CURRENT TOPICS IN GLAUCOMA

JOSEPH SOWKA, OD, FAAO, DIPLOMATE
NOVA SOUTHEASTERN UNIVERSITY
COLLEGE OF OPTOMETRY
Joseph Sowka, OD is/ has been a Consultant/ Speaker Bureau/ Advisory Board member for Alcon Laboratories, Allergan, Sucampo, Merck, and Carl Zeiss Meditec. Dr. Sowka has no direct financial interest in any of the diseases, products or instrumentation mentioned in this presentation.

The ideas, concepts, conclusions and perspectives presented herein reflect the opinions of the speaker; he has not been paid, coerced, extorted or otherwise influenced by any third party individual or entity to present information that conflicts with his professional viewpoints.
GLAUCOMA EPIDEMIOLOGY AND TREATMENT

### Current Medical Treatments for OAG

<table>
<thead>
<tr>
<th>↓ Aqueous Production</th>
<th>↑ Aqueous Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>β-blocker</td>
<td>Conventional</td>
</tr>
<tr>
<td>CAI</td>
<td>Prostaglandin</td>
</tr>
<tr>
<td>α₂-agonist</td>
<td>analog</td>
</tr>
<tr>
<td></td>
<td>α₂-agonist</td>
</tr>
</tbody>
</table>
2016-2017 MEDICAL MANAGEMENT OF GLAUCOMA...
HAS GOTTEN BORING
"IT'S ONLY ROCK 'N ROLL (BUT I LIKE IT)": ARE ROCK INHIBITORS THE NEXT BIG THING OR ONE-HIT WONDER?
ROCK/Norepinephrine Transporter (NET) Inhibitors

Netarsudil 0.02% (Rhopressa™)

Netarsudil/latanoprost 0.02%/0.005% (Roclatan™)
Rho Kinase (ROCK) Inhibition

New Development in IOP Reduction

- Rho activation increases contractility of TM cells
  - Reduces outflow of aqueous humor

- Rho kinase inhibition relaxes TM cells
  - Reduces actin stress fibers/focal adhesions
  - Increases outflow of aqueous humor

- Rho kinase inhibition may also:
  - Increase ocular blood flow
  - Increase retinal ganglion cell survival

Netarsudil ophthalmic solution 0.02% (ROCK-NET Inhibitor) Triple-Action

3 Identified IOP-Lowering Mechanisms

- ROCK inhibition relaxes TM\(^1\), increases outflow\(^1,2\)
- NET inhibition reduces fluid production\(^2\)
- ROCK inhibition lowers Episceral Venous Pressure (EVP)\(^3\)

# Netarsudil ophthalmic solution 0.02%: Rhopressa™ (Rocket 1) Efficacy Results At Different Baseline IOPs

<table>
<thead>
<tr>
<th>Baseline IOP (mmHg)</th>
<th>Non-inferiority</th>
<th>Numerical Superiority</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;27*</td>
<td>Did not meet</td>
<td>Met 2 time points</td>
</tr>
<tr>
<td>&lt;26***</td>
<td>Met</td>
<td>Met 4 time points</td>
</tr>
<tr>
<td>&lt;25***</td>
<td>Met</td>
<td>Met 7 time points</td>
</tr>
<tr>
<td>&lt;24**</td>
<td>Met</td>
<td>Met All 9 time points</td>
</tr>
<tr>
<td>&lt;23***</td>
<td>Met</td>
<td>Met All 9 time points</td>
</tr>
</tbody>
</table>

- Per Protocol population (baseline IOP < 27 mmHg)
- Netarsudil did not meet criteria for non-inferiority to Timolol
- Inferiority was driven by a small subset of Netarsudil patients with the highest baseline IOPs

* Primary endpoint
** Pre-specified secondary endpoint
*** Post-Hoc Analysis
Netarsudil ophthalmic solution 0.02: Rocket 2 study

- Rocket 2 is a 12-month Phase 3 study of Netarsudil vs. Timolol
- The patient group to be used for Rocket 2 primary endpoint analysis was changed with FDA agreement
  - Primary endpoint analysis will include only patients with a baseline IOP above 20 mmHg and below 25 mmHg
  - Rhopressa QD and BID met criterial for non-inferiority to timolol (baseline < 25 mm)
- Seems to work best at lower/modest IOP baseline
**Netarsudil ophthalmic solution 0.02% Rhopressa™**

- In two phase III studies, more than half of patients experienced conjunctival hyperemia compared to 8% to 10% of timolol patients.
  - More complaints of eye redness with Rhopressa.

- 9% and 5% of Rhopressa once-daily patients reported corneal deposits across the two phase III studies compared to 0.4% and 0% of the timolol patients.

- Blurry vision was reported by 7% and 5% of Rhopressa patients compared to 3% and 0.5% of timolol patients in the studies.
Roclutan™ (netarsudil/latanoprost ophthalmic solution) 0.02%/0.005%

Fixed Combination of Rhopressa with Latanoprost

4 Identified
IOP-Lowering Mechanisms

- ROCK inhibition relaxes TM\(^1\), increases outflow\(^{1,2}\)
- NET inhibition reduces fluid production\(^2\)
- ROCK inhibition lowers EVP\(^3\)
- PGA receptor activation increases uveoscleral outflow\(^4\)

4. Latanoprost prescribing information
Roclatan Achieved Statistical Superiority Over Individual Components at All Time Points (p<0.001)

Mean IOP at Each Time Point (Primary Efficacy Measure)

PG324 Phase 2b, Intent to Treat
Roclatan (netarsudil/latanoprost) 0.02%/0.005% Phase 2b Responder Analysis

Day 29 – % of Patients with IOP Reductions of ≥ 20%

Roclatan
Phase 2b Responder Analysis

Day 29 – % of Subjects with IOP Reduced to ≤ 18 mmHg

Roclatan (netarsudil/latanoprost) 0.02%/0.005% Phase 3 Clinical Trial (Mercury 1)

• Roclatan achieved its primary efficacy endpoint demonstrating statistical superiority over each of its components, including Aerie product candidate Rhopressa (netarsudil ophthalmic solution) 0.02%, and latanoprost, all of which were dosed once daily in the evening, according to a company news release.

• The study evaluated patients with maximum baseline IOPs ranging from above 20 mmHg to below 36 mmHg. The IOP-lowering effect of Roclatan was 1 mmHg to 3 mmHg greater than monotherapy with either latanoprost or Rhopressa throughout the duration of the study.
Roclatan™ Phase 3 Responder Analysis

Day 90: % of Patients with IOP Reduced to 18 mmHg or Lower

% of Patients

IOP on Treatment

Rhopressa™ (n=198)  Latanoprost (n=223)  Roclatan™ (n=200)

≤ 14 mmHg: 14% 33% 15%
≤ 15 mmHg: 23% 25% 44%
≤ 16 mmHg: 32% 39% 61%
≤ 17 mmHg: 42% 54% 71%
≤ 18 mmHg: 54% 69% 82%

***p<0.0001 vs Latanoprost and Rhopressa™
###p<0.0001 vs Rhopressa™, p<0.05 vs Latanoprost
Roclatan (netarsudil/latanoprost) 0.02%/0.005% Phase 3 Clinical Trial (Mercury 1)

- Roclatan reduced mean diurnal IOPs to 16 mmHg or lower in 61 percent of patients, a significantly higher percentage than observed in the comparator arms.

- The most common Roclatan adverse event was hyperemia, which was reported in approximately 50 percent of patients, or 30 percent above baseline, and was scored as mild for the large majority of these patients. Conjunctival hemorrhage was also noted. There were no drug-related serious adverse events for any of the comparators in the trial.

- NDA expected near end 2017.
latanoprost bunod (LBN)

- Formerly known as Vesneo™
  - FDA approved name; 10/15 FDA rejected name as too close to Visine
  - Currently called Vysulta

- Nitric oxide-donating prostaglandin F2-alpha analog licensed by Nicox to Bausch + Lomb and currently in phase 3 clinical development.

- In Phase 3 studies, LBN reached its desired primary endpoint of non-inferiority to timolol maleate 0.5%, actually showing superiority to the beta blocker.

- LBN showed a reduction in mean IOP of 7.5 to 9.1 mmHg from baseline between 2 and 12 weeks through Phase 3 studies
lantanoprost bunod (LBN)

- Upon instillation in the eye, lantanoprostene bunod is rapidly metabolized to two actives; lantanoprost acid, a prostaglandin analog, and nitric oxide.
- Nitric oxide is an important physiological signaling molecule, which plays a key role in IOP regulation in healthy eyes.
- LBN/Vysulta is thought to increase aqueous humor outflow by acting on both the uveoscleral (non-conventional) pathway via lantanoprost acid, and trabecular meshwork and Schlemm’s canal (conventional pathway) via nitric oxide signaling.
latanoprost bunod (LBN)

- VOYAGER/ LUNAR Studies, it was seen that latanoprost bunod 0.024% dosed once daily gave significantly greater IOP lowering and comparable side effects relative to latanoprost 0.005%. The most common side effect was hyperemia, which was well tolerated.

- FDA has caused some delays due to manufacturing issues at Bausch + Lomb's facility in Tampa, Florida. There are no efficacy or safety concerns or additional clinical trials needed.
Trabodenoson™

- Inotek Pharmaceutical’s compound is considered to be a first-in-class selective adenosine mimetic whose action appears to be increased trabecular aqueous outflow.

- Trabodenoson™ - long duration of action, making QD dosing possible.

- Approximates the IOP lowering efficacy of prostaglandin analogs.

- It also appears to have an additive effect to other second-line glaucoma medications such as beta blockers and carbonic anhydrase inhibitors.

- Adverse effects don’t seem to increase with dose doubling/tripling.

- 2019 or 2020?
...ONLY TIME WILL TELL
A ROCKET MAN?
TERMINOLOGY

- Compliance: The act of conforming, acquiescing, or yielding; cooperation or obedience
  - Pejorative term
TERMINOLOGY

- **Adherence**: A measure of the degree to which a patient follows prescribed instructions during a defined time period.
  
  - E.g. Timolol BID over 30 days; patient uses 20 drops; adherence is 33%
  
  - Allows the patient to have lapses in drug use and summarizes the percent of days that the patient uses the drug

- **41%- 76% adherence in glaucoma**
TERMINOLOGY

- **Persistence**: A metric that evaluates the time until a patient first discontinues the use of a medication.
  - BID drug used QD and patient refills each month and stockpiles medication has excellent persistence (100%) and poor adherence (50%)

- **White Coat Adherence**: Patient adherence rises sharply 1 week before examination and then declines 30 days following
ADHERENCE BY DRUG CLASS AND THERAPY

- PGAs have higher degree of persistence and adherence
- Nearly half of monotherapy patients had stopped using medications at 6 months
- Less adherence and persistence with polytherapy
- A second drug leads to reduced filling of first-prescribed medication
BARRIERS TO ADHERENCE AND PERSISTENCE

- Cost
- Tolerability
- Dosing schedule
- Denial
- Lack of education about disease
- Forgetfulness
- Travel
- Schedule
INDICATIONS FOR NON-ADHERENCE

- High IOP at follow up
  - Meds don’t fail overnight
- Lack of complaints about adverse effects
- Visit default
  - Rates of admitted non-adherence higher among visit defaulters
  - Worse adherence correlates with worse follow up
- Progression despite seemingly good IOP

DETECTING NON-ADHERENCE

- Videotaped encounters followed by doctor and patient questionnaires and interviews
- Doctor-patient dialog generally physician centered
  - Doctor speaks 70% of words
  - Closed-ended questions designed to elicit “yes/no” response
- Failed to identify non-adherence

Friedman et al. Ophthalmology 2008; 115:1320
IMPROVING PATIENT ADHERENCE AND PERSISTENCE

- Use easy dosing
  - Monotherapy
  - Once daily dosing with PGA

- Ask open ended questions

- Acknowledge that dosages are going to be missed. Encourage patient to report more accurately in non-confrontational manner

- Positive support of patient attempts to adhere
IMAGINE: SUSTAINED RELEASE MEDICATIONS REMOVING ADHERENCE PROBLEMS
OPTIONS FOR DRUG DELIVERY
EVOLUTION OF SUSTAINED DELIVERY

- **1974**: Ocusert® (Pilocarpine) - for Glaucoma
- **1996**: Vitrascert® (Ganciclovir) - for CMV Retinitis
- **2005**: Retisert® (Fluocinolone) - for non infectious posterior uveitis
- **2009**: Ozurdex® (Dexamethasone) - for Macular Edema, Non Infect. Uveitis, Retinal Vein Occlusion, Diabetic Macular Edema (DME)
- **2011**: Iluvien® (Fluocinolone) - for DME
PLATFORMS DELIVERED INSIDE THE EYE
Allergan is currently performing phase 3 clinical trials on its bimatoprost sustained-release implant (bimatoprost SR), which is an intracameral depot implant injected into the anterior chamber.
• Implant comprising a prostamide associated with a biodegradable polymer matrix that releases an amount of a prostamide
Phase 2 trials of the implant showed mean overall IOP reductions from baseline through week 16 after the first implantation of the bimatoprost sustained-release device:
- 7.2, 7.4, 8.1, and 9.5 mm Hg with the 6-, 10-, 15-, and 20-microgram doses compared with an 8.4 mm Hg decrease in the pooled fellow eyes treated with topical bimatoprost (0.03%).
BIMATOPROST SR

- The implant lowered IOP in 92% of patients at 4 months and 71% at 6 months.
  - Did not need additional rescue therapy

- There were no serious adverse ocular events
  - The most common adverse event was transient conjunctival hyperemia (median duration of 5 days), which developed within 2 days after the implant was injected.

- In 24 eyes that did require another treatment to control IOP, the overall mean IOP reduction from the baseline IOP was 8.0 mm Hg through 16 weeks after the repeat bimatoprost sustained-release treatment.
TRAVOPROST SR

ENV515 Intracameral Extended-Release

Target Product Profile
- 24/7 control of IOP (25-30% decrease)
- 6 month duration of action
- Less hyperemia than drops
- Easy administration
- Fully biodegradable
- Excellent safety

Extended-release biodegradable travoprost formulation puts the treatment of the disease in the hands of the doctor, not the patient
8 Months of IOP Reduction in Hypertensive Beagle Dogs

32% reduction in baseline IOP over 8 months from single dose of ENV515
ENV515- phase 2a open-label, 28-day dose-ranging study of 21 patients yielded 28% IOP lowering at day 25 in one group, which was comparable to once-daily Travatan Z.

Envisia is planning to advance to a 12-month study to evaluate the long-term IOP lowering of ENV515.
Envisia Therapeutics Pipeline

**ENV515 (glaucoma)**
- Pre-clinical
- Ph 2a
- Ph 2b
- Ph 3

**ENV905 (post cataract inflammation)**
- Research
- Pre-clinical
- Ph 2
- Ph 3

**Partnership (back of the eye)**
- Research
- Research Collaborations
- Product Development
PLATFORMS DELIVERED OUTSIDE THE EYE
HELIOS (FORSIGHT VISION5)

- Bimatoprost-laden polymer-matrix insert embedded in a compliant ring.
- The ring is positioned under the upper and lower eyelids and rests on the conjunctiva.
- It is visible only at the caruncle once it is in place.
- The ring is designed to be replaced by an optometrist or ophthalmologist every 6 months.
In a phase 2 randomized, double-masked controlled study, the Helios with bimatoprost and artificial tears was compared to a placebo insert and timolol 0.5% BID.

- The bimatoprost insert lowered IOP, but less than did topical timolol 0.5% dosed twice daily in eyes with placebo insert.
- Retention was 90% at 6 mos.
- ForSight Vision5 recently acquired by Allergan.
- Bimatoprost/timolol FC ring in development.
**OTX-TP**

- Releases travoprost and is visible via fluorescence.
- May require flushing the canaliculus with saline or other maneuvers if removal is needed.
- Retention of the OTX-TP device was 91% at 60 days and 48% at 90 days.
Mati Therapeutics device, L-PPDS (latanoprost-punctal plug delivery system), is a drug-eluting punctal plug.

- L-PPDS releases latanoprost and is grossly visible.
- As a superficial punctal plug, it can be pulled out relatively easily.
Conclusions
Sustained delivery of latanoprost by contact lenses is at least as effective as delivery with daily latanoprost ophthalmic solution. More research is needed to determine the optimal continuous-release dose that would be well tolerated and maximally effective. Contact lens drug delivery may become an option for the treatment of glaucoma and a platform for ocular drug delivery.
GREAT THINGS ABOUT SUSTAINED DELIVERY

- Compliance is greatly enhanced
- Potentially fewer issues for patients
NOT SO GREAT THINGS ABOUT SUSTAINED DELIVERY

- Injectable meds and implants- if med doesn’t work topically or has adverse effects, drop is stopped; can’t easily stop implantable devices.
- Implants can theoretically block parts of the angle
- Complications with invasive options
  - Endophthalmitis
- Decreased access to care?
NOT SO GREAT THINGS ABOUT SUSTAINED DELIVERY

- Patients still have to verify if plug or ring is still in place
  - May be challenging for some
    - If patients have to check daily - why not just use a drop?

- Contact lens-delivery system:
  - Older patients handling lenses?
  - Issues with infectious keratitis
NOT SO GREAT THINGS ABOUT SUSTAINED DELIVERY

- Limitations - how many drugs can you load into a ring or put in the anterior chamber? Patients only have 2 puncta per eye - may still need topical therapy as well

- Drugs may work better in pulsatile form and not so well in constant delivery

- PGAs less effective at BID dosing - receptor supersaturation and desensitization
  - Downtime between drops prevents desensitization
NOT SO GREAT THINGS ABOUT SUSTAINED DELIVERY

- SR products seem less effective than drops
- Will insurance pay for it just to increase compliance?
ANTI-VEGF MODEL FOR AMD

- Compared to clinical trials, VA outcomes are worse and there are fewer injections done in the real world. Patients lost to follow-up are doing poorly.
- Drop out rate 20%-30%

NATURAL COURSE OF PATIENTS DISCONTINUING TREATMENT FOR AGE-RELATED MACULAR DEGENERATION AND FACTORS ASSOCIATED WITH VISUAL PROGNOSIS

JAE HUI KIM, MD,* YOUNG SUK CHANG, MD;† JONG WOO KIM, MD*

Purpose: To evaluate the 24-month natural course of visual changes in patients discontinuing treatment despite persistent or recurrent fluid and factors predictive of visual prognosis.

Methods: This retrospective, observational study included 35 patients (35 eyes) who initially received anti-vascular endothelial growth factor treatment for neovascular age-related macular degeneration (AMD), but discontinued treatment despite persistent or recurrent fluid. The best-corrected visual acuity (BCVA) at treatment discontinuation was determined and compared with the 24-month BCVA, which was then compared between polypoidal choroidal vasculopathy and other neovascular age-related macular degeneration subtypes. Baseline characteristics predictive of visual outcome and the degree of visual change were also analyzed.

Results: The mean number of anti-vascular endothelial growth factor injections before treatment discontinuation was 4.0 ± 1.6. The mean logarithm of minimal angle of resolution of BCVA at treatment discontinuation and that at 24 months were 1.02 ± 0.20 (Snellen equivalents = 20/209) and 1.60 ± 0.56 (20/796), respectively (P < 0.001). The 24-month BCVA was not different between polypoidal choroidal vasculopathy and other neovascular age-related macular degeneration subtypes (P = 0.800). The type of fluid (intraretinal fluid vs. no intraretinal fluid) was predictive of 24-month BCVA (P = 0.004) and the degree of changes in BCVA (P = 0.043).

Conclusion: Marked deterioration in visual acuity was noted in patients discontinuing treatment, regardless of neovascular age-related macular degeneration subtypes. The presence of intraretinal fluid was associated with worse visual prognosis, suggesting that patients with intraretinal fluid should be strongly warned about their poor prognosis before they decide to discontinue treatment.

RETINA 0:1-8, 2017
WILL PATIENTS GO FOR IT?
CONCLUSIONS

- Strong push for sustained drug delivery
- Several years away
- Some options will be invasive
  - Limit access to care
- Most options will be non-invasive
- All offer some benefits combined with limitations
- Drops, SLT, and surgery will not become obsolete
- Will these options revolutionize glaucoma management?
NEW MEDICATIONS AND SUSTAINED DRUG DELIVERY REVOLUTIONIZING GLAUCOMA

YOU MAY SAY I'M A DREAMER BUT I'M NOT THE ONLY ONE
ISSUES IN IMAGING

- OCT technology is readily available and present in contemporary practice
- No one single parameter is more important than the others.
- Never base a clinical decision based upon only one piece of data.
- OCT is not a Silicon Valley Rumplestilskin. You cannot put in straw and get out gold
ISSUES IN IMAGING

Interpretation is a three-step process

1. Understand what the printout says
2. Apply experience and value judgement
3. Correlate to the clinical findings
ISSUES IN IMAGING

- You cannot make a diagnosis of glaucoma based solely upon imaging results.
- The use and overemphasis of imaging technology to the exclusion of additional clinical findings and assessment of risk will put patients in peril.
- Exactly how much confidence should an OCT give you as to whether or not a patient has glaucoma?
  - Depends how much confidence you had before you imaged the patient.
Using OCT to Verify Early Glaucoma

A healthy, 39-year-old Caucasian man was referred for evaluation for pigment dispersion. The patient had a moderately elevated cup-to-disc ratio of 0.5 to 0.6, as per his optometrist. His IOP was 13 mm Hg OD and 14 mm Hg OS.

This patient was a glaucoma suspect, so I wanted to get good baseline data. His visual field and central corneal thickness tests were normal, but his OCT scan was abnormal.

To verify the OCT, I carefully examined his optic nerves and found that his cup-to-disc ratio was 0.85 x 0.85 OD and 0.85 x 0.80 OS.
ISSUES IN IMAGING

- Normative Database
- Signal Quality
- Blink/Saccades
- Segmentation Errors
- Media Opacities
- Axial Length
OCT DATABASE INFORMATION

- **RTVue: 600 eyes (Largest database)**
  - Age
  - Disc Size
  - Ethnic Group (African, Chinese, Japanese, Caucasian, Hispanic, Indian, “other”)

- **Cirrus: 284 eyes**
  - Age 19-84
  - RE: -12D to +8D
  - Ethnic Groups: Caucasian (43%), Asian (24%), AA (18%), Hispanic (12%);

- **Spectralis: 201 patients**
  - All Caucasian
  - Age 18-78
  - RE -7D to +5D
  - New database representative of US population
WHAT TO LOOK FOR WHEN INTERPRETING OCT SCANS

- Quality score
- Illumination
- Focus clarity
- Image centered
- Any signs of eye movement
- Segmentation accuracy
- B Scan Centration
- Missing data
- Media issues
- Maculopathy for GCC scans
RTVue-100
EYE MOVEMENT
Accidentally find CSC when looking for glaucoma
Figure 9: Examples of segmentation errors (a) in RNFL thickness map (b) in ONH borders and (c) in GCC layers
Spectralis
IF YOU THINK DEVICES MEASURE TISSUE ACCURATELY EVERY TIME...
Spectralis

Follow-Up #1  May/31/2012

IR 30° ART + OCT ART (100) Q: 30 [HR]

Classification
Borderline
Spectralis
Floor effect
Don’t make clinical decisions based upon bad data
The diagnostic imaging doesn’t agree with my diagnosis? Now what?
ANSWER:

- Things have to make sense. If the imaging findings do not fit with the anatomic and functional correlates of pathophysiologic change, trust your own knowledge and judgment.

- When in doubt, repeat the imaging study and the visual field or both.
RED DISEASE –
A NEW CLINICAL NON-ENTITY

• A supratentorial, non-glaucomatous masquerade disease

• Afflicts the educated patient (especially with Internet access) with good health care plans and/or wealth

• Debilitating to the patient and painful for the visual care provider to treat

2005. Journal of Irreproducible Results and Senseless Studies
SCANNING LASER OPHTHALMOSCOPY
EXAMPLE OF RED DISEASE

First Visit
Follow up visit #1
Follow up visit #2

HRT3 Optic Nerve Head Changes
How long did this change take?
WHAT DO YOU MAKE OF THESE...?

Garbage in, Garbage out.
HELP! THE DIAGNOSTIC IMAGING DOESN’T AGREE WITH MY DIAGNOSIS!

- Low risk OHTN
- Local OD wants imaging for baseline
OCT RNFL NORMAL...

<table>
<thead>
<tr>
<th></th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average RNFL Thickness</td>
<td>84 μm</td>
<td>81 μm</td>
</tr>
<tr>
<td>RNFL Symmetry</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>Rim Area</td>
<td>0.98 mm²</td>
<td>0.88 mm²</td>
</tr>
<tr>
<td>Disc Area</td>
<td>1.61 mm²</td>
<td>1.91 mm²</td>
</tr>
<tr>
<td>Average C/D Ratio</td>
<td>0.61</td>
<td>0.73</td>
</tr>
<tr>
<td>Vertical C/D Ratio</td>
<td>0.57</td>
<td>0.70</td>
</tr>
<tr>
<td>Cup Volume</td>
<td>0.190 mm³</td>
<td>0.394 mm³</td>
</tr>
</tbody>
</table>
...but markedly abnormal GCC OS

Same patient, same day, same quality, GCC now normal

Signal strength: 10/10 OD, OS on both images
Don’t make clinical decisions based upon bad data
CASE: 62 YOHM

- Asymptomatic; 20/20 OD; OS
- TA 30 mm OD, 28 mm OS
  - Isolated measurement
  - 12-17 mm OD, 13-17 mm OS
    • 11 visits
- Gonio: open OU w/o abnormalities
- CCT: 597 OU
So, What are your thoughts?

Debate: Treat or Observe?
Debate: Why the disparate findings?
Debate: Why the isolated IOP elevation?
GREEN DISEASE—AN INSIDIOUS CLINICAL ENTITY

A glaucomatous process masquerading as non-disease
Afflicts inexperienced, poorly-educated, and lazy doctors who simply want a machine to make all clinical decisions for them
Debilitating to the patient and painful for the visual care provider, but a boon for malpractice attorneys

2015. Journal of Irreproducible Results and Senseless Studies
HELP! THE DIAGNOSTIC IMAGING DOESN'T AGREE WITH MY DIAGNOSIS!

- 56 YOM- Glaucoma suspect since 2012
Is this person really a glaucoma ‘suspect’?

A example of Green Disease
Green Disease
GREEN DISEASE
RED + GREEN = YELLOW DISEASE?
OCT IMAGING TAKE HOME POINTS

- Serial overlays/imaging to determine baseline (intra-session) noise
- Good signal strength
- Good segmentation without errors
- Optic nerve head exam for disc hemorrhage, pallor, myopic, and tilted nerve heads
- Determine structure-function correlation
- Follow all ancillary tests visual fields and optic nerve head head photos for progression
CAUTIONS ABOUT IMAGING

- No current technology is better than the human eye and common sense
- Beware of “Red Disease”
- Treat Real Disease and not Red Disease
- Don’t miss Green Disease
- Know the limitations of the technology: normative database, reproducibility, resolution, quality of imaging
- Technologies come and go
Surgical updates
SURGICAL OPTIONS

• Laser trabeculoplasty
  - Argon laser trabeculoplasty (ALT)
  - Selective laser trabeculoplasty (SLT)

• Trabeculectomy with an antifibrotic agent

• Tube shunt

• Newer glaucoma surgical procedure (MIGS)
  • MEGS?
- **Short-term results**
  - Initial success: 65-95%
  - Reduction in IOP: 20-30%

- **Long-term results**
  - Attrition rate: 5-10% per year
  - 5 year success rate: 50%
Mechanism of action

- Shrinkage of collagen in TM pulls open intertrabecular spaces between treatment sites
- Stimulates trabecular endothelial cells to divide and migrate
- Stimulates trabecular endothelial cells to produce an altered extracellular matrix with less outflow-obstructing properties
Laser Trabeculoplasty Mechanisms

**Argon (ALT)**
- Causes scarring of the TM
  - Mechanical contraction of TM tissue
  - Opens up adjacent areas in TM

**Selective (SLT)**
- Biological activation of inflammatory mediators
  - “Cleans up“ TM
## ALT VS SLT

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Eyes</th>
<th>IOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damji, 1999</td>
<td>18 ALT</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>18 SLT</td>
<td>21%</td>
</tr>
<tr>
<td>Popiela, 2000</td>
<td>27 ALT</td>
<td>13.0%</td>
</tr>
<tr>
<td></td>
<td>27 SLT</td>
<td>13.4%</td>
</tr>
<tr>
<td>Martinez-de-la-Casa, 2004</td>
<td>20 ALT</td>
<td>19.5%</td>
</tr>
<tr>
<td></td>
<td>20 SLT</td>
<td>22.2%</td>
</tr>
</tbody>
</table>
“TRADITIONAL” TRABECULECTOMY

Trabeculectomy (1968) + anti-metabolite (MMC)

- Bleb forming procedure
- Long established procedure with vast experience
- Risk of bleb related complications
  - Seidel Sign (leak)
  - Blebitis / Endophthalmitis
OUTCOMES: TRABECULECTOMY

Success After 20 Years:

- 57% = complete success
- 88% = qualified success (w/ meds)

Complications:

- Cataract: 55%
- Loss of ≥3 lines of acuity: 21%
- Bleb-related problems: 10%
- Infection: 4%

Jampel HD. Ophthalmol 2012
Gedde SJ. Arch Ophthal 2012
ANTIFIBROTIC AGENTS

- Inhibit fibroblast proliferation
  - MMC; 5-FU

- Indications
  - Neovascular glaucoma
  - Uveitic glaucoma
  - Previous ocular surgery (e.g. CE, failed filter)
  - African American race
  - Young age
    - Good healing
  - Need for a very low IOP
    - Very advanced disease
TRABECULECTOMY

- Historically performed by general ophthalmologists
- As ophthalmology has evolved, most general ophthalmologists have abandoned trabs to glaucoma specialists
- Established glaucoma specialists have now learned tubes and seatons (drainage implants)
- Newer glaucoma specialists are increasingly learning drainage implants
- So, traditional trabeculectomy is becoming a relic compared to drainage devices (but not MIGS)
DRAINAGE DEVICES/ TUBE SHUNTS

- **AC tube**
  - Shunts aqueous from AC to plate
  - Maintains patency of fistula

- **Episcleral plate (explant)**
  - Located in equatorial region of globe
  - Forms a nonadherent capsule
TUBE SHUNTS

- Indications
  - Neovascular glaucoma
  - Uveitic glaucoma
  - Previous ocular surgery (e.g. CE, failed filter)
  - Perilimbal conjunctival scarring
  - ICE syndrome
  - Congenital glaucoma refractory to angle surgery
  - Primary surgical procedure?
EX-PRESS™ MINI GLAUCOMA SHUNT

E-Shunt (Alcon)

- FDA 2002
- NOT a MIGS procedure
  - still is a bleb forming procedure
- Stainless steel implant into angle
- Generally good outcomes, about on par with standard trabeculectomy
- Reported fewer complications
MIGS

- Micro Invasive Glaucoma Surgery

- Emerging category of devices and procedures
  - Fills a gap between medications and trabeculectomy
  - Overall fewer complications than trabeculectomy
  - Typically combined with cataract extraction and generally “easy” to perform
    - “MEGS?”
MIGS

- Appear to have improved safety profile over trabeculectomy, but reduced efficacy

- Procedures:
  - Canaloplasty
  - Trabectome*
  - Glaukos iStent
  - ECP
  - Cypass
  - XEN Gel stent
    - Bleb forming
  - Kahook Dual Blade*

* Modified goniotomy
TRABECTOME (NEOMEDIX)

FDA Approved 2004
A thermal cautery device with irrigation and aspiration
Used to remove a 2-4 clock hour segment of TM/SC
Less traumatic and safer than trabeculectomy surgery
Is combined with CE
Modest IOP lowering
CANALOPLASTY (ISCIENCE)

FDA Approved 2008

The goal of this procedure is to enlarge Schlemm's canal and enhance outflow.

A prolene suture is passed 360 degrees through Schlemm's canal with the aid of a microcatheter and viscoelastic to dilate the canal.

One drawback of this procedure is that it is technically challenging.
ISTENT (GLAUKOS CORP.)

iStent: Trabecular Micro-Bypass Stent

- FDA Approved 2012 for:
  Mild to Moderate glaucoma in patients who need cataract surgery

No Bleb is formed

- Few complications

Relatively Easy to perform
iStent safely improves outflow by creating a patent bypass between the anterior chamber and Schlemm’s canal.

iStent is surgical-grade nonferromagnetic titanium micro-bypass stent preloaded in a single-use, sterile inserter.
ISTENT: TWO YEAR DATA

OAG patients to have CE alone or with single iStent

Results:

• 61% in iStent had IOP ≤ 21 mmHg vs. 50% CE alone
• IOP similar at first (~17), but then 1mmHG higher in CE alone
• iStent group had fewer medications
• Results will likely improve once approval granted for multiple devices

CYPASS

Supraciliary microstent that increases uveoscleral outflow.

It is implanted through a clear corneal incision and can be combined with cataract surgery.
CYPASS

• Placed in angle between ciliary body and sclera and drains to suprachoroidal space.

• 2 year outcome: Phaco plus CyPass - 7.4 mm IOP reduction

• Phaco alone - 5.4 mm IOP reduction
KAHOOK DUAL BLADE

- Single use, ophthalmic blade
- Utilizes ab interno approach through a clear cornea micro incision
- Precision engineered to fit in the canal of Schlemm
- Dual blades positioned for precise parallel incisions of the trabecular meshwork with minimal residual leaflets
- Maintains natural physiologic outflow pathways
KAHOOK DUAL BLADE

- Tip of the blade is pierced across the trabecular meshwork, then the dual blades create two incisions as the blade is advanced.

- Beveling allows for apposition with outer wall of Schlemm’s canal and advancement of the dual blade neatly excises a strip of trabecular meshwork for 90 to 150 degrees of the angle.

- An analysis of post-op outcomes at three months found a 33% reduction in IOP, from 17.5 mm Hg pre-op to 11.8 mm Hg post-op. Sixty-nine percent of patients were able to stop using at least one of their glaucoma medications after surgery.

- Must have good visualization of the angle

- Vision can be decreased due to hyphema

- Can be used stand alone or with cataract surgery
Now FDA Cleared

Minimally Invasive. Powerfully Effective.
XEN GEL STENT

- FDA approved the XEN45 Gel Stent and the XEN Injector for patients with refractory glaucoma who failed previous surgical treatment or in patients with primary open angle glaucoma, pseudoexfoliative or pigmentary glaucoma with open angles that are unresponsive to maximum tolerated medical therapy
- “Lower maintenance” bleb-forming procedure
- Potential for low (<15 mm) IOP
XEN GEL STENT

- The stent is a soft, permanent, subconjunctival implant that shunts fluid from the anterior chamber to the subconjunctival space.
- 6-mm long and the width of a human hair
- Preloaded in a disposable Xen injector and is implanted through a small, self-sealing corneal incision.
- The stent’s collagen-derived non-inflammatory gelatin material allows it to conform to the ocular tissue, possibly minimizing many of the issues seen with synthetic materials such as migration, erosion and corneal endothelial damage.
In the pivotal trial conducted in refractory glaucoma patients, XEN reduced IOP from a mean medicated baseline of 25.1 (+ 3.7) mmHg to 15.9 (+ 5.2) mmHg at 12 months postop.

The mean baseline number of IOP-lowering medications was 3.5 versus an average use of 1.7 medications at 12 months.

XEN also allows for other IOP-reduction techniques should they be required after surgery.
XEN GEL STENT

- Allergan plans to launch the device in the US in 2017. Xen is already approved for use in the EU, Canada, Switzerland and Turkey, with more than 10,500 stents distributed worldwide.

- Complications may include choroidal effusion, hyphema, hypotony, implant migration, implant exposure, wound leak, need for secondary surgical intervention, and intraocular surgery complications.
The most common postoperative adverse events included BCVA loss of ≥ 2 lines (≤ 30 days 15.4%; > 30 days 10.8%; 12 months 6.2%), hypotony IOP < 6 mm Hg at any time (24.6%; no clinically significant consequences were associated, no cases of persistent hypotony, and no surgical intervention was required), IOP increase ≥ 10 mm Hg from baseline (21.5%), and needling procedure (32.3%).
WHERE ARE WE TODAY?

- **MIGS**
  - Several new options/procedures that will be offered by a growing number of general ophthalmologists to manage patients with mild glaucoma requiring IOP in the high teens

- **Trabeculectomy**
  - Will continue as the mainstay procedure by glaucoma specialists for patients with moderate stage glaucoma requiring IOP in the low teens

- **Primary tube implants are increasing in use as glaucoma surgeons become more comfortable**
ENDOCYTOPHOTOCOAGULATION (ECP)

- Intraocular procedure performed as a stand alone or combined with cataract surgery
- Ablation of the ciliary body under direct visualization
- Inflow procedure - Decreases aqueous production to reduce IOP
- Partially destroys the ciliary body
- Cyclophotocoagulation is an external procedure
ECP - RISKS

- Endophthalmitis
- Suprachoroidal hemorrhage
- CME (10%)

Not indicated for:
- Patients with real high IOP
- End stage glaucoma
- Compromised outflow (NVG)
WHEN IS SURGERY WRONG FOR THE PATIENT?
**ANSWER:**

- When the risk of surgery is greater than its expected benefit.
- When it is more dangerous to undergo a surgical procedure than to continue on the same medical treatment.
- When you would not recommend the same intervention to your family members.
GLAUCOMA SURGICAL DECISION MAKING

- Establishing the course of treatment
  - Is the disc or field status stable or worse?
  - If progression has occurred, over what time period?
  - What is the rate of change?
  - What is the risk of visual disability in the patient’s lifetime?
  - Is the patient aware of either decreased central visual acuity or peripheral visual field loss?
    - Classic question: Is it the cataract or the glaucoma or the age related macular degeneration?
IMPORTANT QUESTIONS ABOUT VALUE OF SURGICAL INTERVENTION – HOW FAR TO GO?

- Does the patient value the visual acuity of Hand Motions or Light Perception or remaining visual field?
- What is the status of the fellow eye?
- Is glaucoma a primary condition or related to a cause (proliferative diabetic retinopathy, central retinal vein occlusion, trauma)?
- Has a family member become visually disabled from glaucoma?
- Has a family member lost vision after glaucoma surgery?
IS FILTERING SURGERY A PANACEA?

- Trabeculectomy will give low IOP
  - Single digits
- Long history of success
- Technically straightforward process
- Eye never looks/feels the same
- Potential complications
RISKS OF ANY INTRAOCULAR PROCEDURE

- **Intraoperative suprachoroidal hemorrhage** ("expulsive hemorrhage")
  - Risks – elderly, hypertensive, prior vitrectomy, aphakia, very high preoperative IOP
  - About 1:1500 to 2000 overall

- **Postoperative endophthalmitis**
  - About 1:1500 to 1:2000 eyes in USA

- **Ptosis**
  - Uncommon, probably less than 2%
RISKS OF GLAUCOMA SURGERY

- **Trabeculectomy**
  - Immediate postoperative period
    - Hypotony – flat anterior chamber, acute cataract, angle closure, choroidal effusion
    - “Wipe out” or “snuff out” syndrome – acute loss of central acuity without obvious intraoperative complication
    - Decreased visual acuity - Patient only knows that they see much worse after surgery

- **Glaucoma drainage implant surgery**
  - Muscle imbalance – noncomitant diplopia
ADDITIONAL RISKS OF GLAUCOMA SURGERY

- **Late postoperative period**
  - Posterior synechiae formation – poor dilation
  - Cataract formation
  - Bleb scarring and return of high IOP

- **Very late postoperative period**
  - Endophthalmitis and blebitis
  - **Remember “RSVP”**
    - R – Redness
    - S – Sensitivity to light
    - V – Vision Change
    - P – Pain
Edna
20/20 OD, OS
Age 37
Central 10-2 Threshold Test
Stimulus: III, White
Background: 31.6 ASB
Visual Acuity:
Pupil Diameter: 3.1 mm
Date: 05-17-2011
Time: 8:57 AM
Age: 37

Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/16
False POS Errors: 0%
False NEG Errors: 0%
Test Duration: 06:15

Visual Field: OS

Central 10-2 Threshold Test
Stimulus: III, White
Background: 31.6 ASB
Visual Acuity:
Pupil Diameter: 3.6 mm
Date: 05-17-2011
Time: 9:46 AM
Age: 37

Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/16
False POS Errors: 0%
False NEG Errors: 0%
Test Duration: 06:34

Visual Field: OD

10-2 SS OS

10-2 SS OD
JUNIOR: 20/60 OD; 20/400 OS
56 YO
### Central 10-2 Threshold Test

<table>
<thead>
<tr>
<th>Fixation Monitor</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
<th>Fixation Target</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Haze/Blind Spot</td>
<td>III White</td>
<td>5.9 mm</td>
<td>02-09-2010</td>
<td>10:39 AM</td>
<td>Central</td>
<td>III White</td>
<td>7.0 mm</td>
<td>02-09-2010</td>
<td>10:32 AM</td>
</tr>
<tr>
<td>Fixation Losses: 0/13</td>
<td>Background: 31.6 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
<td>Fixation Losses: 0/15</td>
<td>Background: 31.5 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False POS Errors: 0 %</td>
<td>Strategy: SITA-Standard</td>
<td>False NEG Errors: N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True Positive Errors: 0 %</td>
<td>Test Duration: 05:38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOVEA OFF**

**Total Deviation**

<table>
<thead>
<tr>
<th>MD</th>
<th>Pattern Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>-34.03 dB P &lt; 1%</td>
<td>2.68 dB P &lt; 1%</td>
</tr>
</tbody>
</table>

**PSD**

<table>
<thead>
<tr>
<th>II &lt; 5%</th>
<th>III &lt; 2%</th>
<th>IV &lt; 1%</th>
</tr>
</thead>
</table>

**Central 10-2 Threshold Test**

<table>
<thead>
<tr>
<th>Fixation Monitor</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
<th>Fixation Target</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Haze/Blind Spot</td>
<td>III White</td>
<td>5.9 mm</td>
<td>02-09-2010</td>
<td>10:39 AM</td>
<td>Central</td>
<td>III White</td>
<td>7.0 mm</td>
<td>02-09-2010</td>
<td>10:32 AM</td>
</tr>
<tr>
<td>Fixation Losses: 0/13</td>
<td>Background: 31.6 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
<td>Fixation Losses: 0/15</td>
<td>Background: 31.5 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False POS Errors: 0 %</td>
<td>Strategy: SITA-Standard</td>
<td>False NEG Errors: N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True Positive Errors: 0 %</td>
<td>Test Duration: 05:38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOVEA OFF**

**Total Deviation**

<table>
<thead>
<tr>
<th>MD</th>
<th>Pattern Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>-34.03 dB P &lt; 1%</td>
<td>2.68 dB P &lt; 1%</td>
</tr>
</tbody>
</table>

**PSD**

<table>
<thead>
<tr>
<th>II &lt; 5%</th>
<th>III &lt; 2%</th>
<th>IV &lt; 1%</th>
</tr>
</thead>
</table>

**Central 10-2 Threshold Test**

<table>
<thead>
<tr>
<th>Fixation Monitor</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
<th>Fixation Target</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Haze/Blind Spot</td>
<td>III White</td>
<td>5.9 mm</td>
<td>02-09-2010</td>
<td>10:39 AM</td>
<td>Central</td>
<td>III White</td>
<td>7.0 mm</td>
<td>02-09-2010</td>
<td>10:32 AM</td>
</tr>
<tr>
<td>Fixation Losses: 0/13</td>
<td>Background: 31.6 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
<td>Fixation Losses: 0/15</td>
<td>Background: 31.5 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False POS Errors: 0 %</td>
<td>Strategy: SITA-Standard</td>
<td>False NEG Errors: N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True Positive Errors: 0 %</td>
<td>Test Duration: 05:38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOVEA OFF**

**Total Deviation**

<table>
<thead>
<tr>
<th>MD</th>
<th>Pattern Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>-34.03 dB P &lt; 1%</td>
<td>2.68 dB P &lt; 1%</td>
</tr>
</tbody>
</table>

**PSD**

<table>
<thead>
<tr>
<th>II &lt; 5%</th>
<th>III &lt; 2%</th>
<th>IV &lt; 1%</th>
</tr>
</thead>
</table>

**Central 10-2 Threshold Test**

<table>
<thead>
<tr>
<th>Fixation Monitor</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
<th>Fixation Target</th>
<th>Stimulation</th>
<th>Pupil Diameter</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Haze/Blind Spot</td>
<td>III White</td>
<td>5.9 mm</td>
<td>02-09-2010</td>
<td>10:39 AM</td>
<td>Central</td>
<td>III White</td>
<td>7.0 mm</td>
<td>02-09-2010</td>
<td>10:32 AM</td>
</tr>
<tr>
<td>Fixation Losses: 0/13</td>
<td>Background: 31.6 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
<td>Fixation Losses: 0/15</td>
<td>Background: 31.5 ASB</td>
<td>Visual Acuity: RX +3.75 DS DC X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>False POS Errors: 0 %</td>
<td>Strategy: SITA-Standard</td>
<td>False NEG Errors: N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>True Positive Errors: 0 %</td>
<td>Test Duration: 05:38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOVEA OFF**

**Total Deviation**

<table>
<thead>
<tr>
<th>MD</th>
<th>Pattern Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>-34.03 dB P &lt; 1%</td>
<td>2.68 dB P &lt; 1%</td>
</tr>
</tbody>
</table>

**PSD**

<table>
<thead>
<tr>
<th>II &lt; 5%</th>
<th>III &lt; 2%</th>
<th>IV &lt; 1%</th>
</tr>
</thead>
</table>
EDNA AND JUNIOR

- Surgery is likely wrong for Edna and Junior
- Risk of wipeout of remaining vision/ fixation very real even if low
  - “Doctor, I can’t see your face anymore”
- Medical therapy safest but maybe not surest
  - IOP in mid-to-low teens for both
HAZEL AND JOSEPH

- 87 YOF; 95 YOM- managed for 16 years
- Hazel: 20/20 OD; 20/30 OS; MMT; s/p SLT
  - IOP; 17 mm OD; 20 mm OS
  - CCT: 472 OD, 474 OS
- Joseph: 20/25 OD, OS
  - Cosopt, xalatan, and alphagan
  - IOP 11 mm OD, 13 mm OS
  - CCT 473 OD, 473 OS
HAZEL
JOSEPH
HAZEL AND JOSEPH

- For whom is surgery right and for whom is surgery wrong?
SUMMARY

- Pts with bare fixation are at high risk of surgical morbidity
  - At some point even aggressive surgeons will decline
    - “Better God than I take their vision”

- Surgery is wrong for your patient when someone you trust as your surgical consultant would not recommend the same procedure to their own family member.
THANK YOU FOR YOUR ATTENTION.
ALWAYS REMEMBER TO RECYCLE AND PROTECT
THE PLANET THAT WE WILL ULTIMATELY LEAVE
TO KEITH RICHARDS