Glaucoma Live Case Studies and Surgical Considerations

COPE#65053-GL

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The Most Valuable Glaucoma Tool

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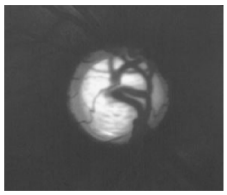
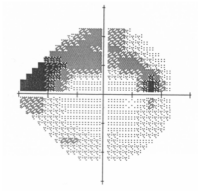
Glaucoma: Diagnosis

- We know it when we see it



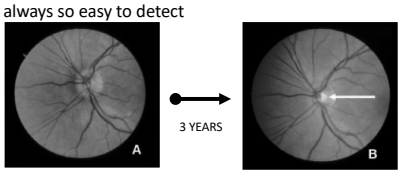


IOP: 26 OU

5

Glaucoma Diagnosis

- Yet not always so easy to detect



IOP: 23

IOP: 25

CCT: 450

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Glaucomatous Optic Neuropathy: Clinical Findings

- Concentric cupping, thinning to the Neural Retinal Rim

This Example:

- Focal rim erosion:
  - Notching
  - Vertical elongation
- Nerve fiber layer defects
- Disc hemorrhage

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A Common Clinical Scenario

- A 53-year-old healthy patient presents for a routine eye exam
- Last exam was 10 years ago (for emerging presbyopia) and exam was unremarkable
- On examination, the patient now has an unremarkable examination with one exception: IOP is 25 mmHg OU

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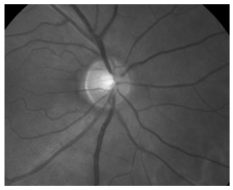
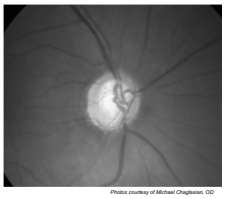
Optic Nerve Examination

OHTN



POAG



Photos courtesy of Michael Chaglasian, OD

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POAG vs OHTN

From the American Optometric Association's POAG Clinical Practice Guidelines:

"POAG is a chronic, progressive disease that most often presents with characteristic optic ON damage, RNFL defects, and subsequent VF loss.

"[OHTN consists of] IOP levels [that] are statistically abnormal (>21 mm Hg) [and] have no evidence of ON damage or loss of vision function

From the American Academy of Ophthalmology's Preferred Practice Pattern for Primary Open-Angle Glaucoma:

"POAG is a chronic, progressive optic neuropathy in adults in which there is a characteristic acquired atrophy of the optic nerve and loss of retinal ganglion cells and their axons. This condition is associated with an open anterior chamber angle by gonioscopy."[2]

From the American Academy of Ophthalmology's Preferred Practice Pattern for POAG *Suspect*:

"[OHTN consists of]…consistently elevated intraocular pressure (IOP) associated with normal appearance of the optic disc, RNFL, and visual field."[3]

Abbreviations: OHTN, ocular hypertension; ON, optic nerve; POAG, primary open-angle glaucoma; RNFL, retinal nerve fiber layer.

1. *Clinical Practice Guideline. Primary Open-Angle Glaucoma*. St. Louis, MO: American Optometric Association; 2010.
2. *Preferred Practice Guideline: Primary Open-Angle Glaucoma*. San Francisco, CA: American Academy of Ophthalmology; 2015.
3. *Preferred Practice Guideline: Primary Open-Angle Glaucoma Suspect*. San Francisco, CA: American Academy of Ophthalmology; 2015.

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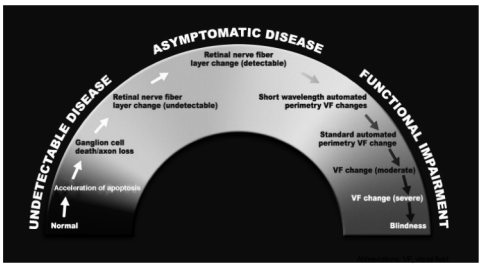
Glaucoma Continuum



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Visual Field Testing

- SITA Standard/Fast 24-2 or 30-2
- First-time tests are often abnormal and/or unreliable
  - Repeat abnormal tests before making clinical decisions
- Even experienced VF test takers produce random abnormal tests from time to time
- In OHTS, 86% of newly-abnormal VFs (in patients with prior normal VFs) reverted to normal on retesting
  - We don't do enough VFs!
  - New SITA Faster™ testing program (Zeiss Meditec)

Keltner JL, et al. *Arch Ophthalmol*. 2000;118(9):1187-1194.

Abbreviations: OHTS, Ocular Hypertension Treatment Study; SITA, Swedish Interactive Threshold Algorithm.

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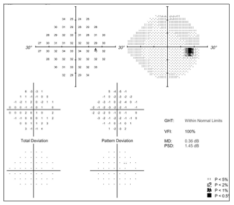
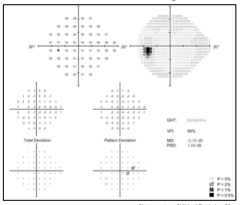
Visual Fields and Glaucoma Staging

OHTN



POAG Mild Stage



Photos courtesy of Michael Chaglasian, OD

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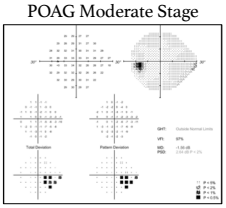
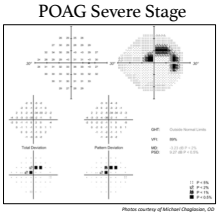
Visual Fields and Glaucoma Staging

POAG Moderate Stage



POAG Severe Stage



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GLAUCOMA SEVERITY SCALE DEFINITIONS

- Mild Stage: optic nerve changes consistent with glaucoma but NO visual field abnormalities on any visual field test OR abnormalities present only on short-wavelength automated perimetry or frequency doubling perimetry.
- Moderate Stage: optic nerve changes consistent with glaucoma AND glaucomatous visual field abnormalities in one hemifield and not within 5 degrees of fixation.
- Severe Stage: optic nerve changes consistent with glaucoma AND glaucomatous visual field abnormalities in both hemifields and/or loss within 5 degrees of fixation in at least one hemifield.

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OCT Testing

- Assess scan quality
- Obvious artifacts?
  - Common artifacts: myopes, segmentation errors, peripapillary atrophy
- Classification based on reference database
  - Everyone in reference database was glaucoma-free
  - "Borderline" and "abnormal" OCTs are based on values from NORMALS
  - Only 95% of normal people have a "normal" OCT
  - "Borderline" means test results are outside the 95% range of normal but within the 99% range of normal
  - "Abnormal" means test results are outside the 99% range of normal
  - 5% of NORMAL scans will be classified "borderline" and 1% will be "abnormal"

Realini T, et al. J Glaucoma. 2015;24(6):480-483.

Abbreviation: OCT, optical coherence tomography.

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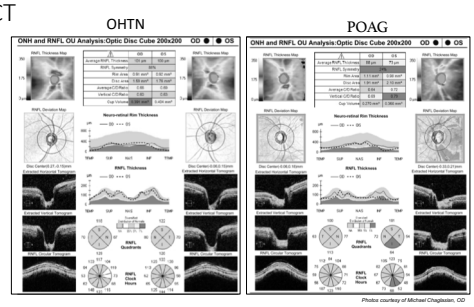
OCT



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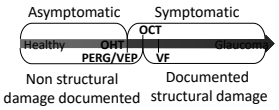
ELECTROPHYSIOLOGY DETECTS CHANGES EARLIER THAN OCT AND VISUAL FIELD[1]



1. Parisi V, Miglior S, Manni G, Centofanti M, Bucci MG. Clinical ability of pattern-electroretinograms and visual evoked potentials in detecting visual dysfunction in ocular hypertension and glaucoma. Ophthalmology. 2006 Feb;113(2):216-28.

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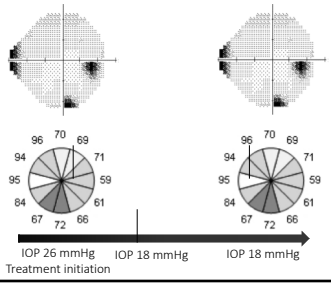
Visual Assessment



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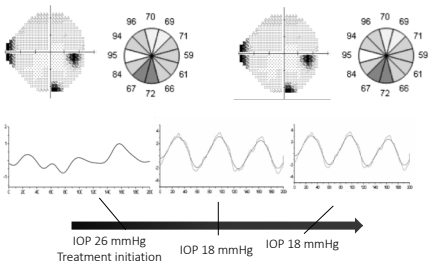
Dynamic Visual Function Assessment



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Ganglion Cell Function Measured By ERG After IOP Reduction in POAG

- Researchers concluded that significant IOP-lowering therapy could improve RGC function measured by PERG in patients with pre-perimetric and early stages of POAG
  - IOP significantly decreased avg 31%
  - Increase in MOPP avg 14%
  - PERG amplitude of P50 and N95 waves increased in 75% and 79% eyes

Karaśkiewicz J, Penkala K, Mularczyk M, et al. Evaluation of retinal ganglion cell function after intraocular pressure reduction measured by pattern electroretinogram in patients with primary open-angle glaucoma. Doc Ophthalmol. 2017; Feb 7. [Epub ahead of print].

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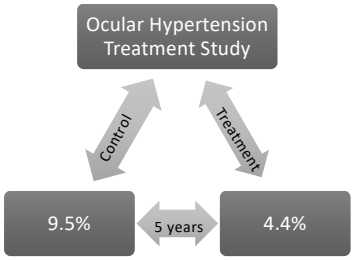

Gordon, M., Beiser, J., Brandt, J., Heuer, D., Higginbotham, E., Johnson, C., & Keltner, J. (2002, June). The Ocular Hypertension Treatment Study. *Archives of Ophthalmology, 120*, 714-720.

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What We Do Know- OHTS

TABLE 1. Hazard Ratios for Baseline Factors Predictive of Primary Open-angle Glaucoma

Baseline Factor	Model Including PSD, VC/D	Model Excluding PSD, VC/D
Age (decade)	1.25 (1.04,1.49)	1.29 (1.09,1.53)
IOP (mm Hg)	1.11 (1.05,1.18)	1.10 (1.04,1.17)
CCT (per 40 μ decrease)	1.82 (1.51,2.19)	1.92 (1.60,2.30)
History of diabetes mellitus	0.35 (0.15,0.78)	0.38 (0.17,0.86)
PSD (per 0.2 dB)	1.25 (1.06,1.48)	Excluded
VC/D (per 0.1)	1.32 (1.20,1.45)	Excluded

CCT = central corneal thickness; IOP = intraocular pressure; PSD = pattern standard deviation; VC/D = vertical cup-to-disk ratio.

Coleman, A., Gordon, M., Kass, M., & Beiser, J. (2004, October). Baseline Risk Factors for the Development of Primary Open-Angle Glaucoma in The Ocular Hypertension Treatment Study. *American Journal of Ophthalmology, 138*(4), 684-685.

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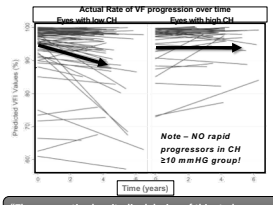
Corneal Hysteresis in Glaucoma
Predictive of Progression in Prospective, Longitudinal Study (DIGS)



- Each 1 mmHg lower CH was associated with a 0.25% per year **increase** in rate of Visual Field loss
  - 2X more predictive of VF loss than GAT IOP (IOP associated w 0.11% per year loss)
- CH was more than **3X more associated** with rate of VF loss than CCT (explained 17.4% vs 5.2%)

"The prospective longitudinal design of this study supports the role of CH as an important factor to be considered in the assessment of risk for glaucoma progression"

Medeiros FA et al. Ophthalmology. 2013;120:1533-1540.

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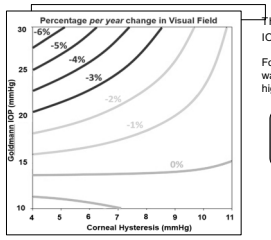
Corneal Hysteresis in Glaucoma

Predictive of Progression in Prospective, Longitudinal Study (DIGS)



The relationship between CH and IOP is complex:

For eyes with lower CH, the impact of IOP was significantly larger than in eyes with higher CH levels.

"The Effect of IOP on rates of progression was dependent upon Corneal Hysteresis"

Medeiros FA et al. *Ophthalmology*. 2013;120:1533-1540.

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CH is Predictive of Response to Glaucoma Therapy

Table 2. IOP response to therapy by baseline CH and CCT

	Baseline CH (mm Hg)	Baseline IOPg (mm Hg)	IOPg change (mm Hg)	p-value	IOPg percent change	p-value
				ANOVA:		ANOVA:
First quartile CH	7.0	19.4	-5.8	p=0.002	-29.0%	p=0.008
Second quartile CH	8.8	17.4	-3.7	0.1[1]	-20.7%	0.2[1]
Third quartile CH	10.0	16.5	-3.7	0.2[1]	-19.9%	0.3[1]
Fourth quartile CH	11.9	15.9	-1.1	0.001[1]	-7.6%	0.006[1]
	Baseline CCT (µm)	**Baseline IOPg (mm Hg)**	**IOPg change (mm Hg)**	**p-value**	**IOPg percent change**	**p-value**
				ANOVA:		ANOVA:
First quartile CCT	497.3	16.4	-3.9	p=0.7	-21.9%	p=0.4
Second quartile CCT	525.2	17.1	-4.0	0.8[1]	-23.1%	0.8[1]
Third quartile CCT	549.1	16.9	-3.1	1.0[1]	-15.9%	0.8[1]
Fourth quartile CCT	586.2	18.3	-2.6	0.5[1]	-13.4%	0.5[1]

Baseline CH is independently associate with the magnitude of IOP reduction from PGA therapy.

The relationship between corneal hysteresis and the magnitude of intraocular pressure reduction with topical prostaglandin therapy. Br J Ophthalmol. 2012 Feb;96(2):254-7. Daniel R. Agarwal, Joshua R. Ehrlich, Mitsugu Shimmyo, Nathan M. Radcliffe

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Icare® HOME tonometer

- Handheld, battery operated device that measures intraocular pressure (IOP) without the need for topical anesthetic
- The device is intended as an adjunct for monitoring IOP of adult patients (self-use). The HOME tonometer is designed for use at home or on the go

1/5/20

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IOP Fluctuation Matters

Research suggests that short-term IOP fluctuation may be an independent risk factor for the incidence, prevalence and progression of glaucoma.

- ✓Boland MV, Quigley HA. *J Glaucoma*. 2007;16:406-418.
- ✓Asrani S, Zeimer R, Wilensky J, et al. *J Glaucoma*. 2000;9:134-142.

Not only is an ideal mean target IOP needed, but also a target for IOP fluctuation.

- ✓ **Asrani S, Zeimer R, Wilensky J, et al. *J Glaucoma*. 2000;9:134-142.**

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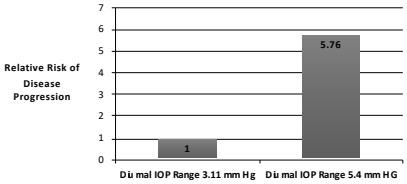
Self-Monitoring Makes a Difference



Arsani S, Zeimer R, Wilensky J, et al. Large diurnal fluctuations in intraocular pressure are an independent risk factor in patients with glaucoma. *J Glaucoma*. 2000;9:134-14

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Global Risk Assessment

- Synthesis of all risk factors informs
  - Diagnosis
  - Risk of developing glaucoma or progression
  - Benefit of starting or intensifying treatment
- Unmet need remains for a validated tool for assessing risk of progression in established glaucoma
- Validated risk calculator for OHTN
  - Based on data from 2 key trials
    - ✓ OHTS
    - ✓ EGPS
  - Provides a 5-year estimate of the risk of developing POAG
  - Does not incorporate new, emerging risk factors

Abbreviation: EGPS, European Glaucoma Prevention Study.

Gordon MO, et al; Ocular Hypertension Treatment Study Group. *Ophthalmology*. 2007;114(1):10-19.

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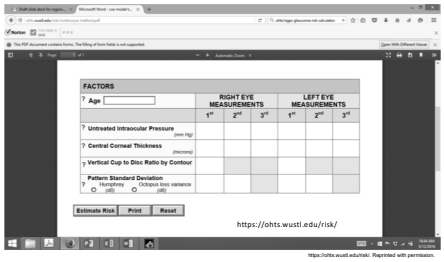
Glaucoma 5-Year Risk Calculator



https://ohts.wustl.edu/risk/. Reprinted with permission.

Gordon MO, et al; Ocular Hypertension Study Group. *Ophthalmology*. 2007;114(1):10-19.

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Interpreting Risk

- Expert consensus supports the following guidelines based on the 5-year risk of progressing from OHTN to POAG
  - < 5%: observe
  - 5%-15%: discuss with patient and consider treatment
  - > 15%: encourage treatment

Weinreb RN, et al. *Am J Ophthalmol*. 2004;138(3):458-467.

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Frequency for Dx Testing Glaucoma Patients

- Monitor IOP reduction: 1-2 weeks, 1 month
- Check IOP every 3-4 months
- Repeat VF every 6-12 months
- Disc photos every 1-2 years
- Gonioscopy every year
- Optic nerve analysis every 6-12 months
- Document everything

http://www.aoa.org/optometrists/tools-and-resources/clinical-care-publications/clinical-practice-guidelines?sso=y
https://www.aao.org/guidelines-browse?filter=preferredpracticepatterns

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First-Line IOP-Lowering Therapy in 2019

- Prostaglandin analogues
- Beta-blockers
- Fixed combinations
- SLT
- New options with novel mechanisms of action:
  - Latanoprostene bunod
  - Netarsudil
  - Netarsudil/Latanoprost fixed combination

Abbreviation: SLT, selective laser trabeculoplasty.

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POAG and the Trabecular Meshwork

- IOP is determined by the balance of aqueous humor inflow and outflow
- Aqueous is manufactured in the epithelium of the ciliary processes of the ciliary body
- Aqueous exits the eye through the trabecular outflow pathway and, secondarily, the uveoscleral outflow pathway
- **In POAG, the TM is altered and aqueous outflow is reduced**

Abbreviation: TM, trabecular meshwork.

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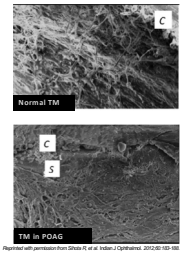
TM Stiffening Linked to Increased IOP

- This is due in part to the contractile tone of the trabecular endothelial cells and in part to changes within the makeup of the extracellular matrix (ECM)
- These two factors interact: increased TM cell contraction leads to ECM changes, and ECM changes can increase TM cell tone
- This stiffness may impede aqueous egress through the trabecular outflow tract, thus raising IOP



Reprinted with permission from Shiota R et al. Indian J Ophthalmol. 2012;60:165-168.

Wang et al. *Exp Eye Res*. 2017;158:3-12.

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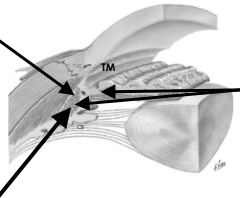
Traditional IOP-Lowering Drugs

Open angle by mechanical tension

Miotics



Increase uveoscleral outflow

Prostaglandins

Alpha-receptor adrenergic agonists

Aqueous suppression

Beta blockers
CAIs
Alpha-receptor adrenergic agonists

Wareham LK, et al. *Nitric Oxide*. 2018;77:75-87.

Abbreviation: CAIs, carbonic anhydrase inhibitors.

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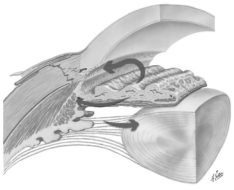
Novel Agents Target the TM to Increase Aqueous Humor Outflow

Decrease trabecular outflow resistance
LBN (nitric oxide)
Netarsudil



Wareham LK, et al. *Nitric Oxide*. 2018;77:75-87.

Abbreviations: LBN, latanoprostene bunod; PGA, prostaglandin analogue.

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New FDA-Approved Therapies for Ocular Hypertension/Primary Open-Angle Glaucoma

- Latanoprostene bunod (LBN) (Vyzulta)
  - Nitric oxide (NO)-donating prostaglandin analogue (PGA)
  - Indication: For the reduction of IOP in patients with open-angle glaucoma or ocular hypertension [1]
  - Dosing: Once daily in the evening
- Netarsudil (Rhopressa) and Netarsudil/latanoprost (Rocklatan)
  - Rho kinase (ROCK) inhibitor alone and in fixed combination with latanoprost
  - Indication: For the reduction of elevated IOP in patients with open-angle glaucoma or ocular hypertension [2,3]
  - Dosing: Once daily in the evening [2,3]

1. Vyzulta [package insert]. Bridgewater, NJ: Bausch & Lomb Incorporated; 2017. 2. Rhopressa [package insert]. Irvine, CA: Aerie Pharmaceuticals, Inc; 2017
3. Aerie Pharmaceuticals Press Release. 3/12/18.

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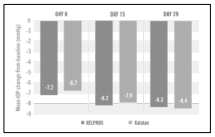
Latanoprost 0.005% (Xelpros)

- Ophthalmic emulsion
- BAK Free, Preserved with Potassium Sorbate
- Delivered with LIPIXELLE, a novel micelle micro-emulsion formulation
- Fixed prices
  - 1-monthy for $55
  - 3 month for $110
- Name brand to avoid generics
- Mean IOP-lowering effect was up to 6-8 mmHg in pts with mean baseline 23-26 mmHg



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CASE Ex.

- 56-year-old male
- First examination in several years; wants reading glasses
- Medical history of asthma, uses inhaler
- No significant ocular history, but positive family history of glaucoma
- Slit-lamp examination is unremarkable; gonioscopy shows open angles
- IOP: 28 mm Hg OD and 21 mm Hg OS
- CCT: 571/585 µm

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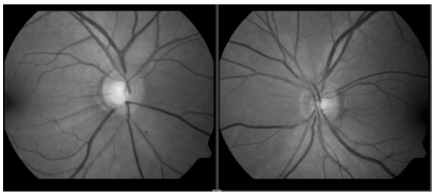
Optic Disc Photos



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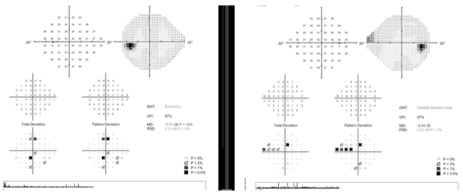
Visual Fields



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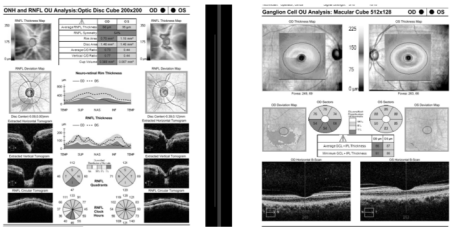
OCT RNFL and Ganglion Cell



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Discussion

- What is the diagnosis?
- What are the significant risk factors?
- Are other tests required?
- What is the target IOP?
- What are the treatment options?
- What is the role of trabecular meshwork outflow in glaucoma?
- What is the follow-up?

45

Case Outcome

- Treatment
  - LBN 0.024%, qhs OU
- Response to treatment
  - IOP @ 4 weeks: 18 mm Hg OD, 15 mm Hg OS
  - Patient denied any side effects
- Follow-up
  - Next follow-up scheduled in 2 to 3 months
  - Close monitoring of OD is recommended
    - Next visual field in 6 months

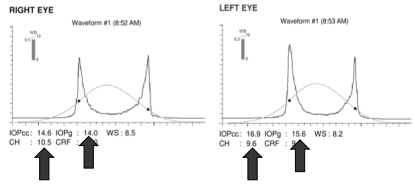
46

Case #2

- 64-year-old female NTG x 4 yrs on latanoprost qhs OU
- Cupping OS > OD
- IOP range: 16 to 19 mm Hg OD and OS (2 visits)
- Denies history of migraines, Raynaud syndrome, or OSA
- No systemic medications; BP: 115/76 mm Hg
- FDT screening VF shows possible defect
- CCT: 537/541 µm
- Tmax 21/20

47

Corneal Hysteresis: Average/Normal



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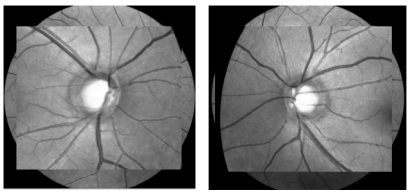
Disc Photographs



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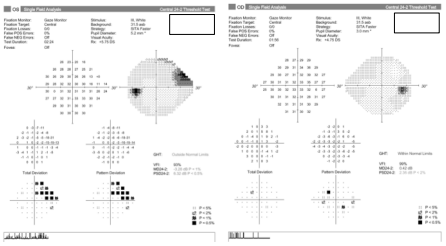

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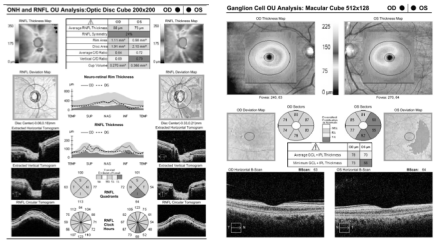

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Discussion

- What glaucoma medications are initially used when IOP is in the normal range?
- Are any of these preferred?
- What evidence is there to support a preferred treatment approach?
- What is the treatment goal (target)?
- What about the blood pressure component?
- Target IOP?

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Glaucoma With Normal IOP: NTG vs POAG

- These are not really different conditions
- "NTG" accounts for 30% to 50% of all open-angle glaucoma
- Should have confirmatory and correlating ONH, OCT, and VF loss
  - Not just a "large C/D" or cupping
- CCT (pachymetry) is in normal range
- Always question what is the out-of-office IOP or IOP fluctuation
  - Multiple IOP measures
- Consider that up to 50% of patients with NTG do not show long-term progression
  - Do not overtreat

53

Case Outcome

- Treatment
  - Continue latanoprost qhs OU
  - Add netarsudil qhs OU
- Response to treatment
  - IOP @ 4 weeks: 14 mm Hg OD and 15 mm Hg OS
  - Well tolerated
- Follow-up
  - 3 months

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Case #3

- CC: vision cloudy OS>OD
- HPI: 68 yo WM presents for cataract evaluation with h/o controlled moderate OAG OS>OD
- Current meds: Levobunolol QD OU, Travataprost qhs OU, Optive
- POHx: SLT OU 2007
- FamHx: mother with glaucoma

55

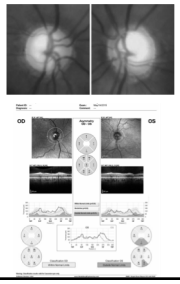
Case Presentation

- BCVA : 20/40 OD, 20/50 OS
- Present Rx: OD -0.50+1.00 x 075 OS -1.00 +0.75 x 110
- Keratometry: OD 43.67/44.00 x 055 OS 43.25/44.37 x 85
- IOP: OD 14, OS 14 (GAT)
- CCT: OD 527, OS 512
- CH: 9.4/9.6
- Tmax: OD 20; OS 24
- Gonioscopy: OU open to scleral spur
- SLE 2+ NS OU

56

Case Presentation

- Dilated Fundus Exam:
- Optic Nerve:
  CDR OD: vert 0.55 horiz 0.5
  (thin rim infer/sup)
  CDR OS: vert 0.7 horiz 0.65
- Macula: OU Flat
- Vessels: WNL
- Periphery: WNL



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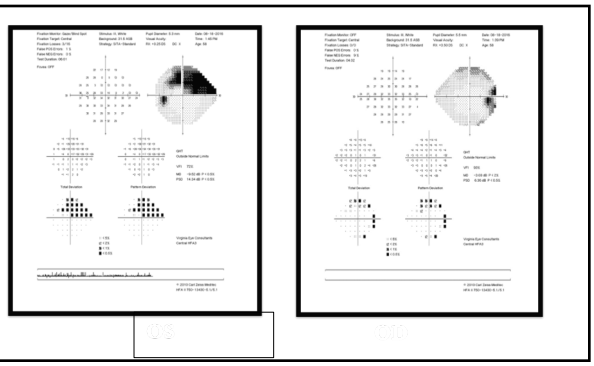

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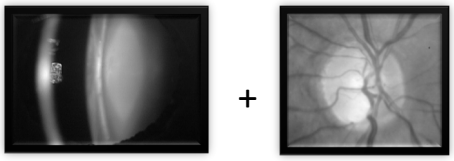
What Do You Get When You Add?



+

= Great Candidate for MIGS/PHACO

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Case Presentation

- Diagnosis: VS Cataract OU, Controlled Glaucoma
- Type of Glaucoma: open angle glaucoma
  - Stage of Glaucoma: **Moderate to severe OS>OD**
  - What is the Tmax? 20/24
  - What is the target pressure? **Low teens OU**
  - What is best surgical option?
    - **Phaco alone**
    - **Phaco / MIGs**
    - **Phaco / Trab or Tube**

60

How Do Patients Feel about their Drop Usage?

- 68 glaucoma pts
- 54% stated their drops were expensive
- 72% were suffering from side effects
- 91% said medical therapy represented minimal/no inconvenience
- 82% were interested in learning about procedures that could reduce or possible eliminate their need for drops
- 63% would be interested in participating in FDA clinical trials

VEC Internal Survey

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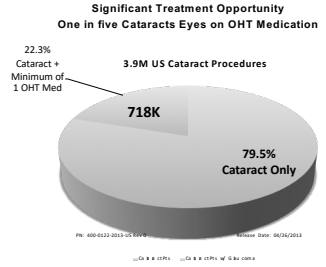
Concomitant Cataract & Glaucoma Patients - US



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QUALITY-OF-LIFE ISSUES

- Improved quality of vision
- Less dependence on glasses / contact lenses
- Patients now
  - More demanding
  - More knowledgeable
  - More sophisticated
  - More informed

Patients looking for better outcomes and quality of life - your practice can offer this!

63

Cataract and Glaucoma

- IOP options??
- How to position the cataract operation in the management scheme of the patient's glaucoma condition?
- Is it better to choose one sequence and type of surgery before the other, or to combine two procedures?
- STRESS the IMPORTANCE of visual fields PRIOR to cataract surgery

64

IOL Choices in Glaucoma

"Yes – I would like to be free from glasses!"

STANDARD

TORIC

MULTIFOCAL

65

The Effects of Phacoemulsification on Intraocular Pressure and Topical Medication Use in Patients With Glaucoma

- A 12%, 14%, 15%, and 9% reduction in IOP from baseline occurred 6, 12, 24, and 36 months after phacoemulsification
- A mean reduction of 0.57, 0.47, 0.38, and 0.16 medications per patient of glaucoma medication occurred 6, 12, 24, and 36 months after phacoemulsification

*3 year data analysis

Armstrong, JJ, Wasiuta, T, and Kiatos, E. et al. Journal of Glaucoma: Post Author Corrections: March 22, 2017

66

Ab interno canaloplasty (ABiC)

Indications:

- POAG
- Other indications:
  - pigmentary glaucoma
  - pseudoexfoliation glaucoma
  - steroid –induced glaucoma
  - s/p SLT and ALT
- Contraindications
  - NVG
  - chronic angle closure
  - angle recession glaucoma

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Ab Interno Canaloplasty (ABiC)

- Provides dilation of:
  - TM
  - Schlemm's Canal
  - Collector channels
- Viscoelastic used to perform dilation
  - No tensioning suture or conjunctival dissection/scleral flap as in *Ab externo* approach
- Combined with phaco or standalone
- Atraumatic, allows for other future MIGS options and/or SLT
- 360 degree approach → addresses all areas of blockage or reduced outflow

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ABiC Video

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ABiC Efficacy[1]

- Combined cohort (n = 228)
- Average IOP reduction 30%, average reduction in medication use 50% at 12 months
  - ABiC + phaco (n = 130) – 23% IOP reduction, 50% fewer medications
  - Standalone (n = 98) – 37% IOP reduction, 67% fewer medications
  - NOTE: lower baseline IOP with phaco, both cohorts with final 1 year IOP of 13 mmHg
- Results similar to previous canaloplasty studies

1. Ellex Science. Ab-Interno Canaloplasty – The Minimally Invasive Glaucoma Surgery That Keeps Its Promise. White Paper. 2016. https://www.ellex.com/uploads/Resources/Files/Ellex-ABiC-Whitepaper-12-Months.pdf

70

One Month PO

- BCVA: OD 20/20 OS 20/25-
- AC: deep and quiet
- PCIOL Centered
- IOP: 13 OU
- Continue to monitor, no topical glaucoma medications
- f/u 3-4 months IOP check, OCT -G

71

These and More Glaucoma Educational Surgical Videos Found at iGlaucoma YouTube Channel

THANK YOU!

72

According to Fechtner, What is the Prevalence of Ocular Surface Complaints in Patients with Glaucoma?

- 28%
- 38%
- 48%
- 58%

Fechtner, RD, Godfrey DG, Budenz D, et al. Prevalence of ocular surface complaints in patients with glaucoma using topical intraocular pressure-lowering medications. Cornea. 2010;29:618-621

73

According to Fechtner, What is the Prevalence of Ocular Surface Complaints in Patients with Glaucoma?

- ~~28%~~
- ~~38%~~
- **48%**
- ~~58%~~

Fechtner, RD, Godfrey DG, Budenz D, et al. Prevalence of ocular surface complaints in patients with glaucoma using topical intraocular pressure-lowering medications. Cornea. 2010;29:618-621

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Glaucoma Considerations

- Glaucoma medications significantly elevate the risk and progression of MGD[1]
- Preservative and dry eye[2]

1. Arita R, Itoh K, Maeda S, et al. Comparison of the long-term effects of various topical antiglaucoma medications on meibomian glands. Cornea. 2012 Nov 31(11): 1229-34.
2. Baudouin, C, Labbe, A, Liang, H, et. Al Preservatives in eyedrops: The good, the bad and the ugly, Progress in Retinal and Eye Research, Volume 29, Issue 4, July 2010, Pages 312-334

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Case #4 - 76YOWF – Present for follow up for Glaucoma and dry eye disease

- Compliant with drops OU. Vision has been blurry and eyes irritated more in the past few months
  - Previous treated with topical azithromycin
  - Current Ocular Meds: Restasis BID OU, latanoprost qhs OU
  - Numerous systemic meds including singulair, synthroid
- SPEED Score: 25
- Tear Osmolarity 308 / 315
- SLE: 2+ MGD OD / 3+ MGD OS / 1+ SPK OU
  - Cloud secretions OU
  - MG Structure: See images
- IOP: 14/13

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Early to Moderate Structural Changes to Meibomian Glands

Advanced Gland Atrophy / Dropout

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Post Treatment

6 Weeks Post Treatment

- Post Tx Osmolarity
  - 300/299
- Post Lipiflow Management
  - Heat masks qhs OU
  - Hydroeye as directed
  - Restasis BID OU
  - Lipid based tear BID OU
  - Latanoprost qhs OU
  - F/u 3 months dry eye
    - Order tear osmolarity
    - Order inflammadry
    - SPEED Questionnaire

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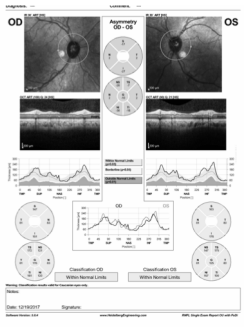
Case Example #5 – 4

Initial encounter: 12-2017

- IOP
- C/D
- Pachymetry
  *Post LASIK
- + FHx
- OCT
- VF
- Open Angles OU



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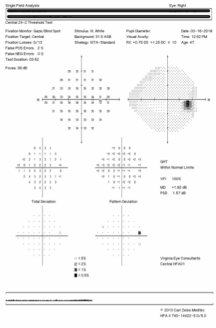
Second encounter: 03-

- IOP 24→
- C/D 0.35
- Pachymetry 505
- OCT Fun
- VF **No s**
- Open Angles



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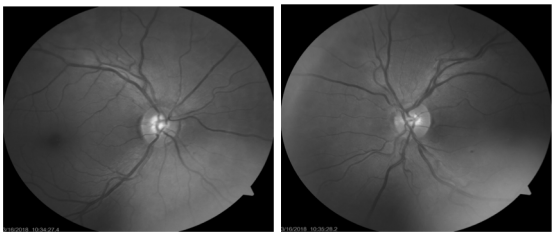
03-2018

OD OS



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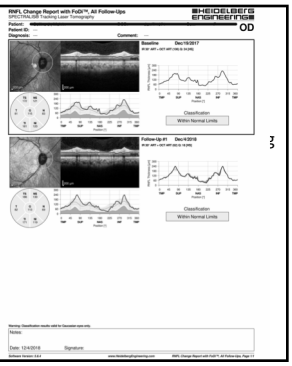
Third encounter: 12-2018



- IOP 24→18
- C/D 0.35→
- **OCT** **positiv**
- VF Not do
- Open Angles
- **Corneal Hysteresis** **8.9**
- **Target IOP** **15 or b**

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Glaucoma 5-Year Risk Calculator

FACTORS							
Age 48	RIGHT EYE MEASUREMENTS			LEFT EYE MEASUREMENTS			
	1st	2nd	3rd	1st	2nd	3rd
Untreated Intraocular Pressure (mm Hg)	22	24	18	20	20	17
Central Corneal Thickness (microns)	505	505	505	500	500	500
Vertical Cup to Disc Ratio by Contour	0.35			0.25		
Pattern Standard Deviation: Humphrey (dB) / Octopus loss variance (dB)	1.5	2.6		1.7	1.1	

Print Reset 12.7% The patient's estimated 5-year risk (%) of developing glaucoma in at least one eye.

https://ohts.wustl.edu/risk/

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Fourth encounter: 01-2019

	OD	OS
• IOP mmHg	18→21→**13** mmHg	17→13→**10**
• C/D	0.5	0.3
• OCT	Fundus photos today	
• VF	Not done at this visit	
• Corneal Hysteresis	8.9	9.7
• Target IOP	15 or below	11 or below

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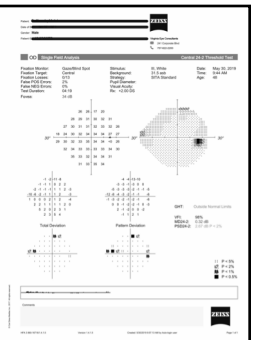
Fifth encounter: 05-2019

	OD
• IOP mmHg	21→13→**16**
• OCT	Not done at
• VF	**SUP-NAS def**
• Corneal Hysteresis	8.9
• Target IOP	15 or below



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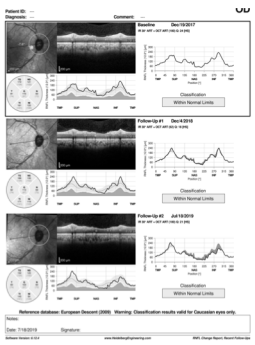
Sixth encounter: 07-2019

	OD
• IOP mmHg	21→13→
• OCT	
• VF	SUP-NAS
• **Corneal Hysteresis**	**8.9 → 9.5**
• Target IOP	15 or belo



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SLT vs. Another drop?

- SLT results in a 6.9–35.9% intraocular pressure (IOP) reduction. Complications are rare.
- Expected IOP reduction: 20-30%
- 80-90% effective at one year
- 30-50% effective at five years

Alvarado et. al Proposed Protocol:

- If patient is not using glaucoma drops, test response with PGA, if successful, proceed with SLT
- If patient is already on PGA, discontinue PGA for 1 month. If IOP increases, expect SLT to work.

PGA and SLT trabeculoplasty have competitive mechanism of action

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Selective laser trabeculoplasty versus medical therapy as initial treatment of glaucoma: a prospective, randomized trial.

- RESULTS: 54 patients reaching 9 to 12-months follow-up.
  - SLT (29 pts)
    - Baseline IOP 24.5 mm Hg
    - Mean IOP at follow up 18.2 mm Hg
  - Med (25 pts)
    - Baseline IOP 24.7 mm Hg
    - Mean IOP at follow up 17.7 mm Hg
  - SLT group -> 11% of eyes required additional SLT
  - Prostaglandin group -> 27% of eyes required additional medication

L., Steinmann, W., Kabir, A. J Glaucoma. 2012 Sep;21(7):460-8.

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Selective Laser Trabeculoplasty

- IOP decrease after SLT
  - Primary Therapy - 28.7%
  - Adjunctive therapy – 19.4%
  - SLT Retreatment – 12.1%

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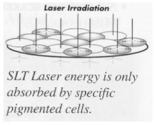
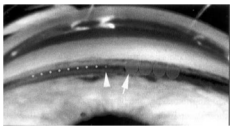
Advantages of SLT vs ALT

- SLT has the potential for repeat procedures
- SLT lacks thermal damage/scaring to the TM
- SLT has less post-operative pain and inflammation





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Glaucoma: Laser Treatment

Table 1: Mean IOP over time.

Time	SLT	ALT	p-value
Pre-op	23.8±4.9 (89)	23.5±4.2 (87)	0.6014
1 year	17.9±4.8 (78)	17.8±3.9 (75)	0.8906
2 years	18.4±6.7 (79)	18.3±4.1 (71)	0.8921
3 years	17.0±6.0 (75)	17.6±4.1 (67)	0.4929
4 years	16.5±6.0 (72)	17.1±3.5 (62)	0.4371
5 years	15.9±5.2 (64)	16.9±5.8 (56)	0.2981

All figures are given as a mean±SD (n).

Five years post-treatment, the mean IOP decrease for the SLT group was **7.4±7.3 mmHg** and **6.7±6.6 mmHg** for the ALT group.

Table 2: Additional interventions required during follow-up.

	SLT	ALT
Ahmed valve	2	0
ALT	5	10
SLT	17	7
Trabeculectomy + MMC	14	15
CE/IOL/Trabeculectomy + MMC	10	1
Diode Cyclophotocoagulation	1	0
Total	**49**	**33**

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Conclusion

- Consider SLT as first line
- Consider new medications targeting TM outflow
- Cataract + Glaucoma = MIGS
- Consider OSD in all glaucoma patients

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