

SECO2026
THE EDUCATION DESTINATION™

CONTEMPORARY GLAUCOMA CARE

Ron Melton, OD, FAAO
Randall Thomas, OD, MPH, FAAO

Please Silence All Mobile Devices.

attendseco.com

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Financial Disclosure

Drs. Ron Melton and Randall Thomas are a consultant to, on the speaker's bureau of, on the advisory committee of, or involved in research for the following companies: ICARE and B+L.

"All relevant relationships have been mitigated."

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Is Glaucoma Over or Under Diagnosed?

- "It is important to understand risk factors for diagnostic changes in glaucoma in order to prevent undertreatment of disease and overtreatment of suspects."

- In a 900-subject study of POAG and POAG-suspect, 14% were found to be erroneously diagnosed."

- Of this 14%, 78% were up-staged from suspect to POAG, and 22% were down-staged from POAG to suspect.

- "Performing VF's or OCT reduced the odds of misdiagnosis."
Note: Medical diagnosis is an art, not an exact science, but we do the best we can.
[Ophthalmology Glaucoma, 2025](#)

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Glaucoma as Cause of Blindness
Has the impact of glaucoma on global blindness changed?

Glaucoma remains a serious public health issue as globally it the most common cause of irreversible blindness with over 50% of glaucoma remaining undiagnosed in developed nations reaching 95% in countries with low Human Development Index.² Overall, the present study presents compelling evidence for prioritizing glaucoma in public health interventions.

11798 Global estimates on the number of people blind or visually impaired by glaucoma: A meta-analysis from 2009 to 2020. Eye (2024), 38, 2039-2046

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The Pressure on Glaucoma Clinics

- "Glaucoma clinics are currently under colossal strain, partly due to aging populations, but mainly because they're increasingly being sent people who have been referred 'just in case', but who in truth have healthy eyes and don't need to be there."

- If there is uncertainty, and you would like a second opinion, seek out an optometric colleague in your area to offer their perspective. But remember, the patient is yours; if you would like to continue his/her care, just let the other consultant know this, just like the situation with any other specialist

- Workforce projections show total number of ophthalmologists (including glaucoma specialists) is expected to decline by 12% by 2035, while demand for care is projected to increase by 24% over the same period. Result- 30% workforce inadequacy in ophthalmology overall.

The Ophthalmologist, June, 2019
American Academy of Ophthalmology, 2026

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Audience poll: What Percent of your practice is glaucoma related?

- A- 0-10%
- B- 10-20%
- C- 20-30%
- D- > 30%

7

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Optometry Increasingly Shoulders Medical Eye Care as Ophthalmology Shrinks

"Medical eye examinations are growing much more rapidly than vision exams; we see it in the data," **Dr. Edlow shared at Optometry's Meeting@ 2025.** "This is an incredible opportunity for optometry."

As ophthalmology continues a workforce contraction, recent data confirms a shift in how Americans receive their eye care with optometry increasingly delivering medical eye care services.

FEBRUARY 17, 2026

The surgical specialty faces an overall net decline in workforce as optometry grows parallel to ballooning demand for eye care services in the U.S.

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Thoughts and Perspectives on Glaucoma

"The overall glaucoma burden in absolute numbers is rising because of a growing and ageing global population."

"Diagnosing and managing glaucoma is a marathon, not a sprint. The condition plays out over decades."

"Elevated intraocular pressure does not define glaucoma as it once did."

The characterization of glaucoma is more complex than thought looking at risk factors such as poor blood flow, abnormal biomechanics of the optic nerve head, and cerebrospinal fluid pressure.

Am J Ophthalmol, February 2026

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Is 22 mm Hg Still a Valid Benchmark?

"These findings suggest that the historical IOP cutoff of 22 mm Hg may still influence clinical decision-making in glaucoma management."

"Most patients with IOPs of 22 mm Hg or higher never go on to develop glaucoma, and over half of patients with glaucoma, have IOPs consistently below 22 mm Hg. In other words, there is a nonclinical basis to support a true IOP cutoff of 22 mm Hg in glaucoma decision-making."

M+T: Thinking and critical analysis is part of being a doctor.

JAMA Ophthalmology, February 2026

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Am J Ophthalmol, February 2026

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JAMA Ophthalmology, February 2026

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Egregious Over-referral of Glaucoma Suspects

-“Only 8% of those under 40 referred for glaucoma evaluation were diagnosed with glaucoma within 2 years.”

-Worse, about half of all referred patients did not follow-up with the referral!

(M+T): Take home message: Optometrists-please provide glaucoma care services to your patients.

JAMA Open Network, February 2025

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Progression from OHT to POAG

-Approximately 25-30% of ocular hypertensive patients progress to POAG over 20 years.

-Key factors to assess risk of progression in OHTs were:

- Age
- IOP
- CCT
- Vertical C/D Ratio
- Visual field status (PSD)

-Now we would also include OCT NFL thickness

-Attentive follow-up monitoring is required to enable timely therapeutic intervention.

JAMA Ophthalmol. April 2021

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Glaucoma “Suspect” Conversion Rate to Glaucoma

-“We found a conversion rate of 13.6% from glaucoma suspect to POAG cases over a median follow-up of 6.7 years.”

-“Clinicians should consider more aggressive IOP-lowering interventions in suspects with elevated IOP.”

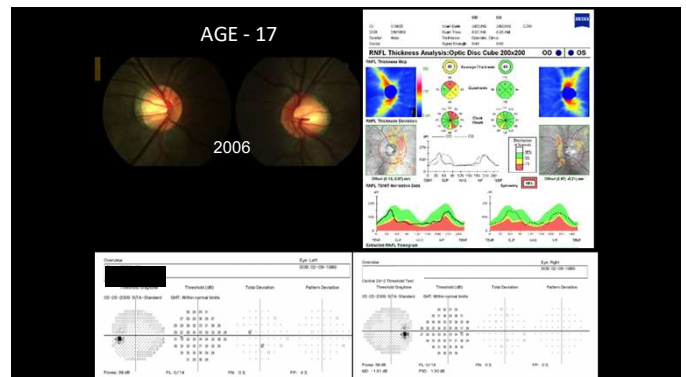
-“Lower baseline mean arterial pressure and systolic BP were associated with faster rates of glaucomatous VF damage.”

-“The association between the absence of hypertension and conversion risk highlights the complex relationship between systemic BP and glaucoma progression.”

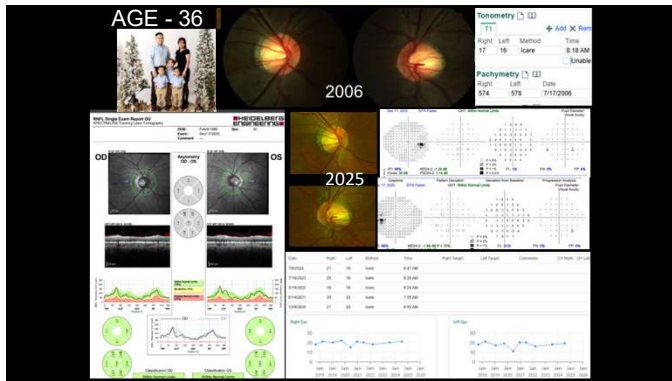
M+T: Check BP on your glaucoma suspects.

Am J Ophthalmol, December 2025

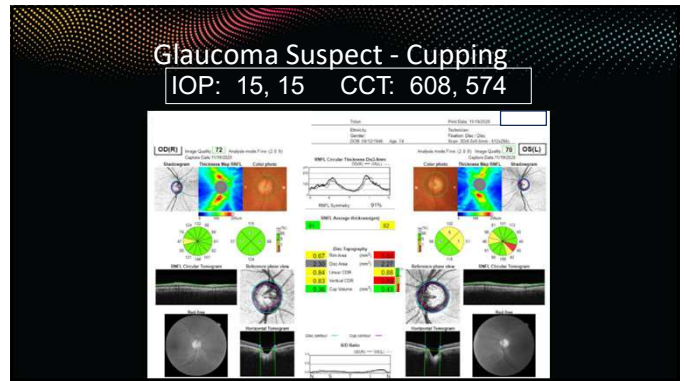
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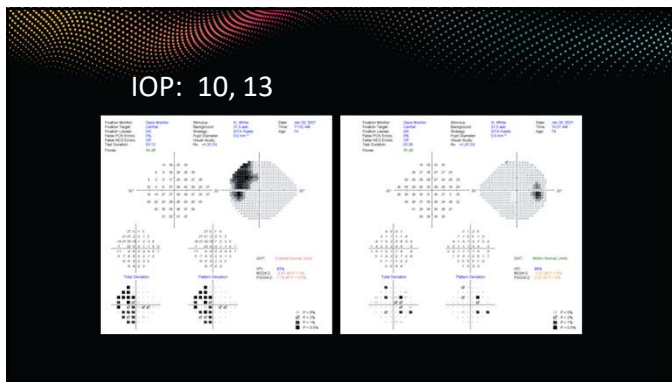
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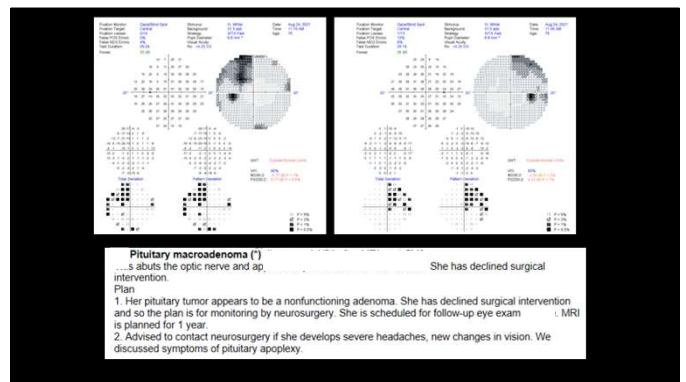
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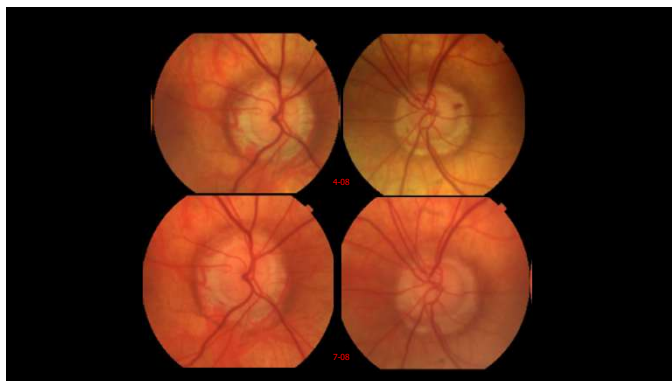
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Audience Poll: Without the benefit of a stereoscopic view, what would you judge the C/D ratio to be in the OD?


A- 0.0 – 0.1
 B- 0.3 – 0.4
 C- 0.60 – 0.65
 D- 0.80 – 0.85

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Mentimeter

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02 - Glaucoma Specialist

Choose a slide to present

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Audience Poll: Does the disc hemorrhage in the OS increase the risk of this patient having glaucoma or possibly developing it in the future?


1 - Yes
2 - No

26

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Mentimeter

Audience Poll: Does the disc hemorrhage in the OS increase the risk of this patient having glaucoma or possibly developing it in the future?

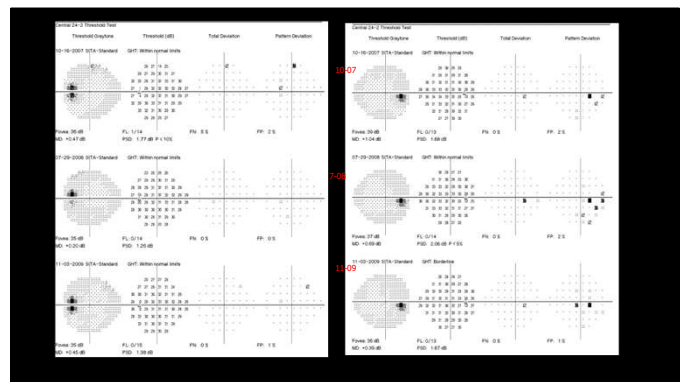


- Yes
- No

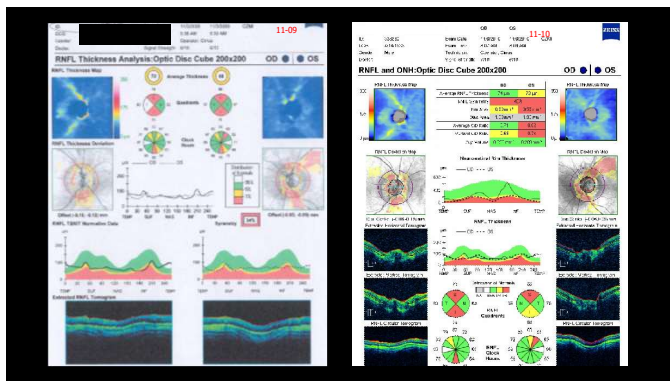
02 - Glaucoma Specialist

Choose a slide to present

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Audience Poll: What is the most appropriate diagnosis and management?

- 1 - Glaucoma suspect; observe annually since IOP is normal
- 2 - Ocular hypertension: start treatment only if IOP exceeds 25 mmHg
- 3 - Early primary open-angle glaucoma (likely low-tension phenotype), OS>OD; start treatment with prostaglandin
- 4 - Moderate low-tension glaucoma; treat aggressively with SLT and first-line glaucoma drops

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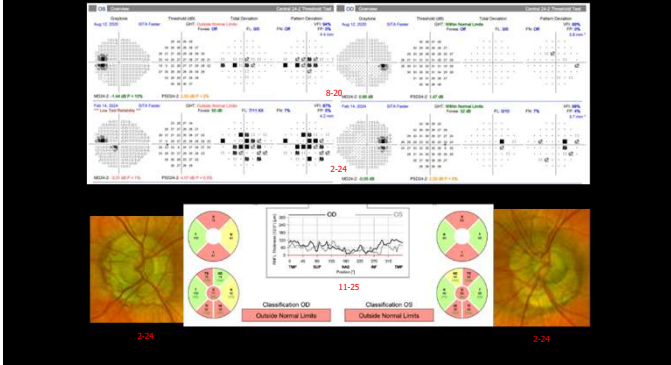
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- Moderate low-tension glaucoma; treat aggressively with SLT and first-line glaucoma drops

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Expert Perspective on Rebound Tonometry

“The rebound tonometer demonstrated significantly lower test-retest variability than Goldman tonometry with good inter-operator and inter-device reproducibility, supporting its value in monitoring IOP changes over time aiding clinicians in assessing the effectiveness of glaucoma therapy and consistency of IOP control.”

“Rebound tonometry can characterize IOP changes over time more robustly than Goldman tonometry.”



J Glaucoma, August, 2021


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Test-Retest Reliability of Intraocular Pressure Measurements With Office-Based Versus Home-Based Rebound Tonometers

Felix Boehm, MD, MPH, Kevin Holman, MD, and Paula Meltzer, PhD

Conclusion: The test-retest reliability of IOP measurements taken by patients using the iCare HOME2 self-tonometer compared with IOP measurements taken by trained operators using the iCare IC100 and IC200 tonometers was uniformly excellent (ICCs all ≥ 0.9). These findings indicate that these three devices should be considered interchangeable for the clinical assessment of circadian IOP.

J Glaucoma, October 2024



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Rebound Tonometry More Stable Than Goldmann

-IOP measurements are shown to be stable and consistent with in-office tonometry and patient self-tonometry

“Rebound tonometry is significantly more reproducible than Goldmann tonometry.”

-“With RT, we can be more confident that changes in measurements between visits represent true IOP changes than we can with GT.”

-“IOP measurements obtained with the office-based tonometer and patient-operated HOME2 tonometer are highly interchangeable.”

J Glaucoma, October 2024

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IOP Can Be Misleading and Unimportant???

“Many individuals, despite having elevated IOP, never progress to glaucoma.”

“While IOP has some ability to discriminate between glaucomatous and healthy eyes, this ability is limited.”

J Ophthalmol, October, 2018

“The importance of evaluating both the visual field and the optic nerve has been noted by others, particularly when evaluating patients with ocular hypertension. Moreover, using both functional and structural metrics is consistent with clinical practice.”

Am J Ophthalmol., March, 2019

M+T: Even if there is no increased IOP, attentively study the optic nerve, and if suspicious, get an NFL scan and a visual field. It's all about the optic nerve!

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JAMA Ophthalmology | Original Investigation
Influence of Intraocular Pressure on Clinical Decision-Making in Glaucoma Management

Author: Pablo, MD, Ben J. Brice, PhD, Rachel Reis, MD, MS, Venkata Lakshmi, MD, PhD, MSc, Felipe A. Medeiros, MD, PhD, Jonathan S. Stein, MD, MS, Brent C. Stagg, MD, MS, for the SCAGL2 Consortium

IMPORTANCE Understanding of intraocular pressure (IOP) as a continuous risk factor for progression of glaucoma is limited. We used a novel risk factor to assess the influence of IOP on clinical decision-making.

“Most patients with IOPs of 22 mm Hg or higher never go on to develop glaucoma, and over half of patients with glaucoma have IOPs consistently below 22 mm Hg.”

“There is no clinical basis to support a true IOP cutoff of 22 mm Hg in glaucoma decision-making.”

JAMA Ophthalmol, Jan 2026

treatment rate at IOPs of 22 mm Hg or higher. With mixed-effects logistic regression modeling, an indicator IOP of 22 mm Hg had a greater effect on treatment initiation (odds ratio, 1.11, 95% CI, 1.08-1.14) compared with lower indicator IOPs.

CONCLUSIONS AND RELEVANCE: In this cohort study, while clinicians seem to generally use IOP as a continuous risk factor in their treatment patterns, with higher rates of glaucoma therapy at increasing IOP levels, these findings suggest that the historical IOP cutoff of 22 mm Hg may still influence clinical decision-making in glaucoma management. Improved clinical decision support may be useful to assist clinicians with using IOP as a continuous risk factor in their decision-making.

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Rapid Progression in Glaucoma

- Approximately 12.5% (1 in 8) of glaucoma patients exhibit fast progression (<-1dB/year MD) under routine care
- Fast progressors are clinically significant due to risk of functional disability and need for intensified monitoring/therapy
- Intensive testing improves detection of rapid progression
- Risk factors include pseudoexfoliation, disc hemorrhages, thinner CCT, older age, and other factors

Ophthalmology, 2023; 130(2); AAO Journal, 2024, Medeiros

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Audience Poll: Has your practice acquired Virtual Visual Field Technology?

1- Yes
 2- No

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Join at meet2.com | Use code: 6462.6358

Audience Poll: Has your practice acquired Virtual Visual Field Technology?

1- Yes
 2- No

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Virtual Visual Field Testing

Advantages:

- Portability – devices are smaller and can be placed in any exam space or taken to outreach clinics.
- Patient experience – more comfortable and less intimidating than dome perimeters
- Speed – shorter test times reduce fatigue and improve reliability
- Workflow flexibility – can test outside traditional eye clinics, including home monitoring

Ophthalmic & Physiological Optics, 2024; Ophthalmology Science, 2025; Vision, 2025.

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Virtual Visual Field Testing

Limitations & Cautions:

- Not yet universally accepted as standard of care - (awaiting larger validation datasets)
- Comparative evidence varies – large, multicenter, prospective trials needed for definitive equivalence to SAP
- User training & calibration – performance can depend on patient familiarity with technology and quality of eye/head tracking
- Reimbursement & coding – standardization for billing continues evolving and varies by practice and payer

Ophthalmic & Physiological Optics, 2024; Ophthalmology Science, 2025; Vision, 2025.

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Gonioscopy: How Pitiful We All Are

-Gonioscopy is the clinical standard for detecting patients at risk for angle closure and plays a key role in the glaucoma evaluation.

-Both AAO and the WGA recommend all patients receive gonioscopy at the initial evaluation for glaucoma and every 5 years thereafter.

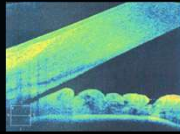
-About 30% of such visits include gonioscopy!

"The van Herick technique is a poor substitute for gonioscopy."

-AS-OCT can be a reasonable substitution

Website: www.gonioscopy.org

Am J Ophthalmol. August, 2024



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Is Laser Photocoagulation (LPI) the "Fix" for Narrow Angles?

-No! but prevents angle closure in most patients

"Primary angle closure suspect eyes with persistent angle narrowing by anterior-segment OCT or cumulative gonioscopy score 2 weeks after LPI were at higher risk of primary angle closure and acute angle closure."

-Quantify (and document) angle anatomy pre-LPI, then again 2 week after LPI. You should see opening and deepening of the angle. If not, follow the patient more closely!

-There is recent trending moving away from LPI toward earlier lens extraction.

JAMA Ophthalmol. June 2023

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Role of Cataract Extraction on IOP

"The role of cataract extraction in the algorithm of glaucoma treatment is undeniable."

"The latest studies to include washout in the context of MIGS show surprisingly large effects of phacoemulsification alone and relatively small incremental benefit of MIGS."

-Results of cataract extraction

-For angle closure, reduction averaged 6.4 mm Hg

-For open angle glaucoma, about 2.7 mm Hg reduction

Survey Ophthalmol. September - October, 2018

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Micromanagement in Glaucoma

DO NOT micromanage these tests:

- Visual fields
- Nerve fiber analyses
- Corneal thickness
- Family History
- IOP

ABSOLUTELY DO micromanage:

- Optic Nerve

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When to Treat?

"Patients with normal optic disc and visual field could tolerate an IOP of 30 mmHg for many years without need of treatment."

"What it comes down to is . . . treat young patients who are in the high-risk group, and it is worth watching the elderly in a low-risk group. The problem remains what to do for those in the middle."

Reference: A Sommer / Johns Hopkins U., *Ophthalmology Times*, January 2011

"AAO PPP states the goal is to "maintain the IOP in a range at which visual field loss is unlikely to significantly reduce a patient's health-related quality of life." Intervention is recommended because untreated IOP is significantly above target.

American Academy of Ophthalmology - Preferred Practice Patterns 2026

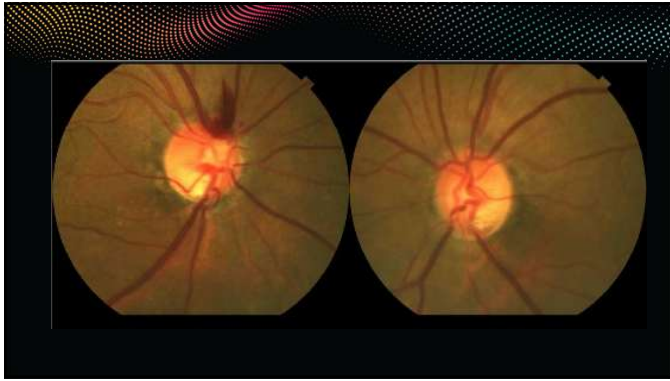
Melton-Thomas: All glaucoma doctors struggle with the decision of whom to treat, and when. Remember: medical care is an art, and equally well-trained doctors commonly differ in clinical decision-making.

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Missed Glaucoma

- 63 yowf with floaters OD that started this am; sees a big "smoke ring" moving in front of vision; no flashes; LEE 6 months ago with new glasses; takes a topical antihistamine for itchy eyes
- Mother sees glaucoma specialist for advanced glaucoma
- BVA: OD 20/30, OS 20/30
- IOP: 18, 17 @ 10:00 am
- Vitreous: PVD OD, negative for Shaffer's sign
- C/D ratio: OD .75 cupped inferiorly, flame heme superiorly; OS .7 notched inferiorly
- DFE: peripheral retina; no tears or detachments
- Plan: S/S of retinal abnormalities f/u immediately; RTC 1 month for f/u of PVD OD and glaucoma work-up to include VF, NFL, gonioscopy, CCT, and IOP

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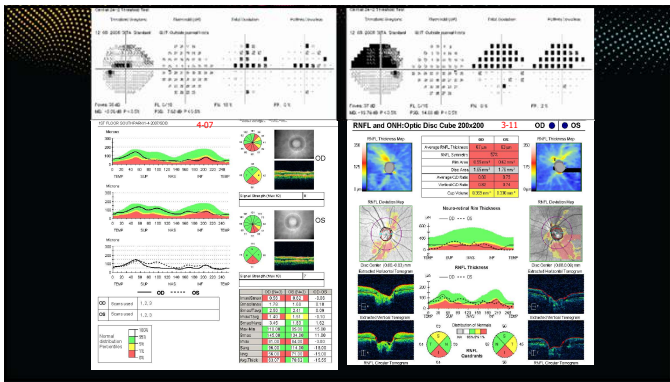


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Missed Glaucoma

- F/U 1 month to check PVD OD and glaucoma work-up
- IOP: 16, 17 @ 935 am
- CCT: OD 588; OS 582
- Gonioscopy: OU Grade 3 angle with ciliary body visible, 1-2+ pigment, negative NVI
- SLE: lens 2 NS, negative PXE OU
- C/D ratio: OD .75 cupped inferiorly, flame heme superiorly has resolved; OS .7 notched inferiorly
- NFL: Thinning inferiorly OD>OS
- VF: OD extensive superior defect; OS mild superior defect
- Plan: prostaglandin OD and IOP recheck 3 weeks

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Missed Glaucoma

- F/U 3 weeks compliant with prostaglandin OD
- IOP: 11, 18 @ 9:35 am
- Plan: Continue with prostaglandin OU and careful f/u with monitoring of IOP's, ONH's, VF's, and NFL

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Glaucoma Treatment Options

- Prostaglandin Analogs (including nitric oxide moiety)
- Timolol
- Brimonidine
- Carbonic Anhydrase inhibitors (CAI's)
- Rho-Kinase inhibitors
- Timolol/brimonidine
- Dorzolamide/timolol
- Brinzolamide/brimonidine
- Latanoprost/Rhopressa
- Pilocarpine derivatives
- Sustained-released implants
- Laser trabeculoplasty
- Surgical options (trabeculectomy, tube shunts, cyclo-destruction, filtering procedures, MIGS, angle surgery)

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Audience Poll: If and when your updated glaucoma management algorithm allows laser trabeculoplasty, would you offer SLT as initial glaucoma therapy over traditional topical medications for first-line treatment?

1- Yes
2- No

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■ Yes
■ No

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Key Advancements in Glaucoma Treatment

New Meds:

- Shift from traditional eye drops to sustained-release drug delivery systems. These include tiny implants that release medication over several months, reducing the need for daily eye drops and improving adherence to treatment.
- Injectable therapies are also being explored, with clinical trials showing promising results in reducing intraocular pressure (IOP) for extended periods, up to six months.

Minimally Invasive Glaucoma Surgery (MIGS):

- MIGS has emerged as a revolutionary approach, offering less invasive options with quicker recovery times compared to traditional surgeries. -Devices like the iStent and Hydrus Microstent are enhancing fluid drainage within the eye, effectively lowering IOP without extensive surgical intervention.
- Procedures such as canaloplasty are also gaining traction, which dilates the eye's natural drainage system to maintain long-term pressure reduction.

Glaucoma Today – 2025-2026

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Key Advancements in Glaucoma Treatment

Laser Innovations:

Advances in selective laser trabeculoplasty (SLT) are making it a first-line treatment option in many clinics. New variations, such as micropulse laser trabeculoplasty, are being developed to minimize tissue damage while effectively managing IOP.

Technological Integration:

The use of AI-powered diagnostic tools and wearable monitoring devices is enhancing the precision of glaucoma detection and treatment. These technologies allow for continuous monitoring of eye pressure, enabling proactive management of the condition.

Neuroprotective Treatments:

Research is ongoing into medications that not only lower IOP but also protect the optic nerve from degeneration, which is crucial for preserving vision in glaucoma patients.

Conclusion: The landscape of glaucoma management in 2026 is marked by innovative treatments and technologies that promise to improve patient care significantly. With ongoing research and development, the outlook for individuals affected by glaucoma is becoming increasingly optimistic, offering more effective options for preserving vision and enhancing quality of life.

Glaucoma Today – 2025-2026

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OCULAR SURGERY NEWS

JULY 10, 2025 | VOL 43 | NO 13

Healio EXCLUSIVE

Interventional glaucoma mindset goes beyond traditional management strategies

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Interventional Glaucoma Therapy (IGT)

-“IGT with laser and/or incisional procedures in combination with implants will play an increasing role in treating our patients with glaucoma.”

-Ophthalmologists point to patient non-adherence to eye drops as a reason to progressively move to laser, etc., procedures.

-(M+T): It is our opinion that if optometrists were the glaucoma doctors, we would take much better care of such patients by spending more time with them!

-“Still, we have excellent eye drops available, which in generic form cost less than \$15.00 per month with strong IOP lowering efficacy and safety.”

Ocular Surgery News, July 10, 2025

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IGT – (continued)

- Because of alleged laser outcomes...“That really gave ophthalmologists confidence that laser first is indeed the best initial treatment.
- “As lasers becomes more common as a first-line treatment, it is changing patient expectations.”
- “The biggest risk of prescribing drops is that patients don’t use them.”
- “If you wanted to help patients adhere better, it would be good to spend a little more time explaining to patients how to use their drops and what their disease is.” (Think optometry!!)

Ocular Surgery News, July 10, 2025

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SLT and Medical Therapy in Reducing IOP

- SLT and medical therapy are roughly equal in all regards.
- Both decreased IOP about 27%
- “The authors found no evidence of a difference in overall quality of life scores between the 2 groups.”
- “SLT does not provide an IOP advantage over topical medications as an initial treatment, although it may have a modest quality of life advantage.”

Ophthalmology, January 2024

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Factors Affecting Laser Trabeculoplasty

- 80% respond to LTP; 20% do not
Of responders, 80% remain controlled after 2 years
- “Medication cost is also a major barrier in therapy adherence.”
(M+T: Think timolol!)
- “Higher pretreatment IOP correlates with higher treatment success.”
- “This analysis of 380,951 eyes revealed a modest overall LTP response rate.”

Am J Ophthalmol, March, 2021

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SLT Success Assessment

- “There is often a continued need for adjunctive eye drop medication as the effect of SLT wears off.”
- “The data show that a substantial proportion of persons who have either 1 or 2 SLT treatments will still need to take drops within 2 years.”
- “1/3 of patients failed to achieve short-term target IOP either immediately following or within 2 years of initial SLT.”
- “Participants who were older, female, had lower baseline IOP, or had moderate or severe visual field loss experienced worse outcomes.”

JAMA Ophthalmol, October 2024

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Direct SLT: The Voyager

- “A non-touch, faster and easier technique, with fewer side effects and more comfort for the patient.”
- “Drop therapy should no longer be considered first line.”
- “DSLTL as first-line therapy is a revenue generator for the practice.”
- “Voyager DLT democratizes glaucoma care in allowing non-glaucoma specialists to take care of the broad base of glaucoma patients who we diagnose at the early stages in our practices.”
- Procedure takes 2.3 seconds to apply over 360°
- Alcon has purchased this technology from Belkin Eagle (developed in Israel)



Ocular Surgery News, March 5, 2025

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A Perspective on Why SLT Matters

-“SLT and topical drops are both recommended for the treatment of glaucoma and reduction of IOP. The 6-year LIGHT trial results, however, provide compelling evidence that SLT rather than IOP-lowering eye drops should be the initial treatment for eligible patients newly diagnosed with ocular hypertension or open-angle glaucoma.”

Glaucoma Today, Sept/Oct, 2023

-M+T: The profession of optometry needs to gain competency in this straight-forward procedure or be left behind. It's our duty to be proactive in our ability to fully meet our patient's needs.

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Just How Good is Laser Trabeculoplasty?

- IOP reduction is about 4 mm Hg
- Repeat LT helps further reduce IOP about 1.0 to 1.5 mm Hg
- Risk factors for non-responsiveness are older age, female sex, and lower baseline IOP
- “The data show that a substantial proportion of persons who have either 1 or 2 SLT treatments will still need to take drops within 2 years.”
- “36% failed to achieve short-term target IOP either immediately following or within 2 years of initial SLT.”

JAMA Ophthalmol, October 2024

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Audience poll: Has your practice recommended your glaucoma patients needing cataract surgery also consider MIGS?

1- Yes
2- No

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Join at meet.com | Use code 6462 6358

Mentimeter

Audience poll: Has your practice recommended your glaucoma patients needing cataract

0 0
Yes No

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MINIMALLY INVASIVE GLAUCOMA SURGERY

-While cataract surgery alone will often achieve a degree of IOP reduction for glaucoma patients, combining planned cataract surgery with a MIGS device achieves greater reductions in IOP.

-Additionally, there is a greater likelihood of the patient achieving post-operative drop-independence compared to cataract surgery alone.

-Fan Gaskin et al. reported that 57% of eyes with mild to moderate glaucoma undergoing cataract surgery with MIGS achieved drop independence versus 36% for patients undergoing cataract surgery alone.

-Readers will be familiar with the current array of MIGS devices, the most common of which are Glaukos' iStent trabecular microbypass system in its various generations, and Alcon's Hydrus microstent. Initially developed to be used in combination with cataract surgery, these MIGS devices lower IOP by enhancing conventional aqueous outflow.

Hydrus Microstent iStent inject

MIVISION - The Ophthalmic Journal (9/2025) P Moore, MD

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Special Report on MIGS

-New metric: Minimal Clinically Important Difference (MICD) (Much more relevant than "statistical significance")

-Generally, a 20% reduction in IOP

-For MIGS, 50% success at 2 years
 -For cataract surgery alone, 50-60% at 2 years
 -For cataract surgery plus MIGS, 65% at 2 years

-Incremental benefit of MIGS over phaco alone: 5-15%

-"Long-term studies assessing the safety and efficacy of MIGS are needed to better define it's role in the surgical treatment of glaucoma."

Ophthalmology, February 2025

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Latanoprost Cup Runneth Over

- First was Xalatan® 1996
- Then a bunch of generics after patent expiration
- Then Xelpros® preserved with potassium sorbate
- Then iyuzeh™ by Thea has its PF product
- Imprimis has its PF product line as well
- A sort of hybrid, Vyzulta® (latanoprostene bunod) contains latanoprost with a fixed nitric oxide moiety.



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The Efficacy and Safety of Once-Daily Versus Once-Weekly Latanoprost Treatment for Increased Intraocular Pressure

"Latanoprost treatment for ocular hypertension or early glaucoma once-weekly was as effective as once-daily after 3 months of follow-up, and there were fewer, and only minor, side effects with this protocol."

Reference: S. Kurtz, MD and G. Shemesh, MD. Journal of Ocular Pharmacology and Therapeutics, November 2004

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(Bimatoprost Implant) 10 mcg



- First FDA-approved biodegradable, intracameral implant
- Indicated to reduce IOP in patients with open angle glaucoma or ocular hypertension via a sustained-release drug delivery system
- Reduces IOP approximately 5-8 mmHg and engineered to release bimatoprost 3-4 months
- Currently FDA approval limited to one implant per eye (no re-treatment)
- Most common adverse reaction was conjunctival hyperemia (27%); nonocular was headache (5%)
- Durysta is manufactured by Allergan, an AbbVie company

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Travoprost Intracameral Device




- For about 2 decades, Travatan-Z® has been available
- Intracameral device approved December 2023
- iDose® TR (travoprost intracameral implant) uses a metallic (titanium) delivery device
- The implant is MRI-conditional, not fully "MRI-safe" universally
- Engineered to control IOP for 3 months
- IOP change from baseline 6.6-8.4 mmHg, and for timolol 6.5-7.7 mmHg
- iDose TR is marketed by Glaukos


Ophthalmology, September 2024

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Topical Beta-Blockers



- Decrease aqueous production
- Reduces IOP .25%; no response 15%
- R/O asthma
- Recommend monocular trial with lowest concentration once daily
- Possible diminished effect if used with systemic beta-blockers
- No advantage to gel-forming solution
- Available preservative-free in unit doses as .25% and .5% in .2mL individual units of solution from B+L (Timoptic in Ocudose)



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Do Systemic Beta-Blockers Preclude use of Topical Beta-Blockers?

- Tradition teaching says they do
- Newer research says not
- "Patients taking a systemic beta blocker still achieve more than a 75% lowering (about 5 mmHg), on average, when using a topical beta blocker. Therefore, withholding a topical beta blocker from these patients seems unwarranted."
- "The present data suggests that the use of a systemic beta blocker does not meaningfully affect the IOP-lowering effectiveness of glaucoma eyedrop regimens as prescribed and used in a real-world scenario."
- In summary, being on a systemic beta blocker may ever so slightly dampen the effectiveness of a topical beta blocker, but in no way precludes the beneficial use of topical beta blocker treatment.

Ophthalmology, February 2021

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β-Blockers Are Helpful In Patients with COPD!

- "Conclusion: Treatment with β-blockers may reduce the risk of exacerbations and improve survival in patients with COPD, possibly a result of dual cardiopulmonary protective properties."¹
- "Patients with COPD often do not receive β-blockers because of concerns that they might exacerbate respiratory symptoms."²
- "Beta-blocker users who subsequently received diagnosis of COPD didn't have worse outcomes; indeed, outcomes were better in the beta-blocker cohort."²

1. Rutten F, et al. *Arch Int Med.* 2010;170(10)
2. *E-Clin Med*, January, 2019 (as reported in *Journal Watch*, April 1, 2019).

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Timolol Eyedrops to Treat Migraine Headache

- Oral timolol or propranolol are effective in helping prevent migraine headaches but are ineffective for treating acute HA.
- Oral beta blockers must be metabolized in the liver which is why they are not effective for acute treatment.
- However, "the use of eyedrops has the advantage of attaining peak plasma levels quickly at levels high enough to abort the acute migraine attacks effectively."
- Instill 1-2 drops at the onset of the attack; 80% were significantly helped in 20 min.

JAMA Ophthalmol. Nov 2020

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Topical Ophthalmic Timolol in Dermatology



- Timolol is used to treat congenital capillary hemangiomas, and to stop early onset migraine HA.
- Now it has been found to cure a rare, post traumatic vasculodermatopathy.
- Reactive angioendotheliomatosis is a benign vasculoproliferation disease often occurring at the site of traumatic scars.
- Treatment was 0.5% timolol eye drops (two drops three times a day for six weeks)
- It appears that beta adrenergic receptor blockade has a role in some forms of vascular lesions.

JAMA Dermatology, July 2021

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Adrenergic Receptor Agonists


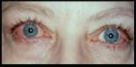

- Brimonidine
- Apraclonidine



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Brimonidine Tartrate


- Alpha-2 adrenergic agonist; tid FDA approval
- Acts by reducing aqueous production with some enhancement of uveoscleral outflow
- Reduces IOP similar to timolol 0.5% bid
- Side effects: fatigue and dry mouth most common side effects; uveitis reported; may reduce systolic BP 10 mmHg; allergic response in 10-20% of patients
- Less tachyphylaxis or allergy development than the other alpha-2 agonists
- Neuro-protective potential unknown (as of late 2025, there is still no FDA approved "neuroprotective glaucoma drop")
- Alphagan (0.2%) by Allergan and generic
Alphagan P (0.15%) by Allergan and generic
Alphagan P (0.1%) by Allergan and [recently generic](#)

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Topical CAI's

- Dorzolamide 2% sol. and brinzolamide 1% susp.
- Mechanism: decreases aqueous humor secretion
- Reduces IOP approximately 15%
- FDA dosage: tid, practical dosage bid
- Contraindications: allergy to sulfa and/or history of blood dyscrasias
- Side effects: minimal; some burning, bitter taste, rare allergic reaction
- Most all patients controlled with oral acetazolamide were successfully controlled with a topical CAI
- Brinzolamide 1.0% (Azopt susp-Alcon); dorzolamide 2.0% (Trusopt sol-Merck discontinued), generically available



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Efficacy of Glaucoma Drugs at Night



- "Alpha agonists and beta-blockers have reduced, or even lack, IOP lowering during the nocturnal period."
- All prostaglandins reduce nocturnal IOP, but with a "reduced magnitude" as compared to diurnal efficacy.
- CAI's might reduce IOP about 15% around the clock but BID dorzolamide "failed to reduce IOP versus baseline at any of the nighttime measurements."

Survey Ophthalmol. 2020

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Netarsudil 0.02%



- FDA approved in December 2017
- First rho-kinase inhibitor
- MOA purported to be enhancement of conventional trabecular outflow
- Use once daily in the evening
- Reduces IOP about 4-5 mm Hg
- Preserved with 0.015% BAK
- Comes in a 2.5 ml bottle
- Potential Side Effects:
 - Subconjunctival hemorrhages
 - Can cause an amiodarone-like vortex keratopathy
 - In phase III, 53% experienced red eyes
- *Marketed as Rhopressa by Alcon

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Netarsudil 0.02% + Latanoprost 0.005%


- A combination of netarsudil 0.02% (Rhopressa) and latanoprost 0.005%
- First combination drug of a prostaglandin and a rho-kinase inhibitor
- Both ingredient drugs are "once daily" administration and reduce IOP 6-10 mmHg
- Conjunctival hyperemia (59%)
- Marketed by Alcon

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Brimonidine 0.2% + Timolol 0.5%



- Combination of 0.2% brimonidine and 0.5% timolol
- Reduces IOP 4.4 – 7.6 mmHg (27-35%)
- With ANY combination drug, always try one of the component drugs as monotherapy, and only use the combination product if or when the monotherapy drug comes close, but does not achieve target IOP
- Remember, most all drugs have a non-response rate of about 10%, so there is a 20% chance that one of the components of any combination drug is not performing
- Marketed as Combigan by Allergan and generic, preserved with BAK .005%



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Dorzolamide 2.0% – Timolol 0.5%


- Both components decrease IOP by reducing aqueous humor secretion
- Reduces IOP by 5-9 mmHg (25-30 %)
- Because of the CAI, must be used bid, which results in excessive beta-blocker therapy
- Contraindications: patients with asthma, heart disease, or allergy to sulfa drugs
- Ocular side effects: burning/stinging and persion in taste
- Marketed as Cosopt by Merck
- PF and generic

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Brinzolamide 1.0% - Brimonidine 0.2%

- Combination drug without a beta blocker
- Combines 1% brinzolamide (Azopt ophthalmic suspension) with 0.2% brimonidine
- FDA approval for TID dosing
- Offers a wide range of treatment possibilities due to its efficacy and ability to decrease IOP by 5-9 mmHg (25-35 %)
- Marketed as Simbrinza by Alcon



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Contemporary Glaucoma Medication Flow

- 1st Tier:** Prostaglandin, or timolol
- 2nd Tier:** Latanoprostene bunod, topical CAI, brimonidine, or netarsudil
- 3rd Tier:** Fixed Combinations
 - Brimonidine 0.2% + Timolol 0.5%
 - Dorzolamide 2.0% + Timolol 0.5%
 - Brinzolamide 1.0% + Brimonidine 0.2%
 - Latanoprost 0.005% + Netarsudil 0.02%
- 4th Tier:** Pilocarpine
Oral CAI (preferably methazolamide)

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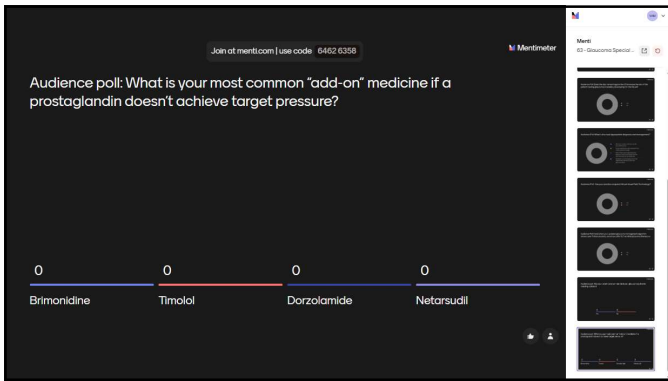
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Audience poll:

What is your most common "add-on" medicine if a prostaglandin doesn't achieve target pressure?

- 1- Brimonidine
- 2- Timolol
- 3- Latanoprostene bunod
- 4- Netarsudil

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After a Prostaglandin; What to Add?

Meta-analysis of studies regarding what drug to add to a prostaglandin. Is it brimonidine, a beta-blocker, or a CAI?

- Conclusions: "All 3 classes are similarly effective in lowering mean diurnal IOP when used in combination with PGAs. Brimonidine is statistically less effective in reducing IOP at trough compared with the beta-blockers and CAI's." *Arch. Oph. July 2010*
- Additional lowering of IOP was, on average, 2.5 to 3 mmHg for all three *2025-2026 Data*
- Modern alternative add-ons include netarsudil (1-3 mmHg additional) *Arch. Oph. July 2010*
- If a patient does not respond well to prostaglandin medication A, it is of little value to switch to another prostaglandin medication B or to add another prostaglandin medication. *Arch. Oph. July 2010*

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After Prostaglandin First-Line Therapy

- 1st - First-Line**
Prostaglandin analog (QHS) or SLT (reduce IOP 20-25 %)
- 2nd - Most Common Add-On**
Beta-blocker (Timolol qAM) or SLT
Best daytime control
Avoid in asthma/bradycardia
- 3rd - If More Reduction Needed or BB Contraindicated**
Brimonidine or Carbonic Anhydrase Inhibitor (CAI)
Rho-kinase Inhibitor
- 4th - Fixed Combinations (preferred over multiple)**
- 5th - Escalation Beyond Drops**
SLT (often earlier than a 3rd-4th drop)
MIGS/incisional surgery if progression continues

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Advanced Glaucoma Surgery – OD Quick Reference

Procedure	Best Use	Typical IOP
Trabeculectomy	Advanced POAG / NTG	Single digits–low teens
Tube Shunt	Failed trab, NVG, uveitic	Low–mid teens
Micropulse CPC	Poor candidates, end-stage	Variable
Filtering MIGS	Moderate–advanced	Mid-teens

Key Pearls

- Target IOP determines surgery choice
- Trabeculectomy remains gold standard for very low pressures
- Tube shunts excel in complex and secondary glaucomas
- MIGS reduces risk, not IOP expectations
- Earlier referral preserves vision

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Preventing / Delaying Glaucoma Through Exercise

- Recommended: 150 minutes of moderate intensity aerobic exercise and 2 days of resistance exercise each week
- Such exercise may reduce glaucoma risk by about 40-50%
- "The magnitude of a 40-50% reduced risk of developing glaucoma by being active and fit is surprising and may be one of the strongest factors in glaucoma prevention besides aging." *Medical Science & Sports Exercise, August, 2018*
- "Our study found that physical activity was associated with less visual field progression in patients with glaucoma."
Ophthalmology, July, 2019
- "Increased steps per day, minutes of non-sedentary activity, and minutes of moderate-to-vigorous physical activity were associated with slower rates of decline."
Ophthalmology, July, 2019

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Associations Between Physical Activity and Glaucoma: Analysis of the National Institutes of Health All of Us Research Program

Akarapimand, Patrick BS^{1,2}; Hallaj, Shahin MD¹; Weinreb, Robert N. MD¹; Baxter, Sally L. MD, MSc^{1,2}
Author Information@
Journal of Glaucoma 35(1):p 34–41, January 2026. | DOI: 10.1097/JIG.0000000000002660


BUY | SDC

Conclusions:

There were no definitive associations between physical activity and primary open angle glaucoma diagnosis among All of Us participants, which was replicated among age-stratified subgroup analyses.

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Angle Closure Management Options



- 500 mg of acetazolamide in tablet form
- Brimonidine q 15 min x 2 doses
- A beta-blocker, q 15 min x 2 doses
- Pilocarpine 2% once above steps completed
- Potent steroid q 1h if there is much associated inflammation
- YAG photostriptomomy once control is achieved

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Don't Forget Oral CAI's When Needed



- Topical CAI's reduce IOP about 20%, whereas systemic CAI's reduce IOP about 30%
- The risk of a "severe complicated adverse reaction" is about 3 per 1,000 patients for systemic, and about 2 per 1,000 patients for topical CAI. Such events are not necessarily seen right after initiation but can occur over time.
- Dosages of acetazolamide are safe and tolerable up to 4 gm per day. Only dysgeusia and paresthesia side effects are dose dependent.
- Sulfa allergy does not contraindicate CAI use.
- We should not be reluctant to prescribe an oral CAI given the low risk of severe adverse events.

JAMA Ophthalmol, March, 2022


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Key Developments in the Glaucoma Pipeline

Innovative Surgical Techniques:

A novel class of glaucoma surgery is being explored that targets the supraciliary space, which may help modulate aqueous flow and minimize complications. This includes the development of a new drainage device designed to enhance glaucoma treatment.

The Voyager system, which performs direct selective laser trabeculoplasty (DSLT), received FDA clearance in December 2023. This automated system allows for efficient laser delivery without the need for contact with the eye, potentially improving patient comfort and compliance.



Emerging Therapies:


DelveInsight's report highlights over 20 pipeline drugs for open-angle glaucoma, including promising candidates like NCX 470, a nitric oxide-donating prostaglandin analog currently in Phase 3 trials, and DE-126, a once-daily eye drop from Santen Pharmaceuticals.

Other notable therapies include XEM45, a glaucoma gel stent, and BTQ-1902, an EyeSol-based formulation of timolol, both of which are in various stages of clinical trials.

Glaucoma Today 2025 - 2026

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Key Developments in the Glaucoma Pipeline (continued)



Technological Innovations

- The integration of minimally invasive glaucoma surgery (MIGS) is becoming more prevalent, with techniques that allow for better intraocular pressure control and reduced reliance on daily medications. This includes devices that can be implanted during cataract surgery to enhance treatment outcomes.
- Remote monitoring technologies are also being explored to improve patient management and adherence to treatment protocols, which is crucial for effective glaucoma care.

Conclusion:

The glaucoma pipeline is evolving rapidly, with numerous innovative treatments and technologies on the horizon. These advancements aim to enhance the efficacy of glaucoma management, reduce patient burden, and improve overall outcomes. Keeping abreast of these developments is essential for healthcare providers and patients alike as they navigate the complexities of glaucoma treatment.

Glaucoma Today 2025 - 2026

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