Hot Topics in Eyecare

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Disclosure Slide for Eric Schmidt

- Dr Schmidt is an advisor or consultant for the following:
  - Allergan
  - Tarsus
  - Sydnexis
  - Harrow
  - Thea Pharmaceuticals
  - Topcon
  - B&L
  - Sight Science
  - B&L
  - Visus
  - Lenz Therapeutics
  - Ocuvex

Have You Heard The Latest

Regenereyes

What do we think of Regenereyes?

They Just Received The Dreaded FDA Letter

Sterilization Issues

Fraudulent Claims Issues

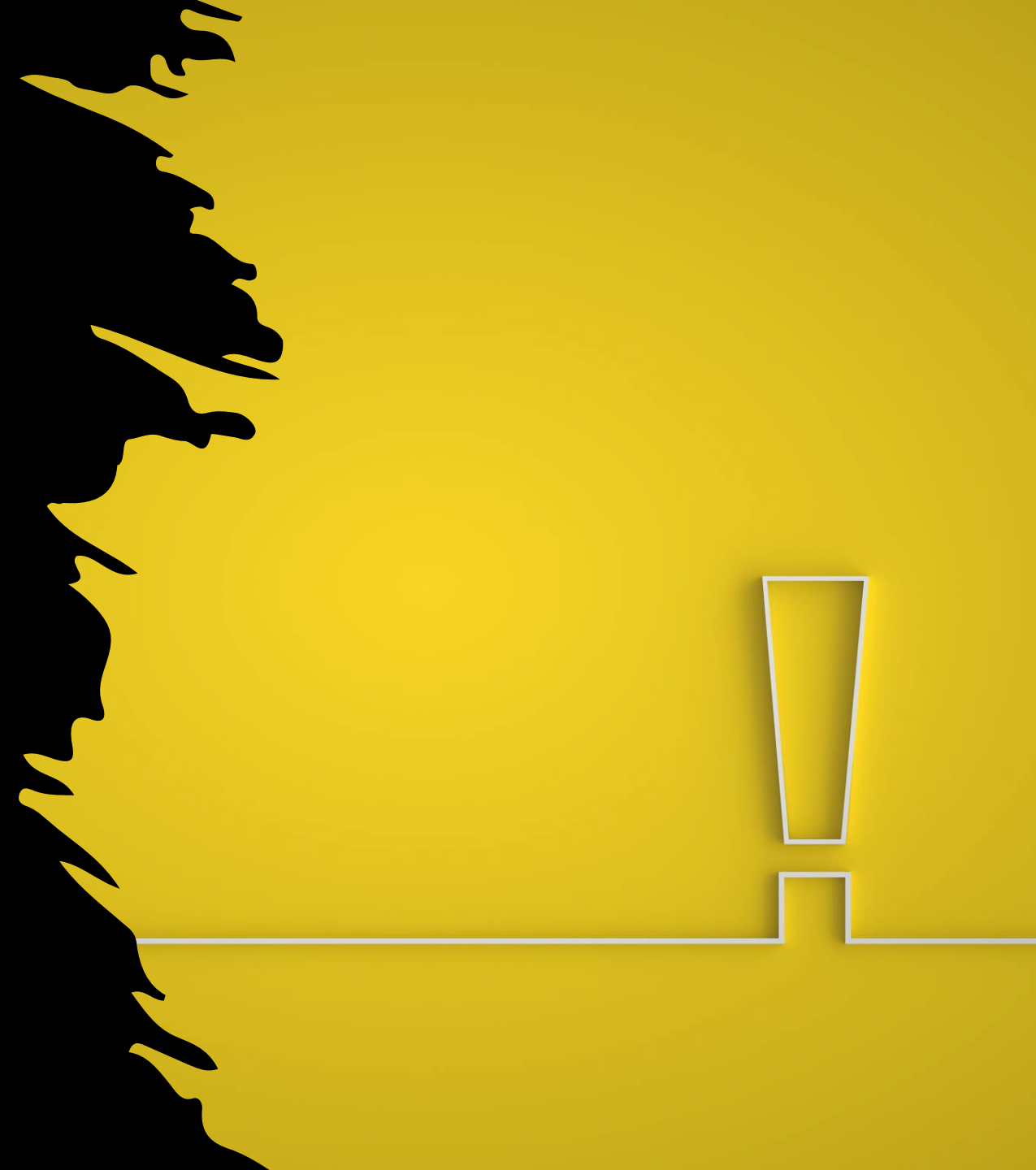
Elasil, Wang et al , (AJO, May 2014)

- Conclusion – “In POAG substantial RNFL thinning or structural loss appears to be necessary before functional visual field defects become detectable.”

- Study showed that there are tipping points on RNFL thickness after which VF defects appear
  - AVG mean RNFL thickness 89 microns BUT>>>
  - Superior RNFL tipping point was 100 microns
  - Inferior RNFL tipping point was 73 microns

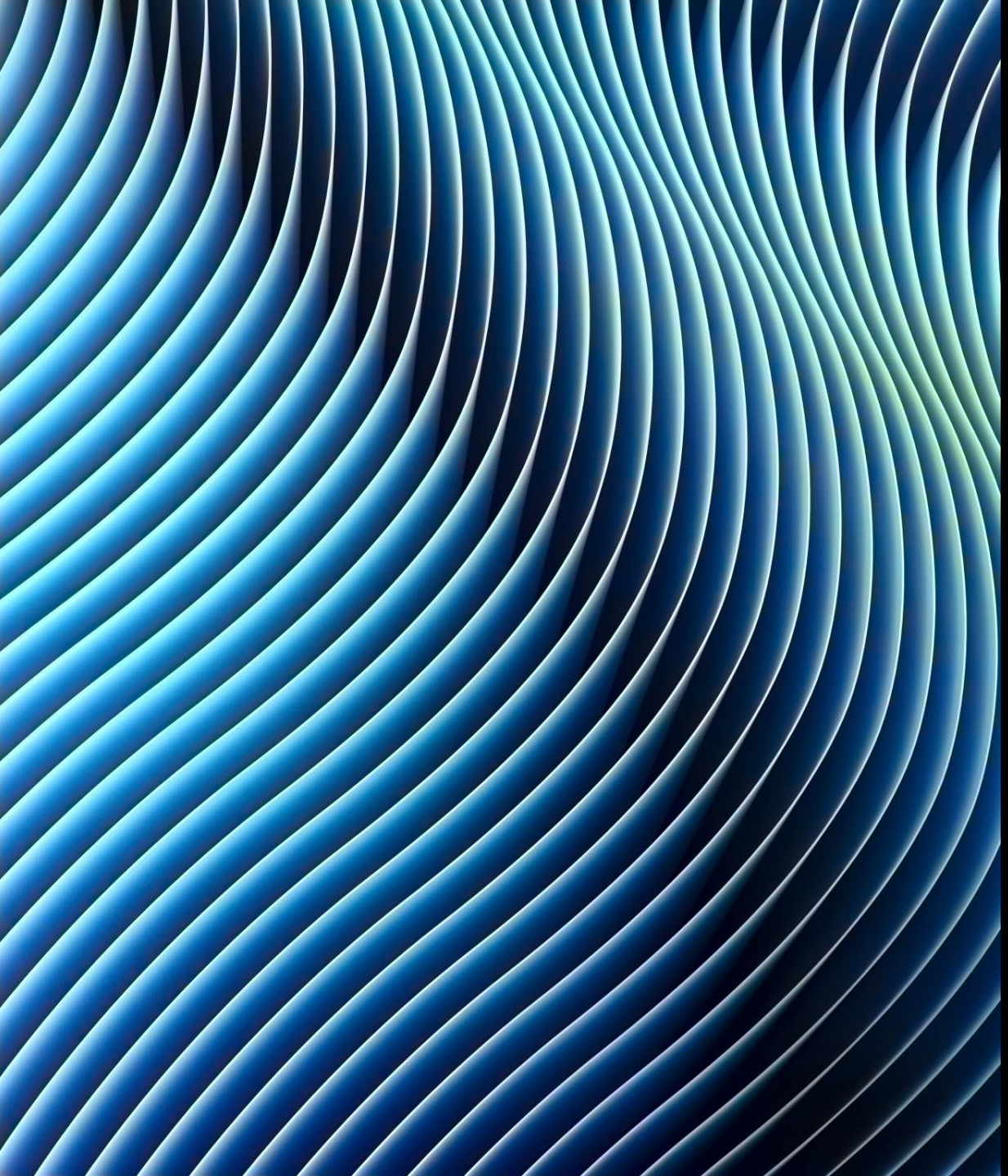
Speaking of Structure vs Function..

- Banegas SA, et al. – J Glaucoma May 2015
- Compared VF, OCT and Stereo Photographs for their ability to pick up progression
- 68% of progressive cases identified by OCT were initially classified as G suspects
- 61% of progressive cases identified by VF were initially classified as POAG



Conclusion

- “Progressing Eyes detected by OCT had a higher mean RNFL thickness (>83 microns) and higher mean VFI than progressing eyes detected by VF or stereo photos.”
- Soooo….
  - OCT is more likely to detect progression in pre-perimetric disease
  - VF and Photos better at detecting progression in more advanced stages of the disease



Clinically Important???

What is the significance of this data?

Does this give greater import for 1 test over another?

- This gives further credence that ALL 3 of the tests have value INDEPENDENT of each other!!

Visual Fields and Glaucoma

- Are they still cool?
- Are they considered the standard of care?
- How often?
- Can they still be relied upon?
- Do they better measure early detection or progression?

Visual Fields Are Still Really Cool, But What's the Problem With Them?

- Hard tests to take
- Subjective nature can cause poor reliability
- Poor reproducibility
- Fluctuation between tests
- Takes multiple tests to establish baseline and to show progression

- Patients don't seem to like them!!

How To Improve VF Test Results

1. Shorten the test time
2. Change the Testing Strategy
3. Increase Spot Size
4. Improve the Testing Environment
5. Increase Frequency of Testing

SITA Faster

- 2/3 of the test time of SITA Fast
- ½ the test time of SITA Standard
- The test time reductions are greatest in eyes with more severe VF loss
- The average 24-2 test time w/ SITA Faster is ~2 minutes

SITA Faster - What's The Big Deal?

- Reduces test time by reducing time between presentation of test spots
- Does not dumb down the test!
- Gets rid of redundancies that have been discovered over past 20 years

SITA Faster – So Again I Say, What's The Big Deal?

Current recommendations are for more frequent Visual Field testing on each px (EGS, OGS)

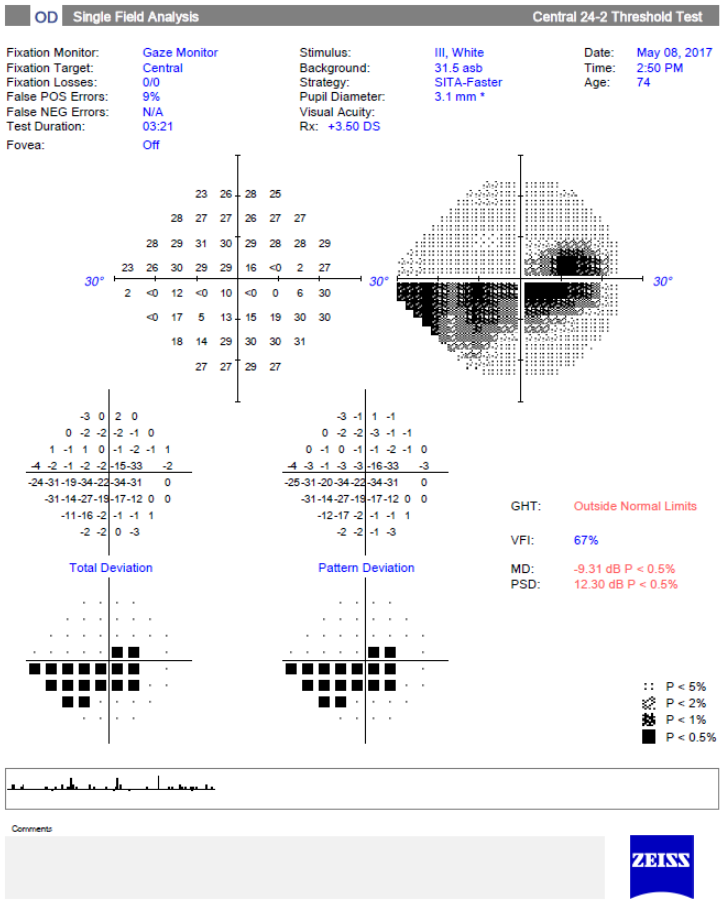
Faster test should allow the patients to be more accepting of the test and better test takers

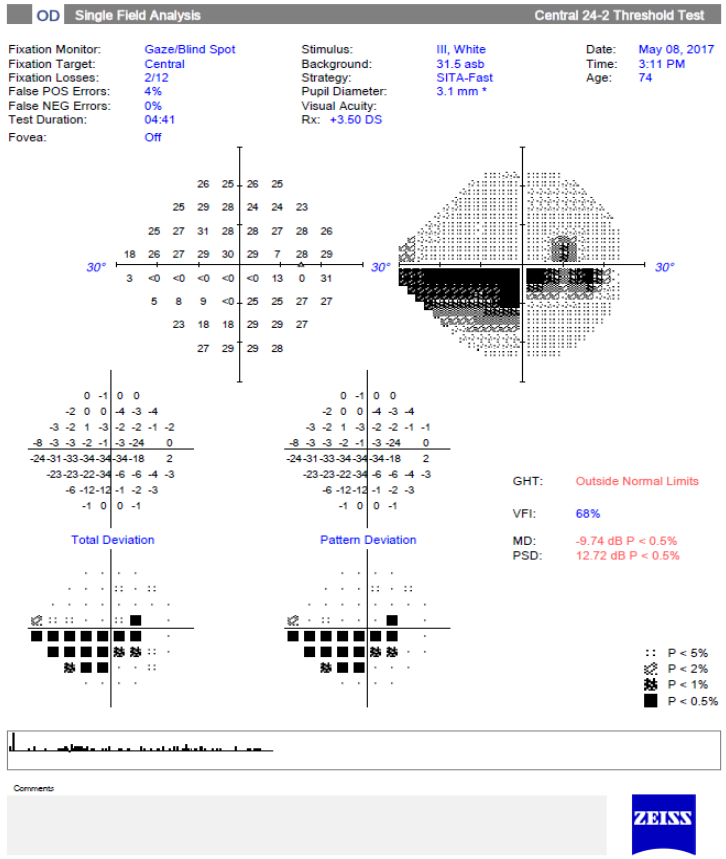
Faster tests should see Drs more willing to order tests more frequently

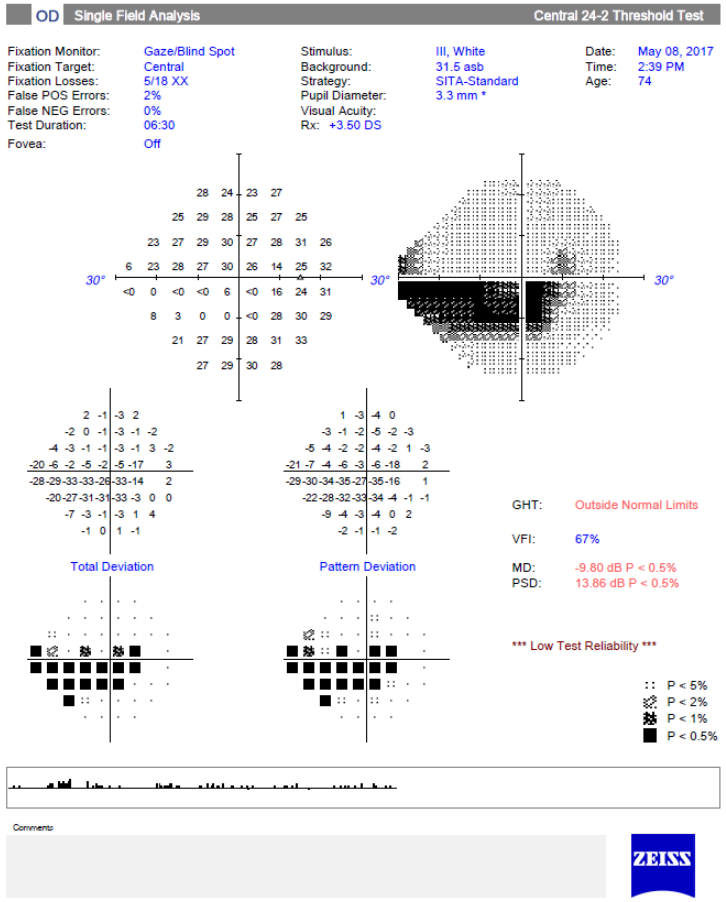
More frequent VF testing should:

- Facilitate earlier detection of glaucoma
- Allow for earlier detection of progression
- Better determine the rate of progression

All of which allow us to better clinical decisions for our patients







Visual fields courtesy Skåne University Hospital, Malmö, Sweden

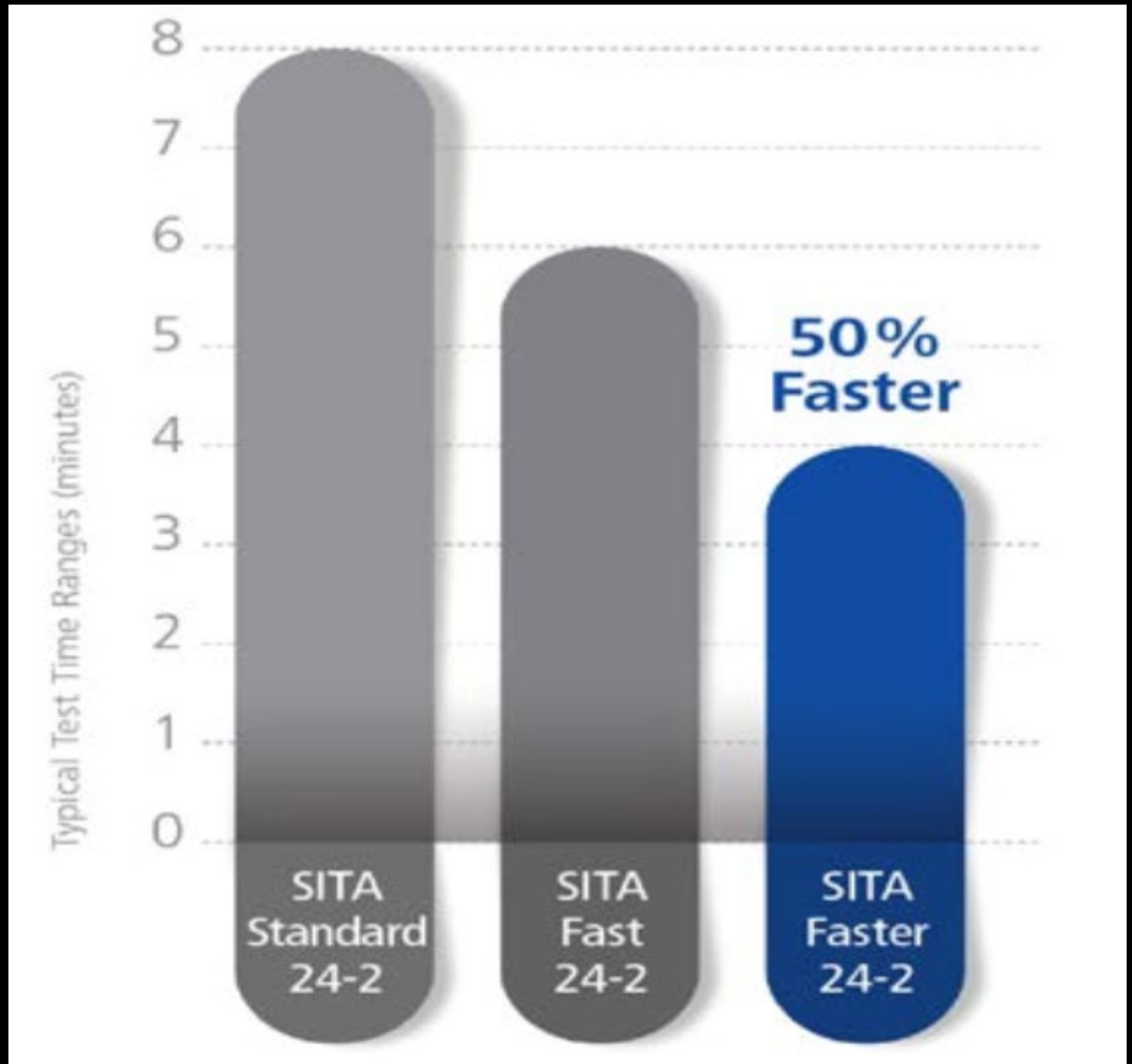
SITA Faster vs SITA Fast

SITA Faster produces similar results to SITA Fast

No loss of reproducibility

Improved reliability

SITA Faster results integrate into the existing Guided Progression Analysis (GPA) of that individual patient


Typical Test Time Ranges (minutes)
8
7
6
5
4
3
2
1
0
50%
Faster
SITA
Standard
24-2
SITA
Fast
24-2
SITA
Faster
24-2

To Improve Visual Field Analysis Remember The ”5 Rs”

Right Test Strategy

Reliability

Repeatability

Reproducibility

Right Software

Not your mother's visual field analyzer anymore!..!..!

Welcome to A Brave New World

FAST, COMFORTABLE, ACCURATE

VISUAL FIELD TESTING

TEMPO™

TEMPO improves the visual field testing experience for patients and enables effective testing from screening through advanced glaucoma without compromising accuracy.

The unique binocular design makes testing faster and more comfortable.

ORIGINAL STUDY

Perimetric Comparison Between the IMOvifa and Humphrey Field Analyzer

Takashi Nishida, MD, PhD, Medi Eslani, MD, Robert N. Weinreb, MD, Juan Arias, MD, Cristiana Vasile, MD, MAS, Vahid Mohammadzadeh, MD, and Sasan Moghimi, MD

J Glaucoma • Volume 32, Number 2, February 2023

- IMOvifa (TEMPO) reduced measurement time by 39%
- MD, PSD, and VFI values for IMOvifa showed good agreement with HFA SITA-Fast strategy.
- Reduced fatigue for both patient and examiner

What Makes Tempo Faster?

- Designated dark room not required, **less patient movement** from room to room
- **No eye patching,** no stopping to occlude second eye – one continual, uninterrupted test
- **Stimuli presented to right and left eye randomly** – patient unaware of eye being tested at each point

FAST

Faster than the gold standard in clinical testing.[1]

COMFORTABLE

Random, binocular testing creates a comfortable "fun" patient experience.

ACCURATE

Performance equivalent to the gold standard and excellent repeatability proven in peer reviewed research.[1, 2]

Intuitive Interface

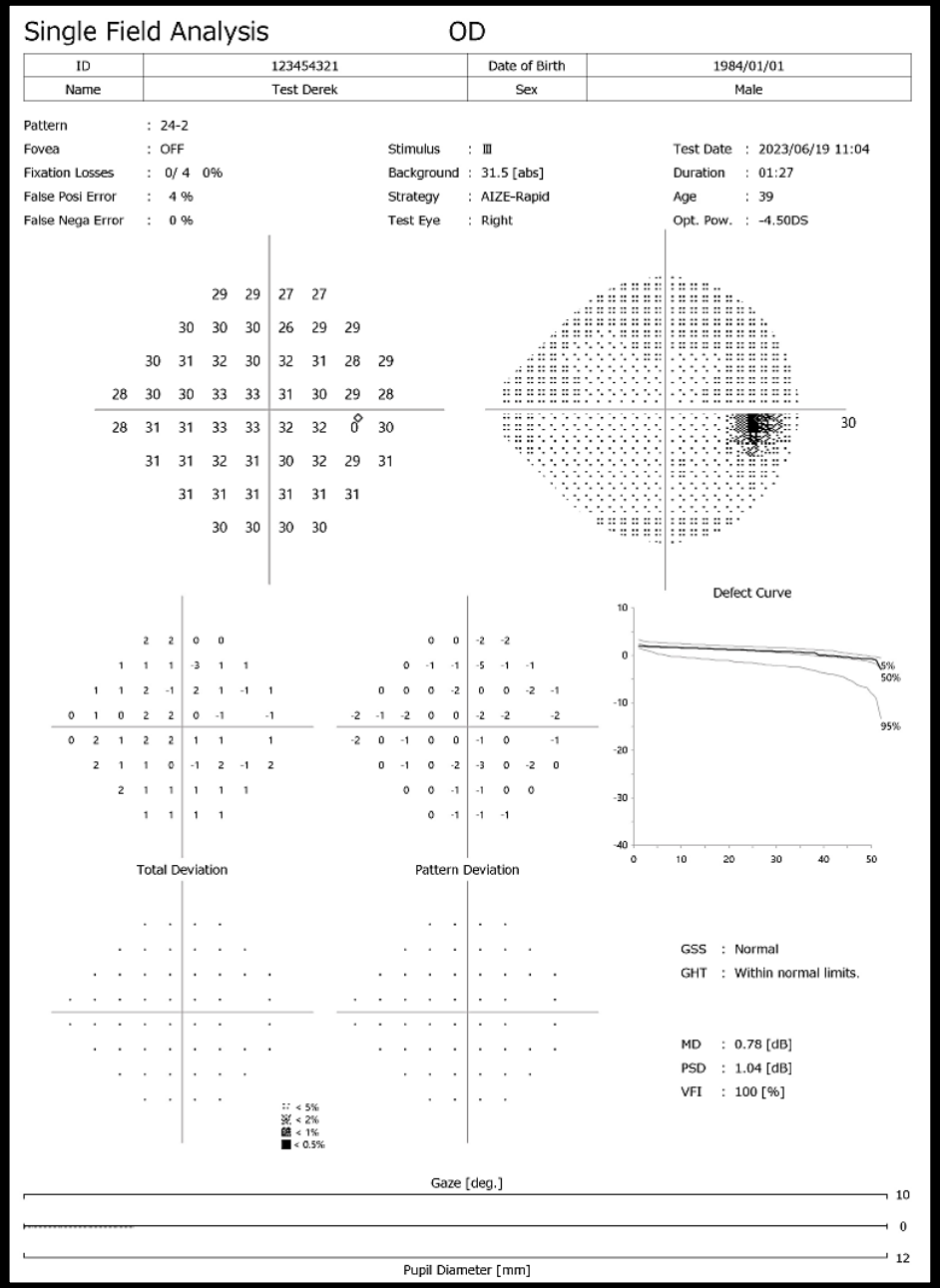
Includes All SAP Test Patterns

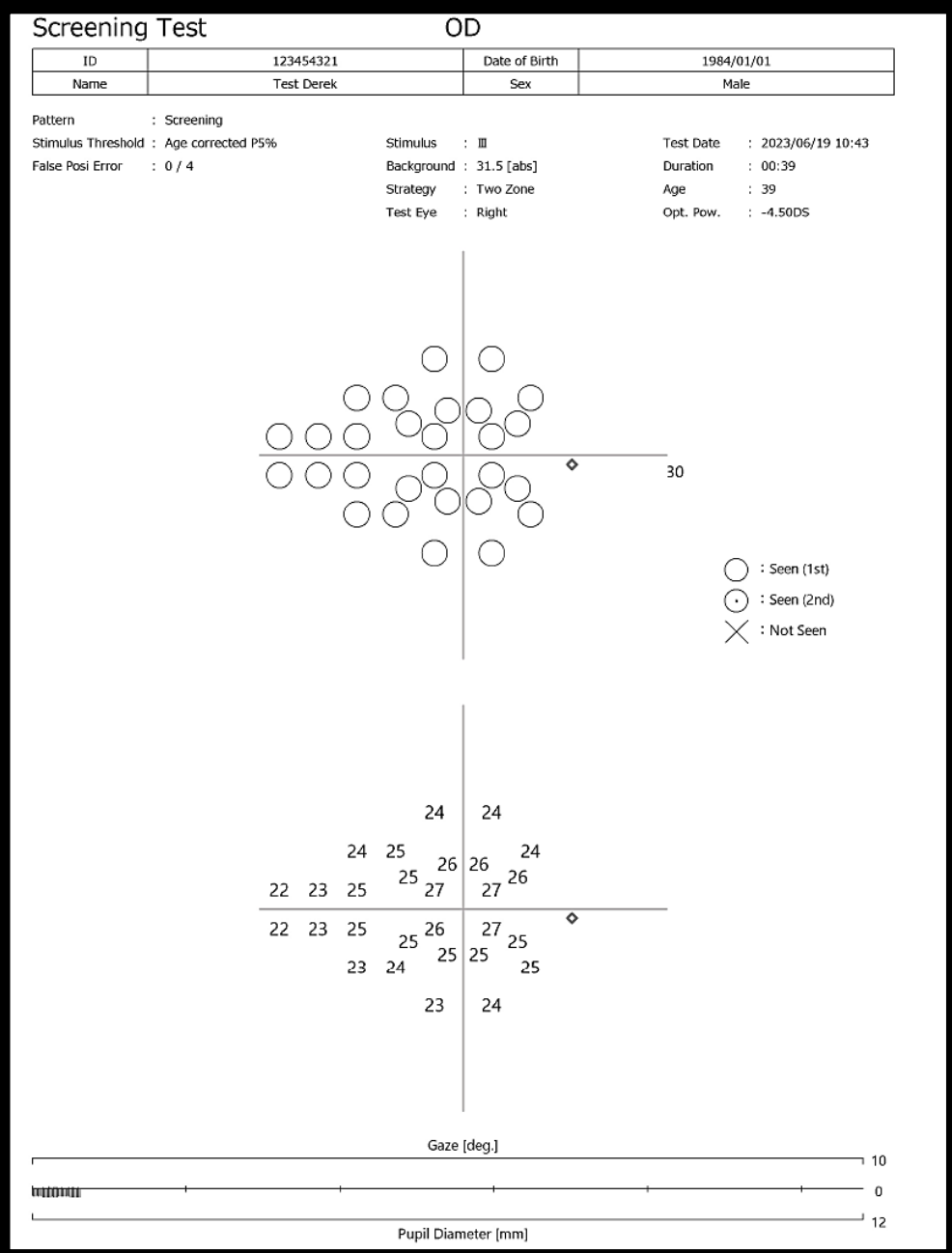
Functions in Ambient Light

Small Footprint

1. M Eslani, T Nishida, S Moghimi, JM Arias, C Vasile, V Mohammadzadeh, RN Weinreb; Comparison Between a New Perimetry Device (IMOvifaTM) and Humphrey Field Analyzer; ARVO Annual Meeting Abstract, IOVS June 2022, Vol.63, 1272 - A0412. 2. M Tafreshi, J Menou MA, D Kasanoff OD, M Durbin PhD, N El-Nimri OD PhD, and K Cieslinski; Repeatability of Visual Fields Taken With the IMOvifa (Tempo) Binocular Perimeter; ARVO 2023, Poster Number 5505.

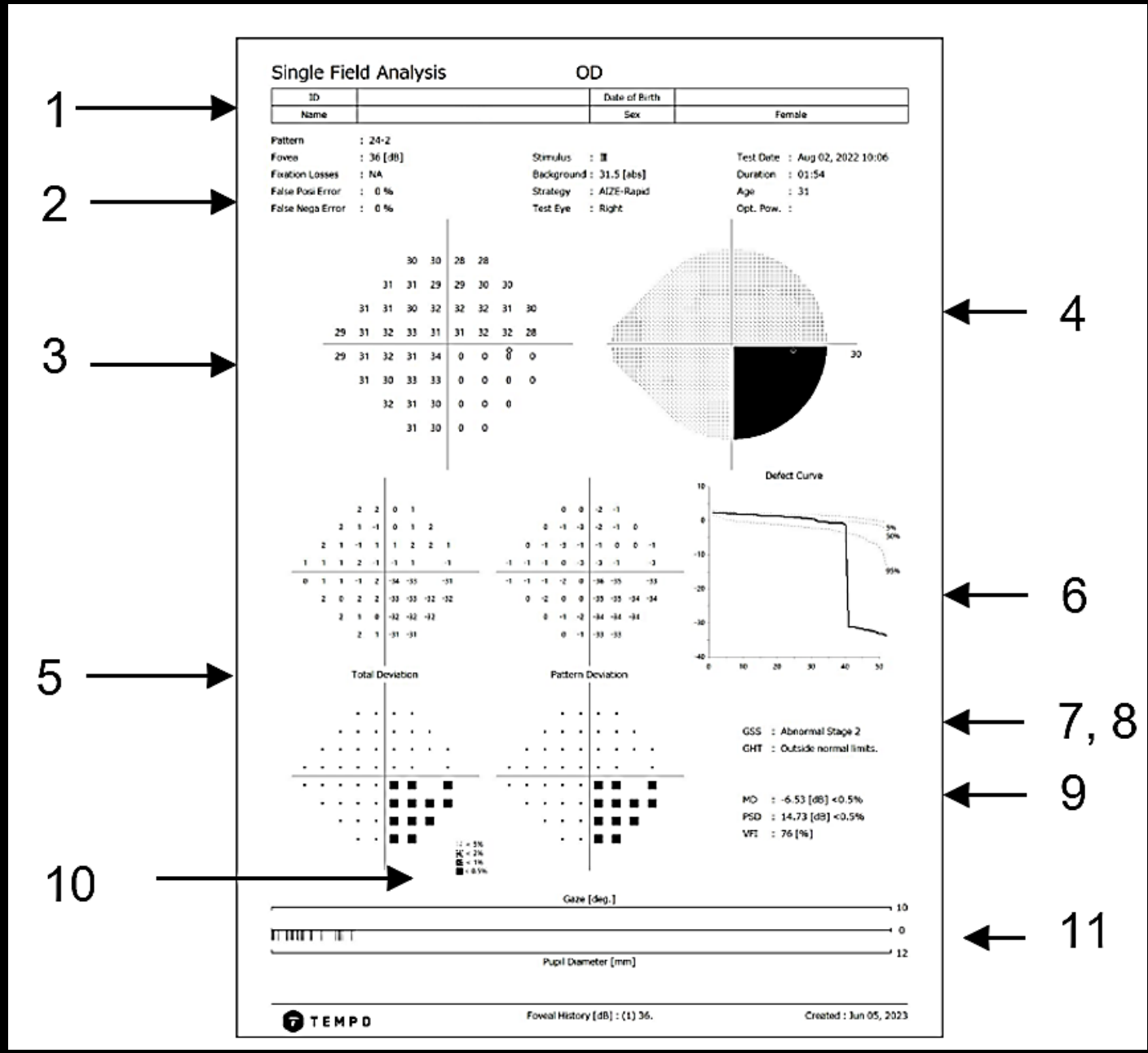
Threshold & Screening Reports





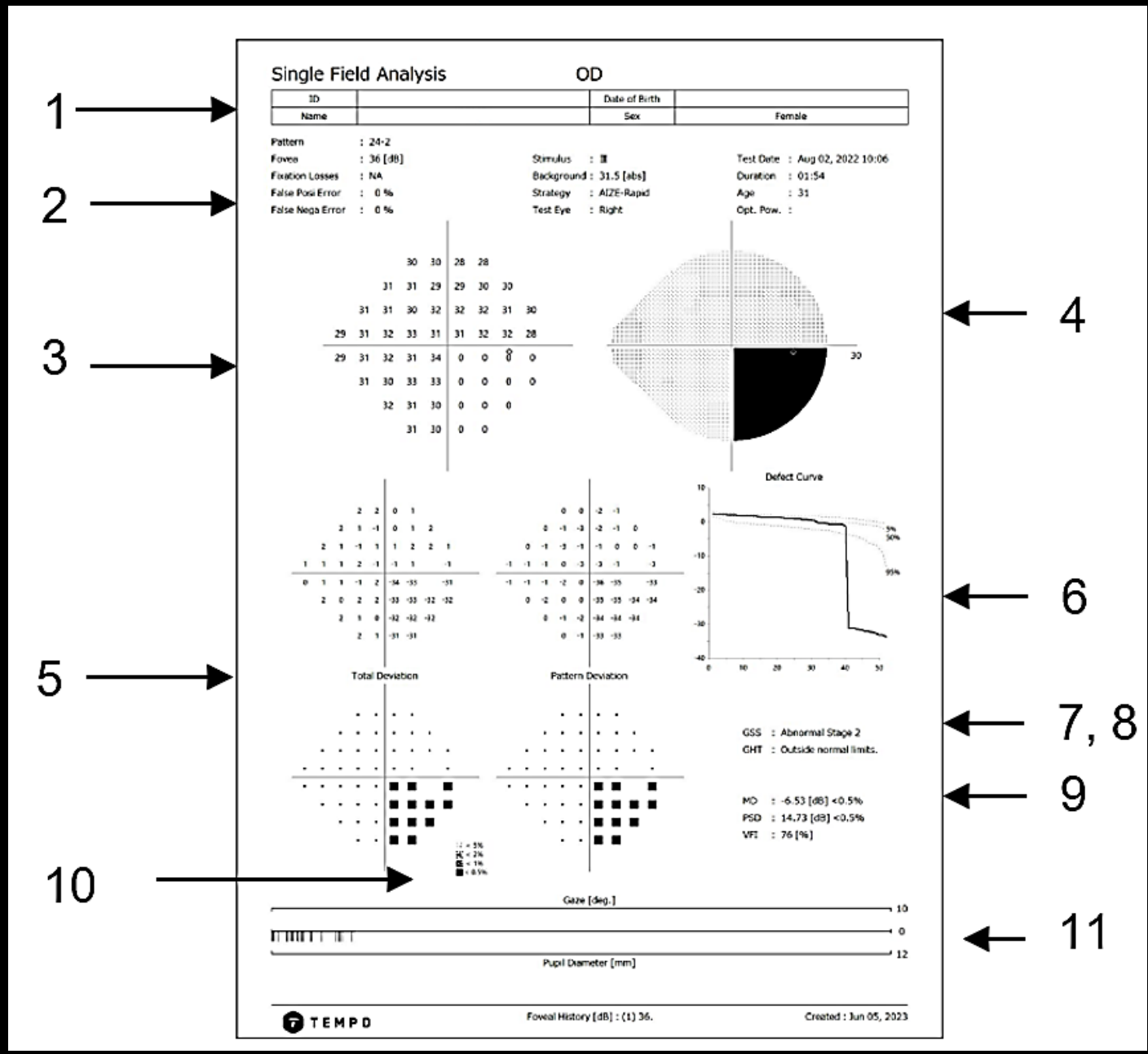
Single Field Analysis (SF) in Detail

1. **Patient data**
2. **Information on the test and reliability indices**.
3. **Threshold values** (dB) are the measured sensitivity thresholds.
4. **Grayscale** is a graphical map of the threshold values.
5. **Deviation plots**
6. **Defect curve** – a graphical representation that provides a summary of the visual field and distinguishes between local and diffuse defects.



Single Field Analysis (SF) in Detail

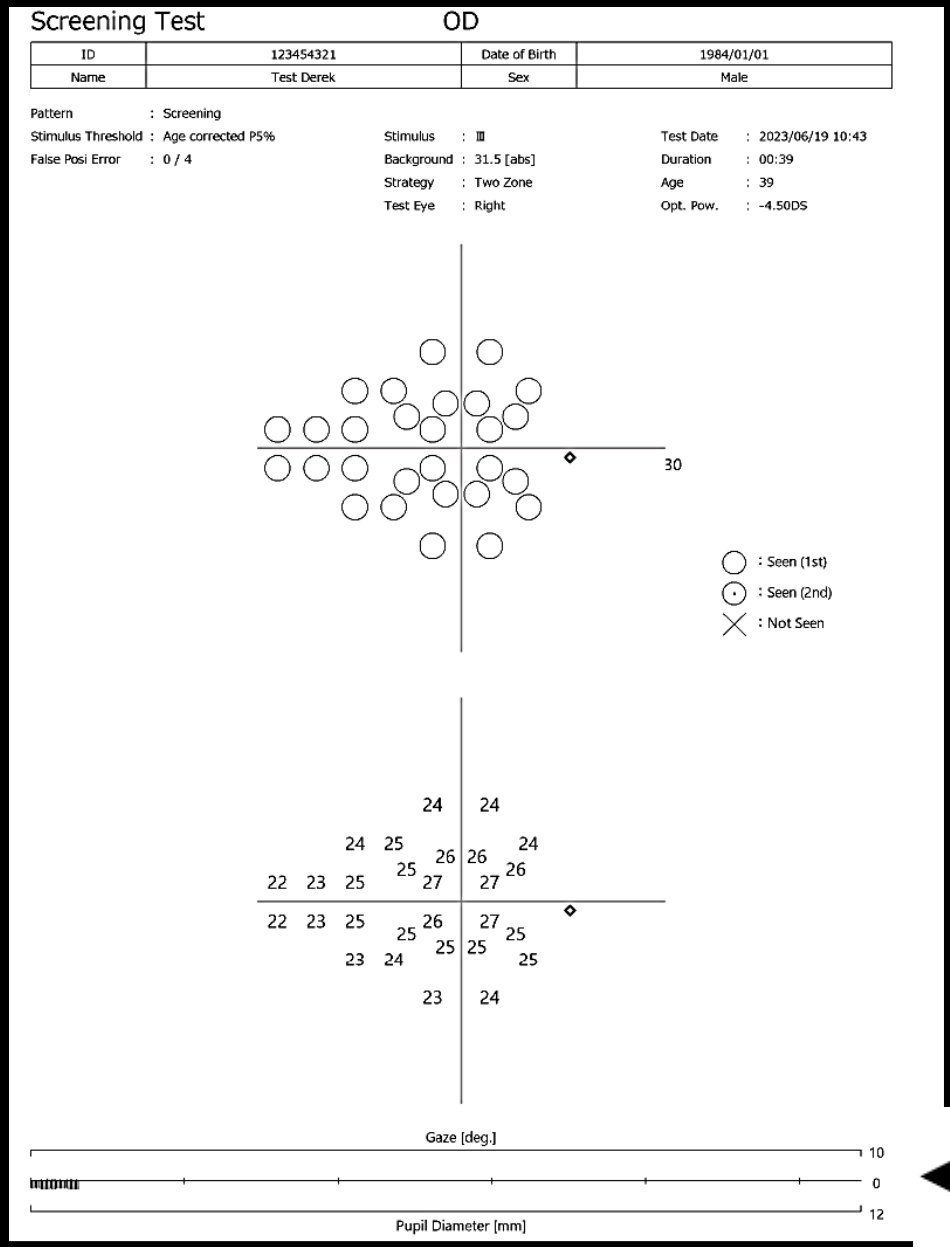
7. **GSS (Glaucoma Staging System)** classifies the field based on a plot of Mean Deviation (MD) and Pattern Standard Deviation (PSD).
8. **GHT (Glaucoma Hemifield Test)** analyses the asymmetry between the inferior and superior fields and gives a categorical value such as within normal limits after
9. **Global indices**
    - **MD (Mean Deviation)** is the average difference between the patient's overall visual field sensitivity compared to normal vision in the same age group.
    - **PSD (Pattern Standard Deviation)** is a measure of the threshold variability and indicates how the shape of the measured field differs from that of an age-matched normal eye.
    - **VFI (Visual Field Index)** gives a percentage for overall vision. A VFI of 100% indicates no visual field loss whereas 0% means the patient is perimetrically blind.
10. **Probability symbols**
11. **Gaze tracking/pupil diameter**



Screening Report in Detail

1 →
2 →
3 →
4 →

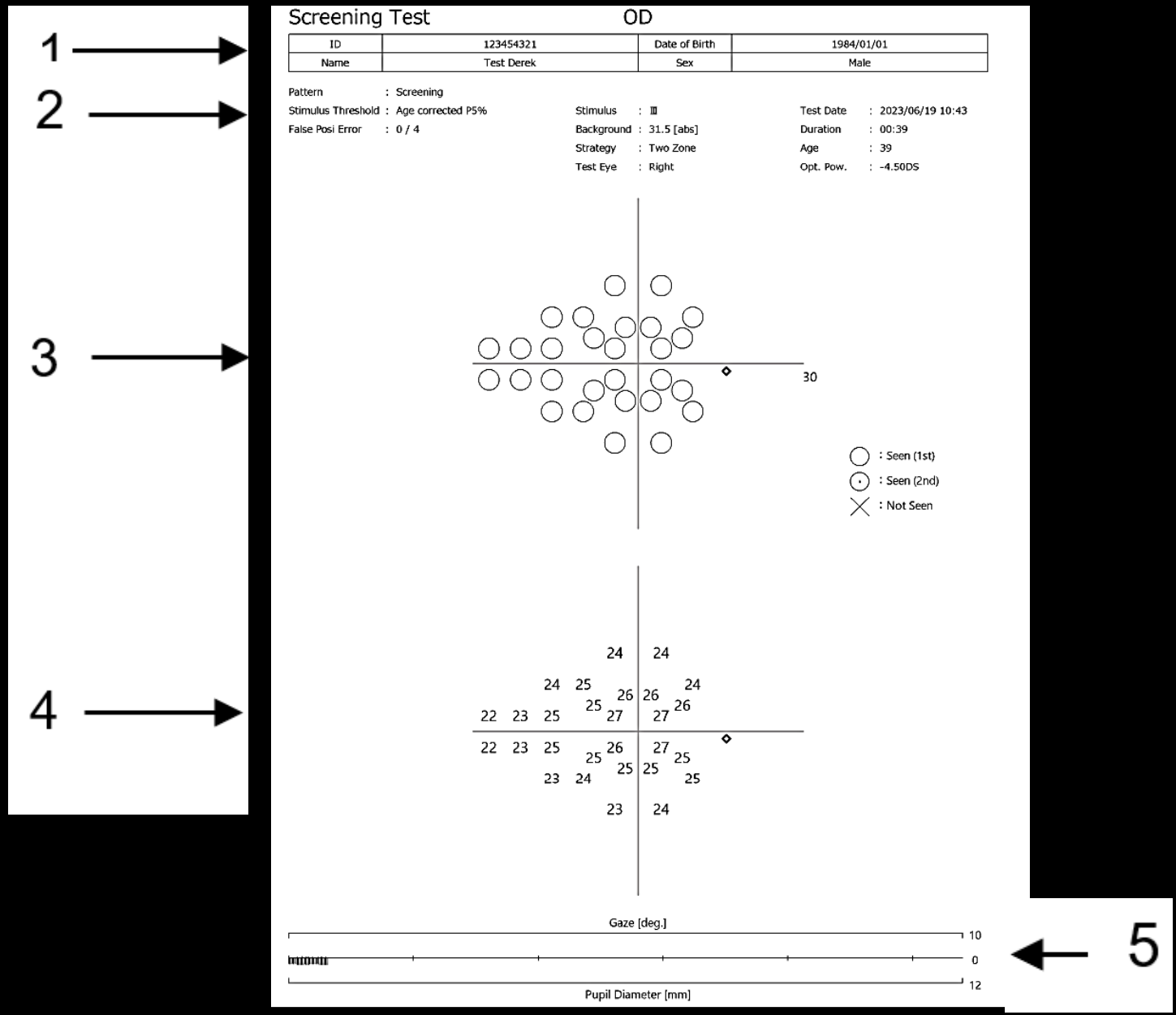
Points seen (first presentation).
Points seen (second presentation)
Points not seen after two presentations.



← 5

Screening Report in Detail

1. **Patient data**
2. **Information on the test and reliability indices.**
3. **Plot of patient's response to a Goldman size III stimulus** presented at an intensity that an average subject of that age would see with 95% or 99% of the time depending on the option chosen.
4. **Plot of intensity of stimulus** (dB)
5. **Gaze tracking/pupil diameter**



What are your thoughts on Tempo?

- Advantages?
- Disadvantages?
- Is this a screening device or diagnostic/progression device?
- What strategy do we order?
- How do we incorporate this into our busy day?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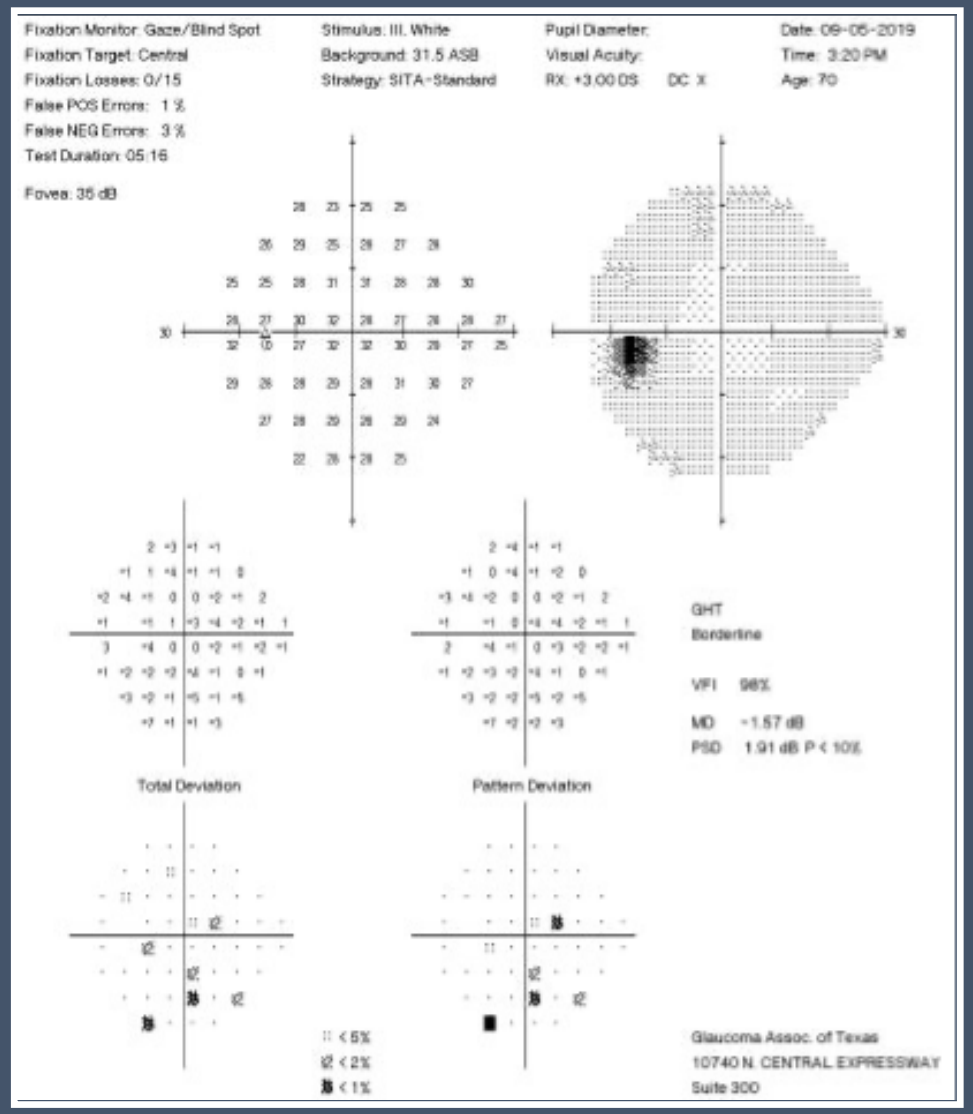
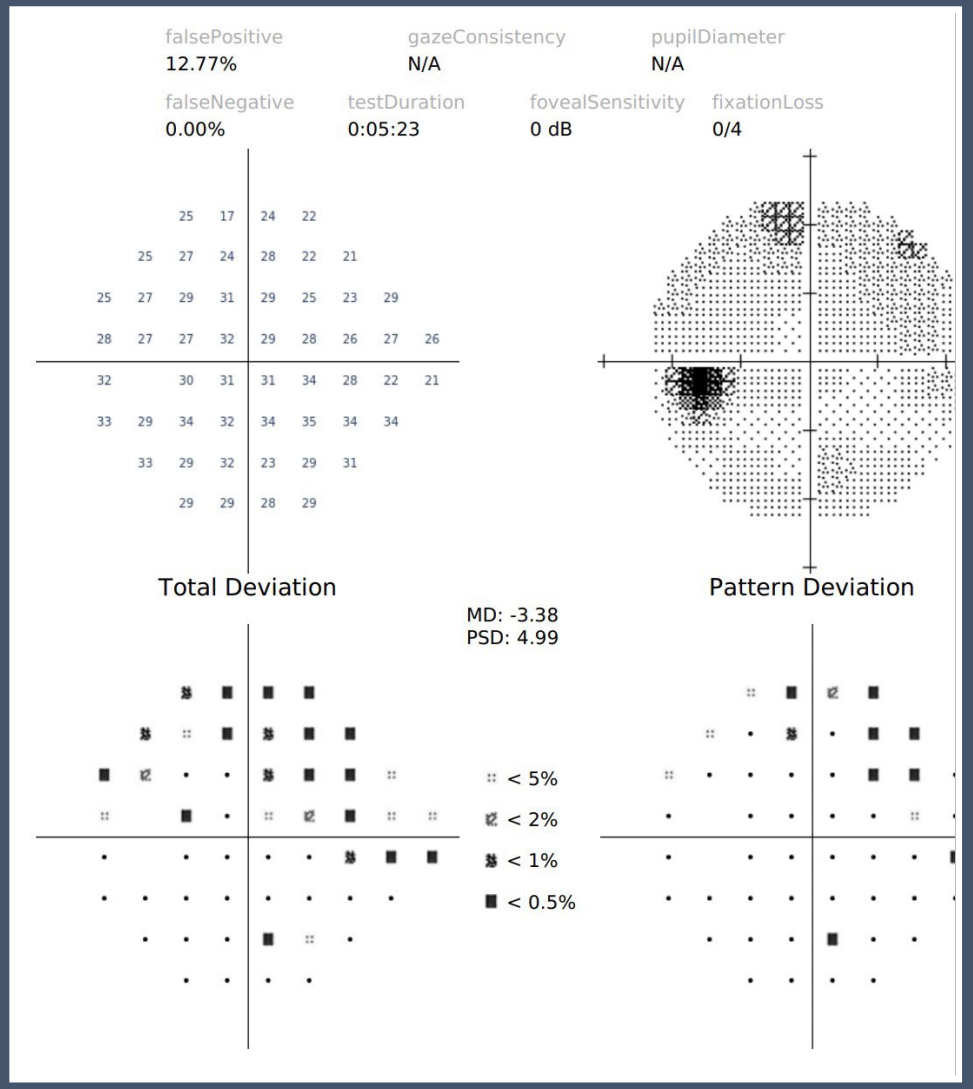
Compact.
Comprehensive.
Does virtually
everything.

Preliminary Report on a Novel Virtual Reality Perimeter Compared with Standard Automated Perimetry - Journal of glaucoma 9/15/20

- “The global mean sensitivity of the Visu*ALL* and the HFA correlated significantly in both normal (r=0.5, *P*=0.001) and glaucoma (r=0.8, *P*<0.001) groups. The mean sensitivity of all quadrants also correlated significantly in both groups. The Visu*ALL* mean sensitivity had a greater (0.98) Receiving Operating Characteristic (ROC) curve than HFA (0.93) mean sensitivity (*P*=0.06) in discriminating normal versus glaucoma.
- There was an excellent correlation between the VisuALL and the SAP in normal and glaucoma patients and VisuALL showing a high diagnostic performance.”

Visuall vs HFA printout





5496 – C0025

Validation of a Novel Head-Mounted Perimeter versus the Humphrey Field Analyzer

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[1] Carver College of Medicine, University of Iowa, Iowa City, IA
[2] Department of Ophthalmology and Visual Sciences, University of Iowa Hospitals and Clinics, Iowa City, IA

University of Iowa Health Care
Department of Ophthalmology and Visual Sciences

The University of Iowa

BACKGROUND

- Glaucoma is the leading cause of irreversible blindness worldwide[1].
- Standard automated perimetry, commonly with the Humphrey Field Analyzer (HFA; Carl Zeiss Meditec Inc., Dublin, CA), is the current accepted clinical standard for diagnosis and monitoring of glaucomatous visual field loss[2].
- The HFA is a large device that does not allow for examination outside the clinic and can be uncomfortable for patients with limited mobility or large body habitus.
- Recently, there has been growing interest in the development of a head-mounted virtual reality perimeter to address these limitations[3-4].

PURPOSE

- The purpose of the present study was to validate a novel head-mounted perimeter, the Smart System Virtual Reality Perimeter (SSVR, M&S Technologies, Niles, IL), compared to the HFA as an alternative method of visual field testing.

MATERIALS AND METHODS

- IRB-approved prospective cross-sectional study conducted at a tertiary ophthalmology department
- Inclusion criteria: Adult patients with glaucoma or glaucoma suspects
- Exclusion criteria: Non-glaucomatous ophthalmic disease affecting central vision, neurocognitive or psychiatric disease, non-English speakers, prisoners, high myopia or disc tilt, and false positive rate >15% for the HFA or >25% for the SSVR
- Data collected include: demographics, glaucoma diagnosis, and visual field metrics including mean deviation (MD), pattern standard deviation (PSD), and test duration (TD)
- Testing algorithms: HFA, 24-2 Swedish interactive thresholding algorithm (SITA) Standard with size III stimuli; SSVR, 24-2 Neighborhood-Zippy Estimation by Sequential Testing (ZEST) with stimuli increasing in size with eccentricity
- Subjects were randomized to complete visual field testing with the HFA followed by the SSVR, or vice-versa
- Statistical analyses were performed using the Student paired *t*-test or Wilcoxon signed rank test as appropriate (a=0.05)

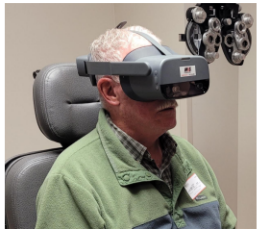

Figure 1. The Smart System Virtual Reality Perimeter in position for testing.

RESULTS

- 45 eyes from 25 subjects (Ages 74.5±9.0, 40.0% Male) were included in the present analysis.
- 5 (11.1%) of eyes had suspect glaucoma, 9 (20.0%) had mild glaucoma, 11 (24.4%) had moderate glaucoma, and 20 (44.4%) had advanced glaucoma.

Table 1. Visual field metrics of the Smart System Virtual Reality (SSVR) Perimeter versus the Humphrey Field Analyzer (HFA) stratified by glaucoma diagnosis severity

All	SSVR	HFA	p
Mean Deviation	-7.46±6.64	-7.04±6.92	0.249
Pattern Standard Deviation	5.45±2.88	6.91±4.82	0.001*
Test Duration	313.13±82.63	368.71±64.26	<0.001*
Suspect			
Mean Deviation	-2.74±3.73	-1.30±2.28	0.063
Pattern Standard Deviation	2.95±2.07	2.72±1.96	0.625
Test Duration	261.00±72.71	329.80±72.57	0.120
Mild			
Mean Deviation	-2.49±3.53	-1.30±2.57	0.169
Pattern Standard Deviation	3.33±2.04	2.01±0.34	0.095
Test Duration	258.00±69.42	330.89±45.85	0.023*
Moderate			
Mean Deviation	-3.59±2.98	-3.50±2.86	0.878
Pattern Standard Deviation	3.98±1.96	4.46±3.05	0.412
Test Duration	262.82±57.30	339.27±50.29	<0.001*
Advanced			
Mean Deviation	-13.00±5.54	-13.00±5.82	1.000
Pattern Standard Deviation	7.83±1.89	11.51±2.52	<0.001*
Test Duration	378.65±52.93	411.65±52.15	0.004*

* p-value indicates a statistically significant difference

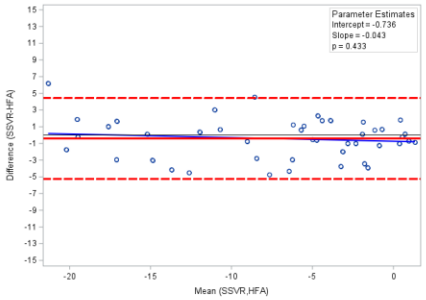

Figure 2. Bland-Altman plot of the mean deviation values of the SSVR versus HFA for all included visual fields

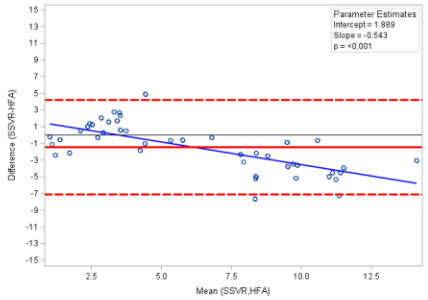

Figure 3. Bland-Altman plot of the pattern standard deviation values of the SSVR versus HFA for all included visual fields

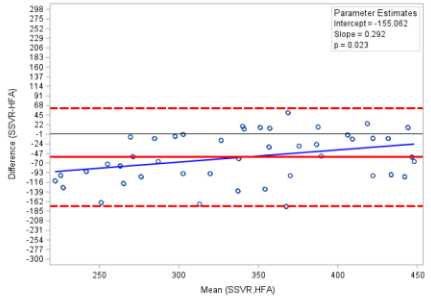

Figure 4. Bland-Altman plot of the test duration values of the SSVR versus HFA for all included visual fields

- Of the 32 patients tested to date, 90.6% reported they would prefer to use the SSVR at follow-up appointments if it becomes regularly available.

CONCLUSIONS

- The SSVR is a reliable alternative to perimetry using the HFA for testing MD, particularly as glaucoma severity increases.
- The SSVR differs from the HFA with regard to PSD in advanced severity glaucoma. This may be due to the method by which PSD is calculated.
- TD was significantly shorter using the SSVR versus the HFA, which will likely improve the patient testing experience.
- When surveyed, the majority of participants preferred the SSVR for visual field testing.
- For patients with postural limitations, the SSVR may be preferable to the HFA for visual field testing.
- The dynamic range of the SSVR is smaller than that of the HFA.

REFERENCES

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2. Wu Z, Medeiros FA. Recent developments in visual field testing for glaucoma. Curr Opin Ophthalmol. Mar 2018;29(2):141-146. doi:10.1097/ICU.0000000000000461
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4. Nakai Y, Bessho K, Shono Y, Taoka K, Nakai Y. Comparison of imo and Humphrey field analyzer perimeters in glaucomatous eyes. Int J Ophthalmol. 2021;14(12):1882-1887. doi:10.18240/ijo.2021.12.11
5. Harris PA, Johsnon CA, Chen Y, et al. Evaluation of the Melbourne Rapid Fields test procedure. Optometry and Vision Science. 2022; 99(4):372-382.

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Are Virtual Reality Visual fields the way of the future?

- PROVE IT TO ME!!!
- Normative data bases
- Consistent reliability
- Data I can depend upon
- DO THEY ACTUALLY WORK???

If Virtual Reality VFs are so good…

Why aren't Glaucoma Specialists Using Them?

Why aren't they universally accepted?

Billing and Coding concerns

- Is this a screening or ordered test? (That will determine the fee)
- 92083 – again diagnosis must correlate with procedure code used
- Test must be ordered and interpreted
- What do you do if screening shows an abnormal result?

The Structure vs Function Dilemna

- Structural damage leads to functional damage
- Do they always correlate though?

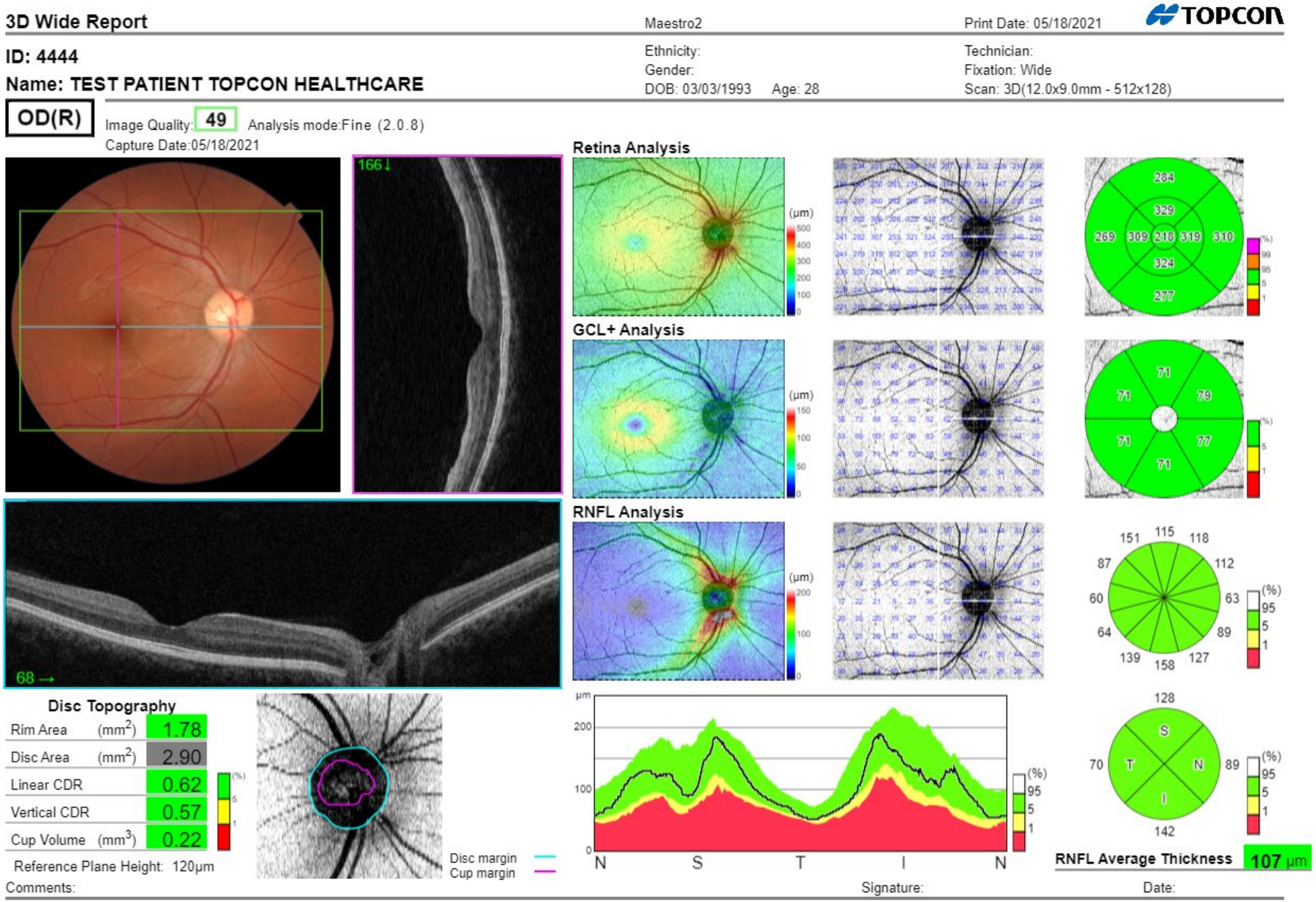
- If they don’t why???

THIS ISN’T YOUR FATHER’S OCT REPORTS ANYMORE!.!.!.

Welcome To The Brave new world!!

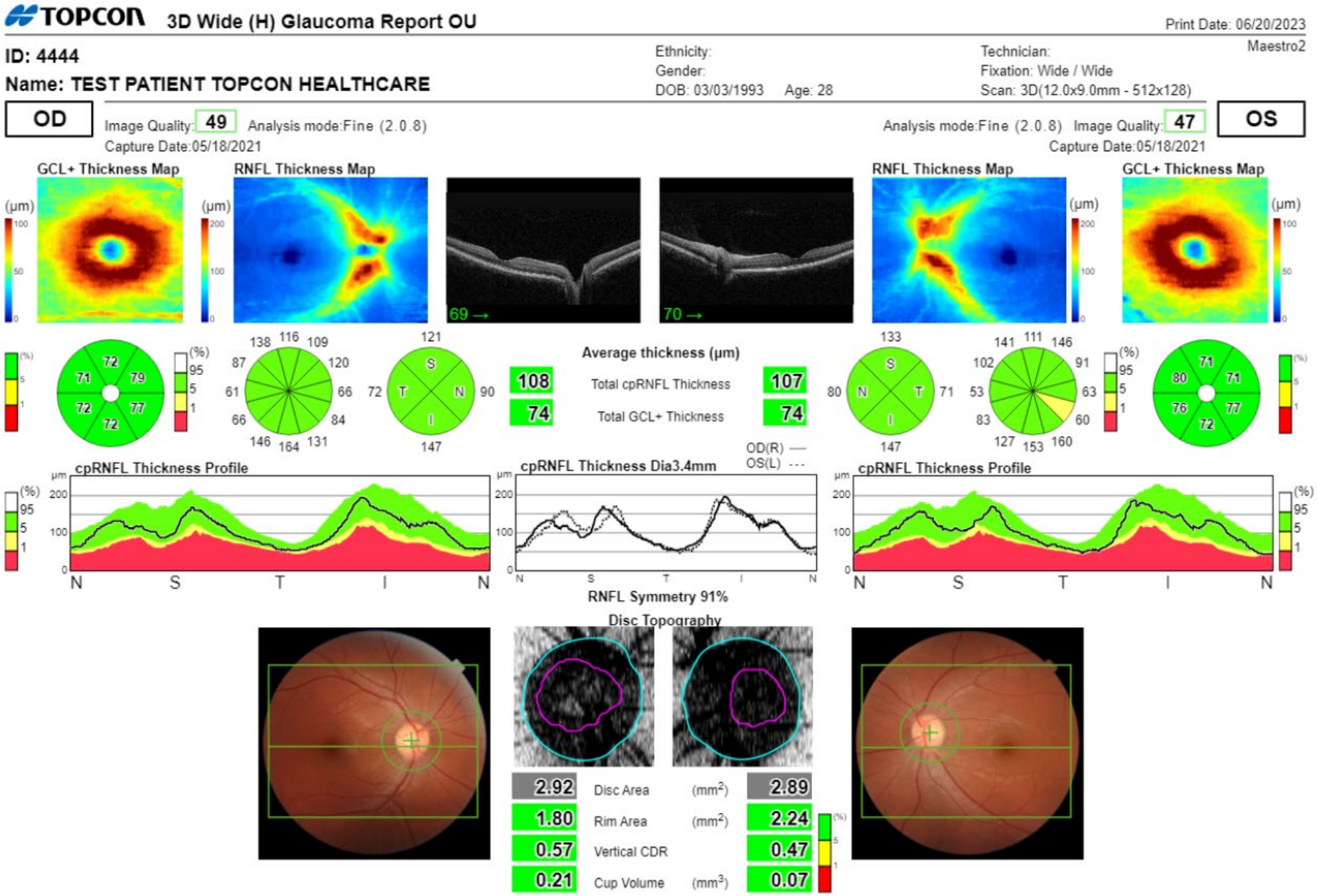
3D WIDE STANDARD REPORT

Your new standard. One scan blanketing the posterior pole generating RNFL, ONH, GCL and ETDRS data of nerve and macula.



3D WIDE GLAUCOMA REPORT OU

One scan per eye presents exhaustive data for the Glaucoma suspect and known Glaucoma patients alike.

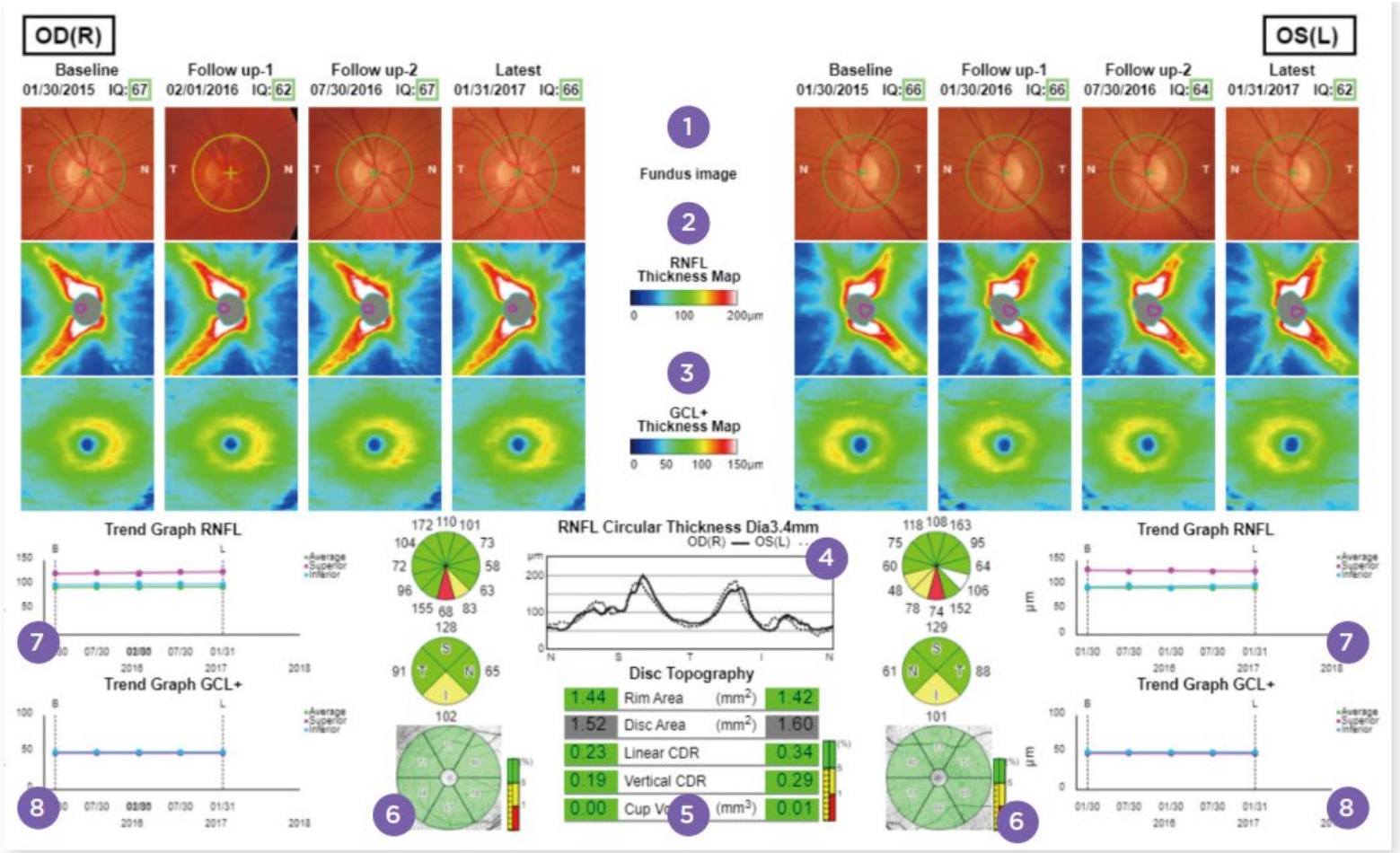


3D WIDE TREND REPORT OU

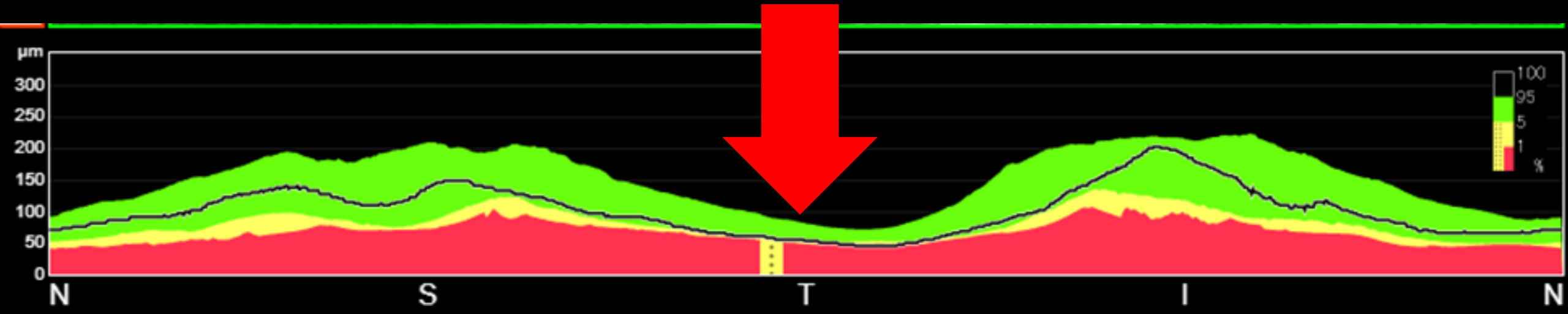
3 Key Metrics

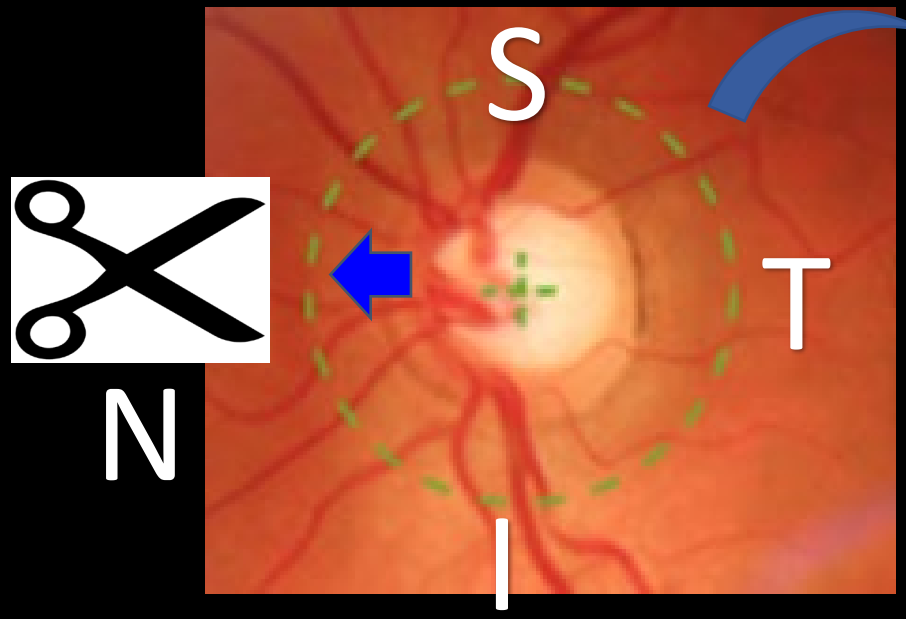
presented over time from just one scan per eye.

1. 45° true-color fundus photographs magnified on optic nerve with cpRNFL scan position
2. RNFL Thickness Map with cup/ disc margins and color scale
3. GCL+ Thickness Map with color scale
4. Latest visit 3.4 mm cpRNFL thickness NSTIN in 4 Sectors and 12 clock hours with reference data
5. Disc Topography with reference data, latest visit
6. GCL+ thickness with reference data, latest visit
7. Trend Graph cpRNFL
8. Trend Graph GCL+



“NSTIN” (Nasal,Superior,Temporal,Inferior,Nasal) vs TSNIT



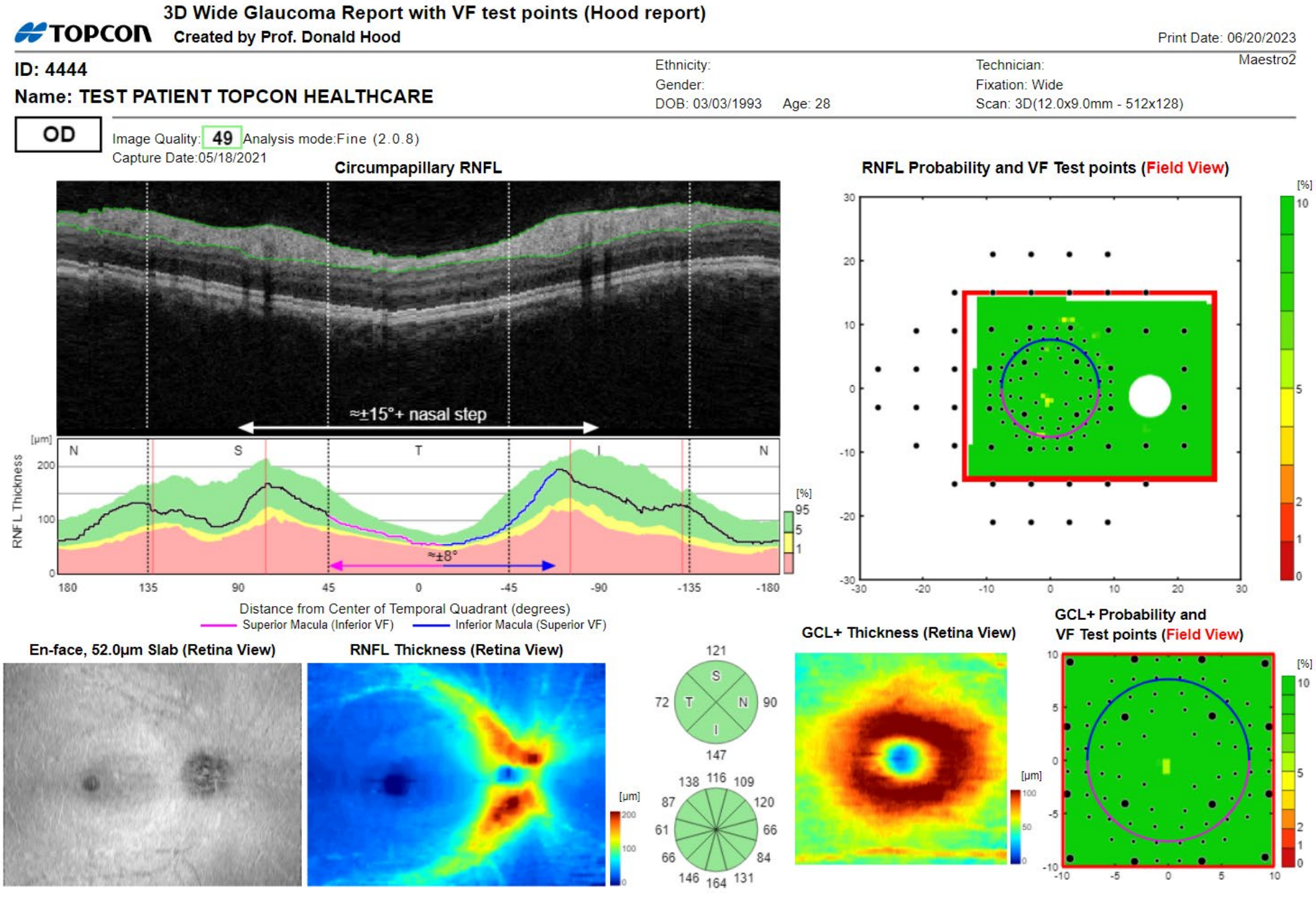


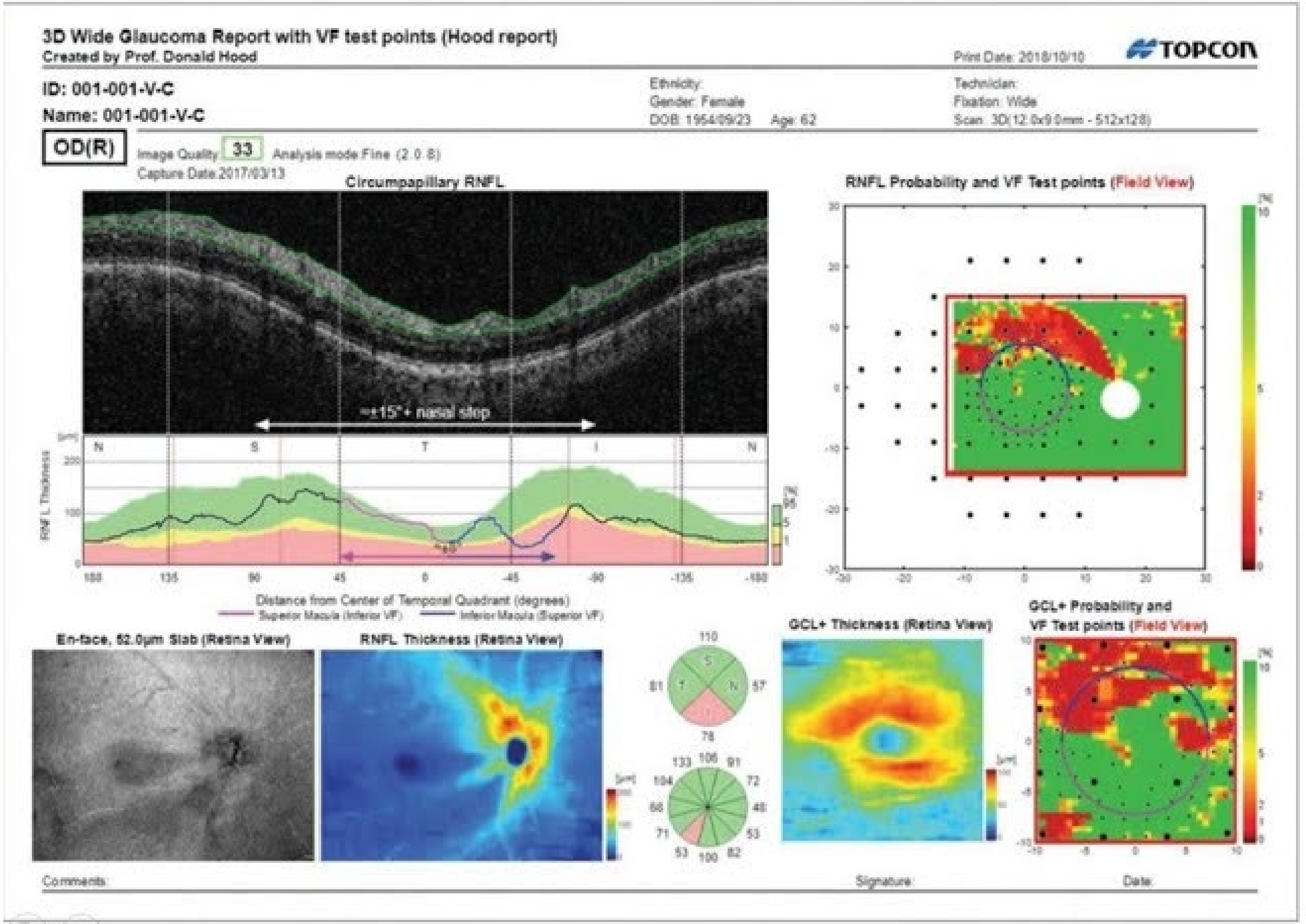
N S T I N

HOOD REPORT FOR GLAUCOMA

Generated from one **3D Wide Scan**

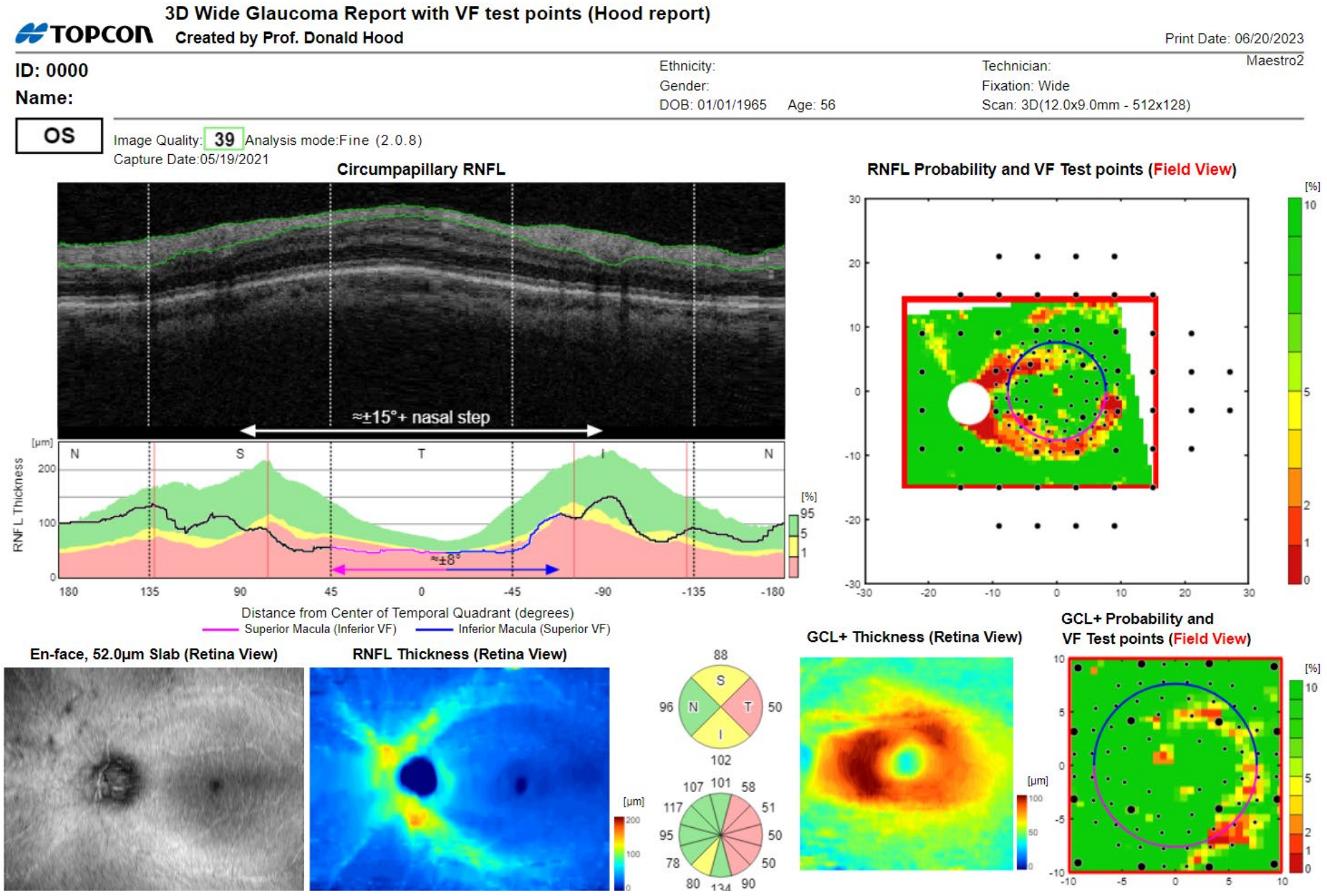
RNFL and GCL Probability Maps



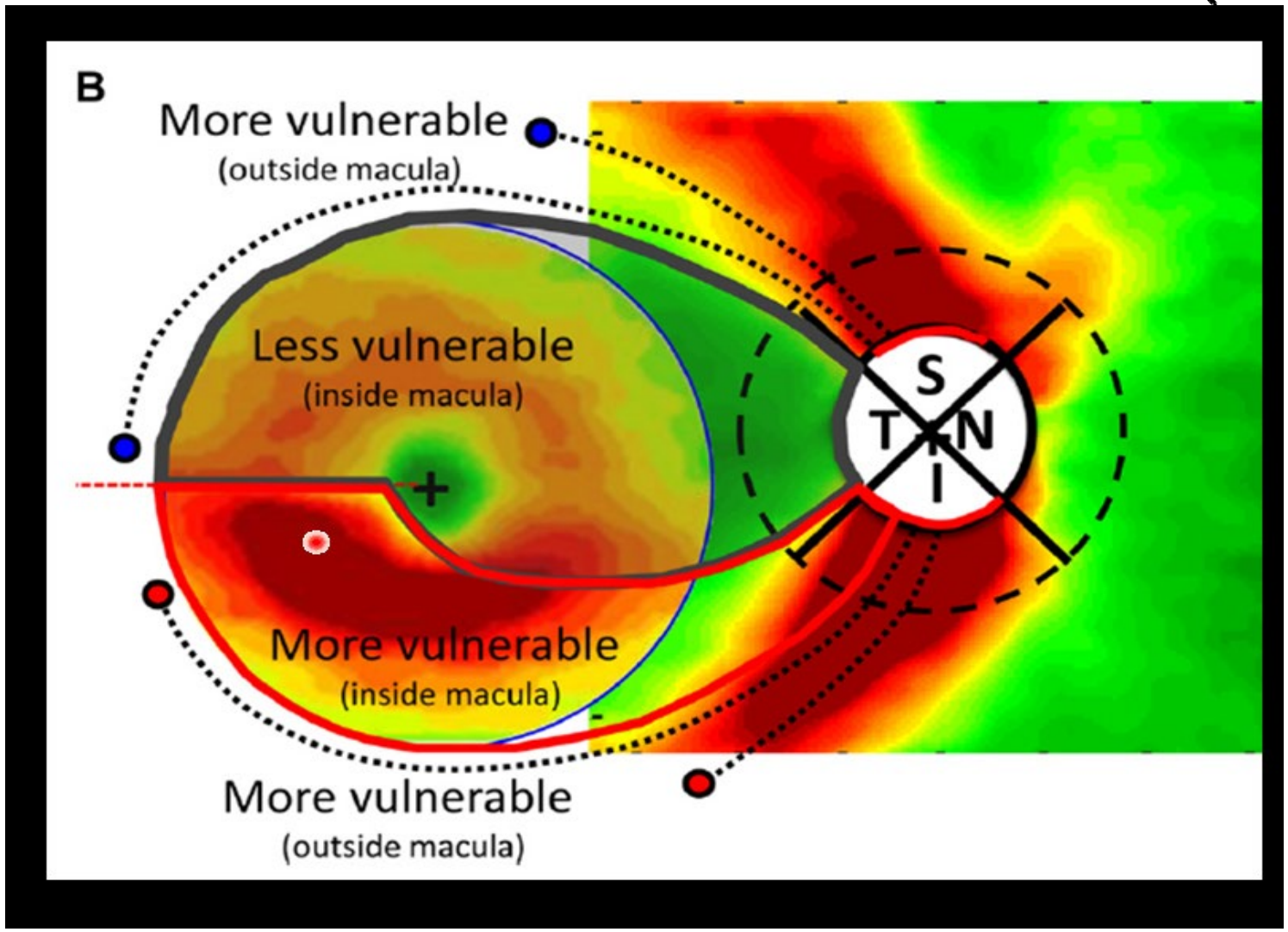

3D Wide Glaucoma Report with VF test points (Hood report)
Created by Prof. Donald Hood
Print Date: 2018/10/10
TOPCON
ID: 001-001-V-C
Name: 001-001-V-C
Ethnicity:
Gender: Female
DOB: 1954/09/23 Age: 62
Technician:
Fixation: Wide
Scan: 3D(12.0x9.0mm - 512x128)
OD(R)
Image Quality 33 Analysis mode Fine (2.0.8)
Capture Date 2017/03/13
Circumpapillary RNFL
≈±15°+ nasal step
N S T I N
RNFL Thickness
Distance from Center of Temporal Quadrant (degrees)
Superior Macula (Inferior VF)
Inferior Macula (Superior VF)
RNFL Probability and VF Test points (Field View)
En-face, 52.0µm Slab (Retina View)
RNFL Thickness (Retina View)
GCL+ Thickness (Retina View)
GCL+ Probability and
VF Test points (Field View)
Comments
Signature
Date

HOOD REPORT FOR GLAUCOMA

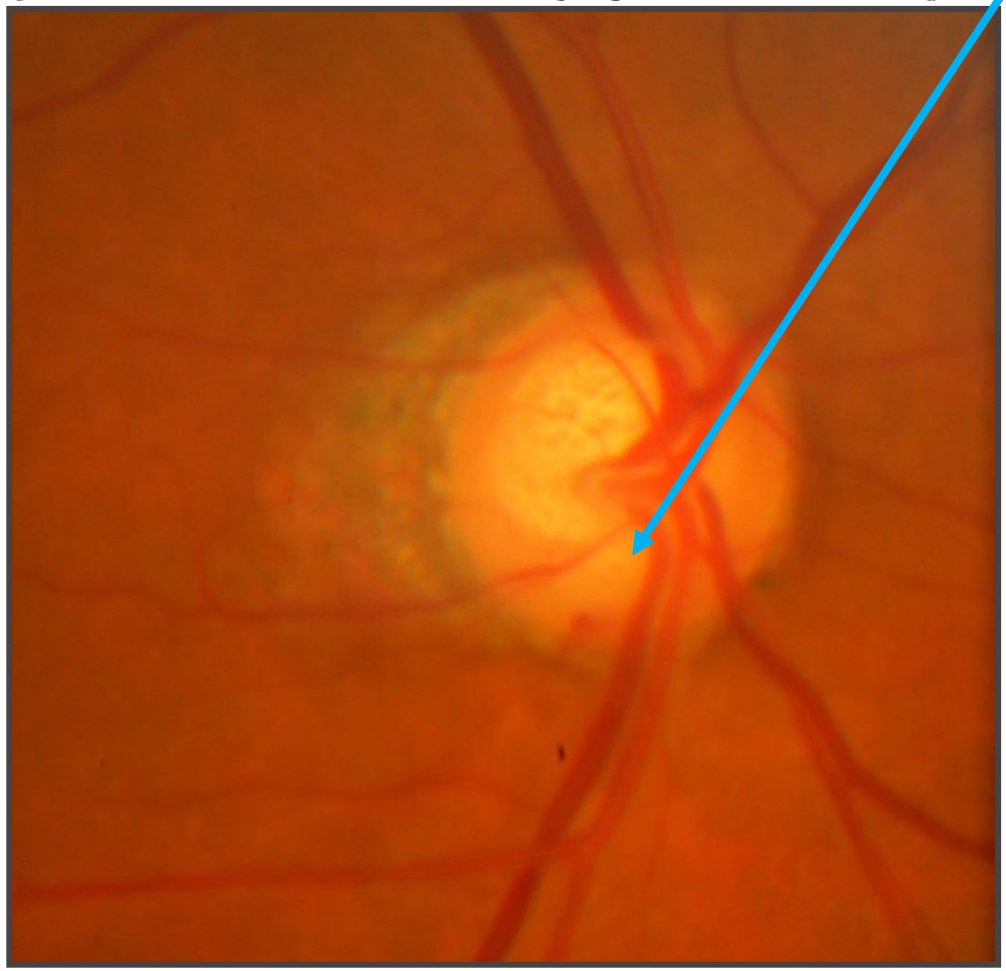
Reference STRUCTURAL RNFL and GCL deficiencies with FUNCTIONAL vulnerability.



MACULAR VULNERABILITY ZONE (MVZ)



DID YOU SEE THE DISC HEMORRHAGE?



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

Donald L. Budenz, MD, MPH,[1] Douglas R. Anderson, MD,[1] William J. Feuer, MS,[1] Julia A. Beiser, MS,[2] Joyce Schiffman, MS,[1] Richard K. Parrish II, MD,[1] Jody R. Piltz-Seymour, MD,[3] Mae O. Gordon, PhD,[2] Michael A. Kass, MD,[2] Ocular Hypertension Treatment Study Group

Main Outcome Measures: Incidence of optic disc hemorrhages and POAG end points.

Results: Median follow-up was 96.3 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 corneas, 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**

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

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 corneas
  - Thinner rims
  - Higher IOP
  - Older age

So a man walks into his optometrist’s office…

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

LiGHT Study

- SLT versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHT): a multicenter randomized controlled trial

  Gus Gazzard, Eugenias Konstantakopoulos, David Garway-Heath et al

www. thelancet.com Vol 393 April 13, 2019

- Pxs had to have mild or moderate glaucoma based on VF criteria
- Target IOP reduction 20-30% (depending on severity)
- Standard SLT energy protocols
- Medicine group – 1st line PGA, 2nd Line Beta blocker, 3rd line CAI or Alpha agonist

- Both groups followed for 36mths

LiGHT study outcomes

Both groups showed similar efficacy in lowering IOP

- 16.3mm Hg Drop group, 16.6 mm Hg SLT Group
- 78.2% SLT group required no drops, 12% required 1 drop
- 64.6% drop group controlled on 1 drop, 18.5% required 2 drops
- 0% SLT Group required trab, 3.3% Drop group required trab
- 93% SLT group at target IOP, 95% Drop group

SLT Group spent 202 pounds less on care

So what does this mean for us , our clinics and our patients??

Does The LiGHT Study…

1) Change your impression of the efficacy of SLT?

2) Change your impression of when you would recommend SLT for your patients?

3) Change your impression on who may be good candidates for SLT?

Automated Direct SLT (Belkin)

Belkin DSLT

Rapid, non-contact Direct SLT

Delivers similar energy as traditional SLT

Automated delivery of energy through limbus (transconjunctival)

Without Gonioscopy

Will be approved in US within months!!

DSLT Data

Baseline IOP 26.7-

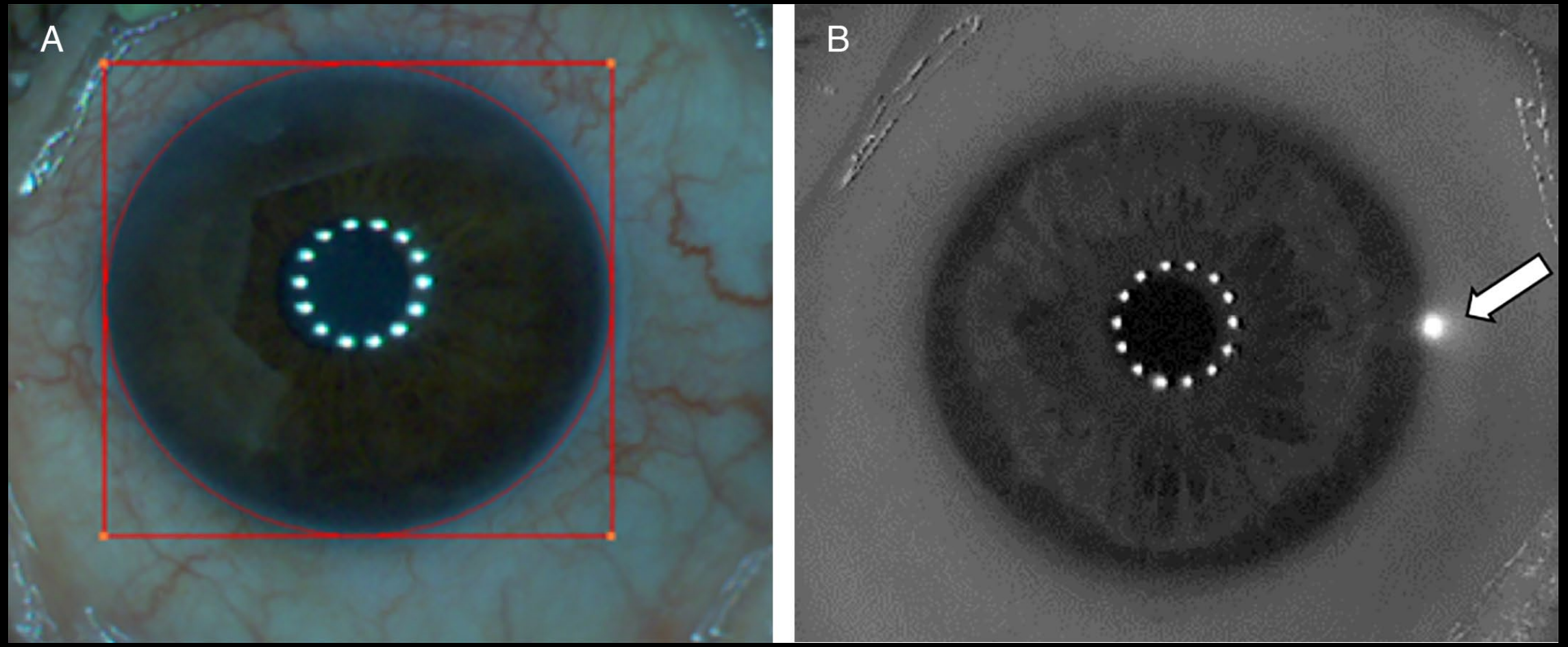
- Patients were washed out of all meds
- Some pxs were treatment naïve

After tx IOP

- 1 mth – 21.7mm Hg (18.1% reduction)
- 3 mth- 20.8mm HG (21.4%)
- 6 mth 21.5mm Hg (18.8% reduction)

At 6 mths medication need reduced from 1.6 to 0.4

Automated Direct SLT



#This Is A BFD!!

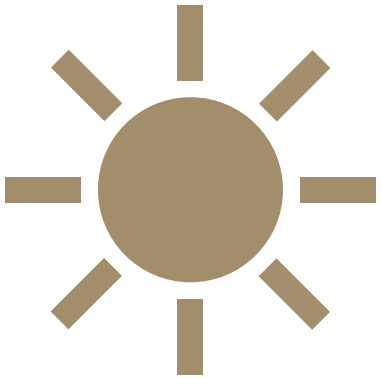
Are we ready???

So, a patient on latanoprost needs 4 more mm of Iop reduction- do you…

- Add Rhopressa?
- Switch to Rocklatan??
- Add a combo drop??
- Switch to a combo drop??
- Switch to another PGA?
- SLT??

MYOPIA MANAGEMENT

This is definitely a hot topic



It might be the HOTTEST topic of 2025

Prevalence

United States

- **Prevalence**: Approximately **36.1%** of children aged 5 to 17 in urban areas have myopia, with a nationwide prevalence estimated at **41.0%**.
- **High Myopia**: Nearly **4%** of adults in the United States have high myopia, defined as -6.0 D or worse in their right eye.
- **Racial Differences**: Myopia prevalence varies by race, with higher rates observed in White and Hispanic populations compared to Black and other ethnic groups.

Global Incidence

- **Global Prevalence**: Around **2.6 billion** people worldwide have myopia, with nearly **224 million** people being highly nearsighted (requiring glasses or contacts stronger than -5.00 diopters).
- **Projected Increase**: By 2050, nearly **50%** of the world's population is projected to be myopic, equating to almost **5 billion** people.
- **Regional Differences**: Myopia rates are particularly high in urban East Asian countries, with prevalence rates between **80-90%**.

1.**"Global Prevalence, Trend, and Projection of Myopia in Children and Adolescents from 1990 to 2050"**

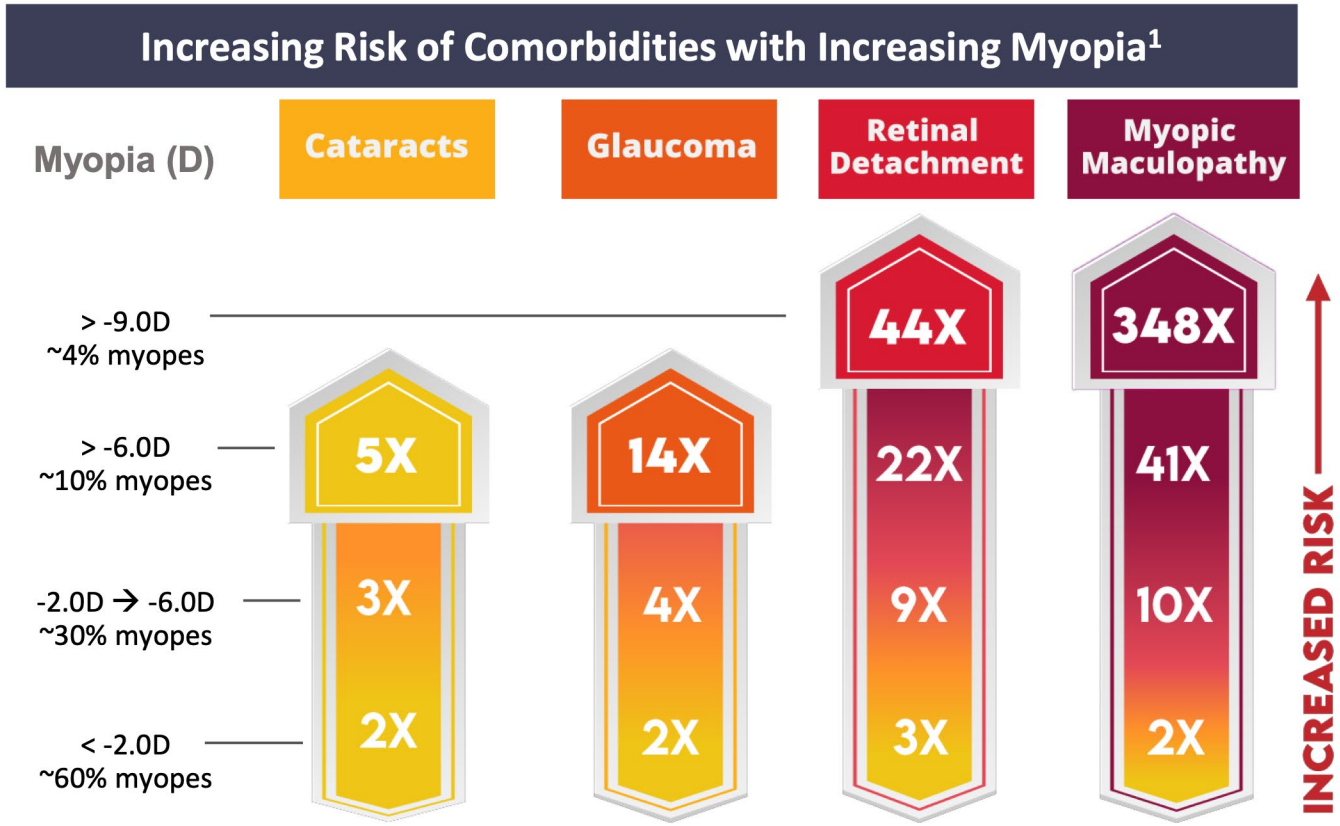
2.**"World report on vision Executive Summary"**.

3.**"High Myopia Prevalence across Racial Groups in the United States"**

How Serious are the Clinical Risks of Progressive Myopia?

Recent Epidemiology Studies Have Changed How We Look at Myopia

SYDNEXIS
Formulation Matters



It is predicted by the WHO report on **Myopia to be the #1 cause of blindness worldwide** in the future (Cataract is presently)

(WHO report breakdown is in the Appendix section)

Data derived from

- Blue Mountains Eye Study, 2002 (>3500 patients)
- Beaver Dam Eye Study, 2001 (>5900 patients)
- Rotterdam Eye Study, 2011 (>3900 patients)
- Summarized in [1]Flitcroft et al., 2012

Myopia is a disease

Any amount of myopia is abnormal

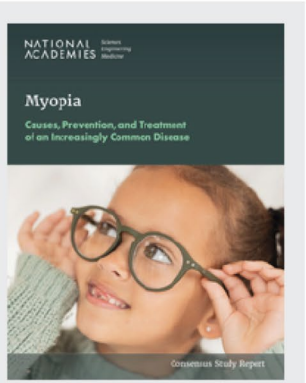
Is Pediatric Myopia Progression Considered a Disease?

YES, it is a disease; not just a refractive condition *(October 2024)*

SYDNEXIS
Formulation Matters

NATIONAL ACADEMIES Sciences Engineering Medicine

NATIONAL ACADEMIES PRESS Washington, DC



Myopia: Causes, Prevention, and Treatment of an Increasingly Common Disease (2024)

DETAILS

374 pages | 8.5 x 11 | PAPERBACK

ISBN 978-0-309-71785-4 | DOI 10.17226/27734

Consensus Study Report

CONTRIBUTORS

Committee on Focus on Myopia: Pathogenesis and Rising Incidence; Board on Behavioral, Cognitive, and Sensory Sciences; Division of Behavioral and Social Sciences and Education; National Academies of Sciences, Engineering, and Medicine

SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine. 2024. *Myopia: Causes, Prevention, and Treatment of an Increasingly Common Disease*. Washington, DC: The National Academies Press. https://doi.org/10.17226/27734.

Committee on Focus on Myopia: Pathogenesis and Rising Incidence

Board on Behavioral, Cognitive, and Sensory Sciences

Division of Behavioral and Social Sciences and Education

TREATMENT INTERVENTIONS

MiSight

- More effective than multifocal lenses
- **Only FDA approved CL**
- Unique dual focus zones
- 52% reduction in axial length (over 3 yrs.) and 59% reduction in spherical equivalent Rx
- No significant rebound (however original study could be flawed)
- Visit schedule 1wk, 3 mo., 6mo (remeasure axial length), 1 yr. (axial measure)

Ortho-K

- Reverse geometric lenses (flatter than baseline k reading)
- Wear overnight
- Topographer (axial, tangential, elevation maps)
- 4 zones to look at
- Must understand how to adjust Decentration
- Video and send to Paragon
- Only change BC if changing Rx
- Visit schedule – 1wk, 1 mo., 3mo., 6mo. (axial measure), 1 year (axial measure)
- Lots of chair time

Atropine .05%

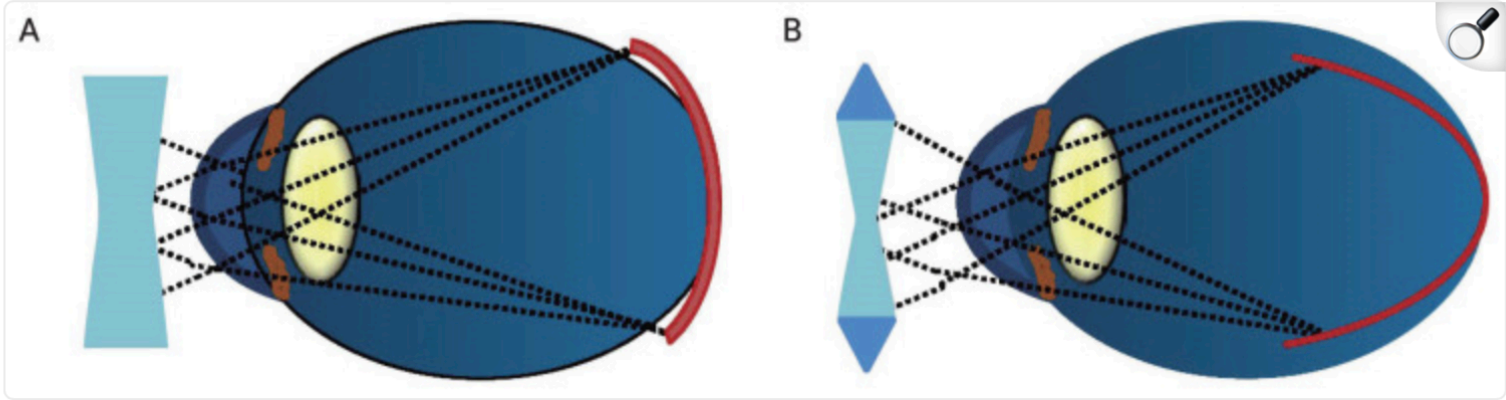
- **Parent waiver**
- Need to compound
- Safe. Only occasional allergic reaction.
- **Avoid in patients with cardiac or connective tissue disorders**
- .01% not effective; however, they are studying .03% to offset blur
- Instilled by parents every night
- Rebound is a real issue and must taper and/or taper and add CLs
- Minimum treatment time 2 yrs. (get them in CLs quickly)

Spectacles

- Not approved for US
- Clinical trials going on
- Earliest approval projected 2025
- DIMs – 50% reduction in SE and 62% axial length (very effective)
- Halt/Stellest (Essilor) – 55% SE & 51% axial
- DOT (Cooper/Essilor) – “MiSIght” spectacle 74% SE & 50% axial (uses different mechanism of action via lowering contrast)
- Zeiss Myopcare/IOT – too early

Axial Length is THE most important objective measure.

Peripheral retinal defocus



Myopic correction with single vision contact lenses or single vision spectacles correct myopia at both the fovea and the peripheral retina in equal amounts. This causes the myopic eye's fovea and peripheral retina to be in different myopic states. (A) The peripheral retina is more hyperopic; therefc equal myopic correction peripherally and centrally is likely to enhance myopia progression. (B) As illustrated, myopic correction with peripheral myopi defocus contact lenses or spectacle lenses correct the full degree of myopia at the fovea but create myopic defocus in the peripheral retina by providing additional positive power in the periphery, thus retarding myopia progression.

Spectacle lenses for Myopia Control

- Hoya MiYOSMART with DIMS Technology:
- In a 6-year study, children wearing MiYOSMART lenses experienced an average myopia progression of -0.15D per year and an average axial elongation of 0.10mm per year[1][2].
- Essilor Stellest with HALT Technology:
- Over a 5-year period, children wearing Stellest lenses showed a reduction in myopia progression by 67% compared to single vision lenses. This translates to an average myopia progression of -1.75D and an axial elongation of 0.72mm over five years[3][4].
- Zeiss MyoCare with CARE Technology:
- In a 12-month study, Zeiss MyoCare lenses reduced myopia progression by 0.31D and axial elongation by 0.13mm in Asian children. In Caucasian children, the reduction was 0.15D and 0.07mm over six months[5][6].
- These lenses have shown promising results in slowing down the progression of myopia in children.

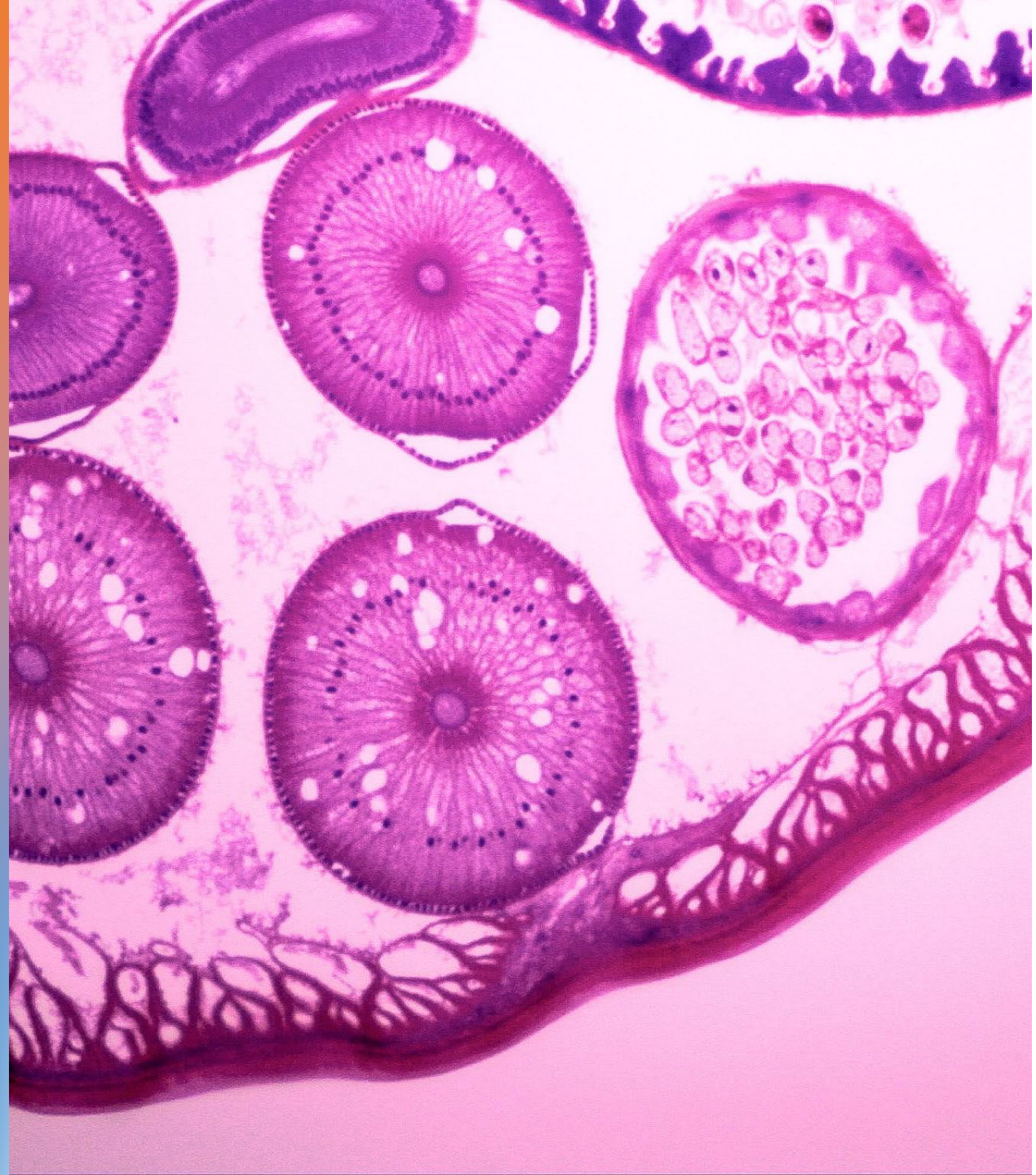
- References
- [1] MiYOSMART I Myopia management lens solutions - HOYA - Hoya Vision
- [2] New long-term and observational study data on Hoya MiYOSMART
- [3] Essilor Stellest lenses slow down myopia progression by 67%, Essilor says
- [4] 5 years of the Essilor Stellest - Myopia Profile
- [5] ZEISS MyoCare Portfolio: Efficacy Confirmed - ZEISS Vision Care
- [6] ZEISS MyoCare - Efficacy Confirmed - ZEISS Vision Care

Commercially available peripheral defocus design ophthalmic lenses

Trade name	Manufacturer	Single vision/multifocal	Unique design
MiyoSmart DIMS	Hoya	Single vision	9 mm optic zone, annular focal zones 33 n to +3.50 D
Apollo	Apollo Eyewear	Multifocal (PAL)	Asymmetric peripheral defocus, full power superior, 80% nasal, 60% temporal
MyopiLux	Essilor	Multifocal	Short progressive and high decentration to designed for children's posture with an add of 2 D
			"Max" version is designed for exophores, e wide near area, and includes 3 prism D base-in for each eye/visible line
			"Plus" design without prism for esophores
Stellest	Essilor	Single vision	Single vision center, 11 aspheric radiating lenslets HALT
MyoVision	Zeiss	Single vision	Full circumference peripheral defocus
SightGlass Vision DOT	CooperVision	Single vision	Central clear zone surrounded by reduced image contrast

DIMS = defocus incorporated multiple segments; D = diopters; PAL =

HALT = Highly Aspheric Lenslet Technology.



Does Diabetic Macular Edema Occur in Mild NPDR?

- Absolutely??

- Do we know the referral criteria for DME?

The New Referral Criteria for DME

Is central involvement (within 500 microns of FAZ), detected on OCT?

If no – monitor Q 6mths

If yes- treatment depends upon VA

-If better than 20/30 – observe closely

- If worse than 20/30 - refer for anti VEG-F therapy

The specific anti Veg-F agent is chosen depending upon VA

What about GLP-1's?

Glucagon-like peptide

- Hormone released when food is eaten to slow gastric emptying
- Increases insulin release
- Controls the feeling of satiety after eating

Options

- Trulicity
- Ozempic
- Rybelsis
- Mounjaro

There are a few issues with the GLP-1s though

Increase in DR

Increase in NAION

Let’s Talk ARMD

How Do You Know If
ARMD Is Getting Worse?

Cross Line Comparison Report

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Signal Strength Index 58

10.00 Scan Size (mm)

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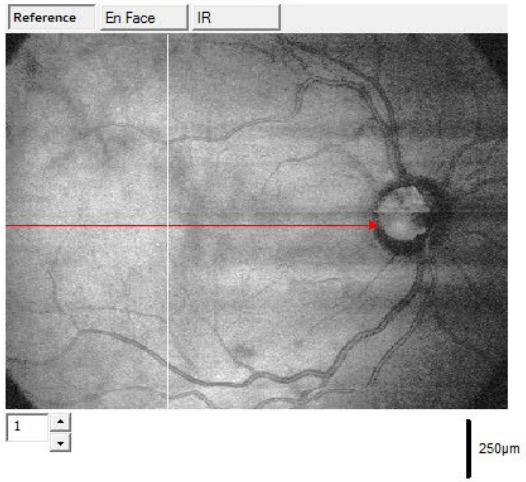
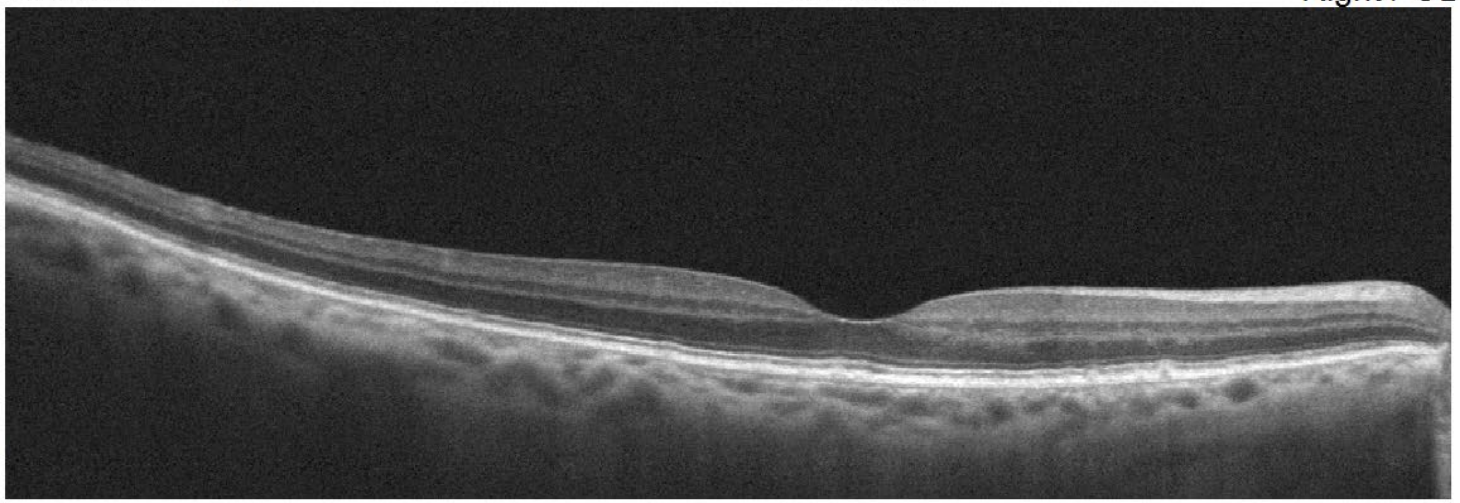
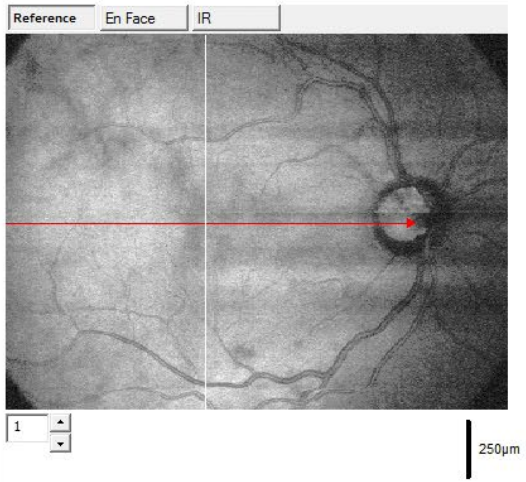
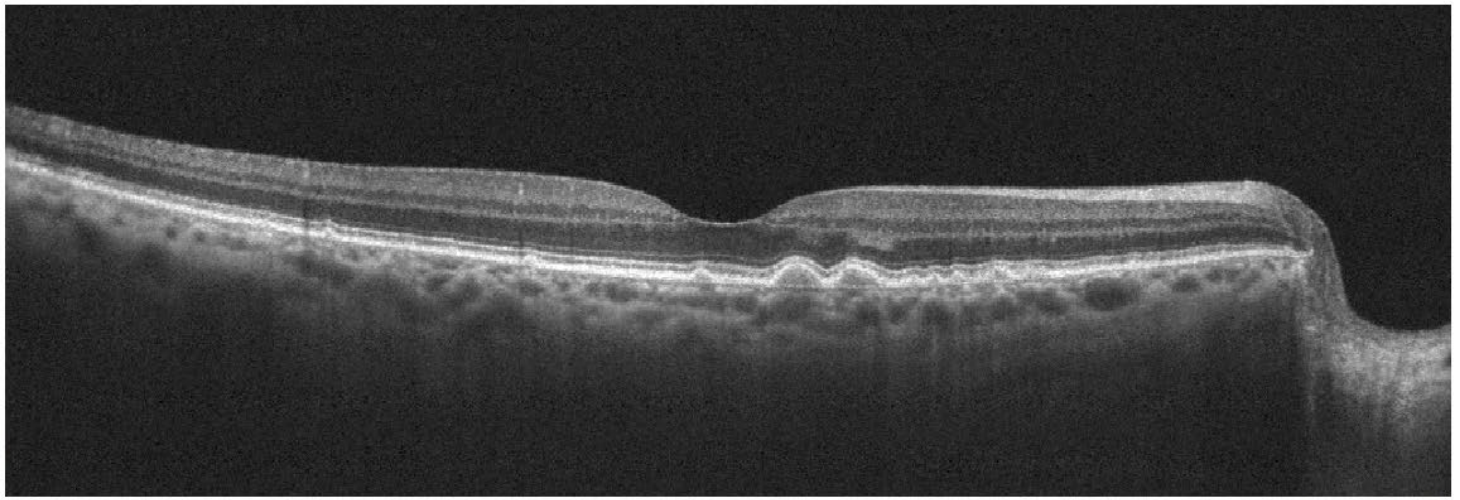




Auto Zoom





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Signal Strength Index 59

10.00 Scan Size (mm)

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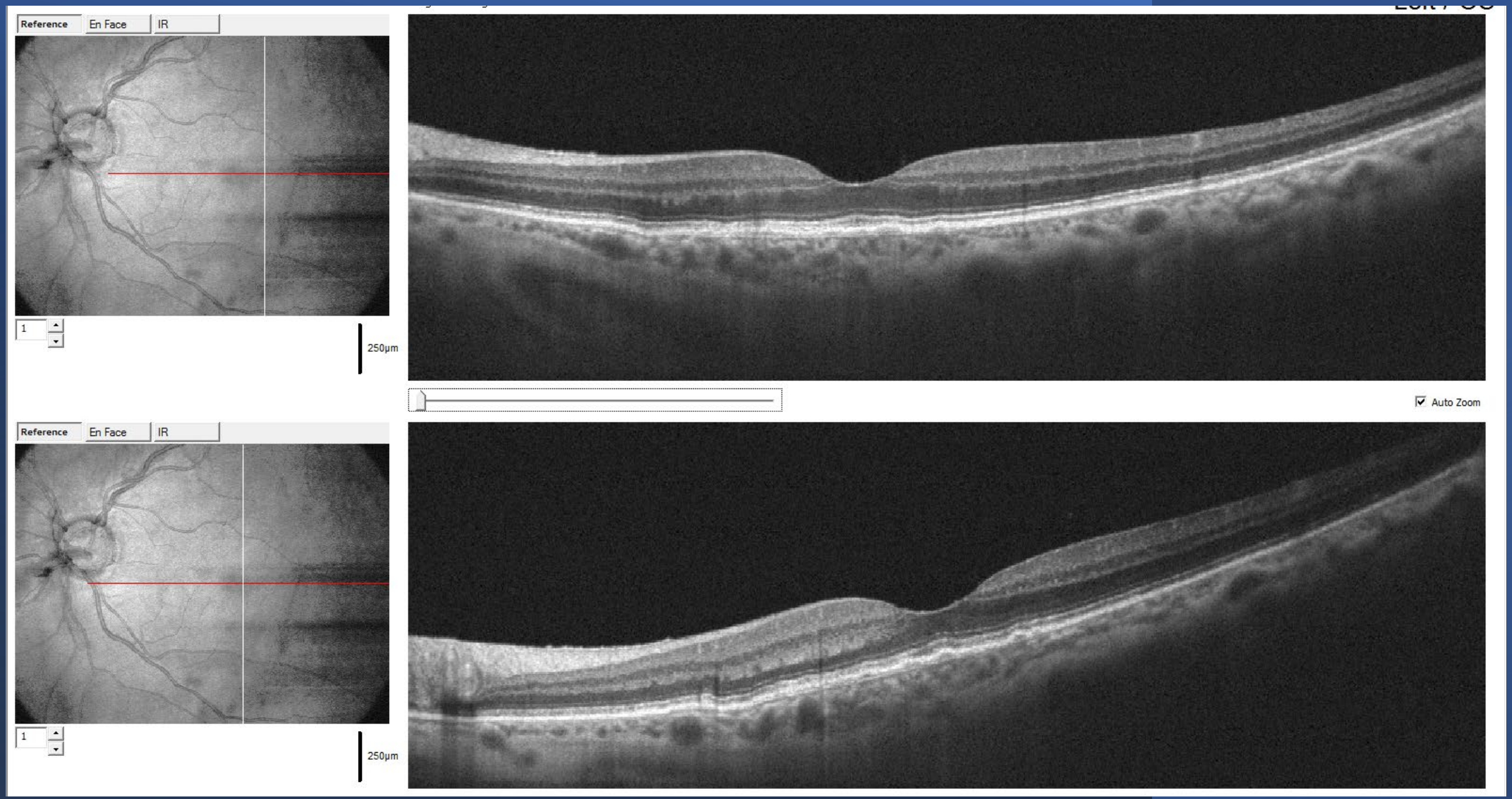
Print

OU Report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IR
1
250µm
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Reference
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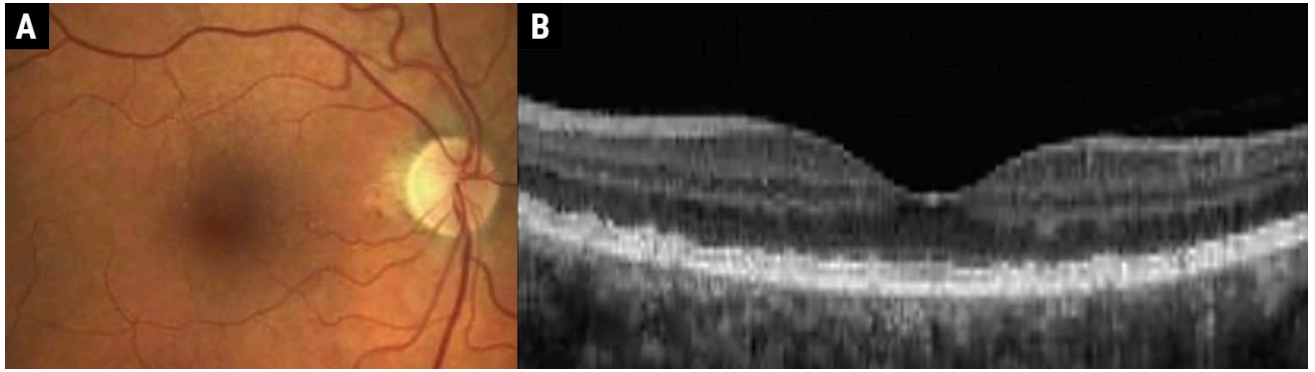
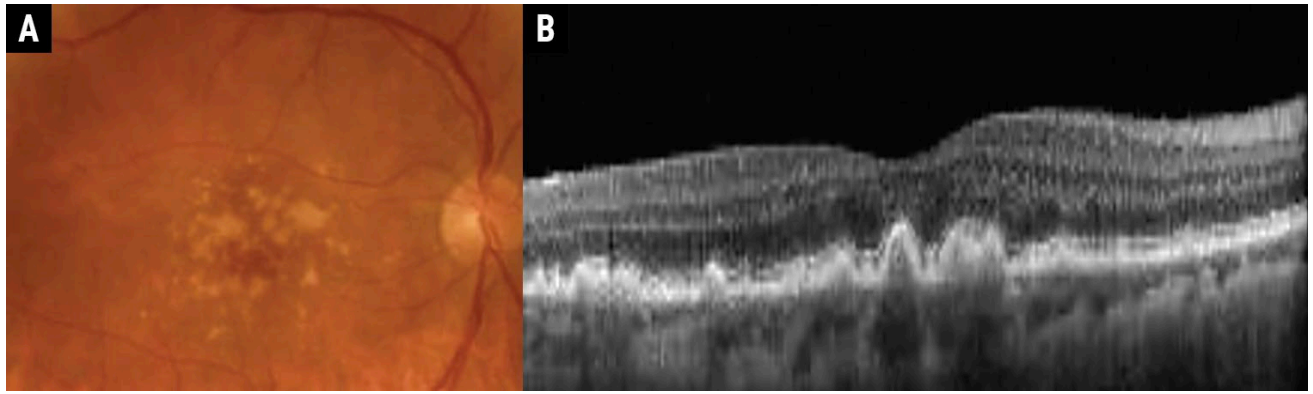
IR
1
250µm

AMD Staging



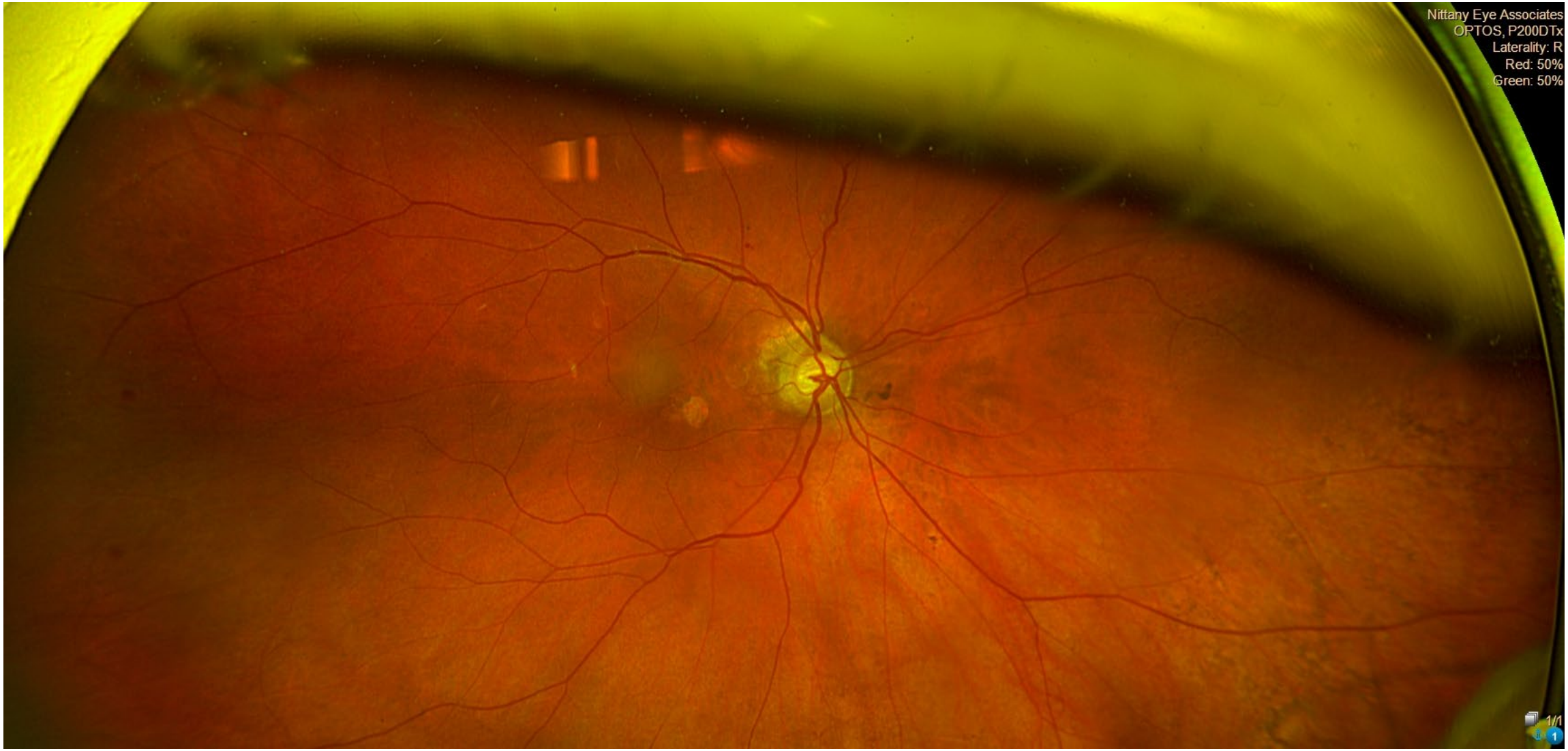
Mild AMD characterized by medium-sized drusen (63µm to 125µm)

- **Category 1**: Early AMD characterized by fewer than five small drusen, each below 63µm in size.
- **Category 2**: Mild AMD defined as multiple small drusen, a single intermediate-sized drusen from 63µm to 124µm or RPE changes.
- **Category 3**: Moderate AMD characterized by one large drusen greater than 125µm, extensive intermediate drusen or GA non-centrally.
- **Category 4**: Advanced AMD defined as more than one large drusen or GA centrally.



Intermediate AMD demonstrating large-sized drusen (>125µm)

Age-Related Eye Disease Study Research Group. The AREDS system for classifying age-related macular degeneration from stereoscopic color fundus photographs: the A
Related Eye Disease Study Report Number 6. Am J Ophthalmol. 2001;132(5):668-81.


Nittany Eye Associates
OPTOS, P200DTx
Laterality: R
Red: 50%
Green: 50%
1/1
1

Radial Lines

Scan Quality 6/10

12.00 Scan Size (mm)

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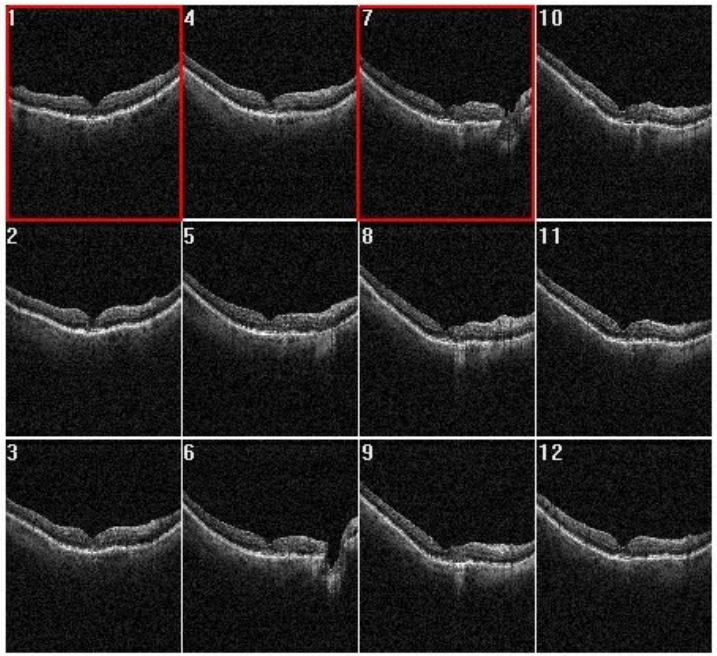

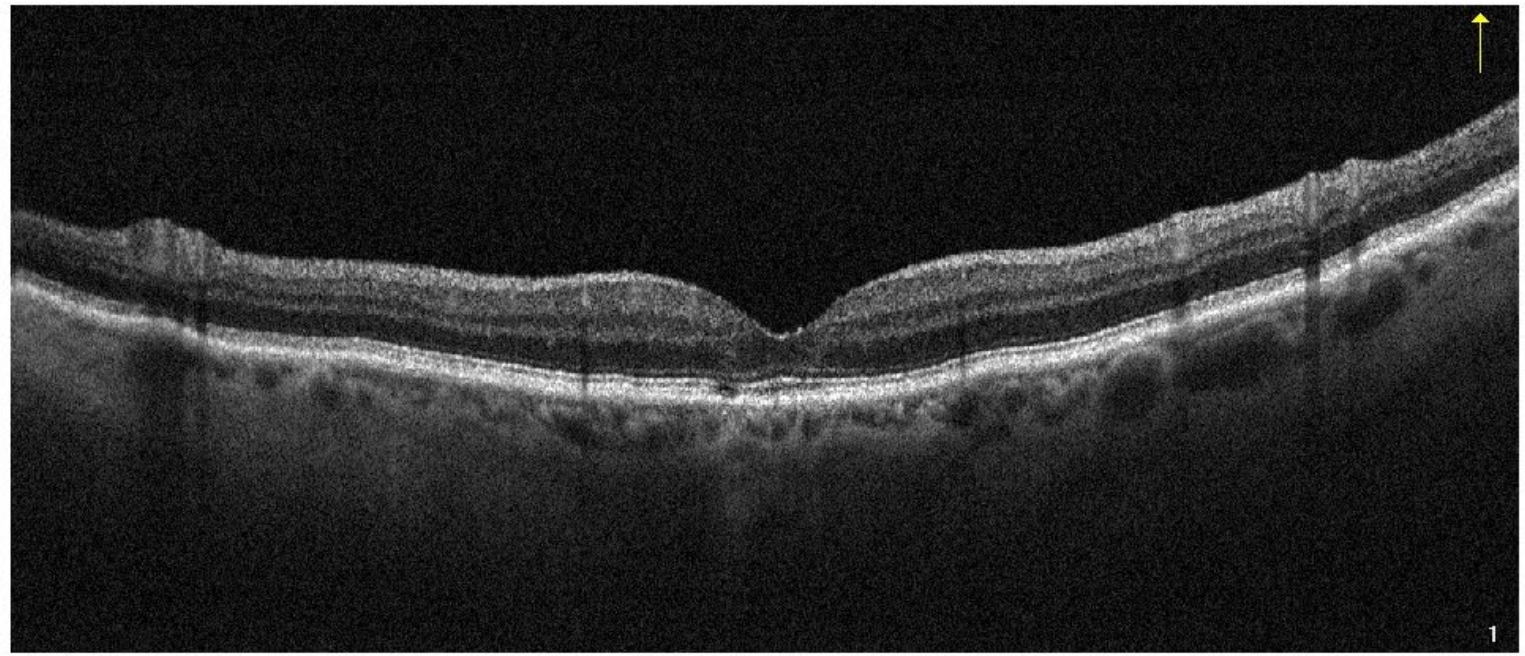

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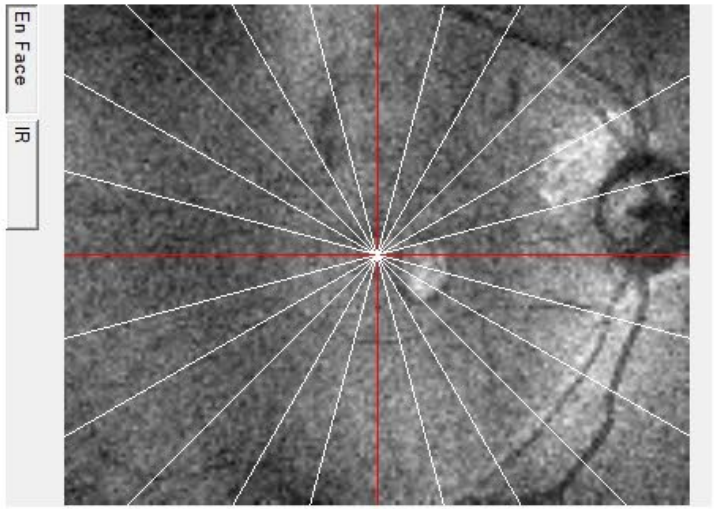
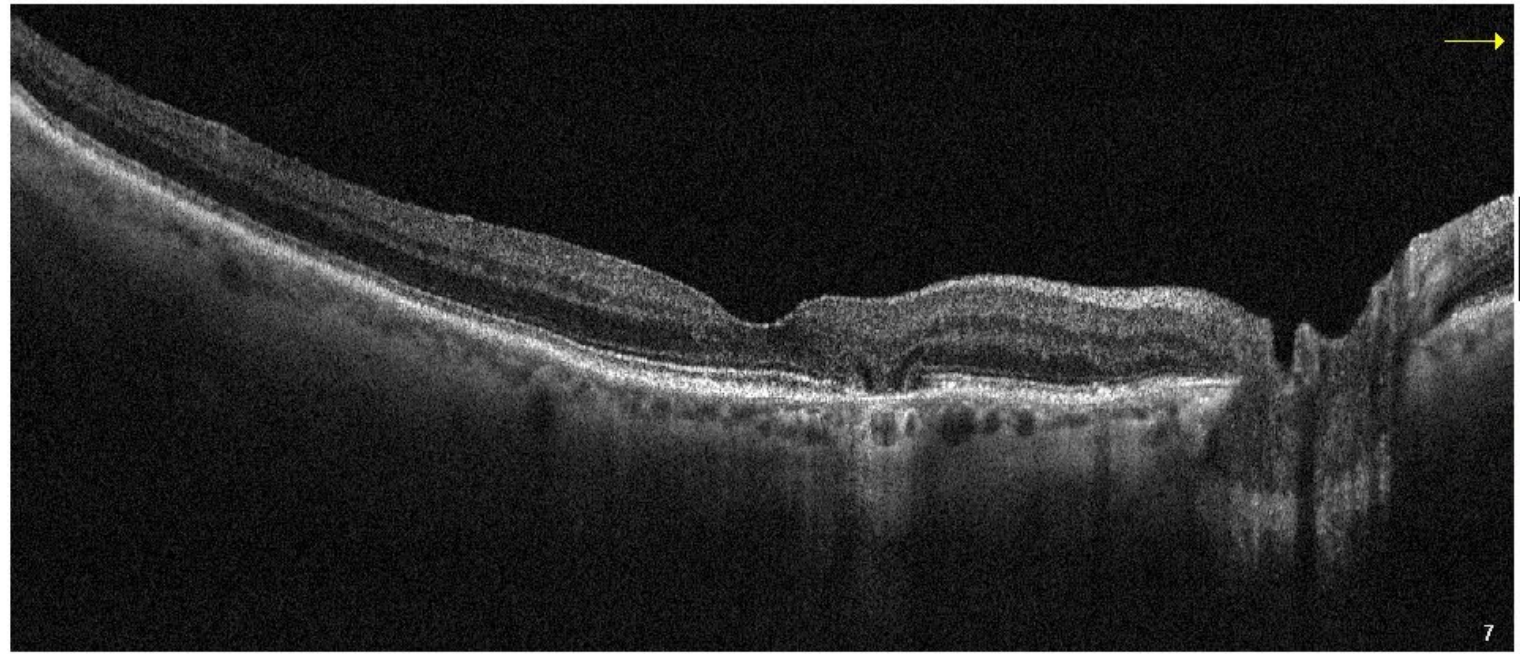
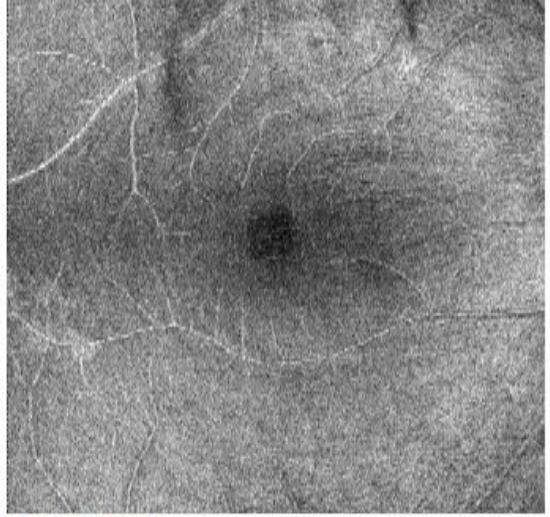




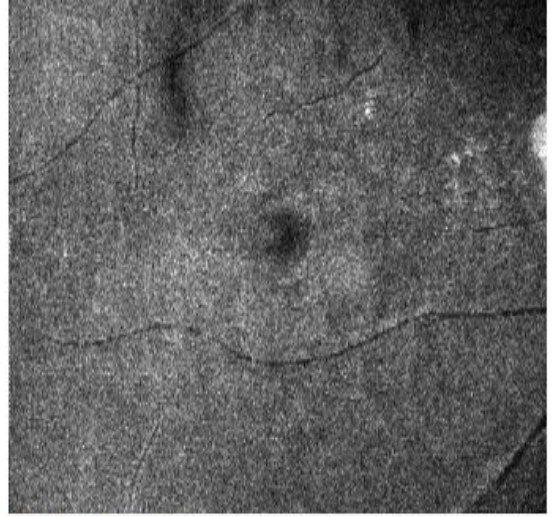
250µm

Include 2nd Print Page

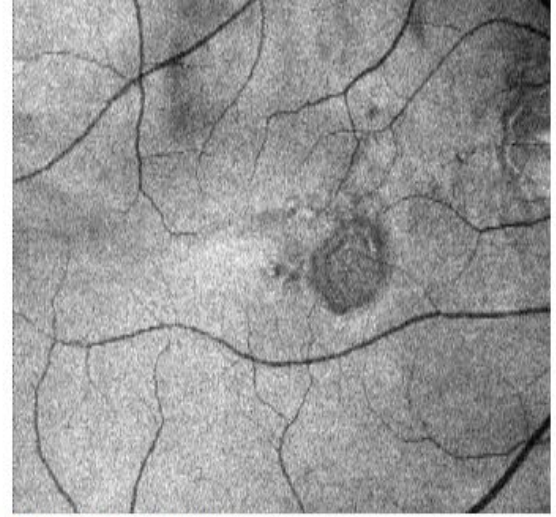
Select For 2nd Page Print



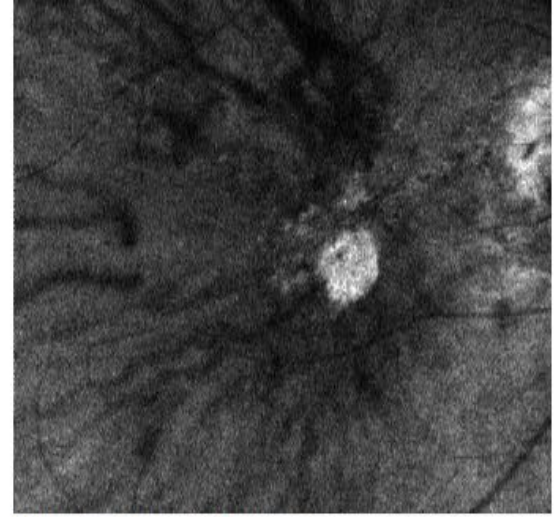
ILM (0 - 60)µm



IPL (0 - 90)µm

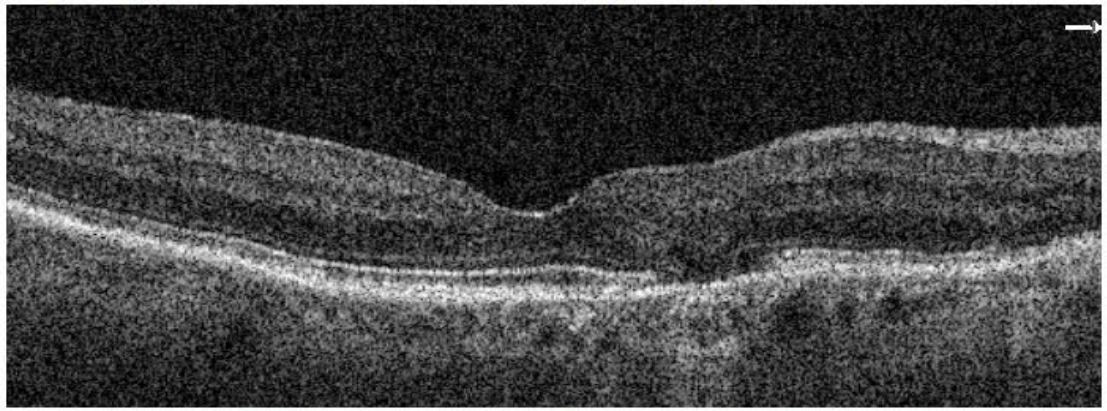


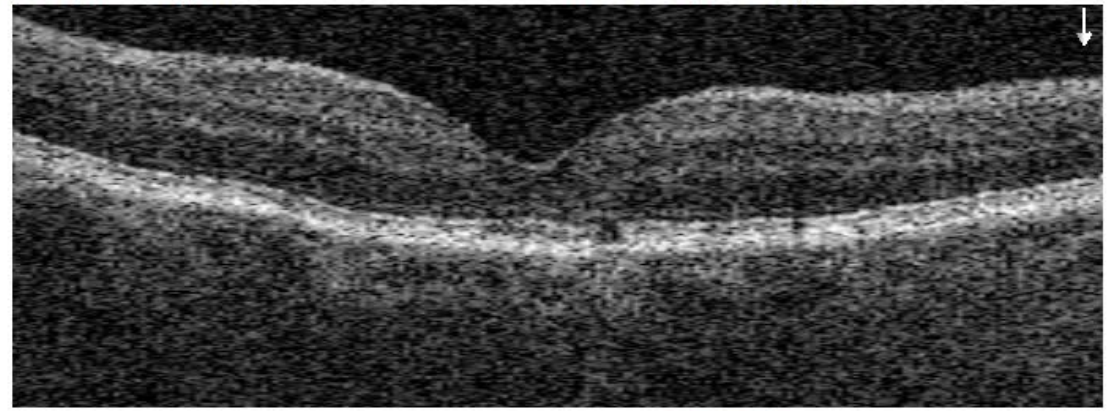
RPE (-60 - 30)µm



RPE Ref (90 - 210)µm

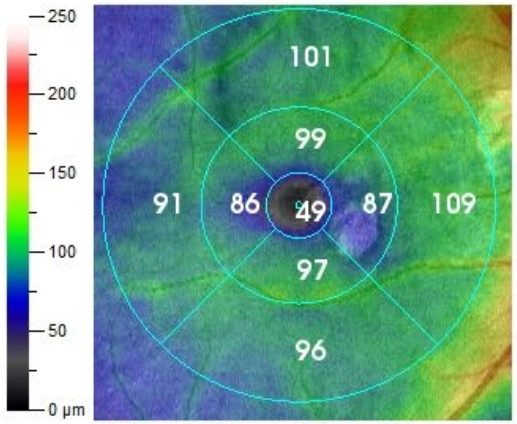
Show Lines



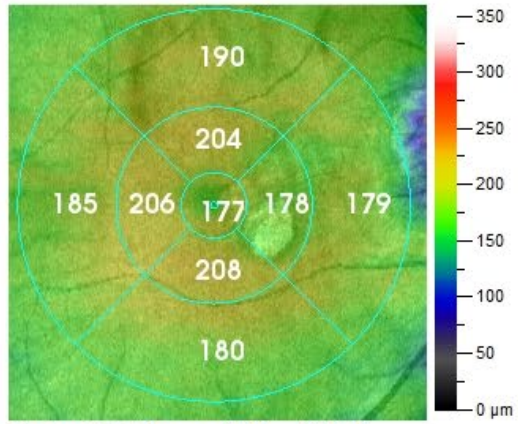


Show Bnd

Auto Zoom

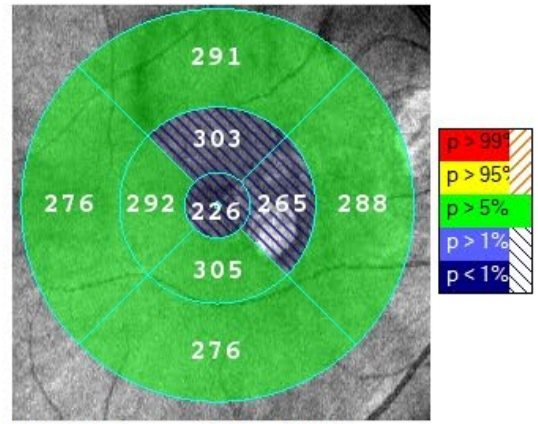


GCC Thickness (ILM - IPL)



Outer Thickness (IPL - RPE)

GCC Analysis	µm
Average GCC (µm)	99
Superior GCC (µm)	101
Inferior GCC (µm)	98
Intra Eye (S-I) (µm)	3
FLV6x6 (%)	2.87
GLV6x6 (%)	5.08



Full Thickness (ILM - RPE)

Overlay

RDB Ref

Deviation Map

OPTOVUE

What Is An Appropriate Referral For ARMD?

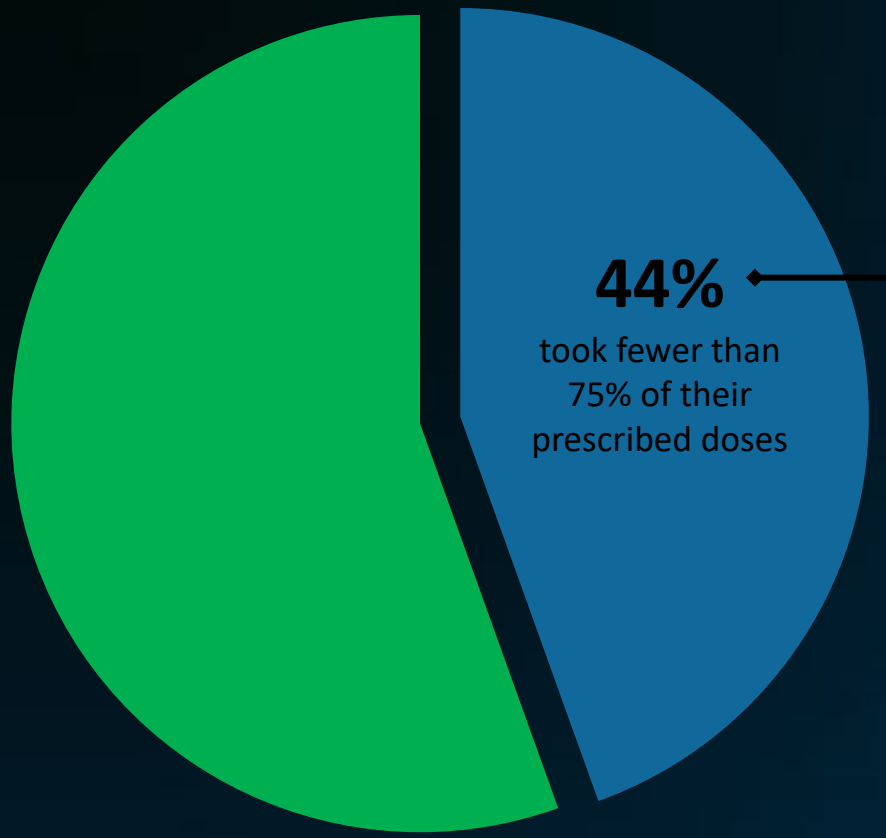
- Increase in SIZE of Drusen
- Decrease in VA
- Concern that GA is worsening
- If you and/or your patient would feel better if you referred
- Who Ya Gonna Call?

And Now It’s Time To Talk About Compliance!!!!!

This is so not Cool…

Adherence to IOP-Lowering Therapy Is Challenging

Over 3 months in a study of 196 patients with glaucoma taking an IOP-lowering medication in one or both eyes[1,2]:



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

IOP=intraocular pressure.

1.Prum BE, et al. AAO PPP: POAG. Available at https://www.aao.org/Assets/77dc248e-f025-4b65-a016-14491633d7a4/636621550399270000/primary-open-angle-glaucoma-2015-pdf.
2. Okeke CO, et al. *Ophthalmology*. 2009;116:191-199.

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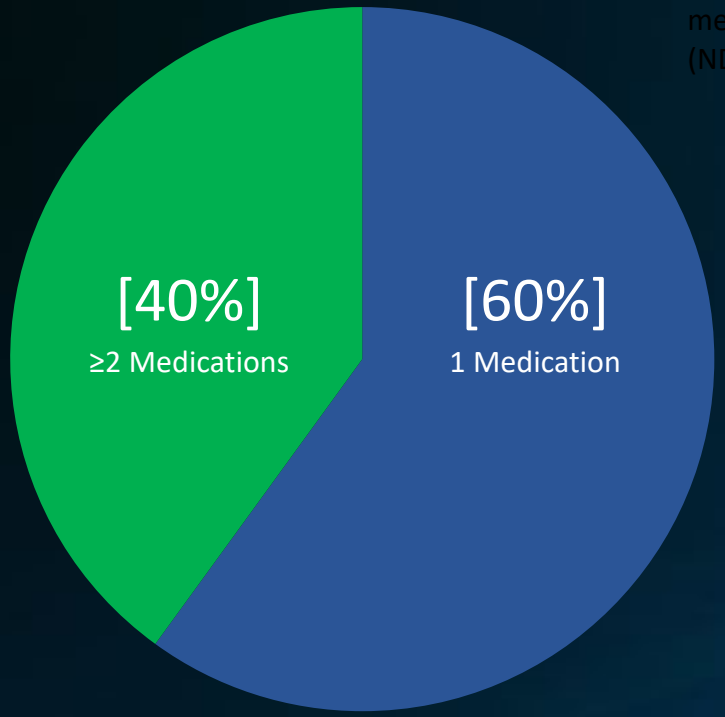
Individualizing the Target IOP

Target IOP should be individualized and updated as needed

Number of IOP-lowering medications used (NDTI Audit)[2]



IOP=intraocular pressure; NDTI=National Disease and Therapeutic Index™; VF=visual field.

1. Prum BE, et al. *AAO PPP*: POAG. Available at https://www.aao.org/Assets/77dc248e-f025-4b65-a016-14491633d7a4/636621550399270000/primary-open-angle-glaucoma-2015-pdf.
2. Glaucoma ATU Message Recall Study Report, July 5, 2018.

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Adherence to IOP-Lowering Therapy Is a Complex, Multifaceted Problem[1,2]

Adherence includes both persistency and compliance issues[1]

Components of successful adherence[1]

- Successfully obtain medication
- Correctly instill drops into eye
- Use drops at appropriate times
- Use drops every day without gaps

IOP=intraocular pressure.

1. Muir K, Lee P. *Arch Ophthalmol.* 2011;129(2):243-245. 2. Prum BE, et al. *AAO PPP*: POAG. Available at https://www.aao.org/Assets/77dc248e-f025-4b65-a016-14491633d7a4/636621550399270000/primary-open-angle-glaucoma-2015-pdf.

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Compliance really is a hot topic

Dr David Friedman – OGF Educators Meeting 9/19

Looked at compliance studies in glaucoma- found that 70% compliance with medications was average

But is that good enough to preserve VF?

Friedman also showed that those who said they missed their drops some of the time… actually used their drops ~50% of the time.

That was much worse than those who say they never miss their drops

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%

Compliance, adherence and side effects of therapy

- Compliance decreases the more bottles Rx'd
- Robin – Each extra bottle used decreased compliance by 1/3
- The more topical meds used the more ocular side effects occur
- OSD in G pxs (way) higher than initially thought
- 60% of G pxs use ocular lubricants

What are the biggest barriers to proper compliance?

1. Forgetfulness
2. Ability to put drops in
3. Unaware of the importance of the drops

Cost was not in the top 5!!!

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

THE PROBLEM OF 24 HOUR IOP

- Both measuring and Controlling it

HOW IOP IS USUALLY MEASURED

- Typically a **single observation**
- During **office hours**
- A moment in time or representative of the entire day?
- Are we missing spikes, peak, or elevated IOPs at other times of day?

WHEN IS THE PEAK IOP?

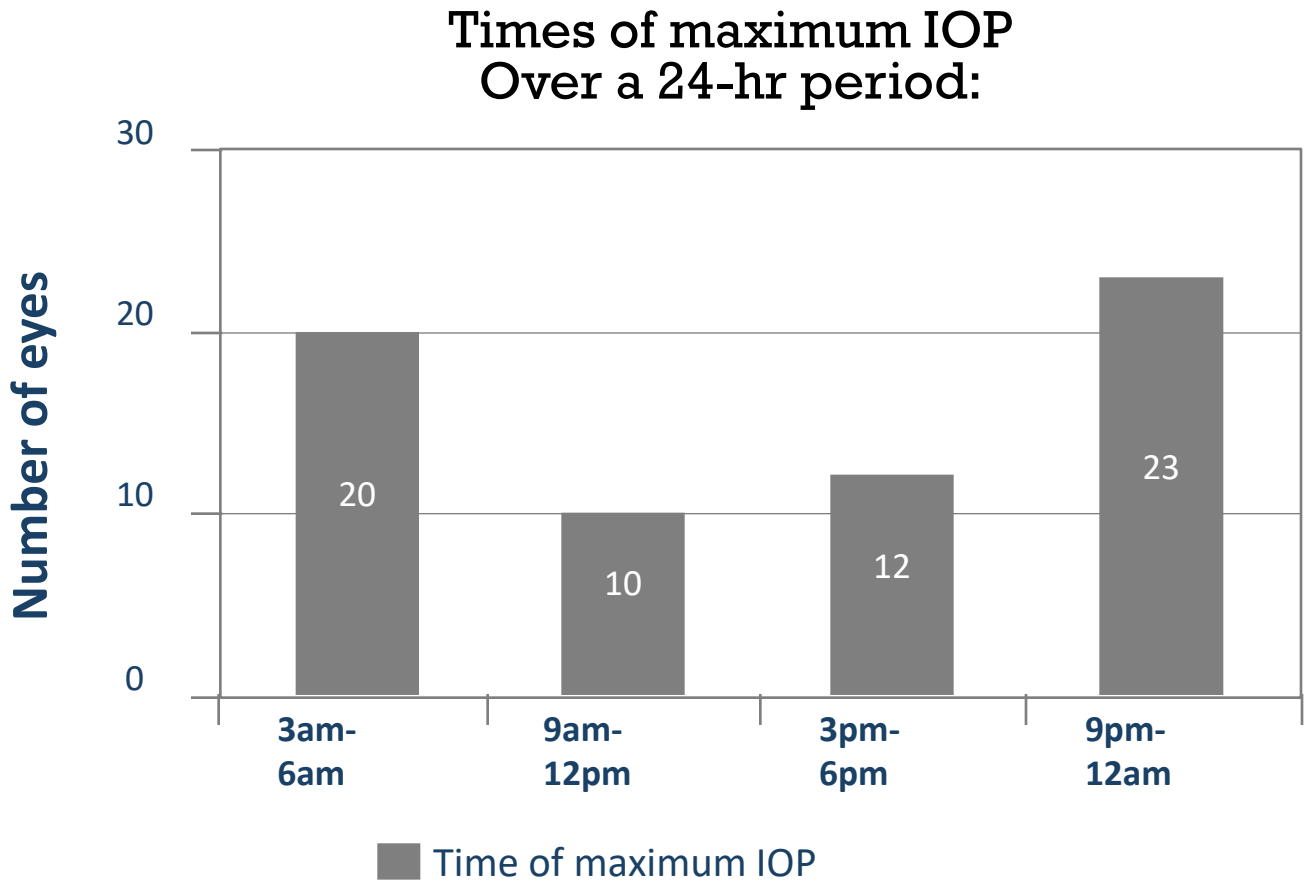
- 3,025 IOP readings on 1,072 eyes
- NTG, POAG, Pre-perimetric G, OHT
- Results:
  - Peak IOP – 7AM – 20.4%
  - Noon – 17.8%
  - 5PM - 13.9%
  - 9PM – 26.7%
    - Jonas, Budde, et al. AJO, June 2005;139:136-137

JONAS STUDY CONCLUSION

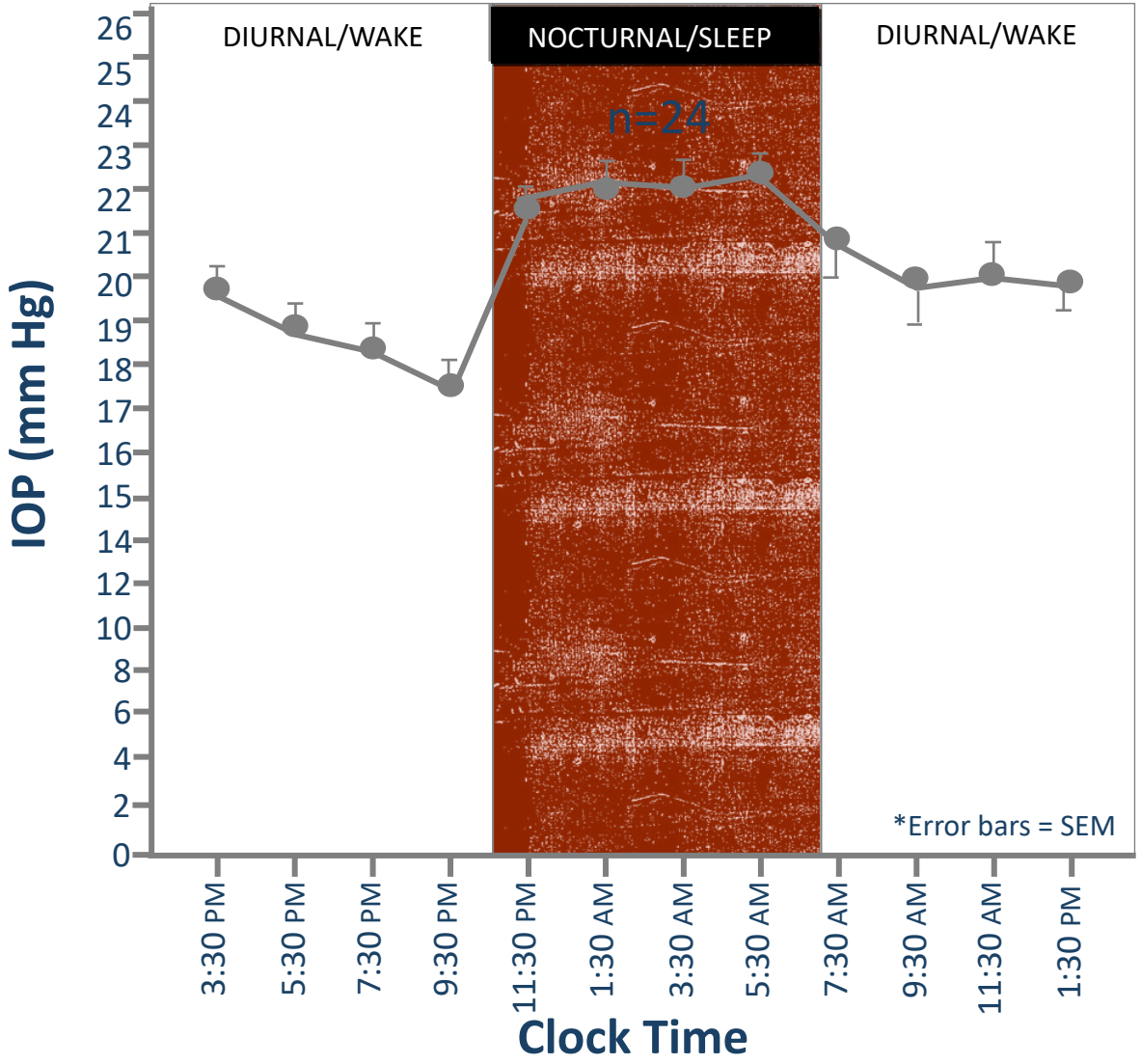
- "Any single IOP measurement taken between 7AM and 9PM has a higher than 75% chance to miss the highest point of the diurnal curve."

- Stresses the need for serial tonometry.

PEAK IOP OUTSIDE OFFICE HOURS FOR 2/3 OF EYES



IOP IS HIGHER AT NIGHT



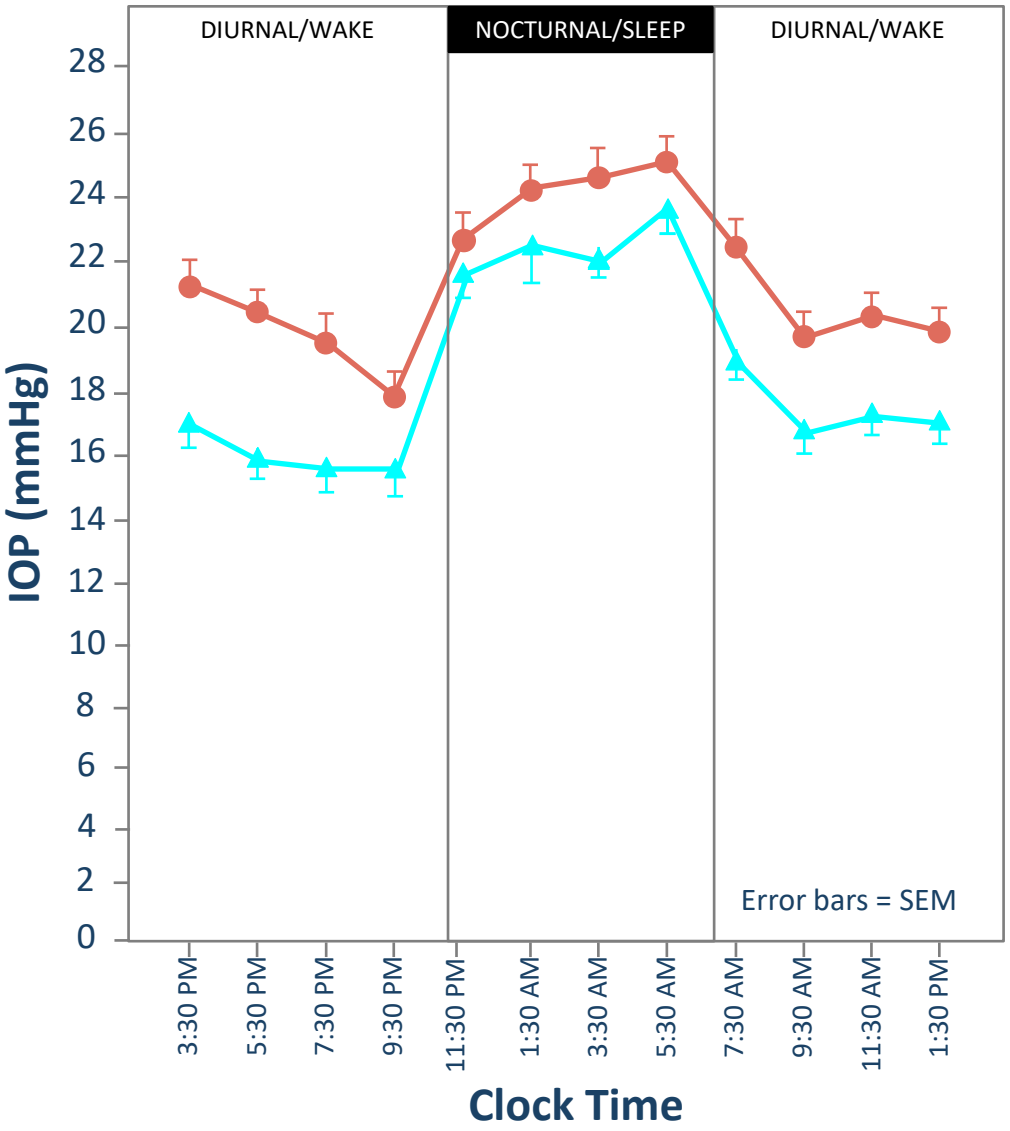
- Habitual IOP of untreated glaucomatous eyes

OBSERVATIONS

- Reducing IOP reduces risk of progression[1-5]
- Peak IOPs often occur outside normal office hours[6-9]
- IOP during office hours does not provide a complete picture of diurnal and nocturnal IOP[6-9]
- What does this mean about your choice of medical therapy?

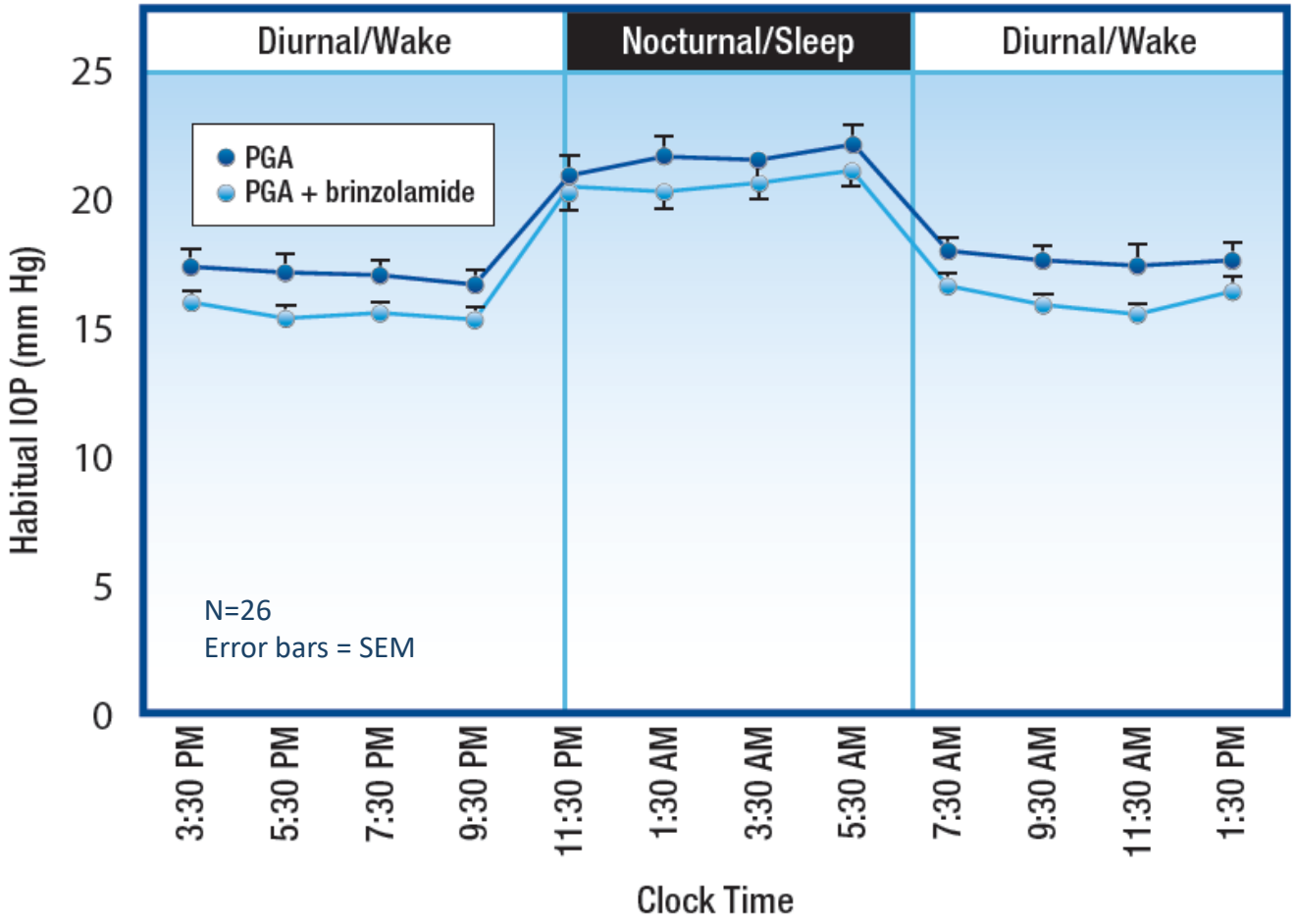
1. Heijl A, et al. *Arch Ophthalmol*. 2002; 120(10): 1268-1279.
2. Kass MA, et al. *Arch Ophthalmol*. 2002; 120(10): 701-713.
3. AGIS Investigators. *Am J Ophthalmol*. 2000; 130(4): 429-440.
4. Lichter PR et al. *Ophthalmology* 2001; 108: 1943-1953.
5. CNTGS. *Am J Ophthalmol*. 1998; 126(4): 487-497.
6. Nakakura S, et al. *J Glaucoma* 2007; 16(2): 201-204.
7. Mosaed S, et al. *Am J Ophthalmol*. 2005; 139: 320-324.
8. Hughes E, et al. *J of Glaucoma* 2003; 12: 232-236.
9. Liu JH et al. *Invest Ophthalmol Vis Sci.* 2003; 44: 1586-1590.

EFFECT OF TRAVOPROST ON DIURNAL AND NOCTURNAL IOP (CONT'D)



- Diurnal period – sitting
- Nocturnal period – supine

Brinzolamide: Adjunct to Latanoprost in an Open-Label Study



SO HOW DO WE BEST MEASURE 24 HOUR IOP

- Multiple iop readings
- At home monitoring
  - Triggerfish
  - Icare "home" tonometer

WHAT CAN WE DO TO BETTER CONTROL IOP OVER A 24 HOUR PERIOD?

- Pick the right drop(s)
- Choose the right procedure
- Identify the Problem
- Get the necessary data

In home tonometry

Icare home tonometer

- Rebound tonometer
- No anesthesia
- Px is seated
- Automatic od/os recognition
- r/g lights guide alignment
- Push button “switch”
- Can take 1 reading or 6 consecutive
- Data stored in instrument
- Download data in doctor’s office

Icare home tonometry

- Readings are not printed out or displayed to patient
- Readings are in mm hg
- No cpt code
- Not reimbursible – because it is administered by the px
- Px rents machine from dr
  - Rental rate is set by dr
  - Abn (waiver of benefits) must be signed by px

Icare home tonometer
is it feasible?

- Pronin, brown, et al – jama ophthalmol (online) 8/31/17
- Report on reproducibility and acceptability of iop as measured by patients

- All pxs had oht or poag
- Gat and icare home tonometry performed by dr in office
- Icare home tonometry performed by px in office

Pronin et al - results

- 73/100 pxs showed measurements w/in 5mm of doctor
- Icare home readings were consistently lower than iop/gat
- This was more pronounced in lower ranges of iop

- Self tonometry was judged “easy and comfortable” by most patients
- 92% of pxs reported: “ they would be happy to perform self-tonometry in future”

Tagaki et al
Jglaucoma 26(7): 613-618, july 2017

- Compared iop measurements of goldmann tonometry with icare home tonometry both by patient and by doctor
- Mean iop ranges
  - Gat: 7- 20 mm Hg
  - Icare (px): 6-24mm hg
  - Icare (dr): 6-25mm hg
- Was found to be “feasible”
- Icare home showed a tendency to record higher iop readings as compared to gat

So...

- More iop readings give us more data points from which to make decisions
- It is reproducible
- It is feasible
- But…

I have some questions

1. Is a 5mm difference between patient and doctor acceptable?
2. Do elevated iop readings on icare home lead to vf defects
3. Is this true 24 hr data?
4. Will this become standard of care?
5. Will this data lead to a change in treatment for the px?

Triggerfish cls

- Wearable cl sensor
  - Single use cl (8.4, 8.7, 9.1 bc), 14.1 mm diameter, 585 microns thick
- Also incorporates:
  - 2 strain gauges
  - Microprocessor
  - Periorbital adhesive (holds receiver antenna)
  - Recorder sleeve

Triggerfish cls

- Worn for 24 straight hours
- Telemetric sensor
- Takes 30 seconds of readings at 5 min intervals for 24 hrs

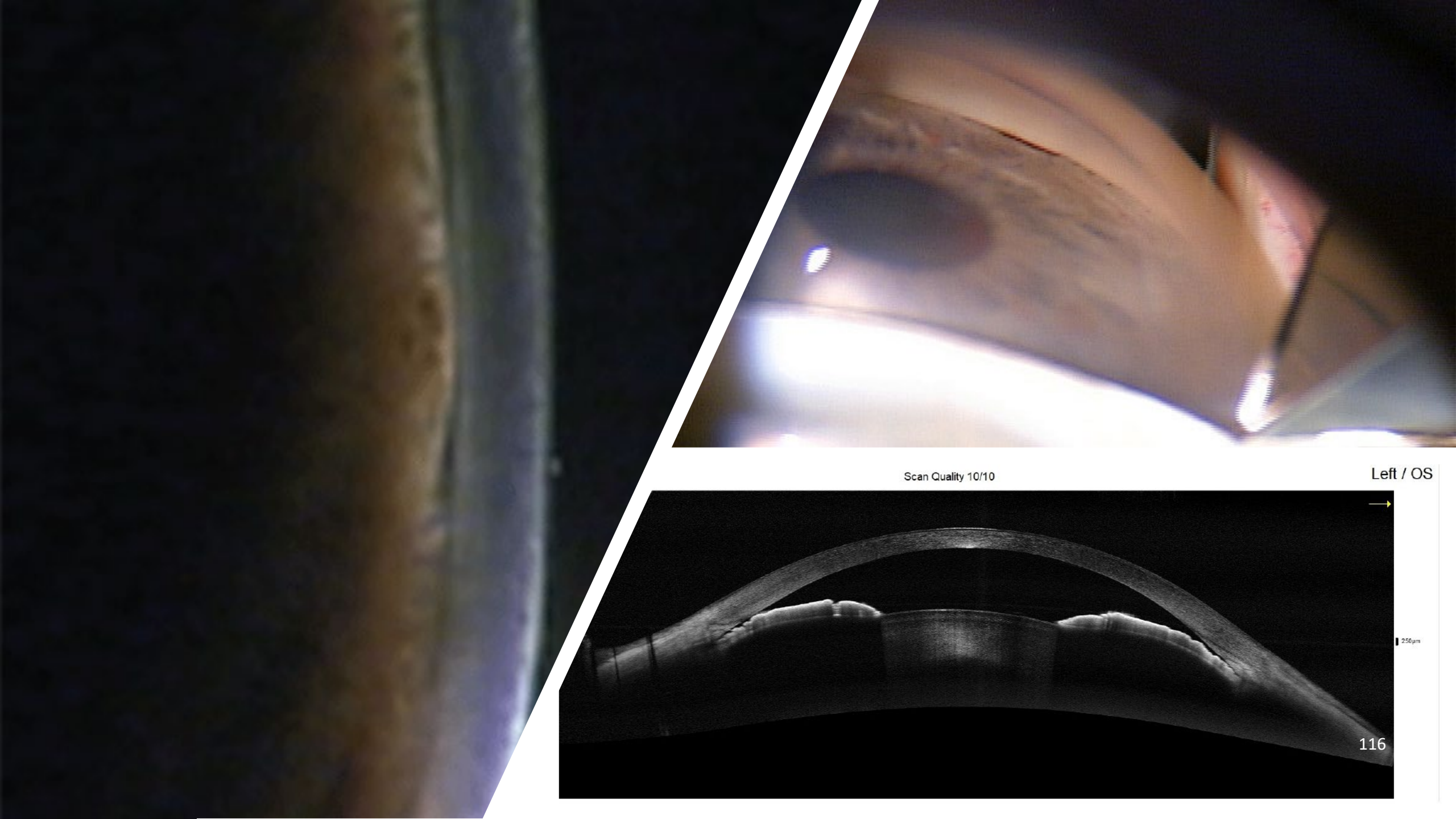
- It is not tonometry
- It doesn’t measure iop
- Measures strain differences

Triggerfish cls pros

- Continual 24 hr data
- No px involvement
- Gathers data while sleeping, standing, sitting, during physical activity
- It is felt that iop changes with those activities as well

Triggerfish Cons

- Uncomfortable
- Ugly
- Expensive
- May cause corneal issues
- Not available in U.S.


Scan Quality 10/10
Left / OS
250µm
116

Critical Questions

Should we dilate?

Should we perform gonioscopy?

Should we perform or recommend LPI?

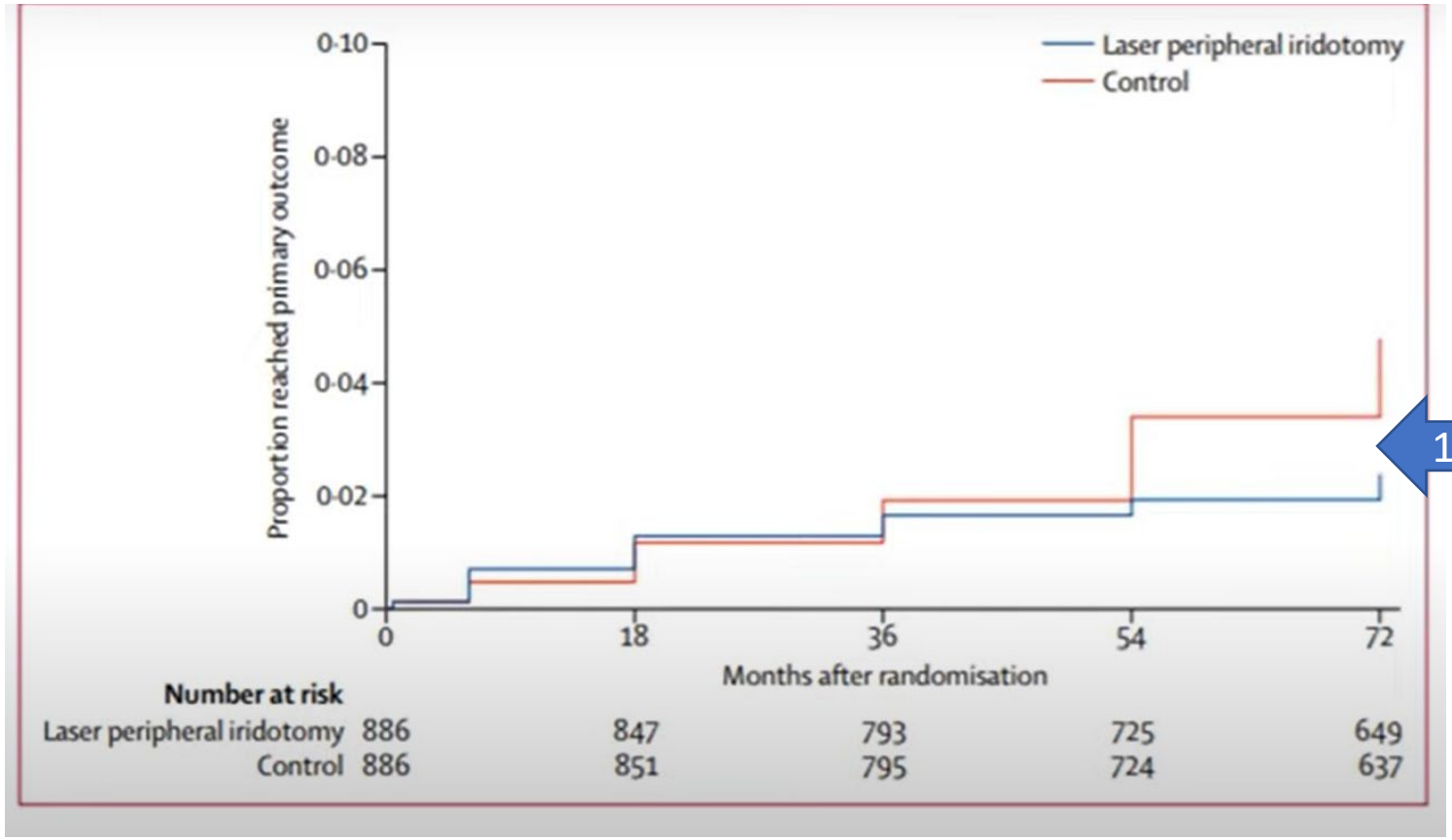
Should we recommend cataract extraction?

ZAP

- should LPI be recommended for all PACS patients to prevent PAC and/or PACG?
- One eye was randomly chosen for PI, other eye acted as a control
- Endpoints – IOP greater than 24mmHg, PAS, acute angle closure

- He M, Jiang Y, Huang S, Chang DS, Munoz B, Aung T, Foster PJ, Friedman DS. Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial. The Lancet. 2019 Apr 20;393(10181):1609-18.

ZAP



17 pts

- End of 3 years – not much going on, continue study another 3 years
- showed a statistically significant but clinically small decrease in the risk of PAC conversion and **recommend against the widespread use of prophylactic LPIs in their study population**
- 44 PACS patients needed treatment to prevent one new PAC case over six year
- 126 needed to prevent one case of PACG

ZAP – 14 year data!!!

69% reduced risk of PAC with LPI

NNT to prevent 1 case of PAC at 14 years is 12.35

“prophylactic LPI should be recommended preferentially to those at the highest risk because the annual incidence of PAC was low”

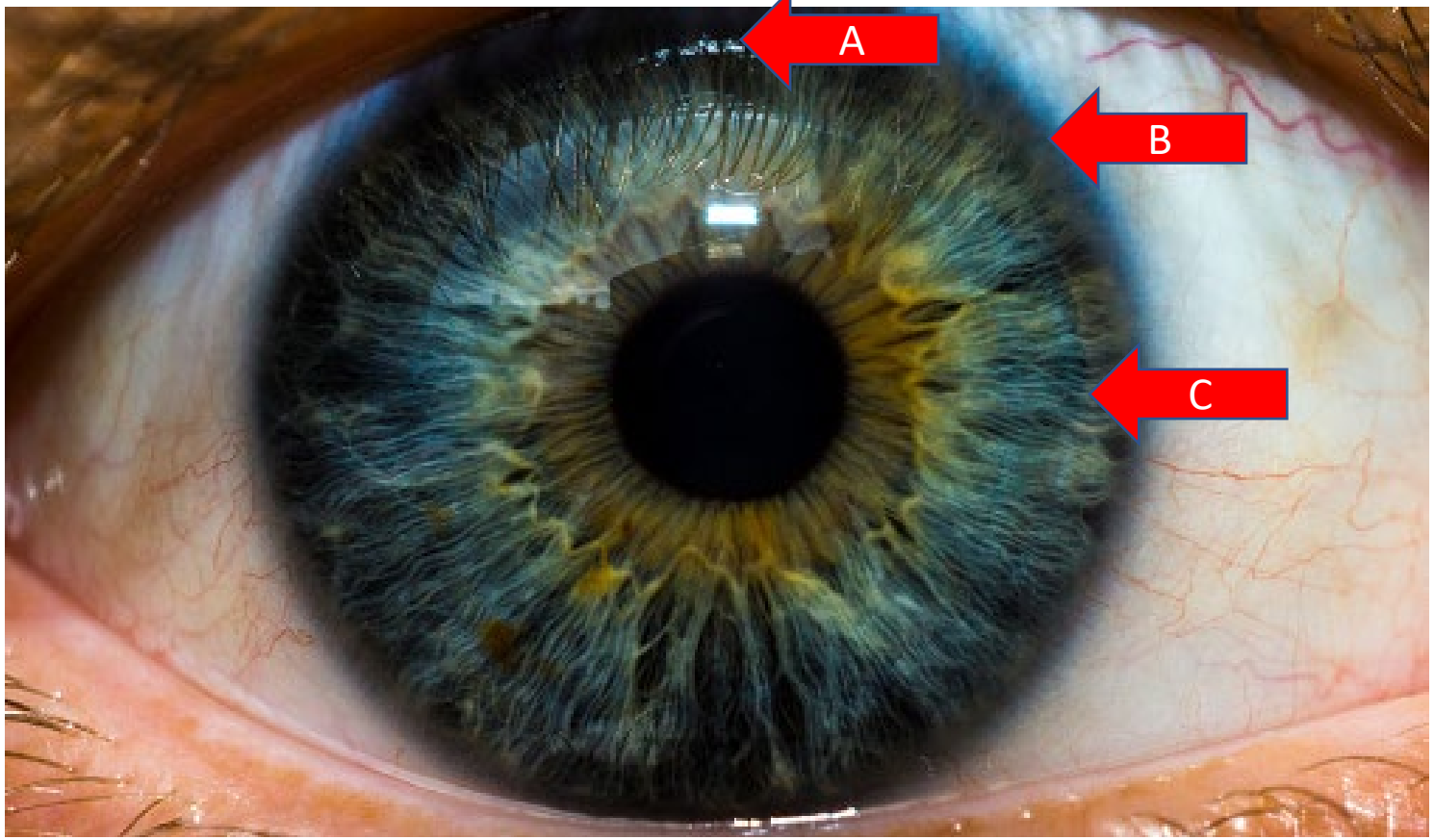
Yuan Y, Wang W, Xiong R, Zhang J, Li C, Yang S, Friedman DS, Foster PJ, He M. 14-Year Outcome of Angle-Closure Prevention with Laser Iridotomy in the Zhongshan Angle Closure Prevention Study: Extended Follow-Up of a Randomized Controlled Trial. Ophthalmology. 2023 Apr 6.

What about dilation?

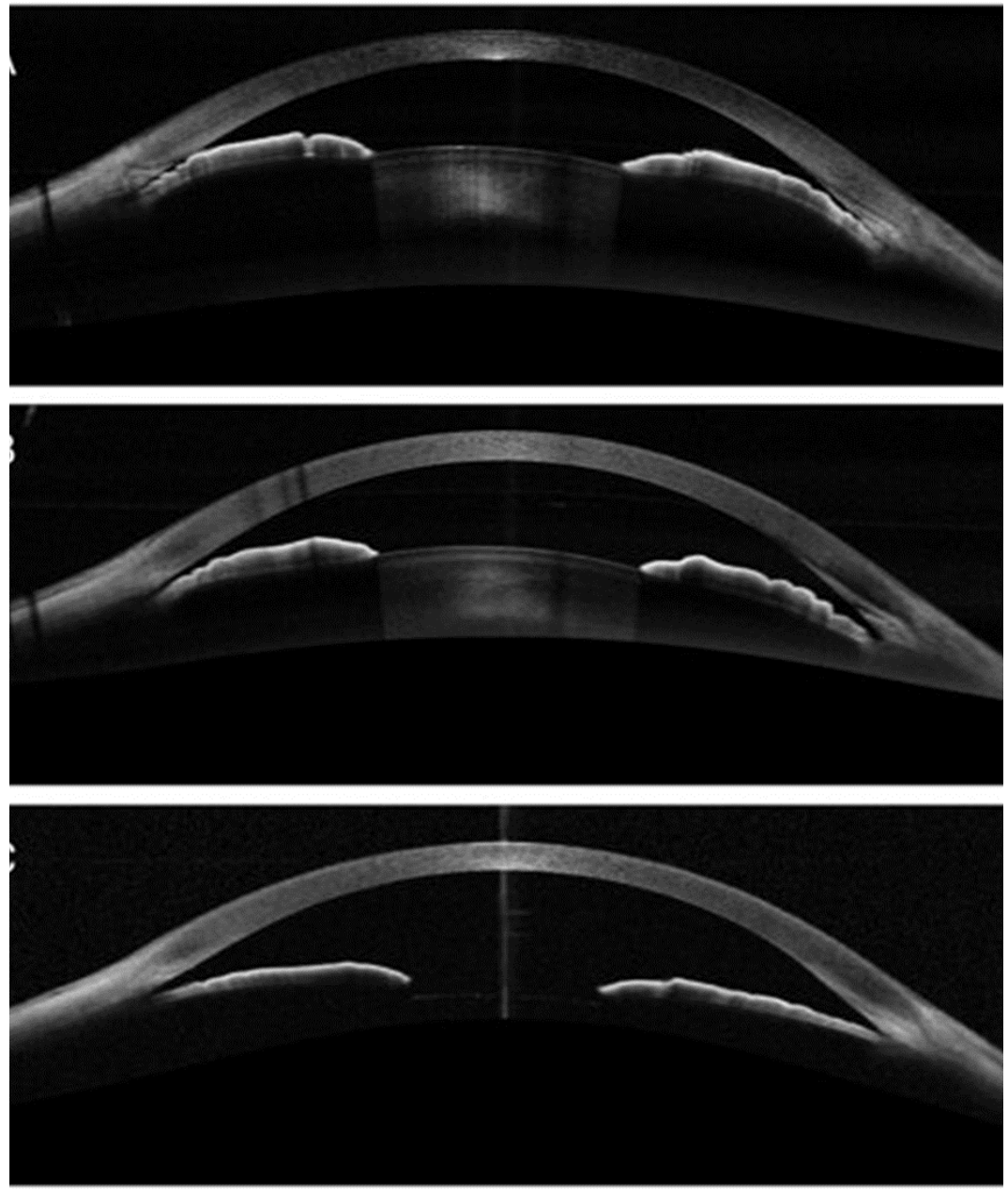
- Dilated 6 or 7 times
- 2.5% and 1%
- Everyone received 250 mg diamox
- If 8mmHg increase, drop of pilo and brimonidine

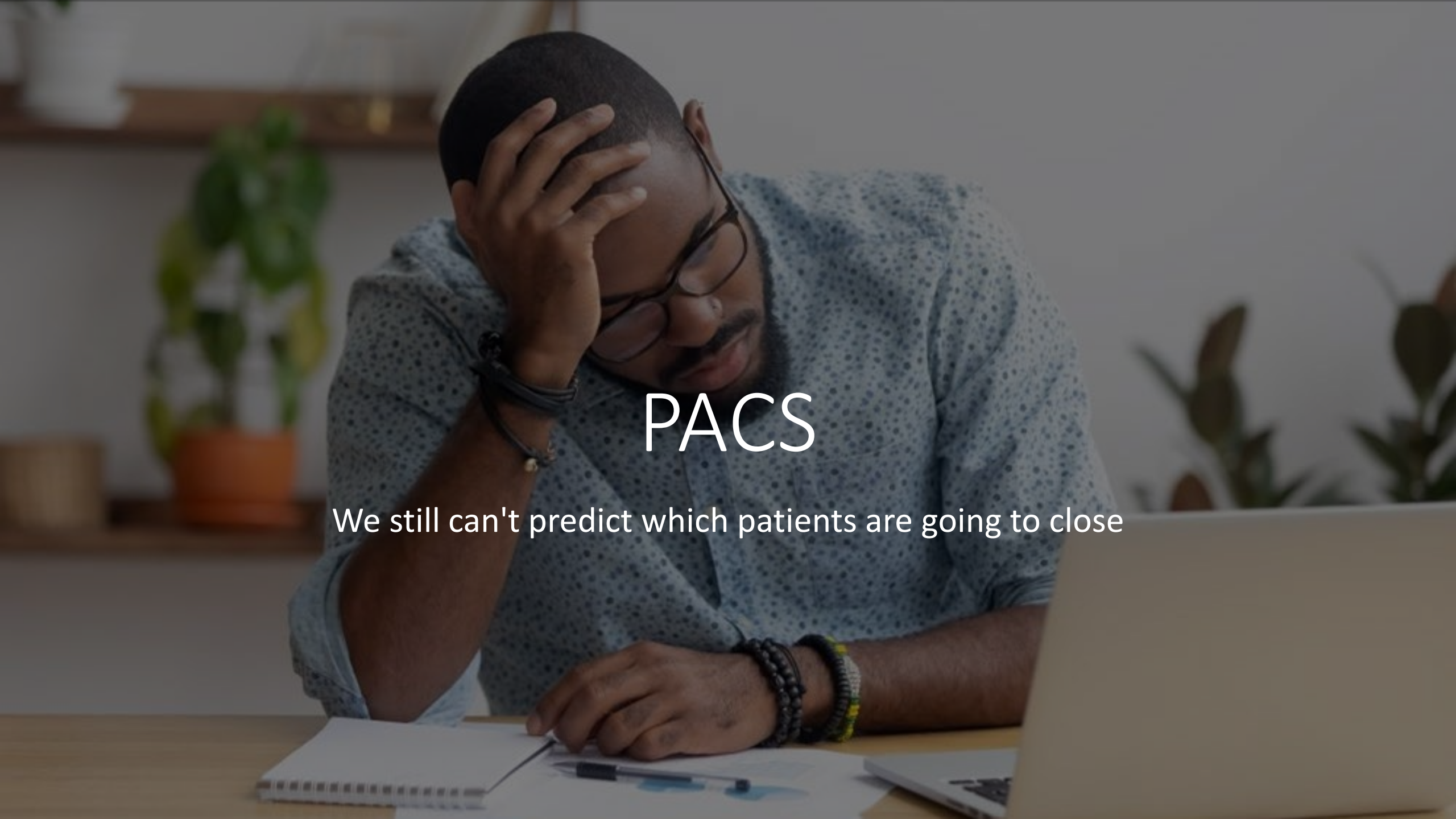
Highest Risk of Closure

- Closed in all 4 quadrants
- Average refractive error of +4.00



- Untreated eyes narrowed by 20%
- A is most efficacious
  - Xu BY, Friedman DS, Foster PJ, Jiang Y, Pardeshi AA, Jiang Y, Munoz B, Aung T, He M. Anatomic Changes and Predictors of Angle Widening after Laser Peripheral Iridotomy: The Zhongshan Angle Closure Prevention Trial. Ophthalmology. 2021 Jan 23





PACS

We still can't predict which patients are going to close

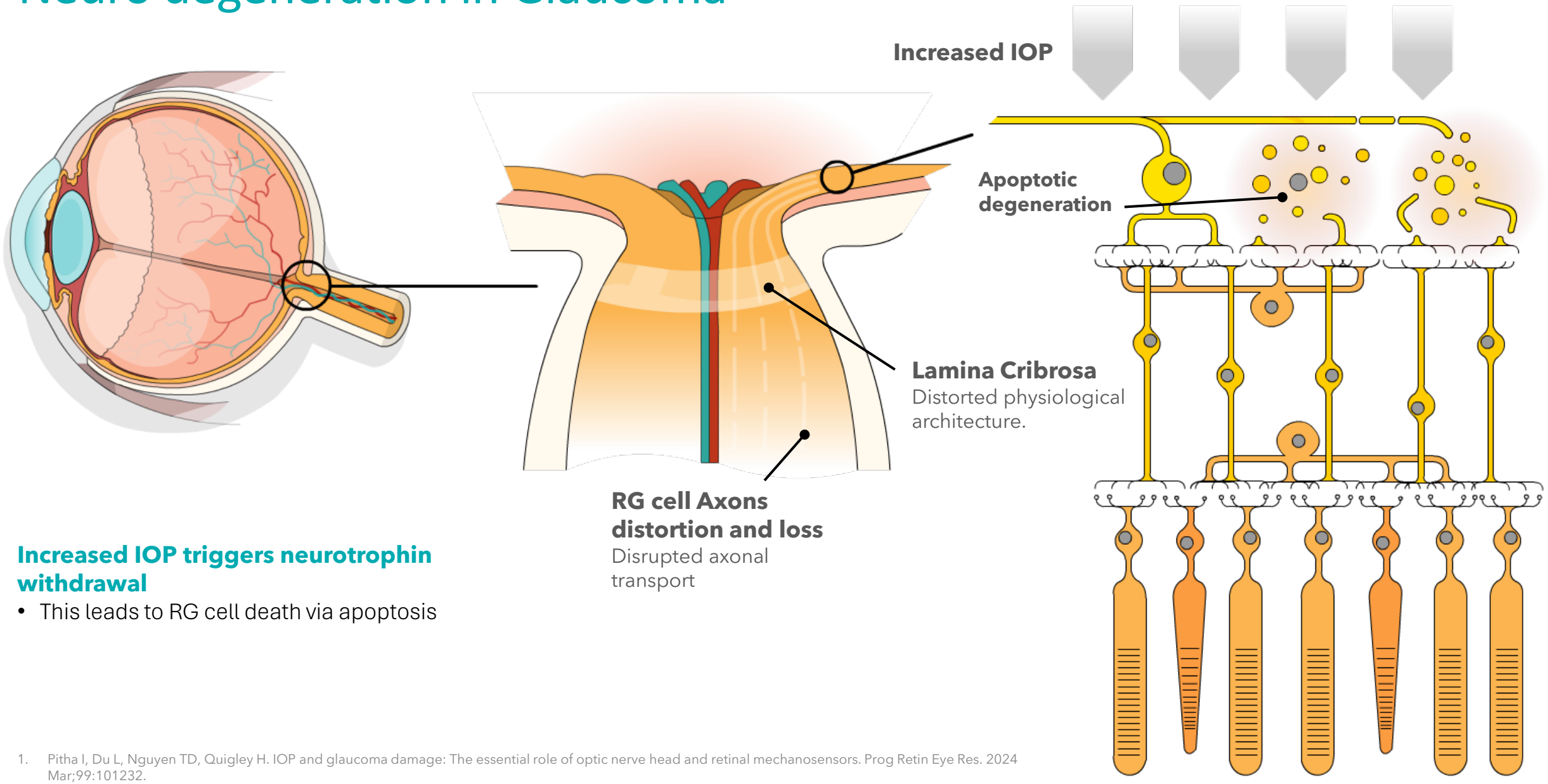
What do we do with PACS?

- In our clinic, we typically follow most asymptomatic PACS patients every six to 12 months. We monitor for changes in the angle, optic nerve and visual field.
- While we approach each patient individually, we generally perform LPI, clear lens exchange or cataract extraction if:
  - the patient mentions symptoms suggestive of closure
  - has a family history of angle-closure
  - if they show progression of angle narrowing or progression to PACG
  - they need frequent dilation
  - they are unusually hyperopic

Neuroprotection

- What Is It?
- How Is It Measured?
- Does It Actually Exist?
- Can We Even Say The Word?

Neuro degeneration in Glaucoma

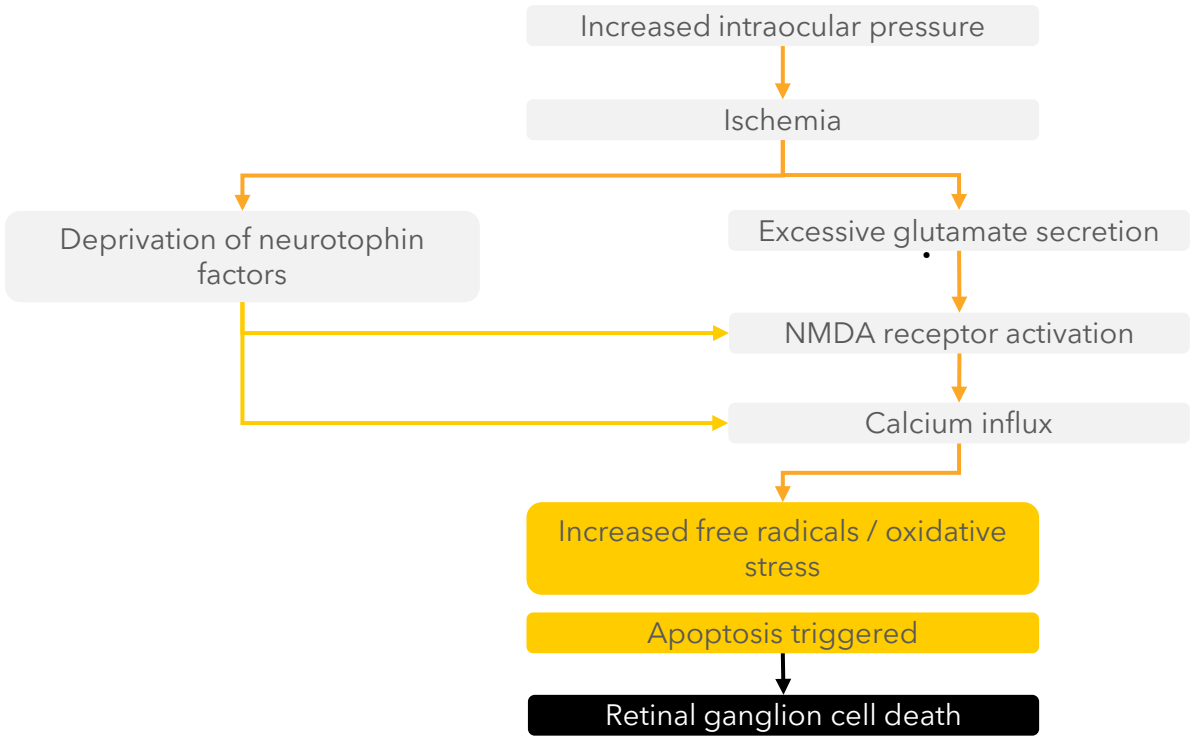


Increased IOP triggers neurotrophin withdrawal

- This leads to RG cell death via apoptosis

1. Pitha I, Du L, Nguyen TD, Quigley H. IOP and glaucoma damage: The essential role of optic nerve head and retinal mechanosensors. Prog Retin Eye Res. 2024 Mar;99:101232.

Neural molecular path in Glaucoma



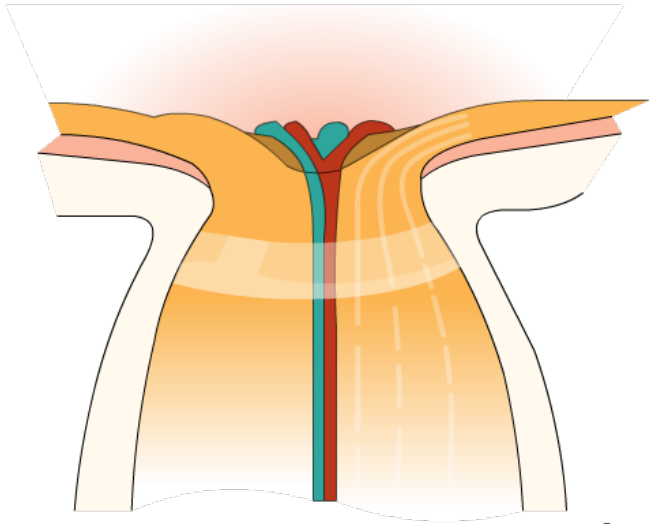
Insights from basic science

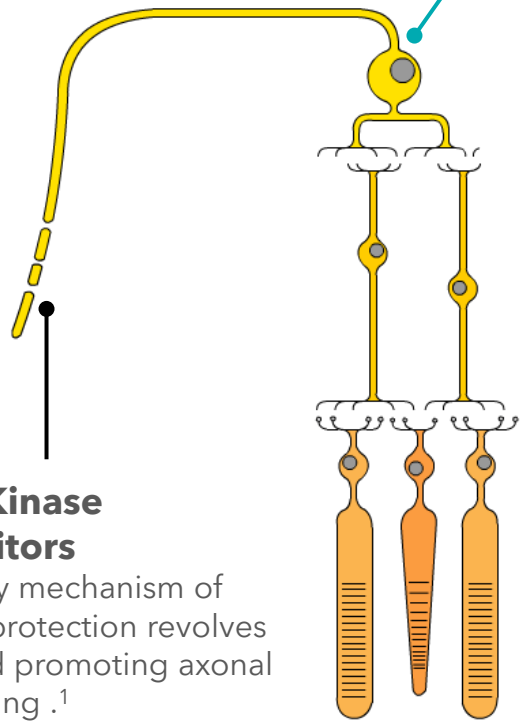
Given the limited restorative capability of neurons after trauma or degeneration, damage to these cells can be critical for their function. Animal model studies have consistently demonstrated the extent of glaucoma-related damage in the central nervous system. These findings suggest that solely lowering intraocular pressure may not be sufficient to prevent glaucoma and the resulting blindness[1].

1. Thomas NM, Nagrale P. Rho Kinase Inhibitors as a Neuroprotective Pharmacological Intervention for the Treatment of Glaucoma. Cureus. 2022 Aug 26;14(8):e28445.

Drug Strategies in Neuro Protection in Glaucoma

Lowering IOP decreases the likely hood of ischemia





Rho Kinase Inhibitors
Primary mechanism of neuroprotection revolves around promoting axonal sprouting .[1]

Omidenepag
Primary mechanism of neuroprotection revolves around regulating cAMP via the EP2 receptor preventing glutamate induced neuroinflamation.[2]

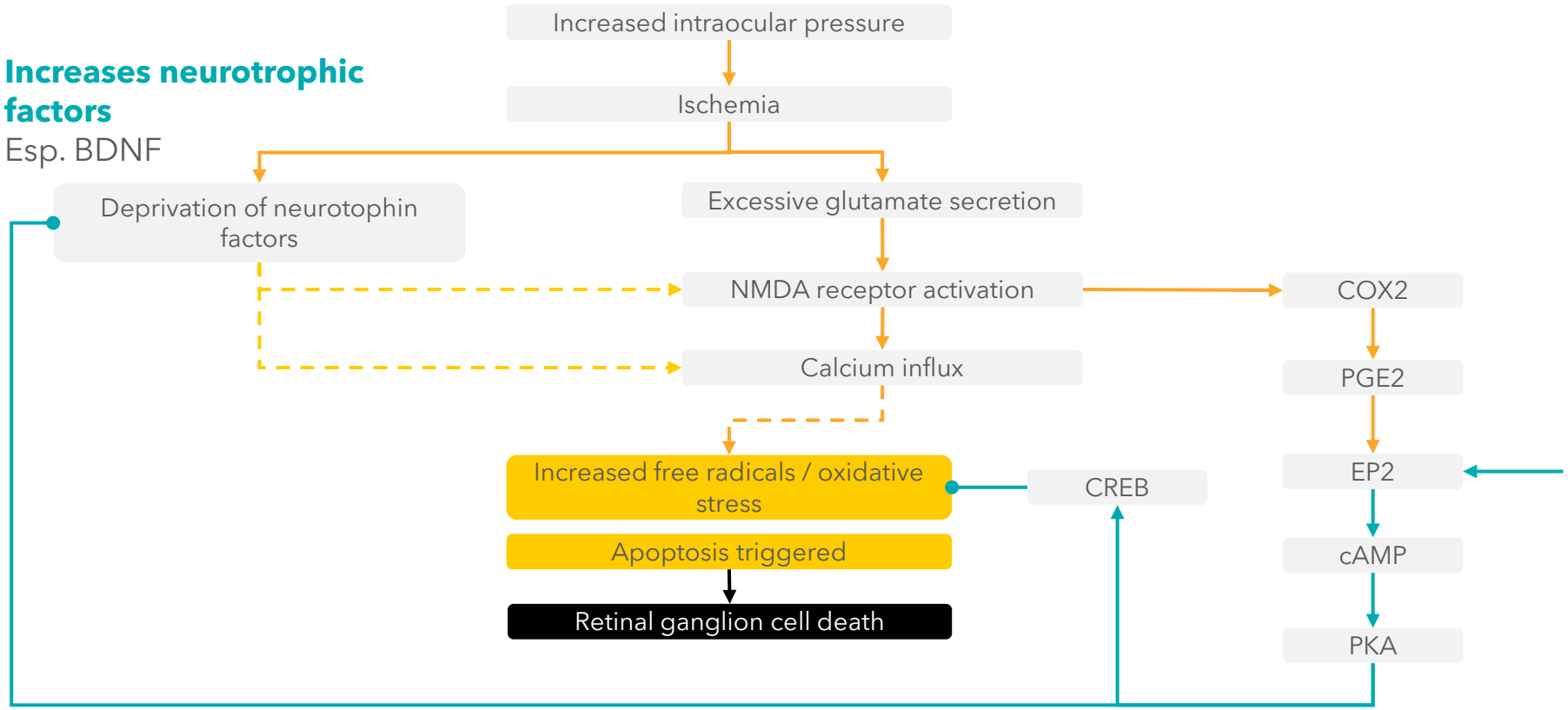
A difference in neuroprotection strategy

- Rho Kinase Inhibitors seem to benefit axonal regrowth, this can only happen once the cells are damaged. And a sprouting axon does not have a guarantee to re-innervate the same network.
- Omidenepag prevents glutamate induced neuroinflammation via the EP2 receptor. This allows the cells to protect themselves from potential damage, offering a more preventative approach to neuroprotection.

Offering both IOP lowering benefits and neuroprotection from inflammation offers could offer the best outcomes for patients

1. Pitha I, Du L, Nguyen TD, Quigley H. IOP and glaucoma damage: The essential role of optic nerve head and retinal mechanosensors. Prog Retin Eye Res. 2024 Mar;99:101232.
2. Nakamura N, Honjo M, Yamagishi-Kimura R, Sakata R, Watanabe S, Aihara M. Neuroprotective effect of omidenepag on excitotoxic retinal ganglion cell death regulating COX-2-EP2-cAMP-PKA/Epac pathway via Neuron-Glia interaction. Neuroscience. 2024 Aug 16;553:145-159.

Omidenepag Neuro Protection MOA



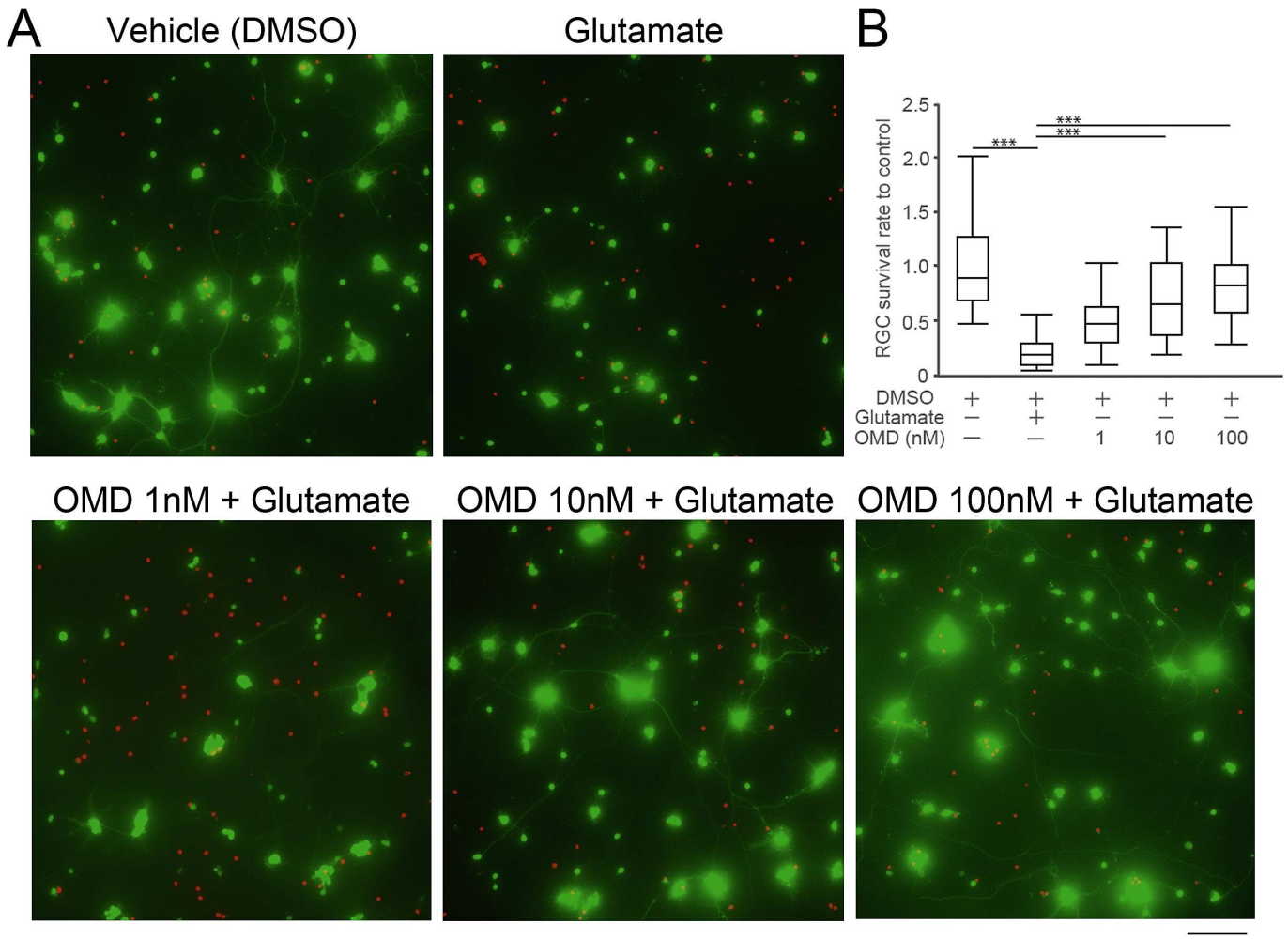
Increases neurotrophic factors
Esp. BDNF

Omidenepag
Activates the EP2 receptor that induces a change in the COX-2–PGE2–EP2–cAMP–Epac1 pathway to favor the neuroprotective COX-2–PGE2–EP2–cAMP–PKA pathway.[2]

Decreases Oxidative stress
Directly via CREB activation

1. Pitha I, Du L, Nguyen TD, Quigley H. IOP and glaucoma damage: The essential role of optic nerve head and retinal mechanosensors. Prog Retin Eye Res. 2024 Mar;99:101232.
2. Nakamura N, Honjo M, Yamagishi-Kimura R, Sakata R, Watanabe S, Aihara M. Neuroprotective effect of omidenepag on excitotoxic retinal ganglion cell death regulating COX-2-EP2-cAMP-PKA/Epac pathway via Neuron-Glia interaction. Neuroscience. 2024 Aug 16;553:145-159.

Omidenepag Neuro Protection– glutamate challenge

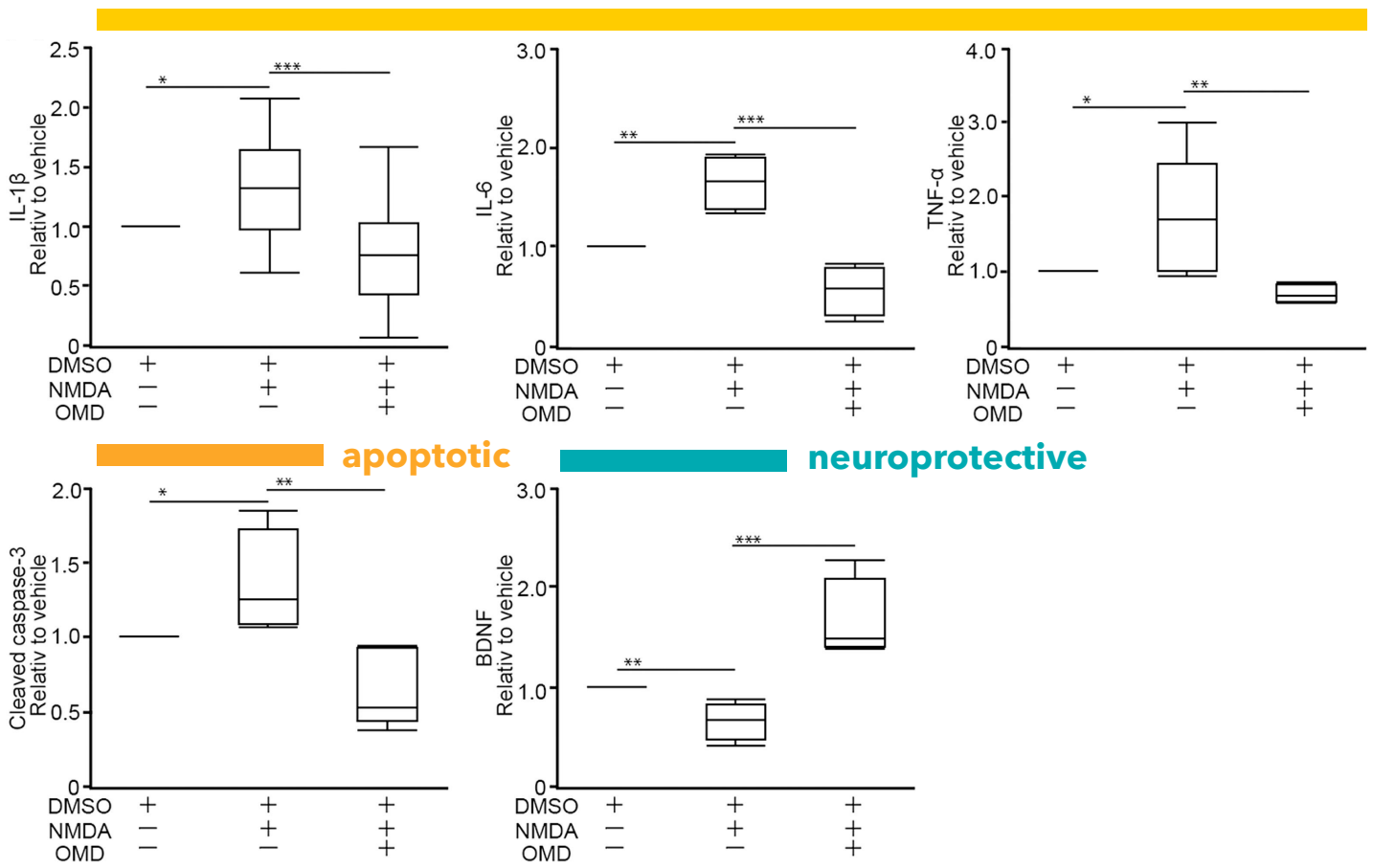


Omidenepag is neuroprotective in a dose dependent manner

Excitotoxicity via a glutamate challenge can be avoided by administering Omidenepag.

1. Nakamura N, Honjo M, Yamagishi-Kimura R, Sakata R, Watanabe S, Aihara M. Neuroprotective effect of omidenepag on excitotoxic retinal ganglion cell death regulating COX-2-EP2-cAMP-PKA/Epac pathway via Neuron-Glia interaction. Neuroscience. 2024 Aug 16;553:145-159.

Omidenepag protecting against NMDA activation



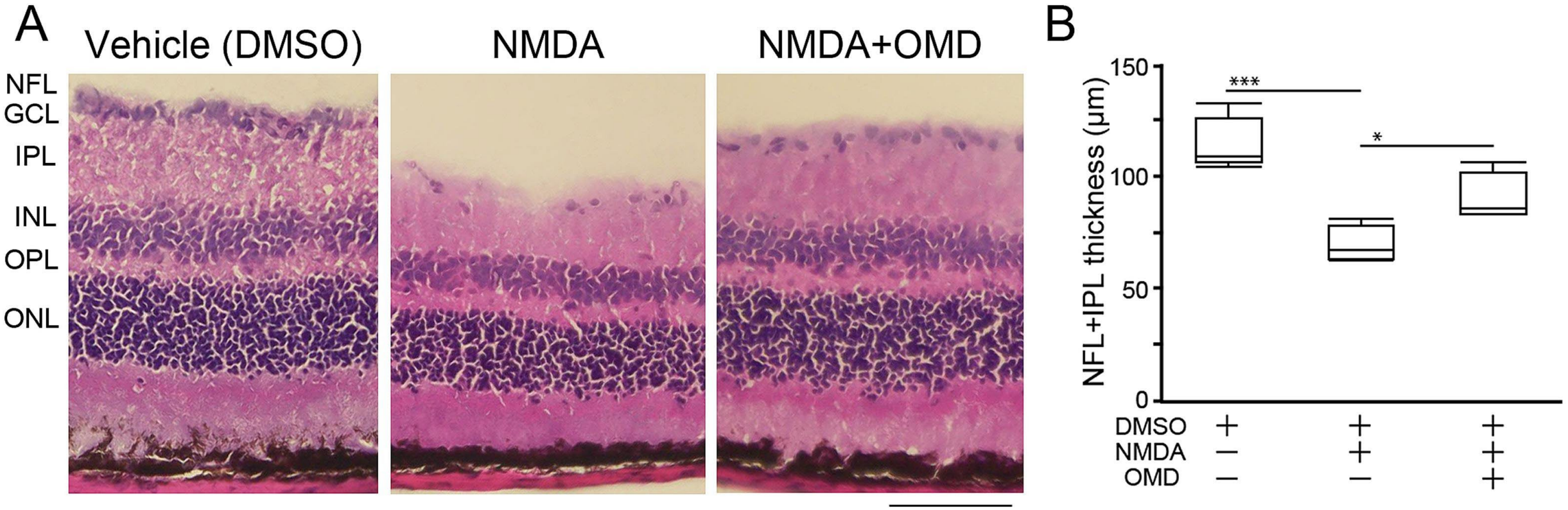
Omidenepag reduces the inflammatory cytokines but increases neuroprotective BDNF

During NMDA activation more inflammatory cytokines can be released this is directly inhibited by Omidenepag.

Omidenepag has shown to have neuroprotective, anti-inflammatory, anti-apoptotic benefits

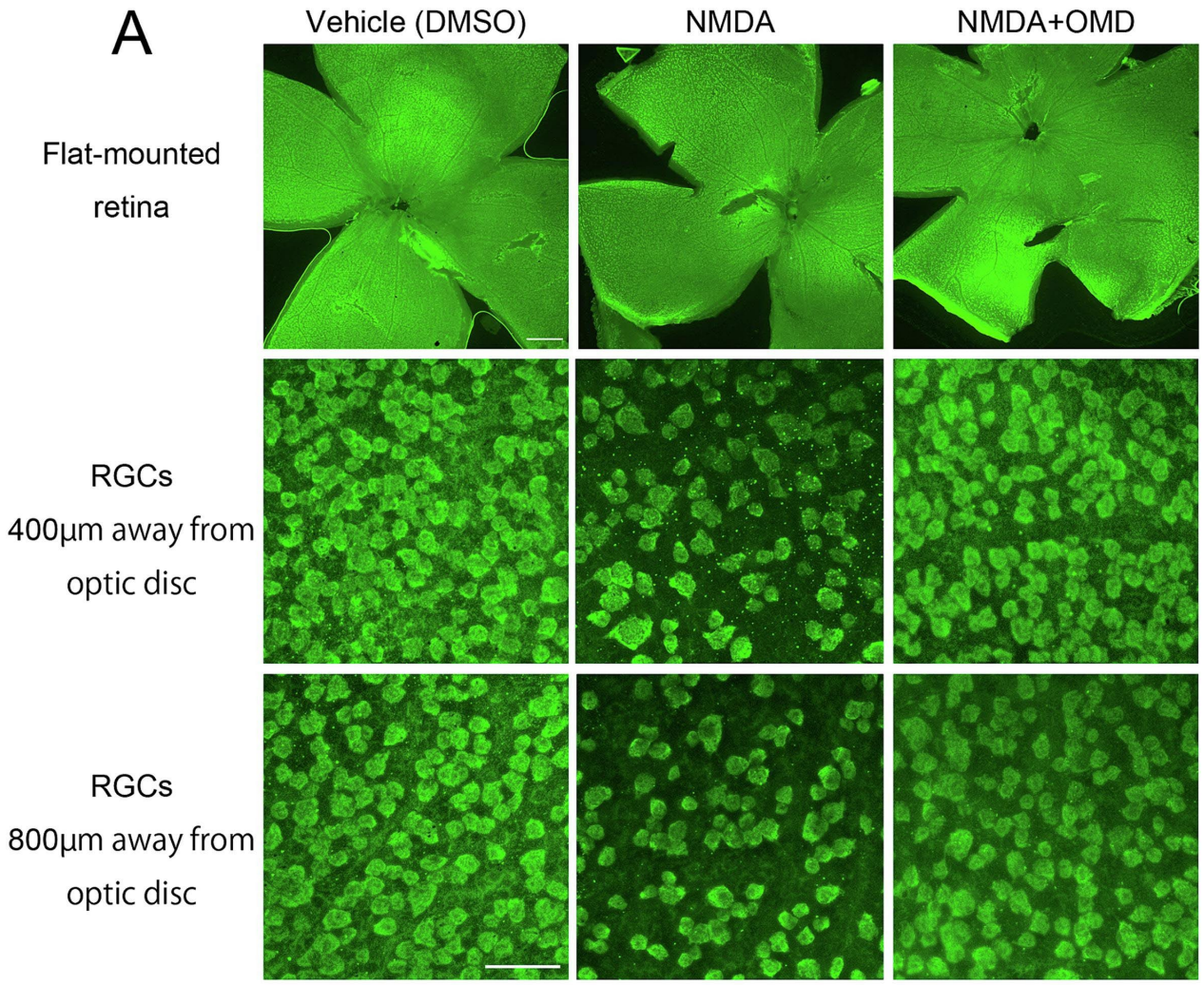
1. Nakamura N, Honjo M, Yamagishi-Kimura R, Sakata R, Watanabe S, Aihara M. Neuroprotective effect of omidenepag on excitotoxic retinal ganglion cell death regulating COX-2-EP2-cAMP-PKA/Epac pathway via Neuron-Glia interaction. Neuroscience. 2024 Aug 16;553:145-159.

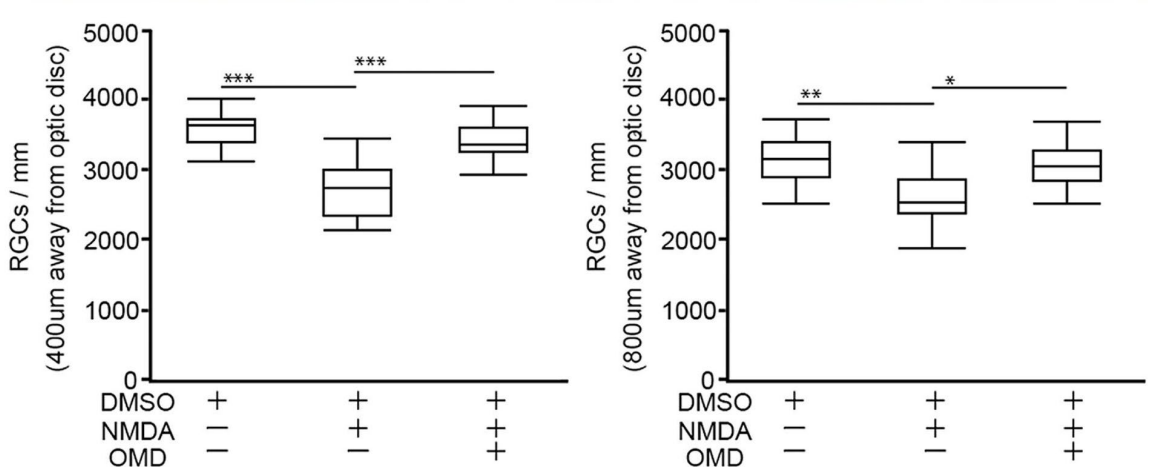
Omidenepag prevents retinal thinning



1. Nakamura N, Honjo M, Yamagishi-Kimura R, Sakata R, Watanabe S, Aihara M. Neuroprotective effect of omidenepag on excitotoxic retinal ganglion cell death regulating COX-2-EP2-cAMP-PKA/Epac pathway via Neuron-Glia interaction. Neuroscience. 2024 Aug 16;553:145-159.

Omidenepag prevents RG cell loss

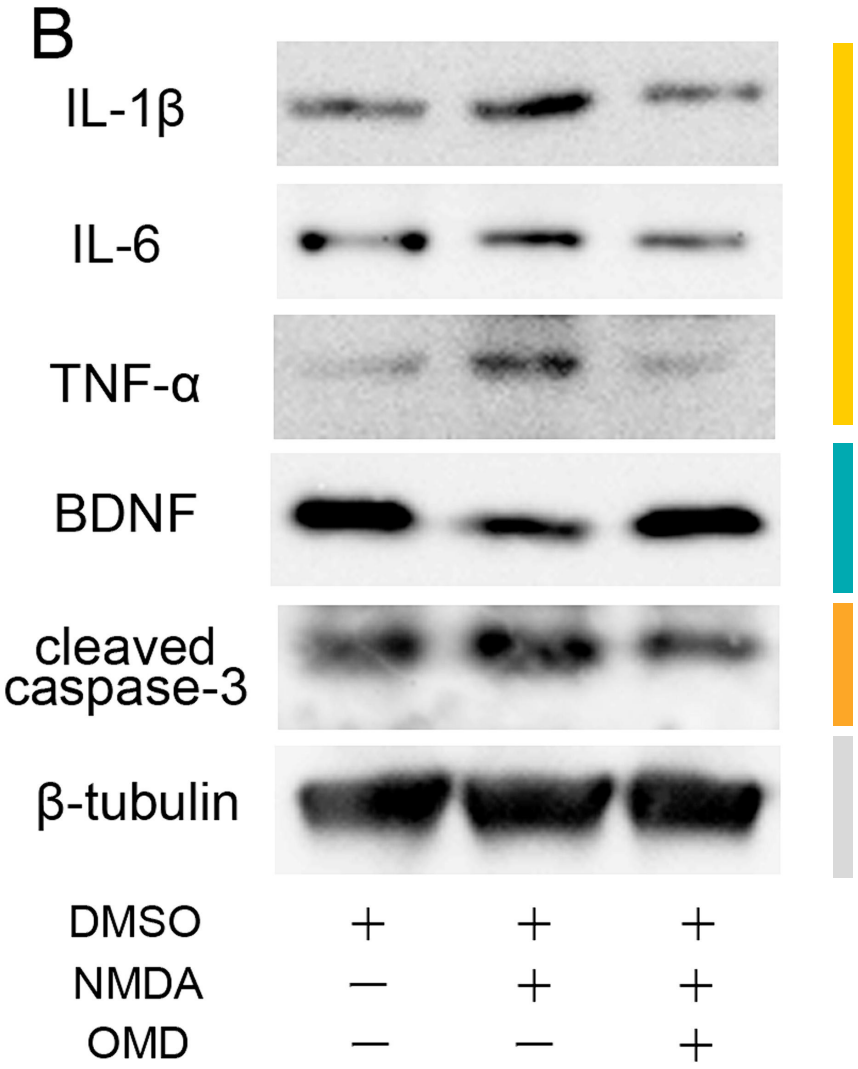




Omidenepag has shown to preserve RG cells and decrease the effects of excitotoxity

1. Nakamura N, Honjo M, Yamagishi-Kimura R, Sakata R, Watanabe S, Aihara M. Neuroprotective effect of omidenepag on excitotoxic retinal ganglion cell death regulating COX-2-EP2-cAMP-PKA/Epac pathway via Neuron-Glia interaction. Neuroscience. 2024 Aug 16;553:145-159.

Omidenepag protecting against NMDA activation



inflammatory

neuroprotective

apoptotic

control

Omidenepag reduces the inflammatory cytokines but increases neuroprotective BDNF

During NMDA activation more inflammatory cytokines can be released this is directly inhibited by Omidenepag.

Omidenepag has shown to have neuroprotective, anti-inflammatory, anti-apoptotic benefits

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Speaking of NTG…

- Do we know anything new about it?

- Brand new 8 year data
- Over half progressed

- Thinner corneas and those with disk hemes more likely to progress
- Progression defined as either disk or VF changes

More New NTG stuff

- Peak IOP in progression group - 17.6mm Hg
- Peak IOP in non-progressors – 15.8mm Hg
- Mean IOP in both groups - ~13.1

- So consistently low IOP is crucial
- Squash the spikes, set a ***LOOOW*** IOP

- Age of pxs didn't matter

Treatment Considerations in NTG

- Avoid beta-blockers
- Keep Diurnal Curve Tight!!
- Choose a Low Target and Identify The Peak

1 MORE THING

NTG PXS TEND TO BE ”OVERDIPPERS”
OVERDIPPERS TEND TO LOSE VF AT A HIGHER RATE

SO HOW DO YOU DETECT OVERDIPPERS?

AND WHAT DO YOU DO ABOUT IT?

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

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 corneas
  - Thinner rims
  - Higher IOP
  - Older age

NORMAL TENSION: ABNORMAL RESULTS

- ANDERSON et al AJO
  - EXAMINED NTG'S FOR MULTIPLE VARIABLES (AGE, GENDER,BP AND MIGRAINES)
  - MIGRAINES,DISC HEMES MOST NOTABLE RISK FOR PROGRESSION
  - AGE , RACE NEXT
  - 230 PATIENTS/NTG/IOP< 20mm Hg

NTG

99 WOMEN/61 MEN

23 WOMEN WITH H/O MIGRAINES

2 MEN

WOMEN WITH MIGRAINES HAD FASTEST RATE OF PROGRESSION

Normal Tension Glaucoma: Clinical Features

- Acquired pits of the optic nerve more common
- Peripapillary atrophy more common
- Drance hemorrhage more common
- Focal nerve fiber layer defects
- Focal notching of the Optic Nerve
- Visual field defects with steep margins and closer to fixation