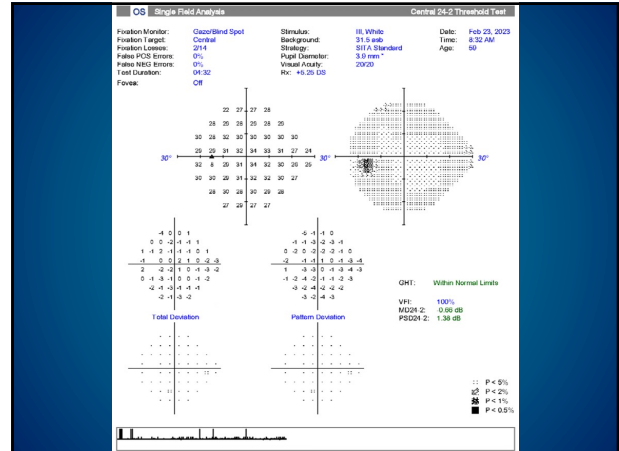


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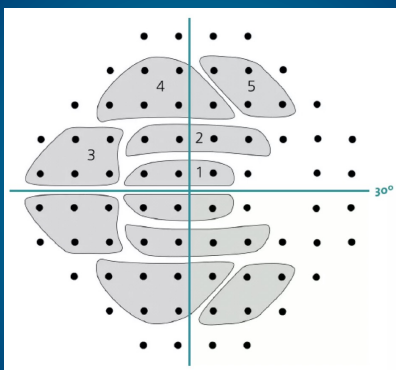
## Visual Field Testing

- Typically performed using *perimetry*
  - Measures differential light sensitivity
- Most common is automated static perimetry
  - E.g. Humphrey Field Analyzer
- Limitations
  - Subjective test
  - Many sources of artifact
  - Data overload
  - No gold standard algorithm for diagnosis/monitoring

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## Glaucoma Hemifield Test

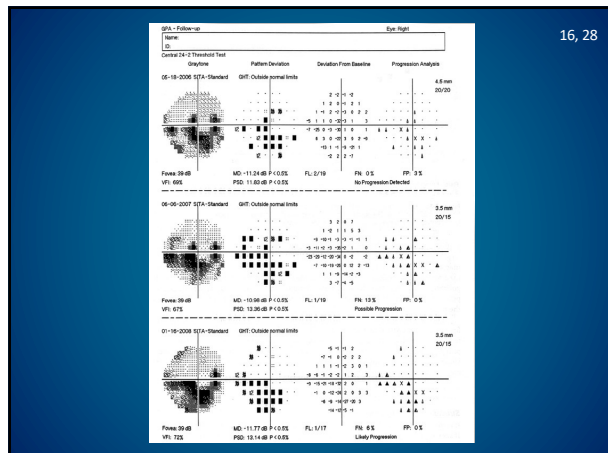
- Within normal limits
- Borderline
- Outside normal limits
- Abnormally high sensitivity
- General reduction in sensitivity

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## Visual Field Testing

- Visual field index (VFI)
  - Represents the entire visual field
  - Starts at 100%
  - Good for trending and creating plots
- Mean deviation (MD)
  - Compares results to age-matched controls
  - Starts at 0 and ends around -30
  - Good for trending
- Pattern standard deviation
  - Represents focal deficits
  - Higher values with dense arcuate or focal defects
  - Can “re-normalize” if an arcuate defect becomes global

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## Visual Field Testing

- Glaucomatous patterns
  - Nasal step
  - Arcuate
  - Altitudinal
  - Paracentral
  - Temporal wedge
  - Generalized depression
  - Central island

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## Glaucoma 2023

- Evaluation of glaucoma
- Treatment of glaucoma
- Future of glaucoma

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## Setting an IOP Goal

- I’m more in favor of a ~2 point general ballpark
- Always flexible
- Many factors to consider
  - Starting IOP (Tmax)
  - Severity of disease
  - Life expectancy/health of patient
  - Rate of progression
  - Risk factors
  - Type of glaucoma
  - Patient’s tolerance for risk (or risk aversion)
  - Toleration of treatment side effects

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## Setting an IOP Goal

Table 45-2 Delphi Panel Recommendations for Initial Target Pressures

Patients with High IOP at Presentation	Preferred Target IOP (mmHg)	Acceptable IOP Range (mmHg)	Recommended Minimum % IOP Reduction
Mild glaucoma	18	16–21 mmHg	25%
Moderate glaucoma	16	14–18	30%
Severe glaucoma	12	18–24	20%
Glaucoma suspects	22	18–24	20%
Moderate normal tension glaucoma	Not determined	Not determined	20%
Severe normal tension glaucoma	Not determined	Not determined	30%

Data reproduced from Katz LJ. Prostaglandin as First-Line Therapy. Ophthalmology Management. 2006, with permission of Lippincott, Williams & Wilkins Visioncare Group.

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## Lifestyle

- Healthy diet and exercise
  - Caution heavy weightlifting
  - Caution yoga (head down positioning)
- Avoid excess salt
  - Unless NTG
- Avoid excess caffeine
- Avoid excess alcohol (does briefly reduce IOP)
- Avoid smoking
- Marijuana not helpful (does briefly reduce IOP)
- Some evidence CBD raises IOP
- Caution collagen joint supplements

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## Medical Treatment

- Prostaglandin analogues
  - Caution
    - Uveitis/macular edema
    - HSV
    - Trichiasis
  - Other considerations
    - Young patients/aesthetic concerns



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## Medical Treatment

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- Alpha agonists
  - Caution
    - Kids/nursing mothers
    - Dementia
  - Other considerations
    - Allergy
    - Dry nose/mouth
    - Lethargy/CNS depression



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## Medical Treatment

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- Beta blockers
  - Caution
    - Heart disease (bradycardia, heart block, CHF, hypotension)
    - Pulmonary disease (asthma, COPD)
  - Other considerations
    - Caution if concern for systemic hypotension
    - Patients on a systemic beta blocker (less potential efficacy)
    - Exercise intolerance
    - Depression



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## Medical Treatment

- Topical CAI inhibitors
  - Caution
    - Fuchs/corneal endothelial disease/transplants
  - Other considerations
    - Burning (dorzolamide)
    - White deposits (brinzolamide)
    - Bitter taste, blurred vision



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## Medical Treatment

- Miotics (pilocarpine, echothiophate iodide)
  - Caution
    - Risk for retinal detachment
    - History of ocular inflammation
    - Need for regular fundus exams
  - Other considerations
    - Brow ache, dimmed vision
    - QID dosing



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## Medical Treatment

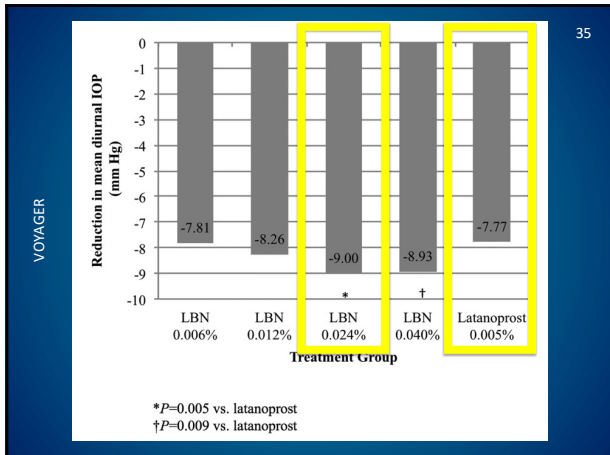
- ROCK inhibitors (netarsudil)
  - Caution
    - Corneal disease?
  - Other considerations
    - Conjunctival hyperemia
    - Corneal verticillata
    - Conjunctival hemorrhage
    - Keratitis (reticular epithelial edema)

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## Medical Treatment

- Nitric oxide donating PG analogs (Latanoprostene Bunod)
  - Caution
    - Same as other prostaglandin analogs
  - Other considerations
    - Same as other prostaglandin analogs
    - Extra NO-donating moiety (butanediol mononitrate) relaxes TM and increases aqueous outflow
      - Latanoprost → primarily uveoscleral pathway

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## Medical Treatment

- Technique
  - Eyes closed 2 minutes
  - Punctal occlusion
  - Okay if some “misses”
  - Wait 5-10 minutes before next drop (or lubrication)

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Medication	Preservative
Brimonidine 0.1% (Alphagan P)	Sodium chloride (Purite)
Dorzolamide-timolol (PF Cosopt)	Preservative-free unit dose vials
Tafuprost	Preservative-free unit dose vials
Timolol	Preservative-free unit dose vials
Timolol gel-forming solution	Benzododecinium bromide (a detergent closely related to BAK)
Travoprost (Travatan Z)	Borate, sorbitol, propylene glycol, and zinc (Sofzia)

BAK = benzalkonium chloride.

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## Laser Surgery

- Laser trabeculoplasty (SLT, ALT)
- Laser iridotomy
- Iridoplasty
- Cyclophotocoagulation

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## Argon Laser Trabeculoplasty (ALT) 36, 37

- Increased outflow facility through release of chemical mediators from TM cells
  - Induction of matrix metalloproteinases (MMPs)
- ALT → thermal damage
  - Not repeatable
  - Local shrinkage of collagen fibers with adjacent stretching/widening
- Glaucoma Laser Trial
  - ALT reduces IOP in 75% of eyes
  - More effective than timolol in IOP lowering
  - Over 5.5 years, equally effective at preserving visual field and disc status

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## Selective Laser Trabeculoplasty (SLT)

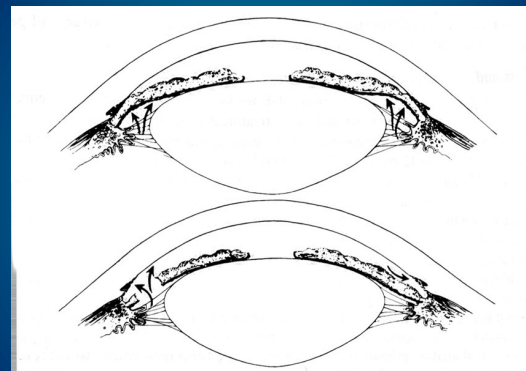
- Delivers less energy
  - Selectively absorbed by pigmented TM cells
- Similar in efficacy to ALT and prostaglandins
- Excellent safety profile
- Repeatable, cost effective

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## Laser Iridotomy 38

- Primary indications/uses
  - Narrow or occludable angle
  - Primary angle closure (+/- glaucoma)
  - Acute angle closure (affected or fellow eye)
  - Diagnosis of plateau iris
  - Pigment dispersion syndrome (select cases)

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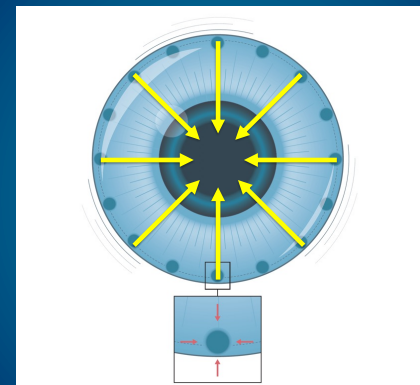


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## Laser Iridotomy 39-44

- Goals
  - Reduce risk of acute angle closure glaucoma
  - Reduce risk of chronic angle closure glaucoma
  - Reduce IOP
  - Reduce symptoms
- Most effective BEFORE elevated IOP/PAS/glaucoma develop!

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### Laser Iridoplasty 46

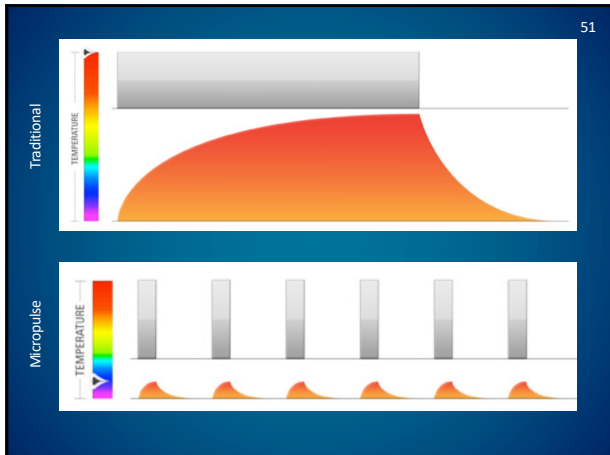
- Large, peripheral burns at low power 360 degrees
- Induces shrinkage/contraction of peripheral iris and mechanical widening of angle
- Can widen angle in plateau iris syndrome or iris root crowding unresponsive to LPI

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### Cyclophotocoagulation (CPC) 47-49

- Reduces rate of aqueous production by reducing ciliary body function
- “Traditional” CPC
  - Reserved for end-stage eyes with limited visual potential and/or poor surgical candidates
- “Micropulse” CPC
  - Less “aggressive” alternative
  - Repetitive short bursts of diode laser energy → less collateral destruction

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### Cyclophotocoagulation (CPC) 47-49

- Risks
  - Reduced vision
  - Inflammation
  - Pain
  - Hypotony
  - CME
  - Poor efficacy
  - Phthisis

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### Cataract Surgery 52-57

- Generally 1-2 mmHg IOP reduction
- Probably proportional to starting IOP
- Higher yield in narrow angles

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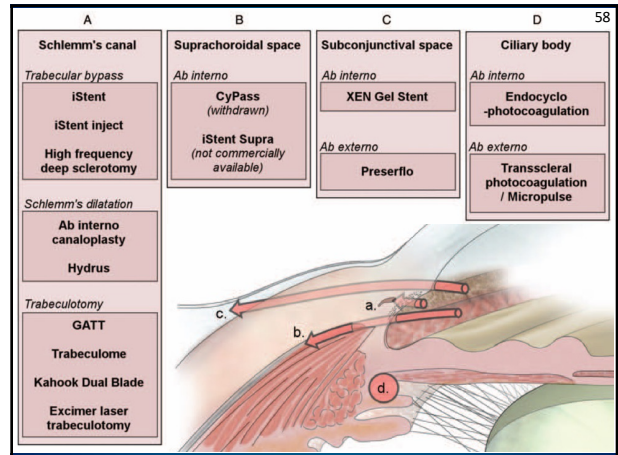
### Cataract Surgery

- Sloppy surgery can also cause glaucoma...
  - E.g. UGH, residual cortex

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# Minimally Invasive Glaucoma Surgery (MIGS)

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- ## MIGS – Trabecular Bypass
- iStent inject
    - 2 microstents spaced 2-3 clock hours apart
    - Efficacy
      - Reduction in IOP ~30%
      - Reduction in meds ~34%
    - Traditionally combined with phaco

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- ## MIGS – Schlemm's dilatation
- OMNI
    - Hollow dilating catheter for viscoelastic injection into Schlemm's +/- goniotomy
    - Efficacy
      - Reduction in IOP ~35%
      - Reduction in meds ~39-55%
  - Hydrus
    - Single microstent for trabecular bypass/stenting
    - Efficacy
      - Reduction in IOP ~34%
      - Reduction in meds ~62%

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- ## MIGS – Goniotomy
- 90 to 120 degrees of TM excision
  - Stand alone or at time of phaco
  - E.g. SION/KDB/TrabEx
  - Efficacy
    - Reduction in IOP ~25%
    - Reduction in meds ~64%

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- ## MIGS – Suprachoroidal Space
- Utilizes the uveoscleral pathway via stenting
  - Examples
    - CyPass (withdrawn due to endothelial cell loss)
    - MINject (not currently available)

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## Incisional Surgery - XEN

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- Gelatin stent designed for subconjunctival injection from ab-interno approach
- Intended for bleb creation similar to a trab

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## Incisional Surgery - XEN

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- Pros
  - Less invasive than trab/tube
  - Requires less available conjunctiva
  - Probably lower risk than trab/tube
- Cons
  - Probably higher rates of failure vs. trab
  - Probably less IOP lowering vs. trab, ?tube

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## Incisional Surgery - Tubes

67

- Permanent sclerostomy (tube) in anterior chamber to drain aqueous to equatorial sub-Tenon's space
- Tube vs. Trabeculectomy Study
  - Compared Baerveldt 350-mm<sup>2</sup> tube shunts to trabeculectomy/MMC (0.4 mg/ml for 4 minutes)
  - Trabeculectomy had higher failure rate at 5 years
  - Trabeculectomy had higher reoperation rate
  - Trabeculectomy had more early complications
  - However, all patients had undergone prior cataract and/or glaucoma surgery
  - Nonetheless, lead to increased popularity of tube shunts

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> J Glaucoma. 2021 Feb 1;30(2):170-174. doi: 10.1097/JIG.0000000000001700.

### Anterior Chamber Versus Ciliary Sulcus Ahmed Glaucoma Valve Tube Placement: Longitudinal Evaluation of Corneal Endothelial Cell Profiles

Gonçalo Godinho<sup>1</sup>, Joao Barbosa-Breda<sup>1 2 3 4</sup>, Cláudia Oliveira-Ferreira<sup>1</sup>, Carolina Madeira<sup>1</sup>, António Melo<sup>1 3</sup>, Fernando Falcão-Reis<sup>1 3</sup>, Sérgio Estrela-Silva<sup>1 3</sup>

**CLINICAL STUDY**

Clinical outcomes of Ahmed glaucoma valve in anterior chamber versus ciliary sulcus

A Bayer and M Onol

Saudi J Ophthalmol. 2020 Jan-Mar; 34(1): 1-7.  
Published online 2020 Nov 22. doi: 10.4103/1319-4534.301298

PMCID: PMC7849853  
PMID: 33542979

Comparison of surgical outcomes between sulcus and anterior chamber implanted glaucoma drainage devices

Ibrahim A. Alobaidja, Rizwan Malli, and Sameer Ahmad

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## Incisional Surgery - Trabs

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- Creates a new pathway (fistula) allowing aqueous to flow out of anterior chamber into subconjunctival space
- Cost-effective, no hardware required
- Primary Tube vs. Trabeculectomy Study
  - Patients WITHOUT prior incisional surgery
  - Compared Baerveldt 350-mm<sup>2</sup> tube shunts to trabeculectomy/MMC (0.4 mg/ml for 2 minutes)
  - Similar failure rates at 5 years
  - Similar IOPs at 5 years
  - Trabeculectomy patients were on fewer meds (higher rate of *complete* success)

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## Incisional Surgery - Trabs

- Recent trends
  - Popularity has returned
  - Training in residency/fellowship more difficult
  - Fornix-based > limbus-based
  - Still the gold-standard for IOP-lowering surgery
    - Especially if very low IOP is required

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Ultimately, any surgical decision depends on many variables related to both the patient and surgeon

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## Glaucoma 2023

- Evaluation of glaucoma
- Treatment of glaucoma
- **Future of glaucoma**

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Will SLT become first-line therapy over drops?

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### Laser in Glaucoma and Ocular Hypertension (LiGHT) Trial

*Six-Year Results of Primary Selective Laser Trabeculoplasty versus Eye Drops for the Treatment of Glaucoma and Ocular Hypertension*

- Newly diagnosed OHTN or POAG
- Randomization
  - SLT first (N = 263)
  - Drops first (N = 261)
- Main outcome measure
  - Health-related quality of life scores
- Secondary outcome measures
  - Clinical effectiveness and adverse events



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### Laser in Glaucoma and Ocular Hypertension (LiGHT) Trial

*Six-Year Results of Primary Selective Laser Trabeculoplasty versus Eye Drops for the Treatment of Glaucoma and Ocular Hypertension*

- After 6 years, SLT group had...
  - Equivalent QOL scores
  - Less disease progression
  - Fewer trabeculectomies
  - Fewer cataract surgeries
  - More cost effective
  - 70% at goal without need for drops or surgery
  - Higher IOP at 6 years vs. drop group (16.3 vs. 15.4)



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### Laser in Glaucoma and Ocular Hypertension (LiGHT) Trial

*Six-Year Results of Primary Selective Laser Trabeculoplasty versus Eye Drops for the Treatment of Glaucoma and Ocular Hypertension*

- Take home points
  - SLT does not require patient's adherence
  - SLT probably reduces IOP *fluctuation*
  - I offer drops or laser as first line, but do favor SLT in most circumstances
  - If drops chosen, I do recommend laser as second line prior to adding a second agent
  - Don't underestimate the effect on the conjunctiva of having years of drop exposure (also QOL)

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Will clear lens extraction replace laser iridotomies?

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### Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial

Augusto Azuara-Blanca, Jennifer Burr, Craig Ramsay, David Cooper, Paul J Foster, David S Friedman, Graham Scotland, Mehdi Javanbakht, Claire Cochrane, John Norrie, for the EAGLE study group

- Is early lens extraction effective, safe, and cost effective?
- Population
  - PAC with IOP  $\geq 30$
  - PACG with IOP  $\geq 21$
- Newly diagnosed, age  $\geq 50$
- Randomized to lens extraction (N = 208) vs. LPIs (N = 211)



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### Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial

Augusto Azuara-Blanca, Jennifer Burr, Craig Ramsay, David Cooper, Paul J Foster, David S Friedman, Graham Scotland, Mehdi Javanbakht, Claire Cochrane, John Norrie, for the EAGLE study group

- At 36 months, lens extraction group...
  - Lower IOP (16.6 vs. 17.9)
  - Fewer meds (0.4 vs. 1.3)
  - Fewer additional surgeries
  - Higher quality of life scores
  - More cost effective

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### Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial

Augusto Azuara-Blanca, Jennifer Burr, Craig Ramsay, David Cooper, Paul J Foster, David S Friedman, Graham Scotland, Mehdi Javanbakht, Claire Cochrane, John Norrie, for the EAGLE study group

- “**Clear-lens extraction** showed greater efficacy and was more cost-effective than peripheral iridotomy, and should be considered as an option for first-line treatment”

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### Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial

Augusto Azuara-Blanca, Jennifer Burr, Craig Ramsay, David Cooper, Paul J Foster, David S Friedman, Graham Scotland, Mehdi Javanbakht, Claire Cochrane, John Norrie, for the EAGLE study group

- Patient characteristics
  - Age 67.5 years
  - Diagnosis
    - PAC 37%
    - PACG 63%
  - IOP 28.9 mmHg
  - HVF MD -4.2 dB

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### Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial

Augusto Azuara-Blanca, Jennifer Burr, Craig Ramsay, David Cooper, Paul J Foster, David S Friedman, Graham Scotland, Mehdi Javanbakht, Claire Cochrane, John Norrie, for the EAGLE study group

- Take home points
  - Cataract surgery can be appropriate as first-line therapy in some patients over LPI
    - E.g. older, PACG
  - This does NOT provide evidence that we should be removing “clear lenses” prior to LPI in the majority of cases
  - Note one patient (N=211) went into acute angle closure while waiting for cataract surgery

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Will patients be monitoring their IOP routinely at home?

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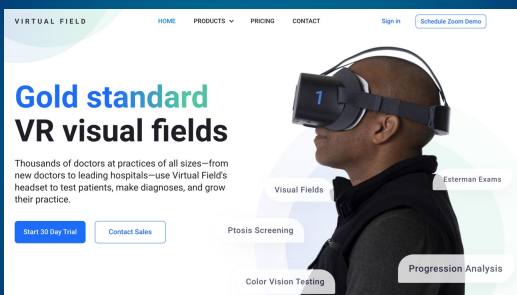
## Home IOP Monitoring

- Pros
  - Better diurnal monitoring potential
- Cons
  - Patient anxiety
  - More patient calls/triaging

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Will patients be monitoring their visual fields routinely at home?

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## Home VF Monitoring

- Humphrey remains gold standard
- No strong data to support virtual reality testing yet
- Stay tuned...

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Will genetic testing help us risk stratify our patients?

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Research Article  
**Polygenic Risk Score Is Associated With Intraocular Pressure and Improves Glaucoma Prediction in the UK Biobank Cohort**

X. Raymond Gao<sup>1,2</sup>, Hua Huang<sup>1</sup>, and Heejin Kim<sup>1</sup>

<sup>1</sup> Department of Ophthalmology and Visual Sciences, University of Illinois at Chicago, Chicago, IL, USA  
<sup>2</sup> Departments of Ophthalmology and Visual Science and Biomedical Informatics, Division of Human Genetics, The Ohio State University, Columbus, OH, USA

**Association of High Polygenic Risk With Visual Field Worsening Despite Treatment in Early Primary Open-Angle Glaucoma**

Owen M. Siggs, MD, DPhil<sup>1,2</sup>; Ayub Qassim, MBBS, PhD<sup>1</sup>; Xikun Han, PhD<sup>1</sup>; et al

> Author Affiliations

JAMA Ophthalmol. 2023;141(1):73-77. doi:10.1001/jamaophthalmol.2022.4688

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## Genetic Testing

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- Polygenic risk scores have shown ability to identify higher risk disease
- Not yet widely available
- AAO Preferred Practice Patterns has not yet endorsed widespread use

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### Learn more about glaucoma

Curious whether you have an increased likelihood of developing glaucoma based on your genetics? Find out more with the Glaucoma report (Powered by 23andMe Research), part of the 23andMe+ Membership. 23andMe+ includes our Health + Ancestry Service plus new premium reports and features throughout the year.

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Will neuroprotective agents be available to supplement our IOP-lowering therapies?

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## Neuroprotection

- Treatment other than eye pressure control that prevents retinal ganglion cell death

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## A Randomized Trial of Brimonidine Versus Timolol in Preserving Visual Function: Results From the Low-pressure Glaucoma Treatment Study

THEODORE KRUPIN, JEFFREY M. LIEBMANN, DAVID S. GREENFIELD, ROBERT RITCH, AND STUART GARDINER, ON BEHALF OF THE LOW-PRESSURE GLAUCOMA STUDY GROUP

- Brimonidine has shown neuroprotective effects in animal studies
- LOGTS study
  - Brimonidine superior to timolol in rate of visual field progression (despite similar IOPs)

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## Oral Memantine for the Treatment of Glaucoma

Design and Results of 2 Randomized, Placebo-Controlled, Phase 3 Studies

Robert N. Weinreb, MD,<sup>1</sup> Jeffrey M. Liebmann, MD,<sup>2</sup> George A. Cioffi, MD,<sup>2</sup> Ivan Goldberg, MBBS, FRANZCO,<sup>3</sup> James D. Brandt, MD,<sup>4</sup> Chris A. Johnson, PhD, DSc,<sup>5</sup> Linda M. Zangwill, PhD,<sup>6</sup> Susan Schneider, MD,<sup>7</sup> Hans Badger, PharmD,<sup>8</sup> Marina Bejani, PhD<sup>9</sup>

- “Based on 24-2 SAP, FDT, and optic disc photograph assessments, long-term daily treatment with memantine did not slow or prevent progression”

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JAMA Ophthalmology | Original Investigation

## Nicotinamide and Pyruvate for Neuroenhancement in Open-Angle Glaucoma

A Phase 2 Randomized Clinical Trial

Carlos Gustavo De Moraes, MD, MPH, PhD; Simon W. M. John, PhD; Pete A. Williams, PhD; Dana M. Blumberg, MD, MPH; George A. Cioffi, MD; Jeffrey M. Liebmann, MD

- High dose nicotinamide (1000 to 3000 mg) and pyruvate (1500 to 3000 mg) vs. placebo in POAG patients
- Treatment group showed more improvement in visual field testing
- Small (N = 42) and short-term (~2 months)

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## Conclusion

- Evaluation
  - Many glaucoma patients remain undiagnosed
  - Identification requires thorough history, ocular examination, and acquisition/interpretation of data
- Treatment
  - Options continue to expand, but the goal remains primarily IOP control
- Future
  - Expansion of current diagnostic and treatment technologies
  - Will likely bring shifts in the paradigm of glaucoma management

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## Questions?

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