

Glaucoma - Human Factors and Pearls that Make a Difference



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Glaucoma and Diabetes Eye Institute
Cincinnati, Ohio

Financial Interests

- Optovue
- Haag – Streit
- Reichert
- Alcon

agenda

- Challenges and rewards of early detection
- Human factors that influence glaucoma diagnosis and management

Optometry is all about early diagnosis and aggressive glaucoma management

- We have the time to diagnose and manage chronic illness
- We have a financial interest in chronic ocular disease
- We are non surgical glaucoma specialists

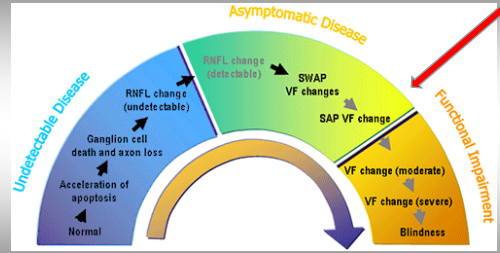


our sea of clinical data

- Confounding IOP data
- Threshold visual fields
- Angle assessment
- Nerve assessment
- General medical status
- Clinical trials



the glaucoma continuum



The Glaucoma Continuum: Adapted from Weinreb et al. Am J Ophthalmology, 2004;138:458-467.

Why does early detection make a difference?

- Momentum of glaucoma progression
- Increased longevity
- Quality of life

quality of life

We want to die young at an old age!



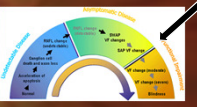
We have increased longevity....

But, Mother Nature doesn't care about our second half !




challenges to early detection

- 100 years of detection and management by procedure oriented physicians
- Sub specialization of ophthalmology
- Retail pressures in commercial settings
- Perceived lack of urgency in early stages
- Resistance to engage with an asymptomatic patient
- Pessimistic attitude toward patient compliance
- LASIK and deceptively low IOP
- Obsolete measurement of structure, function and IOP
- Lack of attention to significant risk factors
- Lack of attention to history and clinical protocol
- Lack of commitment to glaucoma management at its early stages



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procedure oriented physicians



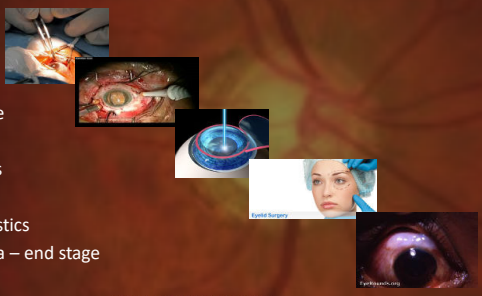
Ophthalmologists rank each other by number of procedures per year.

Few have the mindset to manage chronic non – surgical disease.

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Sub specialization of ophthalmology

- Cataract
- Cornea
- Refractive
- Retina
- Pediatrics
- Neuro
- Oculoplastics
- Glaucoma – end stage



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"The very best surgeons have a deep level of respect for the limitations of surgery....."



Retail pressures in commercial settings

Reality check – retailers gage their success on eyeglass / contact lens sales and profits

not glaucoma diagnosis



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Perceived lack of urgency in early stages

- Borderline IOP
- Borderline nerves
- Disease may take years to progress – if it exists.....

"We'll take another look when you return in 1, 2 or 3 years..."

"nerves .3 and IOP's normal"

"I'm covered"



Resistance to engage with an asymptomatic patient

The discussion about ocular hypertension and glaucoma in an asymptomatic patient is arduous. The temptation to kick the can down the road is ever present.



Our pessimistic attitude toward patient compliance

- If you want to get rid of your patient, just tell them to exercise, loose weight and stop smoking.
- They aren't going to follow instructions, so why bother?
- We'll fix it some time down the road with a surgery.....

OD's need to diagnose and treat more glaucoma

- 40,000 OD's
- 8,000 Rx 4 -6 Rx's per year
- 4,000 average 12 – 24 Rx's per year
- Only 2,500 – 3,000 treat with more than one medicine and Rx more than 3 x / month

Paul Karpecki, OD, FAAO



Making sense
out of IOP

Correct IOP How Important is it?

Elevated IOP is a significant risk factor for Glaucoma; accuracy matters. Since IOP reduction is the only available treatment for Glaucoma, it makes sense to measure our treatment as accurately as possible.

Corneal Thickness & IOP

- Calculation based on data of Ehlers et al (1975)
- Modified from Stodtmeister (1998)
- Arithmetic mean of corneal thickness in healthy subjects: 545 μm (Doughty and Zaman 2000)

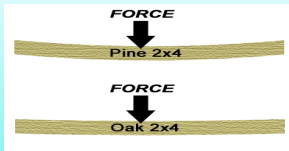
CCT (μm)	Correction Value (mm Hg)
465	+6
485	+5
505	+3
525	+1
545	0
565	-1
585	-3
605	-4
625	-6



James Brandt, MD
Director Glaucoma Services
UC Davis

“Assuming that CCT can be used as a correction factor for GAT is a misinterpretation of the results of OHTS... that couldn't be further from the truth. Adjusting IOP based on CCT is attempting to instill a degree of precision into a flawed measurement. You may actually correct in the wrong direction. The issues related to the most accurate tonometry need to include the material properties of the cornea”

Why CCT-based IOP correction is flawed



A force (applanation) tonometer is simply a gauge that measures the force required to flatten the cornea

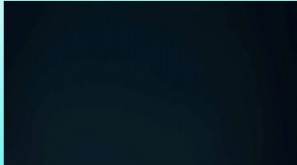
Corneal Resistance to bending is not dependent thickness, but on material properties

Subjects with GAT from 18 - 21 mm Hg GAT the diagnosis “hot spot”

Diagnosis	%
> 4.5mm	10.6%
> 5.5mm	4.4%
• DCT > GAT > 5mm = 5%	> 6.5mm 2.5%

(1.5 mm adjustment in normative values between instruments)

Post-LASIK



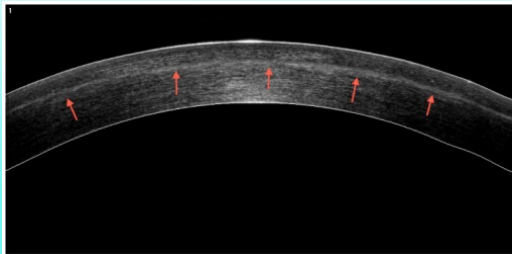
- More than 15 million people in the U.S. have had LASIK surgery (2013) – about 375,000 of them will have or will have glaucoma
- Post LASIK cornea is at least 100 microns thinner and weakened by the flap

Glaucoma and buckeyes grow in Ohio

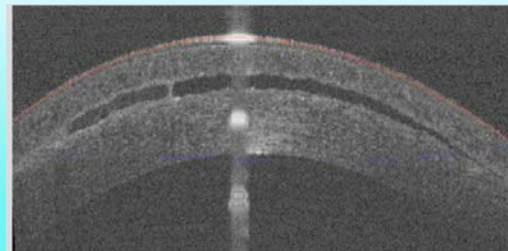
- 3% U.S Population = 10 million Ohioans
- 3% 15 million in U.S. post LASIK = 450,000 in Ohio have had LASIK
- 2.5% of 450,000 with glaucoma = 11,250 have or will have glaucoma



Post LASIK flap



fluid in interface



3. Interface fluid and epithelial ingrowth are observed with anterior segment OCT in a LASIK patient.

LASIK and CCT

- Average cornea 545 microns
- Average ablation 60+ microns
- Average loss from cut 10+ microns

Net post LASIK CCT = 465 microns.

Does LASIK (or cataract surgery) mitigate the glaucoma risk of high myopia?

NO!

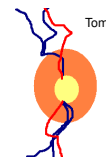
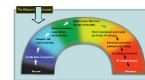
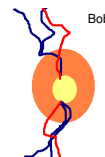
Managing Goldmann IOP

- Thin corneas always underestimate IOP
- Thick corneas can be wrong in either direction
- Sick corneas are almost always underestimated
- Underestimation gets worse as glaucoma progresses
- Keratorefractive corneas are always underestimated

Never shave points and.....use a better tonometer!

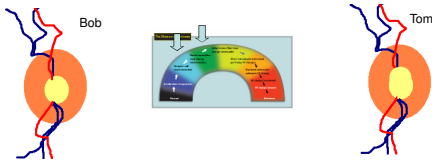
Bob & Tom 2006

- IOPcc 25 mm + FHx
- Work up as suspect
- Treat (Xalatan qpm OU)
- GAT 20 mm = FHx
- RTO 2 years



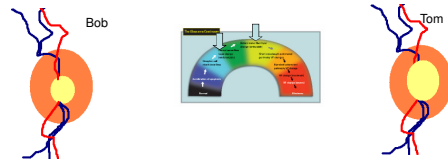
Bob & Tom 2008

- IOPcc 19 mm (Xalatan qpm OU)
- GAT 20 = FHx
- RTO 2 years
- (new doctor)



Bob & Tom 2010

- DCT 19 mm (Xalatan qpm OU)
- GAT 20 + FHx
- RTO 2 years
- (new doctor)



Bob & Tom 2012

- IOPcc 19 mm (Xalatan qpm OU)
- GAT 21 mm + FHx
- Work up!
- (new doctor)
- 6 years late!



tonometers that work

Pascal



Ocular Response Analyzer



NEW IOP RISK !

Watch out for
OTC FLONASE !



OLD IOP RISK !

Watch out for “soft”
STERIODS!



subjective fields

Threshold visual fields

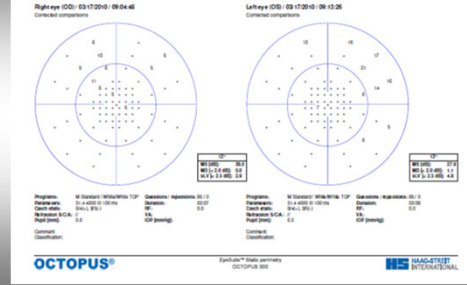
- How often
- When to consider 10 degree fields
- Test duration
- How many do we need?
- Mean and localized progression

current standard of care

- 24 or 30-2 2x per year
- Consider 10 degree for early detection
- Always use 10 degree when fixation is challenged

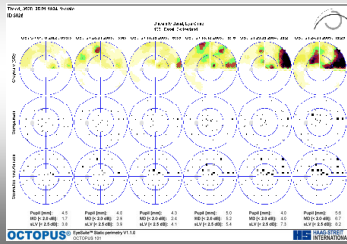


10 degree fields

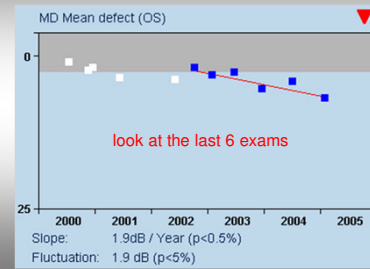


How many decibels to blindness?

Vision is considered lost at about -15 dB

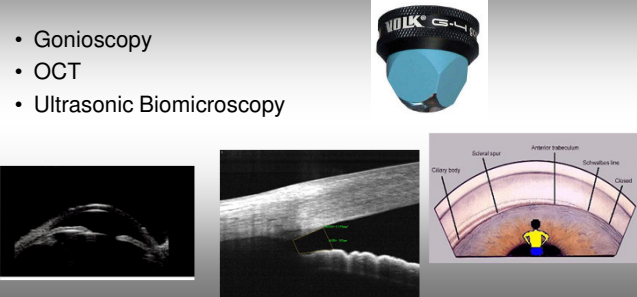


progression



Angle assessment

- Gonioscopy
- OCT
- Ultrasonic Biomicroscopy



The composite image illustrates three methods of angle assessment. On the left is a photograph of a gonioscope lens. In the middle is an OCT scan showing the angle structure. On the right is a schematic diagram of the anterior chamber angle with labels: Trabecular meshwork, Schwalbe line, and Ciliary body.

www.Gonioscopy.org



Wallace L. M. Alward, MD

The slide features a portrait of Wallace L. M. Alward, MD, and two images of a Volk G4 gonioscope lens.

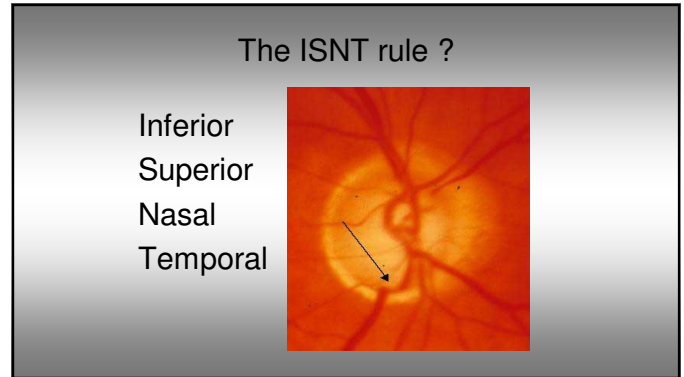
Nerve assessment

- Photography
- OCT – the standard of care
- GCC – the new kid on the block
- Angio OCT - the newest kid on the block

Optometric Glaucoma Society – 2013 Seattle, WA

Session 4: Honoree's lecture
Moderator: John Flanagan

2:00 – 2:45 PM: **The Death of Cup to Disc Ratio in Glaucoma – SDOCT Paradigm Change and its Clinical Implications**
Claude Burgoyne MD
Senior Scientist & Van Buskirk Chair for Ophthalmic Research
Research Director, Optic Nerve Head Research Laboratory
Devers Eye Institute
Clinical Professor of Ophthalmology
Oregon Health and Sciences University



Evaluation of the "IS" Rule to Differentiate Glaucomatous Eyes From Normal

Law, Simon K. MD, PharmD; Kormann, Helen L. MD, PhD; Niforushan, Naveed MD; Moghimi, Sasan MD; Caprioli, Joseph MD

Jules Stein Eye Institute

Journal of Glaucoma:
January 2016 - Volume 25 - Issue 1 - p 27-32

Conclusions: The ISNT rule alone has a high sensitivity but relatively low specificity. Application of the IS rule in eyes with increased CDR yields a much higher specificity for differentiating normal from more advanced glaucomatous eyes.

A combination of different features of the optic disc (increase of CDR and ISNT or IS rule) improves the specificity of optic disc evaluation for glaucoma.

Optic Nerve
5 R's

- Rim margin
- Rim area
- Nerve Fiber layer
- Peri-papillary atrophy
- Drance Hemorrhage

Size matters!

1.25 mm
Optic Nerve



1.75 mm
Optic Nerve



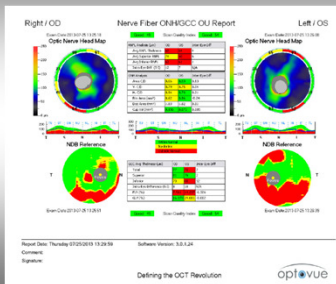
2.25 mm
Optic Nerve



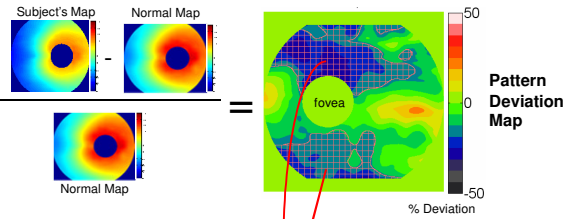
rim matters C/D = .4



OCT nerve and GCC

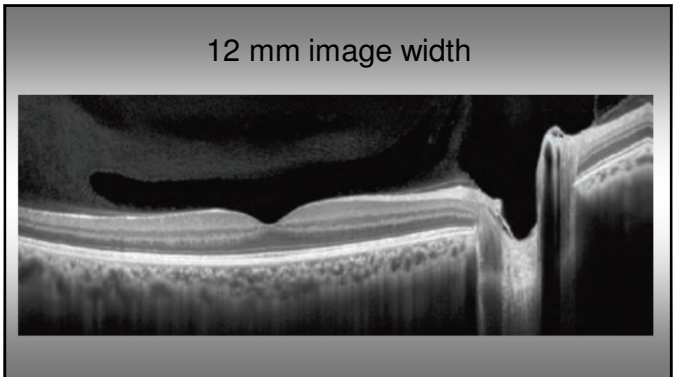
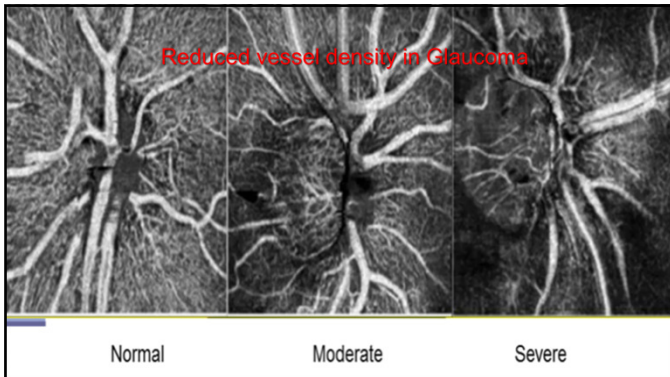
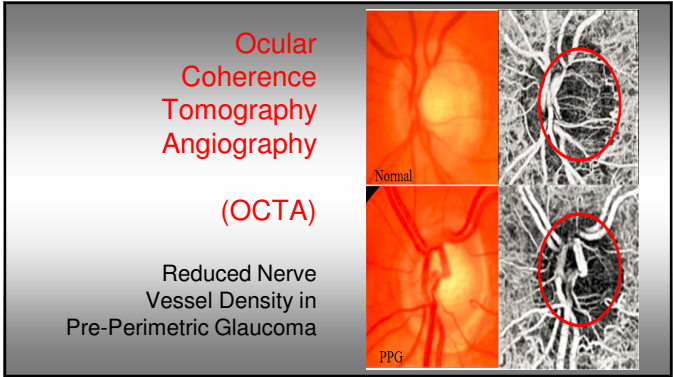
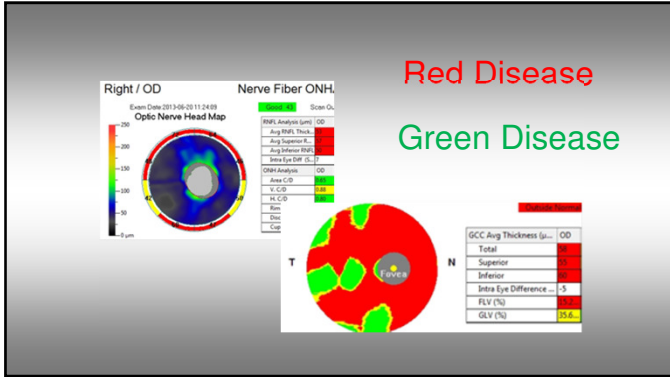


Ganglion Cell Complex – Focal Loss Volume (GCC-FLV)



Focal Loss Volume (FLV) = Volume of tissue loss in areas of significant negative pattern deviation

Tan O et al. *Ophthalmology* 2009;116:2305



Normal Tension Glaucoma

IOP and Blood flow are
like fraternal twins
in glaucoma risk



Perfusion pressure

- $\text{Diastolic BP} - \text{IOP} = \text{DPP}$

Risk of progression multiplies below 55

Glaucoma

...is about IOP
and blood flow

structure - function
the new paradigm

Scientific evidence supporting the
combination of structural and functional data
to optimize diagnosis and therapy

Combining the two – making it practical

Structure and Function
in one scan



Can it be done?

Clinical trials
Reality Check!

- Collaborative Initial Glaucoma Treatment Study (CIGTS)
- The Early Manifest Glaucoma Trial (EMGT)
- The Normal Tension Glaucoma Study (NTGS)
- Ocular Hypertension Treatment Study (OHTS)

Get Organized

establish and adhere to a **clinical PROTOCOL**

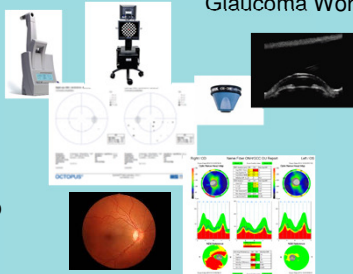
Better adherence to standard of care and clinical protocol

- Consistency of clinical data
- Adherence to standard of care
- Impact on timely glaucoma diagnosis



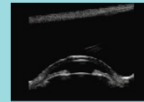
Design and adhere to a concise and consistent Glaucoma Workup

- IOP
- Fields
- Imaging
- Pachymetry
- Gonioscopy
- Timing of follow up



our protocol 2 week follow up with medication (no dilation)

- Photos
- UBM
- IOP
- Plan..... 3 month visit to monitor compliance and IOP



treatment decisions

treatment goals

Reduce IOP and enhance perfusion to halt or minimize progression in the safest and most economical and energy efficient manner

monocular clinical trials?

don't

monocular treatment

don't

under treatment
late treatment

don't

Be AFRAID to add medicine?

don't

Forget oral medications

don't

Forget about LASIK

don't

Assume the ophthalmologist is right?

DON'T

Age

- How do we treat old age as a risk factor?
- How do we treat youth as a risk factor?



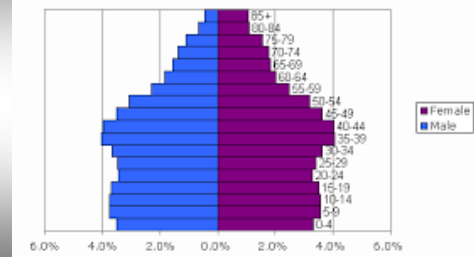
Don't miss the impact of increasing life expectancy

Patients live longer than most doctors predict

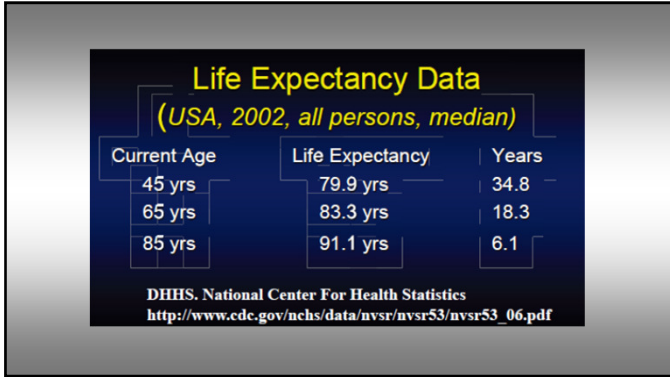
OHTS – mean age 56 years, median life expectancy 30 years

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Age Distribution, 2000




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glaucoma treatment

Plan efficient treatments

- prostaglandins
- adjectve medicines
- combination drugs
- adjunctive medicines as front line
- surgeries



remember.....

Compliance and adherence increase with simplicity of prescription and ease of access of medicine.....



Dorzolamide Backorder !!!!!

- Azopt – Alcon
- Cosopt PF - Akorn



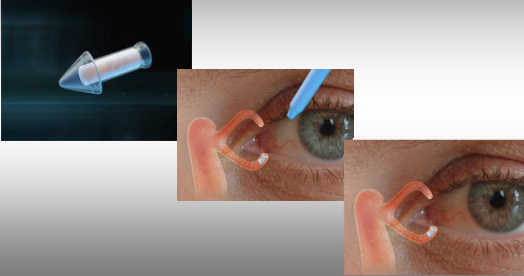
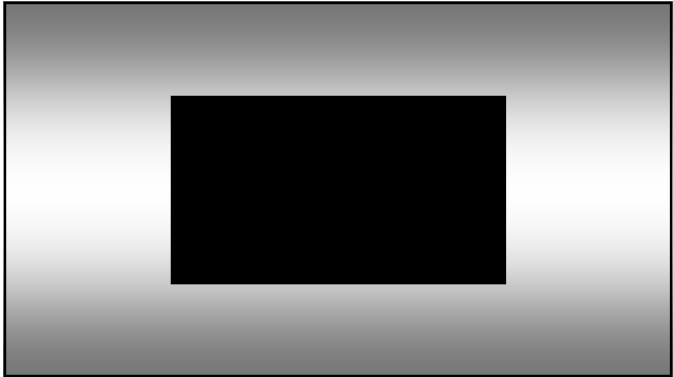
Bausch & Lomb / Nicox latanoprostene bunod VYZULTA

- Preclinical studies have shown that NO plays a role in controlling IOP in normal eyes by increasing aqueous humor outflow through the trabecular meshwork and Schlemm's canal.
- Studies have also demonstrated that patients with glaucoma have reduced levels of NO signaling in their eyes, providing a rationale for the therapeutic value of NO-releasing molecules for patients with open-angle glaucoma or ocular hypertension.

(FDA) has approved Rhopressa®
(netarsudil ophthalmic solution) 0.02%

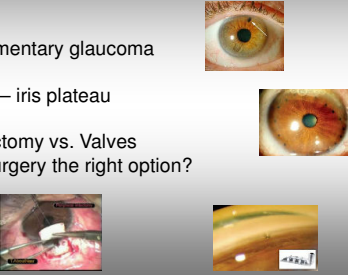
Roclatan™ looks like it's on its way.....
(netarsudil / latanoprost)

inserts and contact lenses


glaucoma surgery

- ALT / SLT
- PI
- PI and pigmentary glaucoma
- SLT
- Iridoplasty – iris plateau
- Stents
- Trabeculectomy vs. Valves
- When is surgery the right option?



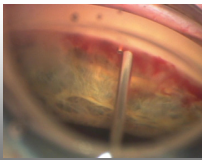
MIGS

- Safe intervention earlier in disease
- Reduce the need for more aggressive surgical options while preserving that option
- Reduce medication burden

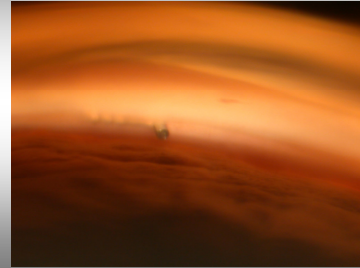


iStent® Surgical Procedure

- iStent® rails are seated against scleral wall of Schlemm's canal
- iStent® Snorkel sits parallel to the iris plane



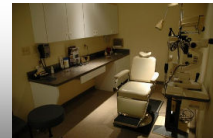
6 months Post-Op: Proper Placement

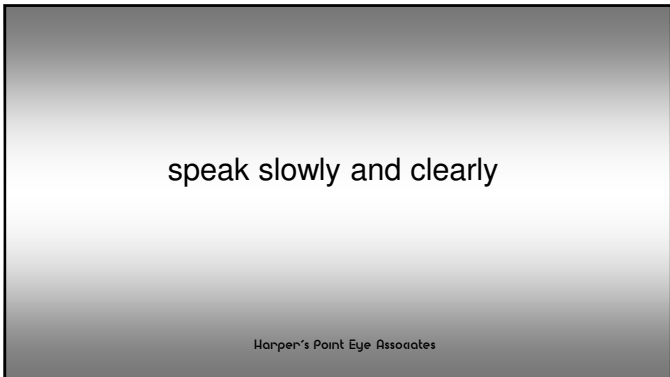
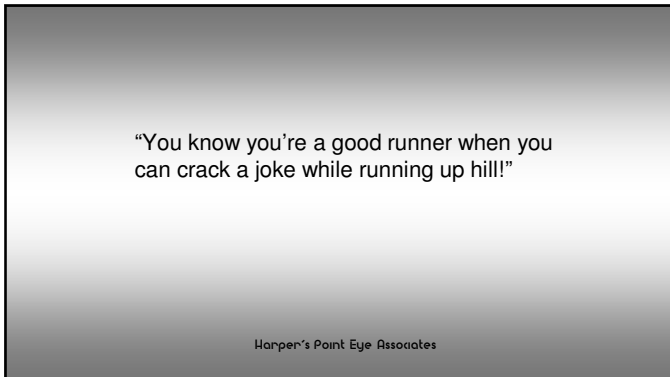


Now...It's time to talk about glaucoma!



*Your exam room is your theatre
and you are the star of the show*





avoid jargon!

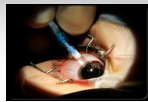
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Never say
"ophthalmologist"



Say....

"Eye Surgeon"



Never say.....



OD's have been treating glaucoma in
Massachusetts for almost two weeks!

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Informed Advocacy

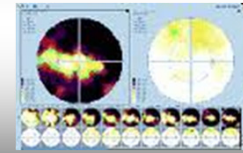
“Mrs. Jones, the reason that we doing these tests and prescribed this medicine is that if my mom had glaucoma, I would do exactly the same for her.”



R. H. Osher, MD
Cincinnati Eye Institute

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If you've never failed in treating glaucoma, you haven't been doing it long enough!



compliance and adherence

- Clear communication of nature of the disease
- Clear communication of the diagnosis
- Clear communication of the methods and goals of treatment
- Commitment to aggressive follow up schedule

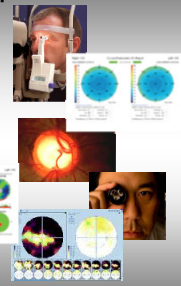
As OD's, this is our time to show why we're better at this!

Keep it Simple!

- IOP
- Fields
- Nerves
- Angles

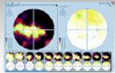
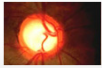



- Systemic considerations
- Family history
- Race
- Gender
- DIGTS.....
- NTGS.....
- OHTS.....



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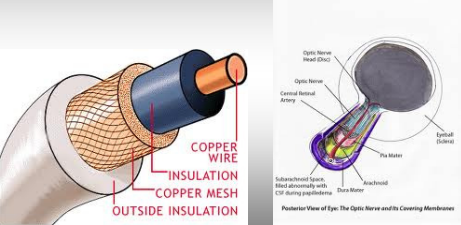
Stick to the 3 critical points in management

- Fields 
- Nerves 
- Pressures 

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Description of Glaucoma

The optic nerve is like living coax cable



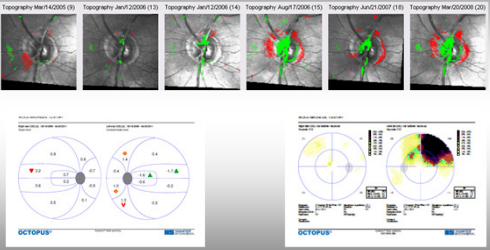
description of glaucoma

- The optic nerve is central nervous system tissue. We can prevent damage, but we do not know how to repair it. Discuss spinal cord injuries.....



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graphics help



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Make sensible comparisons My "earcoma"

How many ear
drops would you
take to avoid this?



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most common questions

- What did I do wrong?
- Is there a cure?
- Does it have to be in the family?
- Will I go blind?
- Do I need surgery?
- How long will I need to take the medicine?

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most common questions - 2

- What if do more yoga?
- Will LASIK fix this?
- What is your opinion regarding green tea?

discussing the workup

- "Though I am not convinced that you have glaucoma, your findings (IOP, fields, nerves) concern me.
- With the additional information, we can better decide whether this should be treated or carefully watched"
- I will instruct my staff to schedule a return visit for additional testing within the next week or two

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Lab rats always take their drops
and show up for their appointments...



discussing follow up

- "Our tests show that you do not appear to have glaucoma at this time."
or...
- "People with these types of borderline findings often develop glaucoma, which would require treatment"
or...
- "In future visits, we will closely watch for changes in your (nerves, IOP, fields), which would signal the need for treatment."

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initiation of therapy - 1

- Sharing scientific data i.e. OHTS ?
- Predicting adherence – sizing up the patient
- Is surgery a good option as an initial therapy? SLT?
- Cost considerations – free meds, generics, foreign pharmacies

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initiation of therapy - 2

- "These eye drops will lower your pressure. Place one in each eye EVERY night.
- It is important that you keep them next to your toothbrush
- My staff will schedule a return visit for 2 weeks
- We are available 24/7 if you have any concerns"

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The discussion about compliance and adherence
informed advocacy vs. **confrontation!**

Have you been taking all of your medicine ?!?!"

"Did you miss any drops ?!?!"

"Don't come back until you redeem yourself ?!?!"



Did you read your Macbeth assignment last night?



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Nurses!



Why have I chosen this medicine?

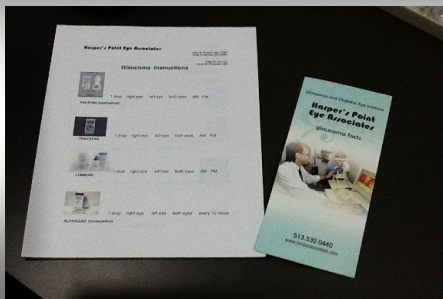
- Standard of care
- Effectiveness
- Safety
- Downside – what could go wrong?

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Instruction Sheets



Show that you are committed to glaucoma



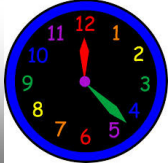

How to take eye drops

- Methods of instillation
- Patient instruction
- OD's do it better
- **Supportive** devices
- How to remember
- What if I forget?
- The pharmacist and the refrigerator.....



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time of day ?



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The follow up visit

- When?
- How often?
- Why?
- Testing frequency?
- What would you do with a CL patient?
- OD's / MD's and adherence

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Something's not right!



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This is the year of the drug COUPON!!



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www.Canadadrugs.com

60 Neptazane 50 mg (U.S.) = \$375.00

100 Neptazane (Canada) = \$180.00

Cosopt (generic) 10 ml (2 month supply) = \$59.00

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take control of second opinions

- MD's as glaucoma managers
- OD's as glaucoma managers
- Non-surgical glaucoma specialists
- The worst second opinion
- Finding an excellent second opinion

OD's own glaucoma!

Glaucoma Management

The reward is the relationship!



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