



## Case Files In Glaucoma

Jessica Steen, O.D., F.A.A.O.  
Eric Schmidt, O.D., F.A.A.O.



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### JESSICA STEEN OD FINANCIAL DISCLOSURES

- Speakers Bureau-Carl Zeiss Meditec, Bausch and Lomb, Viartis, Thea Pharma, Alcon, Allergan, Astellas, Dompé
- Consultant-Bausch and Lomb, Balance Ophthalmics, Carl Zeiss Meditec, Opus Genetics, Viartis, Allergan, Astellas, Alcon, Radius XR, iCare, Glaukos, Eyenovia, Tarsus, Orasis, Topcon, Envision Health Technologies, LKC
- Shareholder-Clearside Biomedical, Annexon Bio (<0.01% ownership)
- All relevant relationships have been mitigated

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### DISCLOSURES FOR DR SCHMIDT

- Dr Schmidt is a consultant or advisor for the following:
  - Tarsus
  - Allergan
  - B&L
  - Tempoform Pharmaceuticals
  - Topcon
  - Orasis
  - Glaukos
  - Sun Pharmaceuticals
  - Thea Pharmaceuticals
  - Sight Science
  - Alcon
  - Apellis
  - Syneos
  - Vista
  - Harrow Pharmaceuticals
  - Lenz Therapeutics
- All relevant financial relationships have been mitigated

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### 64 year old female

Diagnosed with POAG in her 30s with disease progression until IOP within 7-9mmHg range

Netarsudil-latanoprost QHS OU, dorzolamide-timolol BID OU

CCT 477µm OD 495µm OS

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### Is Corneal Thickness an Independent Risk Factor for Glaucoma?

Felipe A. Medeiros, M.D., Ph.D. and Robert N. Weinreb, M.D.  
Hamilton Glaucoma Center, University of California San Diego, La Jolla, CA

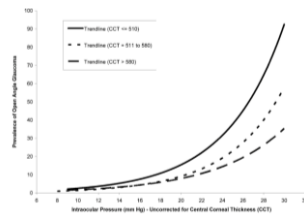
*Ophthalmology*. 2012 March ; 119(3) : doi:10.1016/j.ophtha.2012.01.018.

In conclusion, the results of Brandt et al suggest that the use of CCT correction formulas for GAT measurements is probably of little value in clinical practice. Instead of attempting to use these formulas, clinicians are probably better off incorporating risk information as provided by validated predictive models for glaucoma development.<sup>5,7</sup> However, the conclusion that CCT is a true independent risk factor for glaucoma is not validated at this time and requires further investigations.

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### Intraocular Pressure, Central Corneal Thickness, and Prevalence of Open-Angle Glaucoma: The Los Angeles Latino Eye Study

Brian A. Francis, MD, MS<sup>1</sup>, Rohit Varma, MD, MPH<sup>1,2</sup>, Vikas Chopra, MD<sup>1</sup>, Mei-Ying Lai, MS<sup>2</sup>, Corina Shtir, MS<sup>2</sup>, Stanley P. Azen, PhD<sup>2</sup>, and Los Angeles Latino Eye Study Group<sup>3</sup>  
*Am J Ophthalmol*. 2008 November ; 146(5): 741-746. doi:10.1016/j.ajo.2008.05.048.



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**Decoding the Cornea-Glaucoma Association: Evidence From Mendelian Randomization**

Victor A. de Vries,<sup>1,2</sup> Anita Szabo,<sup>3</sup> Joëlle E. Vergroesen,<sup>1,2</sup> Siyin Liu,<sup>3,4</sup> Karin A. van Garderen,<sup>1,2</sup> Kirithika Muthusamy,<sup>4</sup> Petra Liskova,<sup>5</sup> Lubica Dudakova,<sup>5</sup> Anthony P. Khawaja,<sup>6</sup> Stephen J. Tuft,<sup>3,4</sup> Caroline C. W. Klaver,<sup>1,2,7,8</sup> Alice E. Davidson,<sup>3,4</sup> and Wishal D. Ramdas<sup>1</sup>

**CONCLUSIONS.** We found no evidence for a causal link between CCT and OAG. Nevertheless, CCT measurements are still valuable for population-based risk stratification. We found no clear relationship between FECD and OAG.

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**64 year old female**

**Recently underwent lower lid blepharoplasty**

**Reports ongoing left ocular irritation > 6 weeks post-operatively**

**Surgeon suggested discontinuing dorzolamide-timolol**

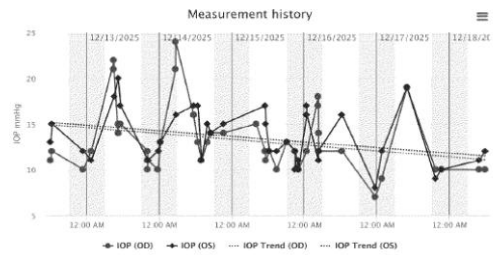
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**64 year old female**

**IOP 11 mmHg OD and OS (netarsudil-latanoprost QHS OU)**

**Advocate for SLT...anticipated effect?**

**iCare Home2**



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**64 year old female**

**Now what?!**

**Restart dorzolamide-timolol BID OU; SLT OU**

**Looking ahead...**

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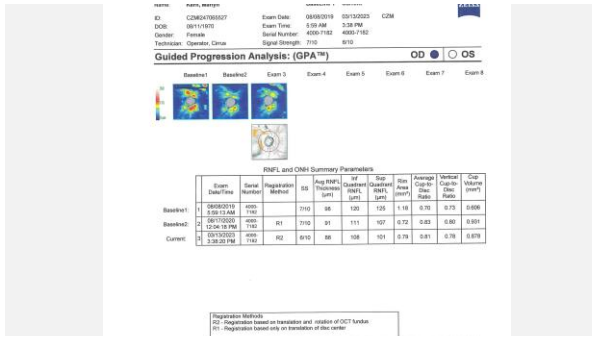
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**WHAT THE FACE!!!!**

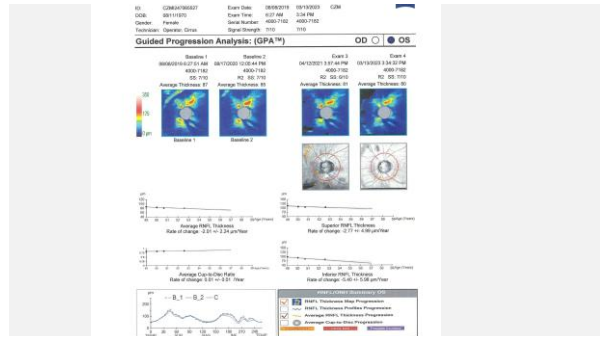
- 46 y/o WF
- No complaints
- Post Lasik x 12 yrs- stable RE
- Referred because of suspicious disks (by a new eye doctor)



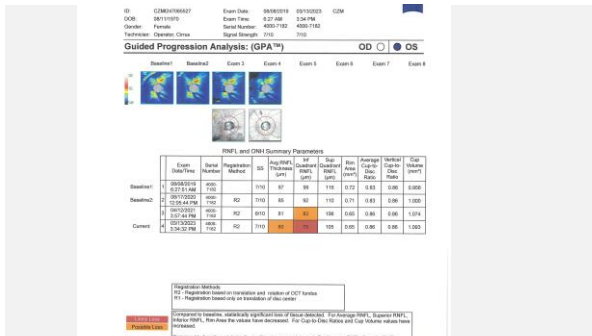




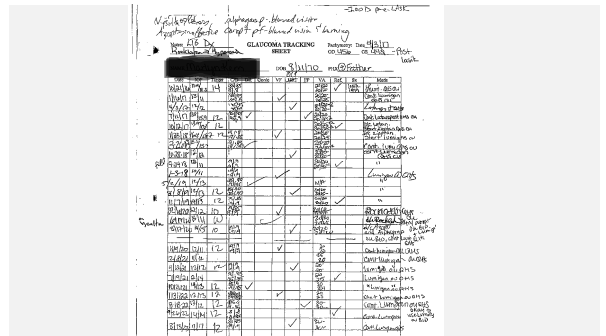
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## IS SHE REALLY STABLE?

- Look at the VF
- Look at the OCT Progression Analysis
- Look at the IOP variability
- How can you maintain a stable and (very) low IOP?

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## 57 year old female

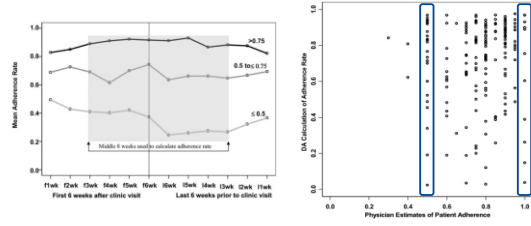
**Peak untreated IOP 21 mmHg OD 26 mmHg OS**

**Transferred care for 5 years; returned taking latanoprost QHS OU...misses about 2 night per week due to irritation**

**“Do I have glaucoma?”**  
**“Do I need to keep taking these eyedrops?”**

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### Adherence during known monitoring



Kohler CO, Goughy HA, Jampel HD, Ying GL, Pyley RL, Zang Y, Friedman DS. Adherence with topical glaucoma medication monitored electronically. The Transcat Dosing Aid Study. Ophthalmology. 2009 Feb;116(2):391-9.

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### Sustained delivery options

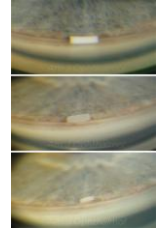
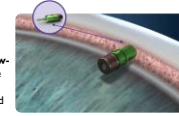
**Bimatoprost implant 10mcg** Equivalent to about 2-3 drops of bimatoprost 0.01%  
Drug release complete in 3-4 months

197 eyes, 94.9% pseudophakic; 41.6% prior SLT, mean age 80.4  
Effect approximately 1 year; reduction in medication use  
16.9% underwent SLT within first 12 months

**Travoprost titanium implant**  
FDA approved December 14, 2023  
Not refillable

36 month data: 70% (fast-release) and 68% (slow-release) fewer or same medications as baseline

Mean IOP reduction: 8.3mmHg (fast-release) and 8.5mmHg (slow-release)



Tompson LC, Crane DR, Nguyen L, Waters T. Real-World Study of the Efficacy and Safety of Transcatheter Bimatoprost Implant in a Clinical Setting in the United States. Clin. Ophthalmol. 2023 Apr;17(4):597-604. doi: 10.54001/co.2022.118.0119. Epub 2023 Apr 14. PMID: 37011111. [PubMed] [Google Scholar]

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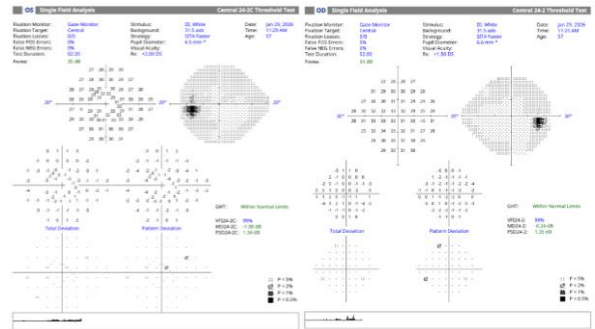
### “Do I really need to use these eyedrops?”

In office: 16mmHg OD and 17mmHg OS  
CCT 555 μm OD 562 μm OS

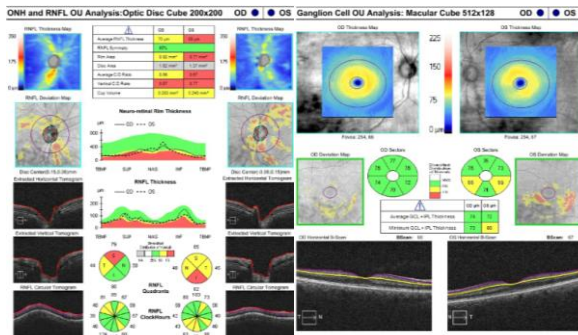
Medication holiday

IOP 21mmHg OD and 22mmHg OS

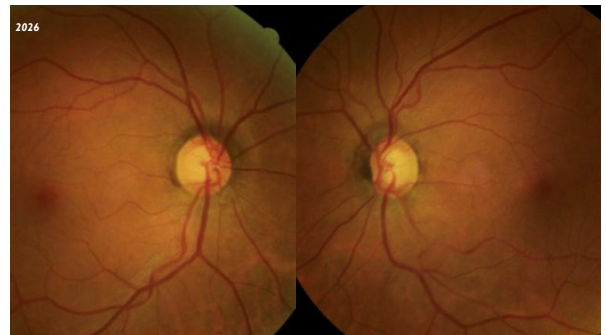
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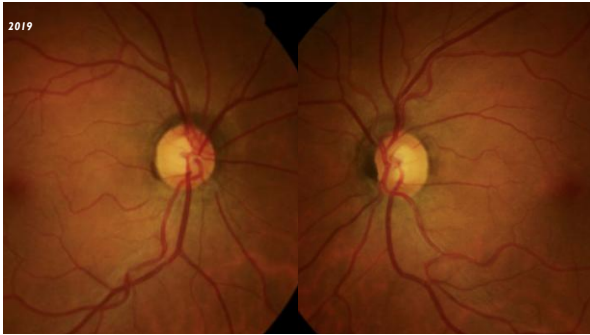
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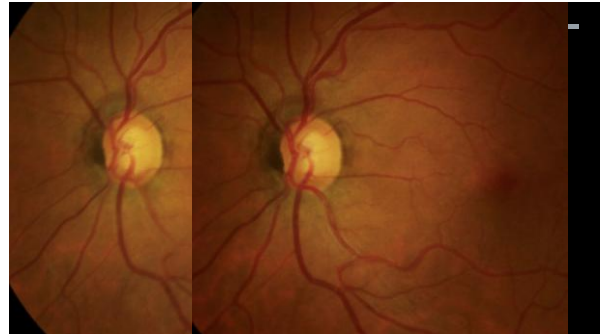
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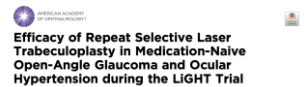
57 year old female

Primary open angle glaucoma, left eye

Treatment options?

Primary SLT? Latanoprost 0.005% (BAK-preserved, preservative-free)

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Efficacy of Repeat Selective Laser Trabeculoplasty in Medication-Naive Open-Angle Glaucoma and Ocular Hypertension during the LiGHT Trial

Selective laser trabeculoplasty versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHT): a multicentre randomised controlled trial

Gus Gazzard, Eugenia Konstantakopoulou, David Garway-Heath, Anung Garg, Victoria Vickerstaff, Rachael Hunter, Gareth Ambler, Catoy Bunce, Richard Wormald, Neil Nathwani, Keith Barton, Gary Rubin, Marta Buzzevicz, on behalf of the LiGHT Trial Study Group\*

No game-changing data; But did provide good quality evidence for what was already known

SLT: at target 93% of visits, 91.3% in the medication group (3 years) What happens if one eye is drop-free, but the other isn't?

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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

Conclusions: Selective laser trabeculoplasty is a safe treatment for OAG and OHT, providing better long-term disease control than initial drop therapy, with reduced need for incisional glaucoma and cataract surgery over 6 years. Ophthalmology 2023;130:139-151 © 2022 by the American Academy of Ophthalmology. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

No difference in health-related quality of life scores: mobility, self-care, usual activities, pain or discomfort.

Minimal difference in Glaucoma Symptom Scale-did not translate to difference in HRQoL

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ARTICLE IN PRESS



Six-Year Rate of Visual Field Progression in the Laser in Glaucoma and Ocular Hypertension Trial

Giovanni Montezano, MD, PhD,<sup>1,2</sup> David P. Crabb, PhD,<sup>2</sup> David F. Garway-Heath, MD, FRCOphth,<sup>1</sup> David M. Wright, PhD,<sup>2</sup> Eugenia Konstantakopoulou, PhD,<sup>1,2</sup> Neil Nathwani, BSc (Hons), DpT(PP),<sup>1</sup> Giovanni Onetto, PhD,<sup>1,2</sup> Gus Gazzard, MD, FRCOphth

Results: Data from 710 eyes (482 with OAG and 354 in the SLT-first arm) were analyzed. The 2 arms had similar baseline MD (P = 0.7). The average intraocular pressure (IOP) during follow-up was 16.1 [14.2–18.2] for the drops-first arm and 16.8 [14.6–18.6] in the SLT-first arm [median [interquartile range], P = 0.057]. The mean [95% credible interval] MD rate was -0.37 [-0.49 to -0.31] decibels (dB)/year in the drops-first arm and -0.26 [-0.31 to -0.21] dB/year in the SLT-first arm (P = 0.007). When stratified by severity, this difference was significant only in mild OAG (P = 0.035; the largest sub-group). The secondary analysis largely confirmed the main results. The difference in MPD rate was also significantly slower in the SLT-first arm (P < 0.001).

26% of med-first eyes were fast-progressors vs. 15% in SLT-first

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JAMA Ophthalmology | Original Investigation

### Selective Laser Trabeculoplasty After Medical Treatment for Glaucoma or Ocular Hypertension

Eugenia Konstantakopoulou, PhD; Gus Gazzard, MA, MD, MBBChir; David Garway-Heath, MD; Mariam Adeleke, PhD; Gareth Ambler, PhD; Victoria Vickerstaff, PhD; Catey Bunce, DSc; Neil Nathwani, BSc; Keith Barton, MD; for the LIGHT Trial Study Group

**Patients were randomized to SLT or medication first (LiGHT)-then after 3 years patients were allowed to have secondary SLT (to reduce medication load) or to escalate therapy if needed**

**65% of 320 taking drops chose to continue medical therapy!**

**Patients “trust” eyedrops and prefer non-procedures—even though they don’t take them as much as we would like...**

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### 57 year old female

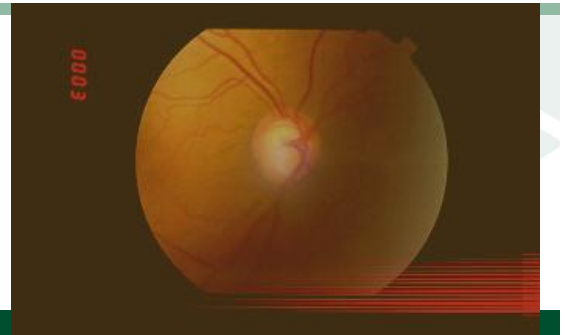
**Opts for preservative-free latanoprost 0.005%**

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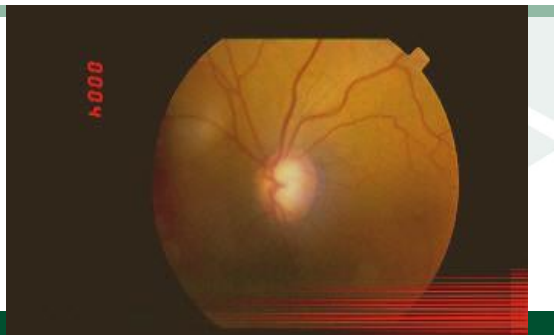
### Case 2 - A Tough Inheritance

- 62 y/o BF, (+) fam hx- treated for POAG for 6 years
- VA 20/20 OD, 20/20 OS
- Pachs – OD 490, OS 495
- No systemic meds
- IOP maintained around 18 OU on Lumigan QHS, AlphaganP OU TID, T1/2 OU BID
- Initial IOP 28 OD, 29OS
- Condition was stable but px developed hypersensitivity (After patient was switched to Brimonidine 0.15%)
- IOP 22 OU on Lumigan only

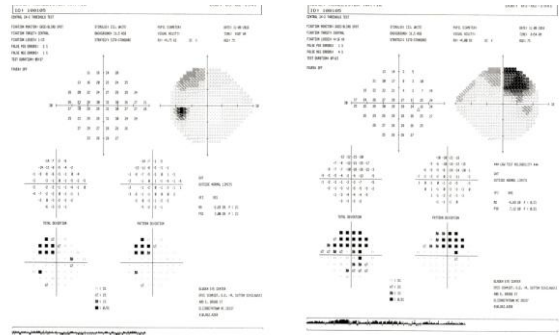
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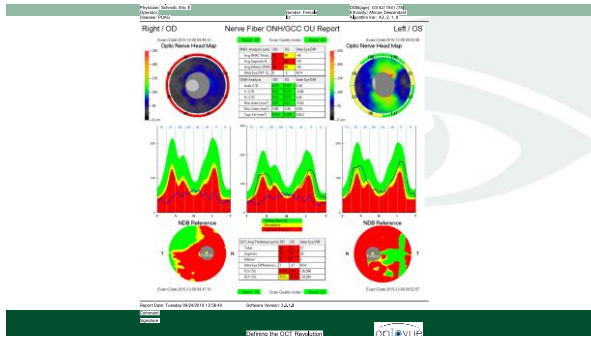
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### Attendance Question

- What is the target IOP?
  - 1. ~18
  - 2. ~15
  - 3. ~12

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### What would you recommend?

- 1. Switch to Rocklatan
- 2. SLT OU 180
- 3. Add Azopt OU BID
- 4. add Timoptic ½ OU BID
- 5. Trabeculectomy
- 6. d/c Lumigan, try Travatan Z OU QHS
- 7. Cosopt OU BID
- 8. Combigan OU BID

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### SLT OU IOP 19 OD, 20 OS

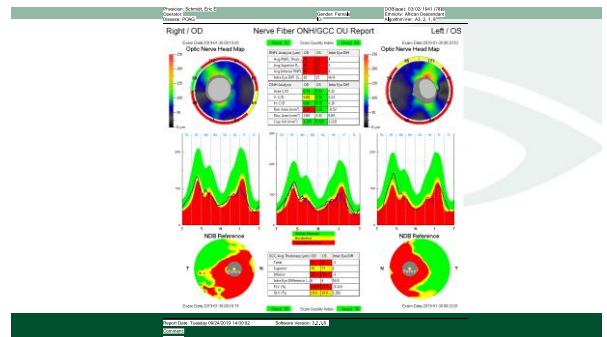
- What would you do now?

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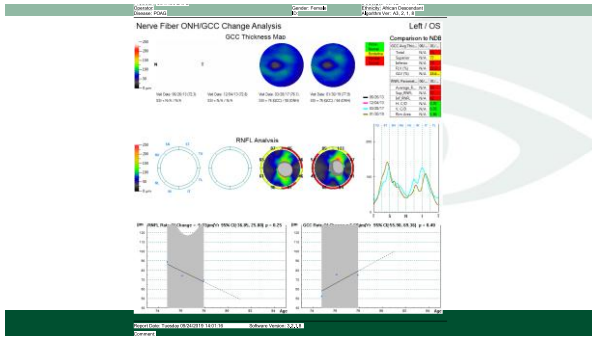
### How Do You Know if the IOP needs to be lower?

- What are the risk factors for progression?
  - Age
  - IOP at diagnosis
  - Neuroretinal rim tissue
  - Disk hemes
  - Corneal hysteresis
- Is she progressing?

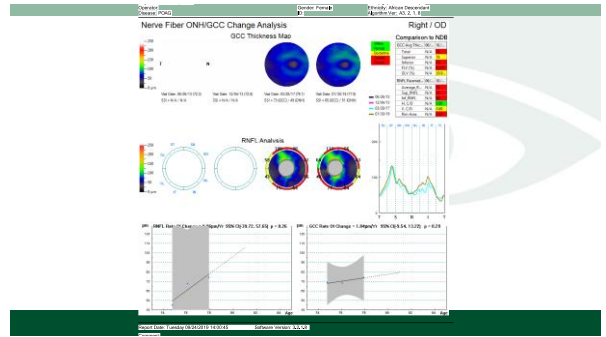
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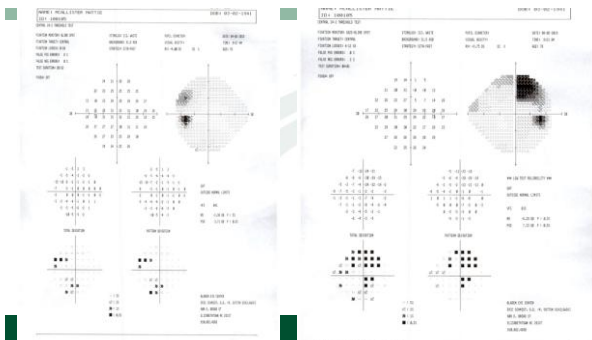
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## So Let's Talk About Compliance

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## Adherence to IOP-Lowering Therapy

**A complex and multifaceted problem<sup>1,2</sup>**

- Includes both persistence and compliance issues

**Factors related to adherence<sup>1-3</sup>**

- Problems tolerating therapy
- Safety issues
- Inadequate efficacy
- Convenience factors, eg, access, cost, dosing
- Patient/situational factors, eg:
  - Competing activities
  - Forgetfulness
  - Poor disease knowledge and health literacy

Over 3 months in a study of 196 patients with glaucoma taking an IOP-lowering medication in one or both eyes<sup>4,5</sup>

44% took fewer than 70% of their prescribed drops

Despite instruction, these medications, once-daily administration, use of a dosing aid, and electronic monitoring of adherence

IOP=Intraocular pressure.

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## Predictors of Poor Adherence – Friedman 2019

- Gaps In Visits
- Patients Don't Understand Severity Of Disease
- Cost of Drops (25%)
- Those who Travel A Lot
- Younger Pxs and Very Old Pxs
- African-Americans
- Those In Poor Health
  - These drop adherence to <60%

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## Ways To Improve Compliance

- See Pxs more frequently... especially early in treatment
  - Improve tracking system – better identify no shows
  - Call/email appointment reminders
  - Reminders to pxs to take their drops
  - Change Dr/Patient intervention
- G pxs ask 3.2 questions at visit whereas in other chronic diseases pxs ask ~ 6 questions/visit

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## Choosing Therapy: Switch or Add?

- Target IOP should be reached with minimal number of medications
- Build strongest foundation prior to adjunctive therapy
- Switching to a more effective medication may be best course of action
- Differences within medication classes exist
- Potential benefits of monotherapy
  - Improved patient compliance
  - Decreased cost
  - Reduced cumulative exposure to benzalkonium chloride

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## Estimating the Lead Time Gained by Optical Coherence Tomography in Detecting Glaucoma before Development of Visual Field Defects

Tammy M. Kaang, MD,<sup>1,2,3</sup> Chunwei Zhang, MD,<sup>1,6</sup> Linda M. Zangwill, PhD,<sup>1</sup> Robert N. Weinreb, MD,<sup>1</sup>  
Fajde A. Medeiros, MD, PhD<sup>7</sup>

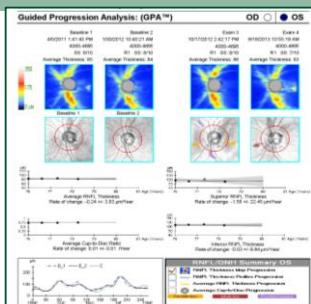
- At 95% specificity, up to 35% of eyes had abnormal average RNFL thickness 4 years before development of visual field loss and 19% of eyes had abnormal results 8 years before field loss.
- **Conclusions:** Assessment of RNFL thickness with OCT was able to detect glaucomatous damage before the appearance of VF defects on SAP. In many subjects, significantly large lead times were seen when applying OCT as an ancillary diagnostic tool.

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## So using an OCT; How do we tell if they are getting worse?

- Progression Analysis Software!!!!!!

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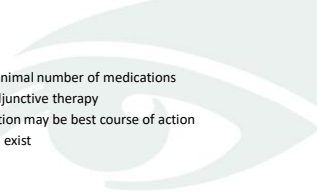
## A NEW LOOK AT GLAUCOMA PROGRESSION

- WHY DO SOME PATIENTS PROGRESS AND SOME DON'T?
- WHY DO SOME PROGRESS AT A FASTER RATE?

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### Choosing Therapy: Switch or Add?

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- Build strongest foundation prior to adjunctive therapy
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- Differences within medication classes exist
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  - Reduced cumulative exposure to benzalkonium chloride



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### 67 year old female



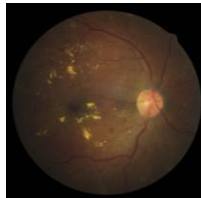
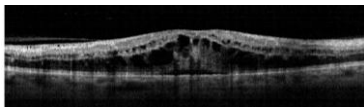
#### What changed?

- Multiple IVI (approximately 6-9 per year) between 2014 and 2016 for macular edema secondary to CRVO
- Bevacizumab, dexamethasone intravitreal implant 0.7mg

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### HOW COULD IVI AND VITRECTOMY CAUSE ELEVATED IOP?!

- Widening indications for vitrectomy
- Anti-VEGF injections are the cornerstone of medical retinal treatment
- Long and short term IOP rise possible
- Development of OAG & progression of OAG



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### SHORT TERM

- We tend to think about the greatest risk of IVI to be endophthalmitis (1/2659)
- Immediately after injection: IOP rise to up to **87mmHg**
  - Most patients increase approximately 20mmHg-35mmHg
  - Do most surgeons measure IOP after injections?
- How does this happen?!
  - Increased intravitreal volume
  - 4-4.4mL average volume; most injections 0.05mL; FDA-approved GA therapeutics 0.1mL

E. Y. Hsu, J. E. Kim, A. Mantravadi: Intraocular Pressure Changes Following Intravitreal Injections in the Office. Invest. Ophthalmol. Vis. Sci. 2007;48(1):9-20.

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CJO  
JCO

Original Article

### Transient vision and intraocular pressure changes following anti-vascular endothelial growth factor injection

Khalid Abbas,<sup>1,2</sup> Amy Bailous,<sup>1,2</sup> Julie Duncan,<sup>1</sup> Thomas Sheidow,<sup>1,2</sup> Philip Hooper,<sup>1,2</sup> John Gonder<sup>1</sup>

At 1 minute after intravitreal injection (IVI), VA worsened significantly from a baseline of  $0.29 \pm 0.21$  to  $0.76 \pm 0.65$  logMAR ( $p < 0.001$ ), while IOP rose from  $14.34 \pm 4.39$  mm Hg to  $54.53 \pm 20.21$  mm Hg ( $p < 0.001$ ). VA progressively improved over time, with 43% of eyes returning to baseline at 1 minute, 67% at 10 minutes, 83% at 20 minutes, and 89% at 30 minutes. The Spearman correlation coefficient for VA and IOP was statistically significant at 1-minute follow-up after IVI at 0.244 ( $p = 0.014$ ) but not at later follow-ups. Eyes returning to baseline VA at 1 minute exhibited lower IOP than those not at baseline ( $p = 0.0004$ ). Logistic regression revealed no significant predictors of delayed VA recovery.

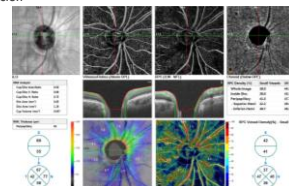
201514

Abbas K, Bailous A, Duncan J, Sheidow T, Hooper P, Gonder J. Transient vision and intraocular pressure changes following anti-vascular endothelial growth factor injection. Can J Ophthalmol. 2015 Oct 8;50(10):1412-1415.

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### WELL THAT CAN'T BE GOOD

- Risk of retinal artery occlusion (as high as 1/1389 Gao et al 2019)
- Repeated, sudden, **significant** IOP spike and temporary loss of perfusion



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## HOW CAN WE FIX THIS?

- Treatment for elevated IOP vs. IOP spike-prevention
  - Role of pre-procedure IOP lowering medication
  - Paracentesis
    - 32 gauge needle
    - Fluid balance

#### Anterior chamber paracentesis during intravitreal injections in observational trials: effectiveness and safety and effects

Sandeep Saxena<sup>1</sup>, Timothy Y. Liu<sup>2</sup>, Hidaki Kobayashi<sup>3</sup>, Michel E. Parah<sup>4</sup>, Daniela Ferrara<sup>5</sup>, David Polley<sup>6</sup>, Tomohiro Sato<sup>7</sup>, Carmen H. Meyer<sup>8</sup>, Timothy Huang<sup>9</sup> and for the International Pharmacokinetic Collaboration

Volume 44 | Issue 10 | October 2018  
ISSN: 1040-701X | DOI: 10.1093/ijr/ijr101018

International Journal  
of Retina and Vitreous

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## ALL ABOUT OUTFLOW

- Reduced trabecular outflow:
  - 1) ~~Direct toxicity of medication~~
  - 2) Inflammation
    - Trabeculitis
  - 3) Aggregation of particles
    - Silicone, protein in the TM
  - 4) Nitric oxide reduction

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## SILICONE?

- Medical grade silicone oil droplets
  - Barrel of the syringe
  - Hub of the needle
  - Tip of the plunger
  - Stopper of the medication vial
- *Silicone oil has the potential to be pro-inflammatory*



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## NITRIC OXIDE

- Nitric oxide is involved in the signaling pathway which leads to relaxation of trabecular beams
- Leads to increased trabecular outflow
  - Latanoprostene bunod
    - Latanoprost acid + butanediol monohydrate
      - NO is a gas, so must be attached to another molecule
- VEGF upregulates nitric oxide synthase = increased nitric oxide
- *Effect of anti-VEGF medications?*

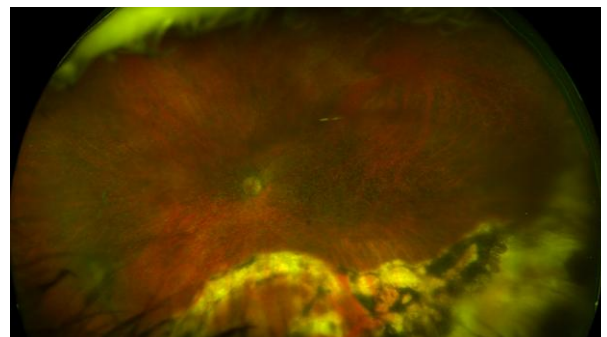
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## SO WHO IS MOST AT RISK?

- Greater number of injections (20+)
- Higher frequency of injections (7/year +)
- Younger patients
- Patients with shorter axial length

Exler JD, Elmman M, Carlsson BC, Maberly DA, Mihalberg PS. Association of Repeated Intravitreal Bevacizumab Injections With Risk for Glaucoma Surgery. *JAMA Ophthalmol*. 2013;131(4):363-368.

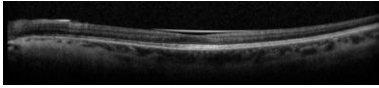
77



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## VITRECTOMY & TAMPONADE AGENTS

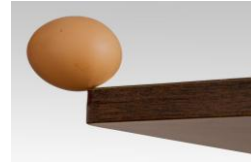
- Long term potential for IOP rise
  - Oxidative stress-fluid/air exchange
- Tamponade agents
  - Sulfur hexafluoride (SF<sub>6</sub>)
  - Perfluoropropane (C<sub>3</sub>F<sub>8</sub>)
  - Silicone oil-greatest risk of IOP elevation-as high as 40%



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## BOTTOM LINE

- Monitor intraocular pressure in patients undergoing IVI or who have a history of PPV



80

## A CLASSIC CASE

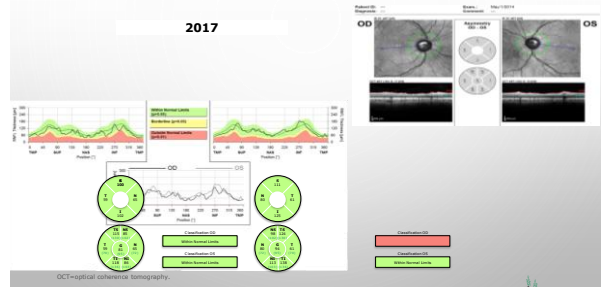
- 68 Y/O AFRICAN AMERICAN MALE
- PMH: HBP, HYPERCHOLESTEROLEMIA
- FMH: MOTHER POAG
- INITIAL PRESENTATION:
  - BCVA: 20/20 OD, OS
  - IOP: OD 21MM HG, OS 22MM HG
  - C/D: 0.6/0.6 OD, 0.6/0.6 OS

SO WHAT NOW???

81

OCT 2017

2017



82

## CASE 1 (CONT)

- FP TAKEN
- VF – WNL
- PACHYMETRY – OD 505, OS 510
- HYSTERESIS- OD 8 OS 9
- TO TREAT OR NOT TO TREAT – THAT IS THE QUESTION!!

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## ARS QUESTION1

- BASED ON THE EVIDENCE AT HAND, WOULD YOU
  - INITIATE TREATMENT
  - SEE PATIENT IN 1 MONTH
  - SEE PATIENT IN 3 MONTHS
  - SEE PATIENT IN 6 MONTHS
  - SEE PATIENT IN 12 MONTHS

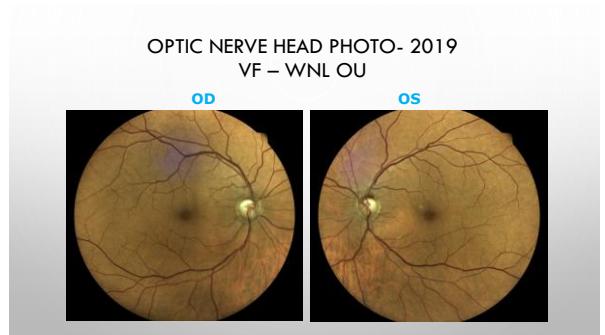
84

2 YEARS LATER – NO TREATMENT

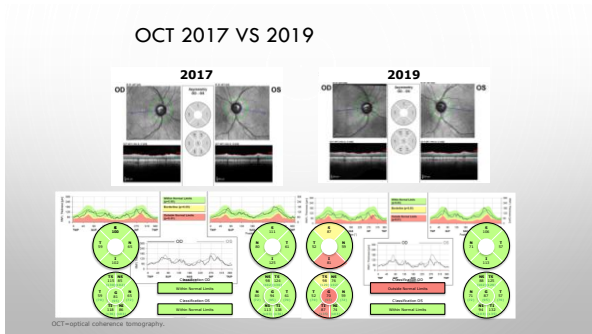
2019 – IOP: 20mm Hg OD, 21mm Hg OS

Followed for 2 years w/out tx  
IOP ranged 19-23mm Hg ( 5 readings)

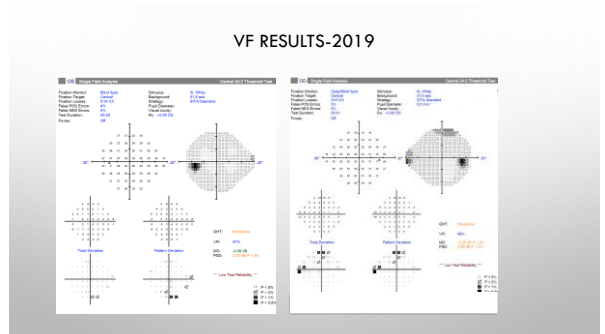
85



86



87



88

DEFINITELY POAG

- WERE THERE ANY CLUES THAT MAY HAVE LED US TO TREAT EARLIER?
- WHAT IS THE SIGNIFICANCE OF THE DISK HEMORRHAGES?
- WHAT IS THE SIGNIFICANCE OF THIN CORNEAS?
- WAS THE OCT REALLY NORMAL?
- TIME FOR A COFFEE TALK!!

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DID YOU SEE THE DISK HEMORRHAGE?



90



## Detection and Prognostic Significance of Optic Disc Hemorrhages during the Ocular Hypertension Treatment Study

Donald L. Budenz, MD, MPH,<sup>1</sup> Douglas R. Anderson, MD,<sup>1</sup> William J. Feuer, MS,<sup>1</sup> Julia A. Heiser, MS,<sup>2</sup> Joyce Schiffman, MS,<sup>1</sup> Richard K. Parrish II, MD,<sup>1</sup> Judy R. Filz-Schuster, MD,<sup>1</sup> Mae O. Gordon, PhD,<sup>2</sup> Michael A. Kass, MD,<sup>2</sup> Ocular Hypertension Treatment Study Group

**Main Outcome Measures:** Incidence of optic disc hemorrhages and POAG end points.  
**Results:** Median follow-up was 98.3 months. Stereophotography-confirmed glaucomatous optic disc hemorrhages were detected in 128 eyes of 123 participants before the POAG end point. Twenty-one cases (16%) were detected by both clinical examination and review of photographs, and 107 cases (84%) were detected only by review of photographs (P<0.0001). Baseline factors associated with disc hemorrhages were older age, thinner cornea, larger vertical cup-to-disc ratio, larger pattern standard deviation index on perimetry, family history of glaucoma, and smoking status. The occurrence of a disc hemorrhage increased the risk of developing POAG 6-fold in a univariate analysis (P<0.001; 95% confidence interval, 3.6–10.1) and 3.7-fold in a multivariate analysis

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- Disc hemorrhages detected in 128 eyes of 123 participants
- 21 cases detected by both doctor and photos
- 107 cases (84%) were detected only by a review of photography

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## DISK HEMORRHAGES AND RATE OF PROGRESSION (MEDEIROS ET AL)

- Cohort of the DIGS
- Pxs followed for 8 years for VF progression (using the VFI)
- 20% had disk hemorrhage
- Eyes with disk heme had more than double the rate of VF loss
- Eyes w/ more than 1 disk heme showed an even higher rate of VF progression
- Persons with disk heme in general had a more severe glaucoma

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## SPEAKING OF OPTIC DISK HEMORRHAGES

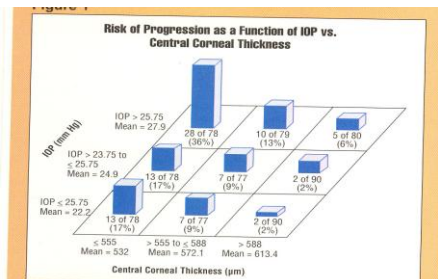
- BUDENZ ET AL, (OHTS GROUP) – AJO 2/17
- 13 YEAR DATA
- ODH ARE AN INDEPENDENT PREDICTOR FOR POAG
- ODH ARE PREDICTIVE OF PROGRESSION
- PREDICTIVE FACTORS FOR ODH ARE SIMILAR TO THOSE FOR POAG (IN OHT PXS)
  - Thin cornea
  - Thinner rims
  - Higher IOP
  - Older age

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## THE PACHYMETRY ISSUE

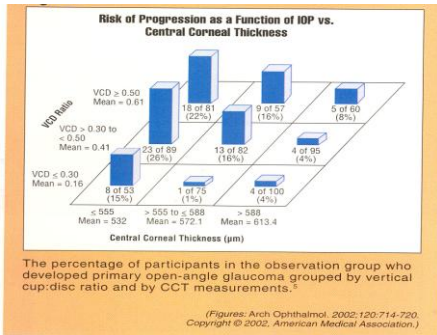
- JUICY DATA
  - 36% OF PXS W/ IOP >25.75 AND K THICKNESS < 555 MICRONS DEVELOPED POAG
  - 6% OF PXS W/ SAME IOP BUT K THICKNESS > 588 CONVERTED TOPOAG
- JUICY DATA II
  - 1.5% PXS W/ C/D .3/.3 AND K THICKNESS < 555 MICRONS CONVERTED BUT
  - 4% OF PXS W/ SAME DISK PARAMETERS AND K THICKNESS > 588 MICRONS CONVERTED

95



The percentage of participants in the observation group who developed primary open-angle glaucoma grouped by baseline IOP and by CCT measurements.

96



97

### IOP 30mmHg, CCT 600µ

#### Glaucoma Risk Estimator

Age: 70

	RIGHT EYE MEASUREMENTS			LEFT EYE MEASUREMENTS		
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Untreated Intraocular Pressure (mm Hg)	30	30	30	30	30	30
Central Corneal Thickness (microns)	600	600	600	600	600	600
Vertical Cup to Disc Ratio by Contour	0.55			0.55		
Pattern Standard Deviation	1.0			1.0		
<input type="radio"/> Humphrey (dB) <input type="radio"/> Octopus loss variance (dB)	1.0			1.0		

Print    Reset    9.1%    The patient's estimated 5-year risk (%) of developing glaucoma in at least one eye.

## Glaucoma risk is 9.1%

98

### IOP 20mmHg, CCT 500µ

#### Glaucoma Risk Estimator

Age: 70

	RIGHT EYE MEASUREMENTS			LEFT EYE MEASUREMENTS		
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Untreated Intraocular Pressure (mm Hg)	20	20	20	20	20	20
Central Corneal Thickness (microns)	500	500	500	500	500	500
Vertical Cup to Disc Ratio by Contour	0.55			0.55		
Pattern Standard Deviation	1.0			1.0		
<input type="radio"/> Humphrey (dB) <input type="radio"/> Octopus loss variance (dB)	1.0			1.0		

Print    Reset    20.7%    The patient's estimated 5-year risk (%) of developing glaucoma in at least one eye.

## Glaucoma risk is 20.7%

99

So a man walks into his optometrist's office...

- He is diagnosed with glaucoma,
- What is your initial treatment??

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