Visual Fields in the management of glaucoma

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Disclosures

- I have no conflicts of interest in this lecture.

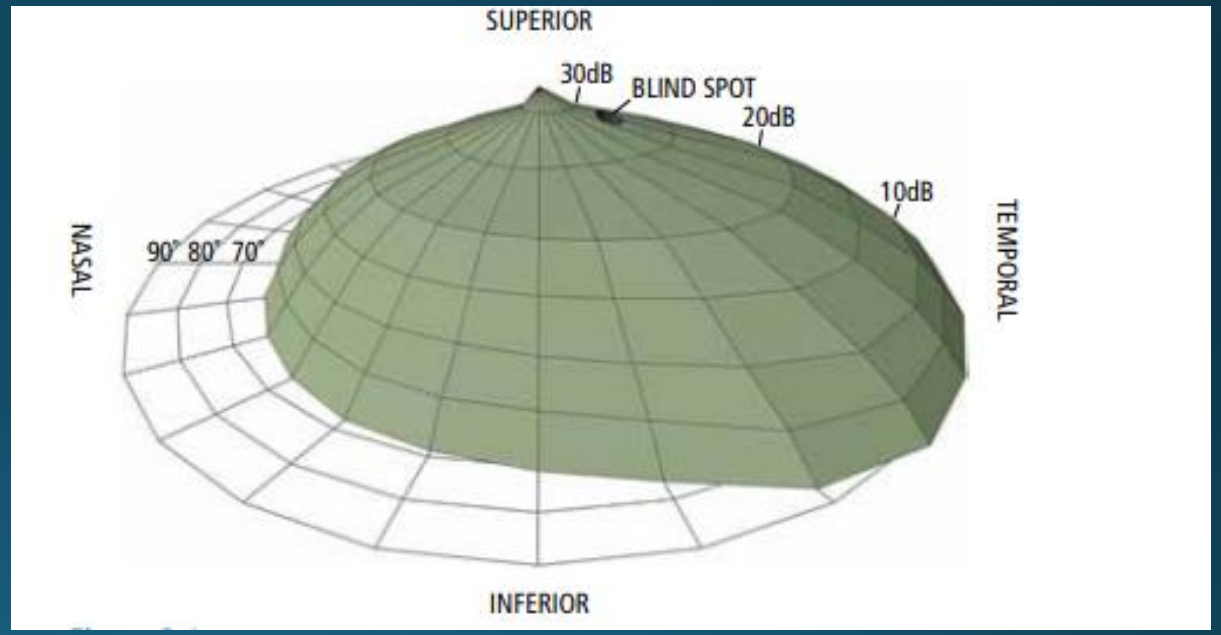
Why run Humphrey visual field testing?

- Glaucoma
  - Visual field loss is a hallmark of glaucomatous optic nerve damage in moderate to advanced disease.
- Neurological disease
  - Neurological disease can cause visual field loss and confound results in patients who also manifest glaucomatous field loss.
- Retinal disease
  - Some retinal diseases will manifest with visual field loss. The visual field will not be the primary way to diagnose retinal disease, but the field may provide results which point to a retinal cause.

Principles of perimetry

- The normal visual field extends 90 degrees temporally, 60 degrees nasal and superiorly, and 70 degrees inferiorly.

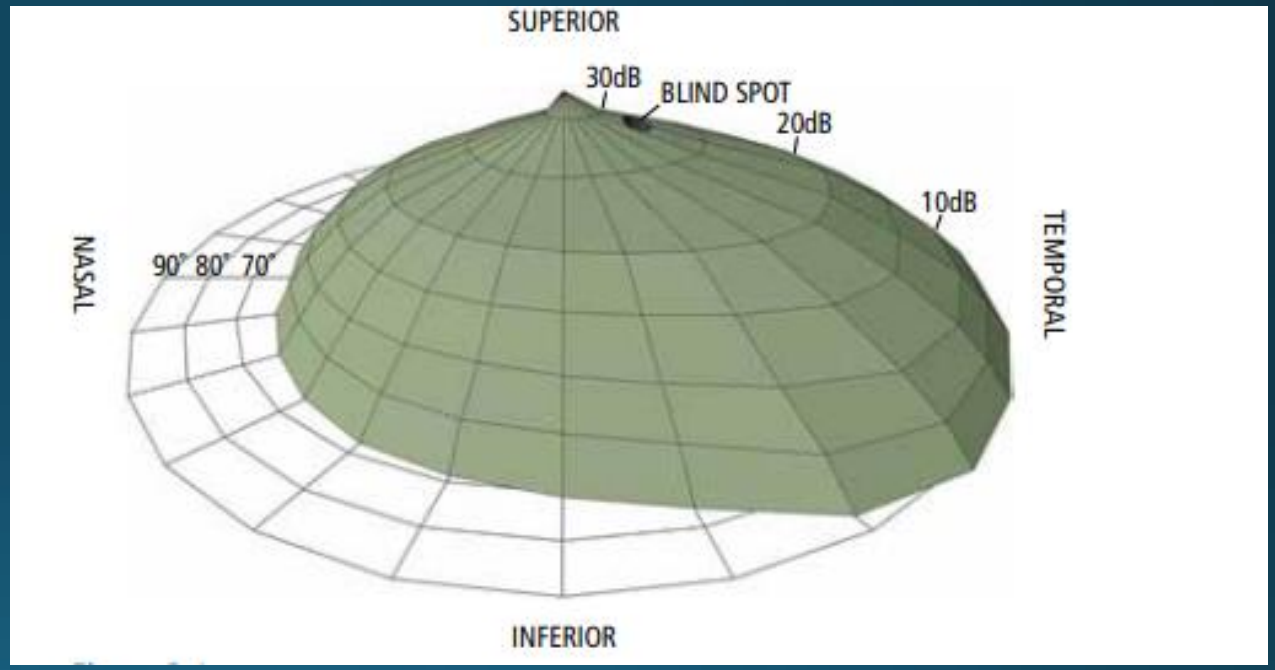
- The visual field is often represented by the "Hill of Vision" with the height of the hill representing visual field sensitivity.



Threshold testing

- The object of Humphrey static perimetry is to measure the different light sensitivities at each tested location.

- Humphrey field testing is STATIC perimetry, Goldmann perimetry is KINETIC.



Questions to ask in perimetry

1) Which test do I run?
2) Is the test reliable?
3) Is there a defect present and is it what I expected?
4) If there is a defect, is it progressing?

https://www.freepik.com/free-photos-vectors/people-thinking

Question 1: Which test to run? Selecting a test

SITA Standard:

- 30-2 SS
- 24-2 SS
- 10-2 SS

Sita Fast:

- 30-2 SF
- 24-2 SF
- 10-2 SF

SITA FASTER:

- 24-2 SITA FASTER
- 24C – Faster strategy with central points.

Peripheral vision testing

- Full field - 120

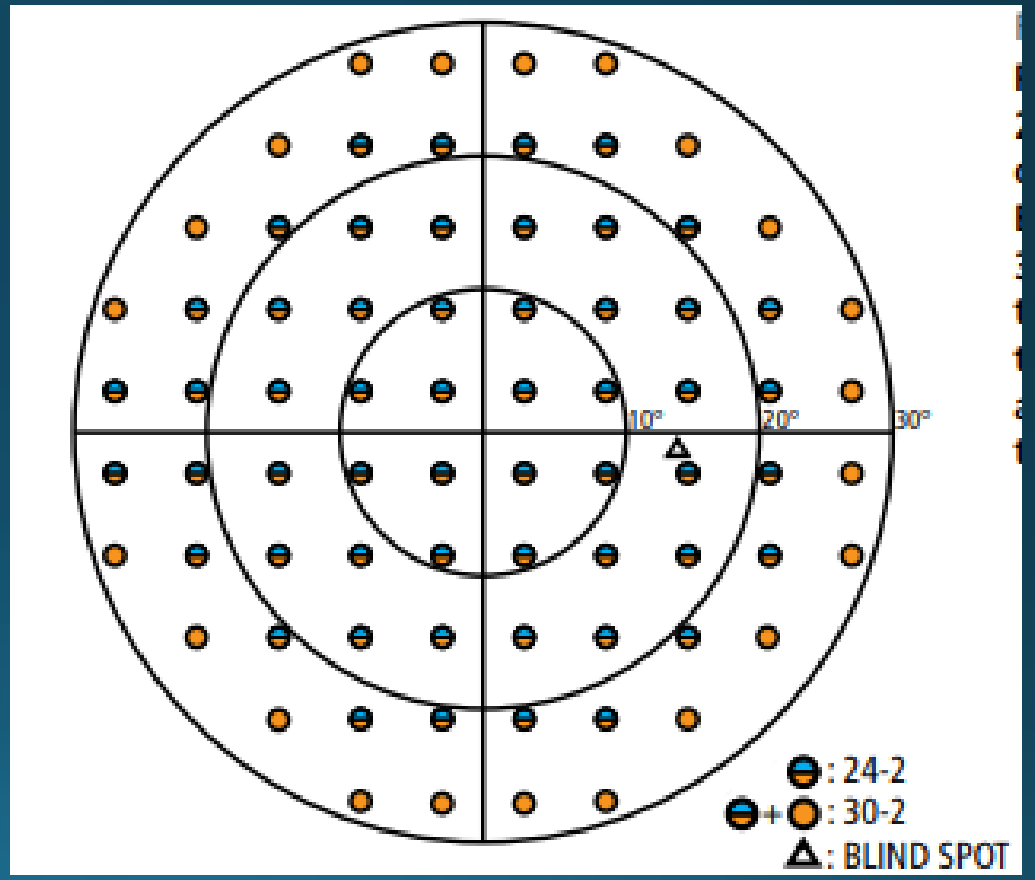
Disability:

- Binocular Esterman

30-2 vs 24-2 tests

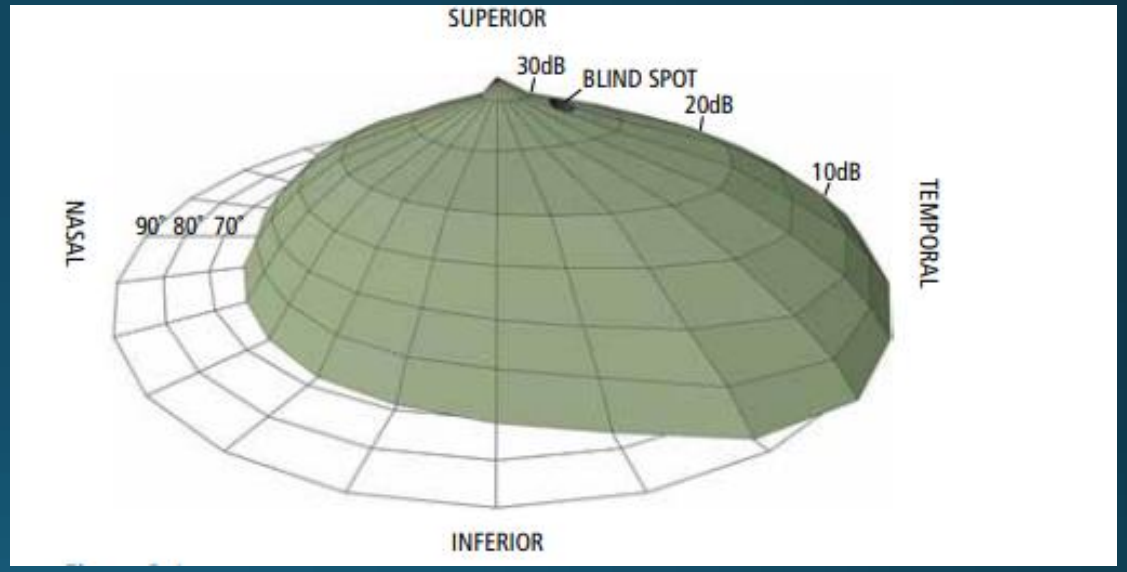
- 30-2 Measures the sensitivity at 76 locations within 30 degrees of fixation.

- 24-2 consists of the 54 most central points of the 30-2 visual field and the nasal points. Little diagnostic information is lost with this strategy compared to 30-2 and testing time is faster.



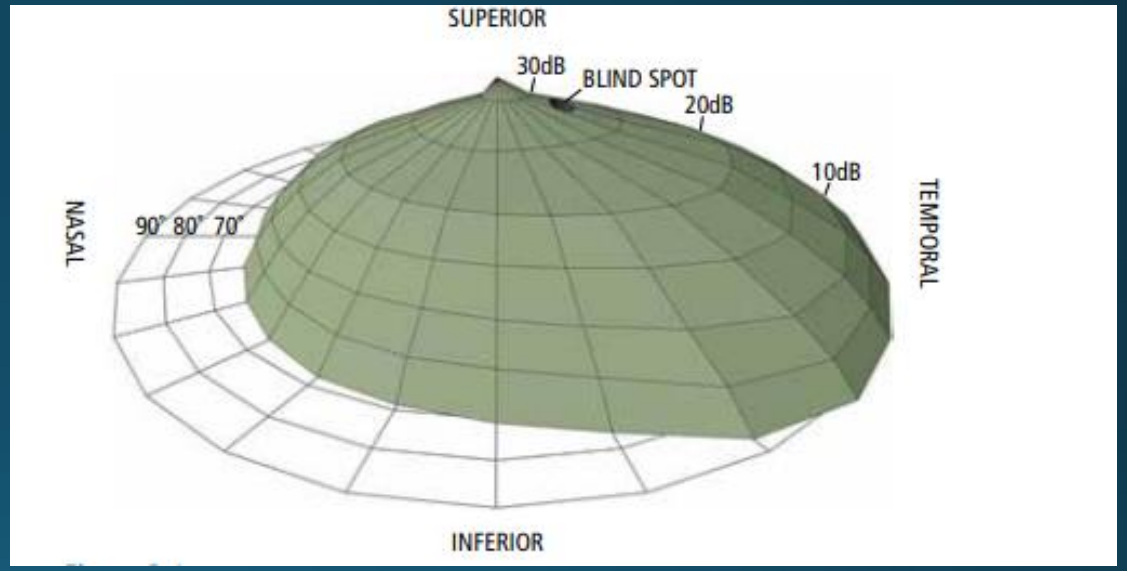
SITA algorithm

- The SITA algorithm continuously estimates what the expected threshold is based on the patient's age and neighboring thresholds.
- It can reduce the time necessary to acquire a visual field by up to 50%, and it decreases patient fatigue and increases reliability.



SITA algorithm

- The algorithm continuously measures the patient's reaction time during the test and speeds up or slows down the test accordingly.



Sita Fast

- Threshold values are again repeatedly calculated at all test points during the test as responses are recorded.

- Stimulus intensities are altered in 4 db steps with one reversal at all test points except the 4 primary test points.

A New SITA Perimetric Threshold Testing Algorithm: Construction and a Multicenter Clinical Study

ANDERS HEIJL, VINCENT MICHAEL PATELLA, LUKE X. CHONG, AIKO IWASE, CHRISTOPHER K. LEUNG, ANJA TUULONEN, GARY C. LEE, THOMAS CALLAN, AND BOEL BENGTSSON

• PURPOSE: To describe a new time-saving threshold visual field–testing strategy—Swedish Interactive Thresholding Algorithm (SITA) Faster, which is intended to replace SITA Fast—and to report on a clinical evaluation of this new strategy.
• DESIGN: Description and validity analysis for modifications applied to SITA Fast.
• METHODS: Five centers tested 1 eye of each of 126 glaucoma and glaucoma suspect patients with SITA Faster, SITA Fast, and SITA Standard at each of 2 visits. Outcomes included test time, mean deviation, and the visual field index (VFI), significant test points in probability maps, and intertest threshold variability.
• RESULTS: Mean (standard deviation) test times were 171.9 (45.3) seconds for SITA Faster, 247.0 (56.7) for SITA Fast, and 369.5 (64.5) for SITA Standard ($P < .001$). SITA Faster test times averaged 30.4 % shorter than SITA Fast and 53.5 % shorter than SITA Standard. Mean deviation was similar among all 3 tests. VFI did not differ between SITA Fast and SITA Faster tests, mean difference 0%, but VFI values were 1.2% lower with SITA Standard compared to both SITA Fast ($P = .007$) and SITA Faster ($P = .002$). A similar trend was seen with a slightly higher number of significant test points with SITA Standard than with SITA Fast and SITA Faster. All 3 tests had similar test–retest variability over the entire range of threshold values.
• CONCLUSIONS: SITA Faster saved considerable test time. SITA Faster and SITA Fast gave almost identical results. There were small differences between SITA Faster and SITA Standard, of the same character as previously shown for SITA Fast vs SITA Standard. (Am J Ophthalmol 2019;198:154–165. © 2018 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).)

COMPUTERIZED PERIMETRY STARTED IN THE EARLY 1970s. Careful theoretical calculations and pilot studies on patients were performed initially.[1–3] Early clinical use and clinical studies of computerized perimetry usually involved supraliminal screening tests.[4–6] At that time, manual kinetic and manual static perimetry were perimetric criterion standards, but automation of threshold perimetry certainly was a goal. Clinical studies of computerized threshold tests would soon follow.[7–10]

Clinical use of computerized threshold perimetry became more common in the early 1980s. Test times for threshold tests available at that time were long—usually 12 to 20 minutes per eye.[11–14] This was tiring for patients and limited the number of tests that could be performed, and there was a strong desire for more rapid testing. Threshold tests could be shortened by simply testing fewer points, by using larger step sizes, and by performing fewer repetitions.[7,10] However such changes generally decreased test quality; there was a trade-off between accuracy and efficiency.[15]

We began developing the Swedish Interactive Thresholding Algorithm (SITA) strategies in the latter half of the 1980s. Our goal was to reduce test time without loss of test quality. We used a Bayesian prior model and iterative maximum posterior probability estimation of threshold values in real time, which made it possible to interrupt testing at each tested location at predetermined levels of test certainty. We also used a new method to calculate false positive (FP) answers and an improved timing algorithm to shorten test time.[16,17] Two SITA tests were developed: SITA Standard,[12] which was intended to replace the original Full Threshold test, and SITA Fast,[18] which was intended to replace Fastpac.

The new SITA tests were compared with the original strategies and performed well. Test times were reduced drastically, by about 50% for SITA Standard as compared with Full Threshold and also about 50% for SITA Fast compared with Fastpac, without worsening intertest variability.[12,14,18–21] Threshold sensitivity values were

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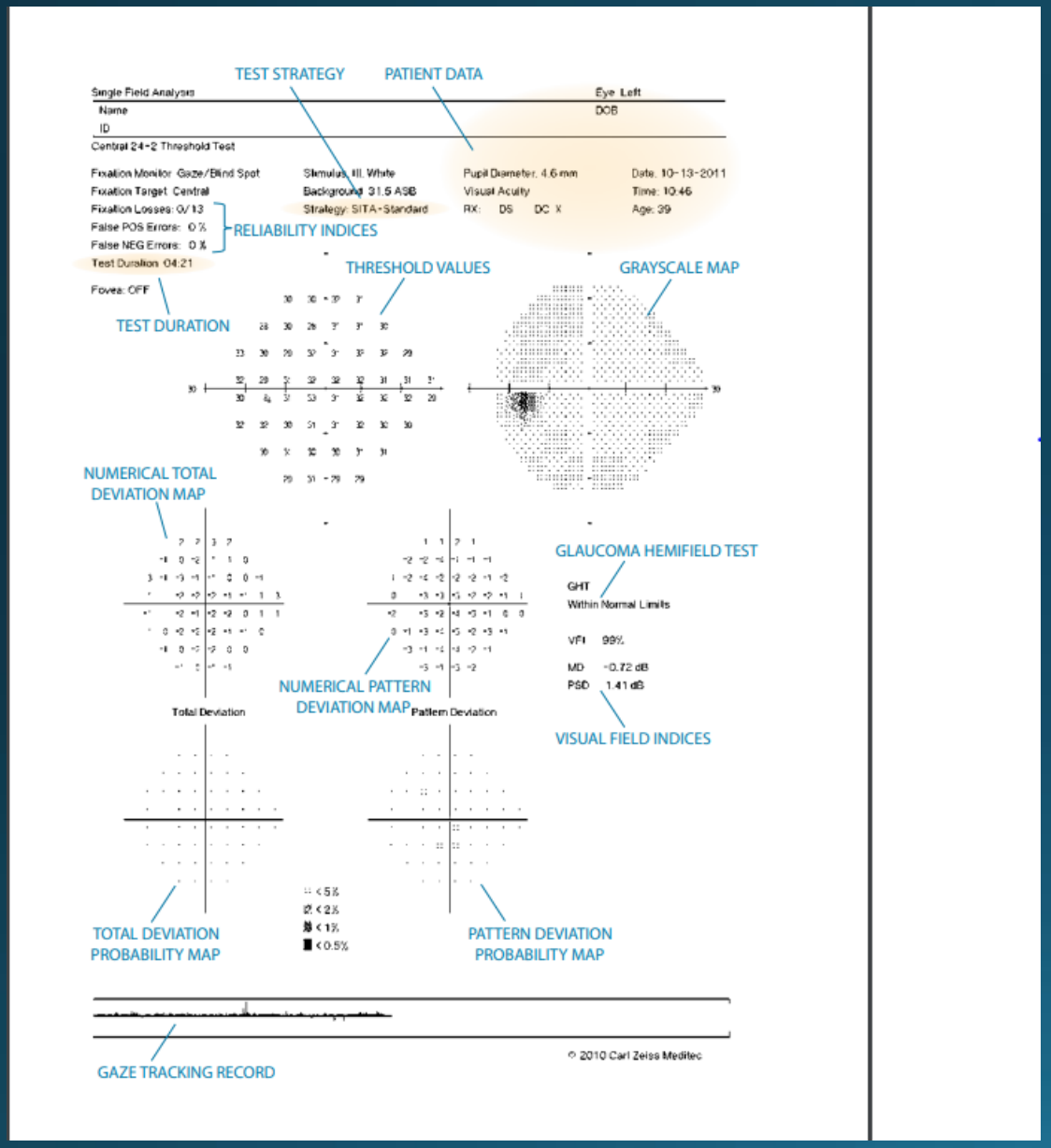
Sita Faster

- Cardinal points start at age-matched values, not 25dB
- Tests primary points once instead of twice
- Testing perimetrically blind points only once instead of twice
- Discontinued false negatives
- Used gaze tracker as blind spot monitor

SITA Faster vs Fast and Standard

- SITA Faster test times are approximately
  - 36.1% shorter than SF
  - 60.7% shorter than SS.
  - MD values were lower with SITA Faster compared with SF and SS.
  - Mean PSD and VF index (VFI) showed no significant differences between the algorithms.
  - The number of points depressed at $p<0.5\%$ was less in SITA Faster than in both SF and SS.
- Detection of early cases with SITA Faster is questionable.

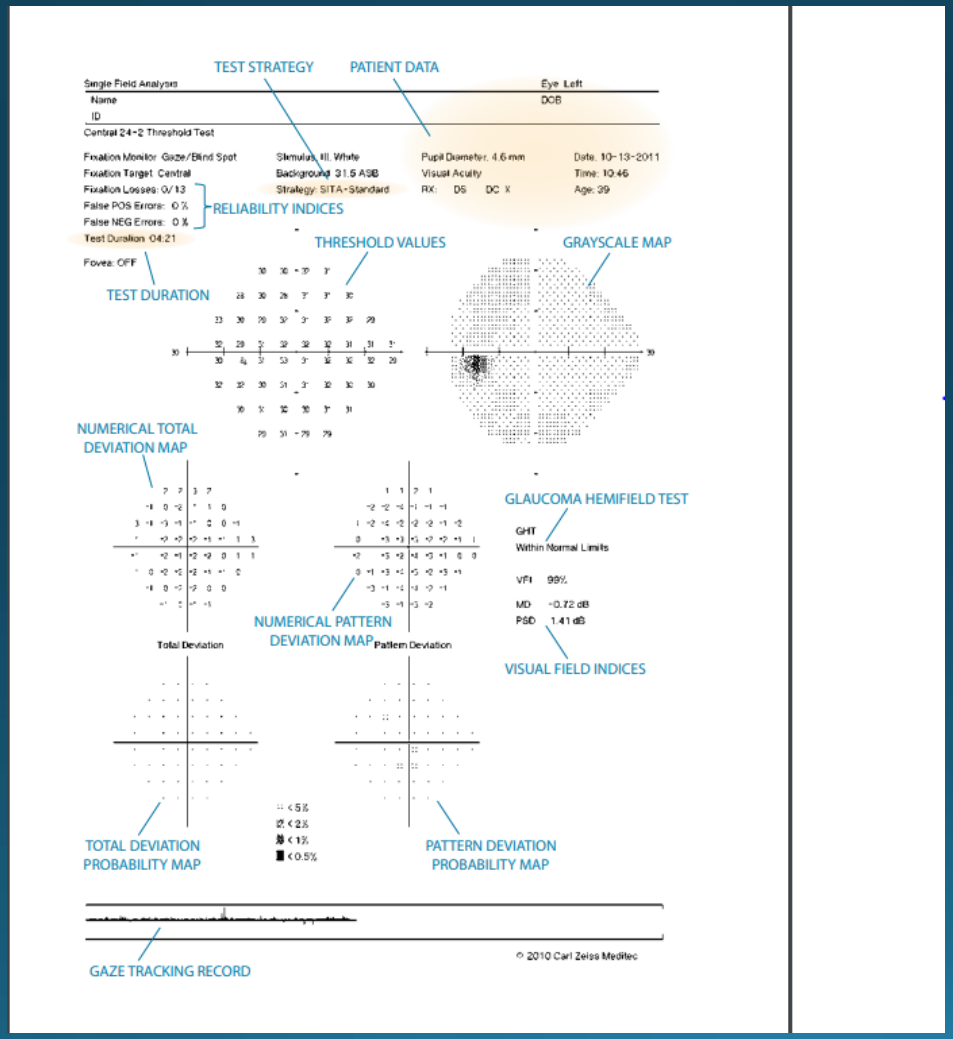
- Patyel S Thulasidas M. Comparison of 24-2 faster, fast, and standard programs of Swedish interactivethreshold algorithm of Humphrey field analyzer for perimetry in patients with manifest and suspect glaucoma. J Glaucoma. September 3, 2020.



The Printout

- Reliability indices
- Test duration
- Test strategy
- Threshold values
- Grayscale map
- Total deviation
- Pattern deviation
- Glaucoma hemifield test (GHT)
- Visual field indices
- Gaze Tracking

How do we read the printout?



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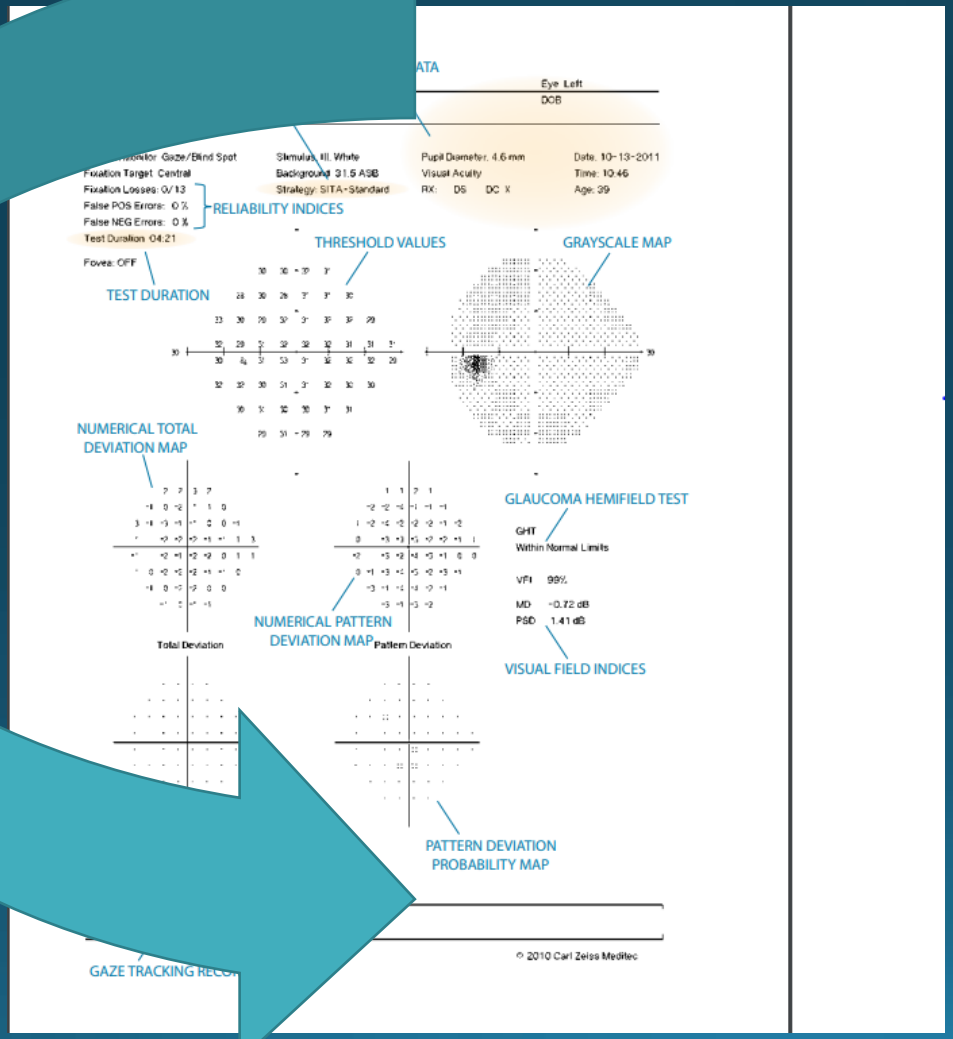
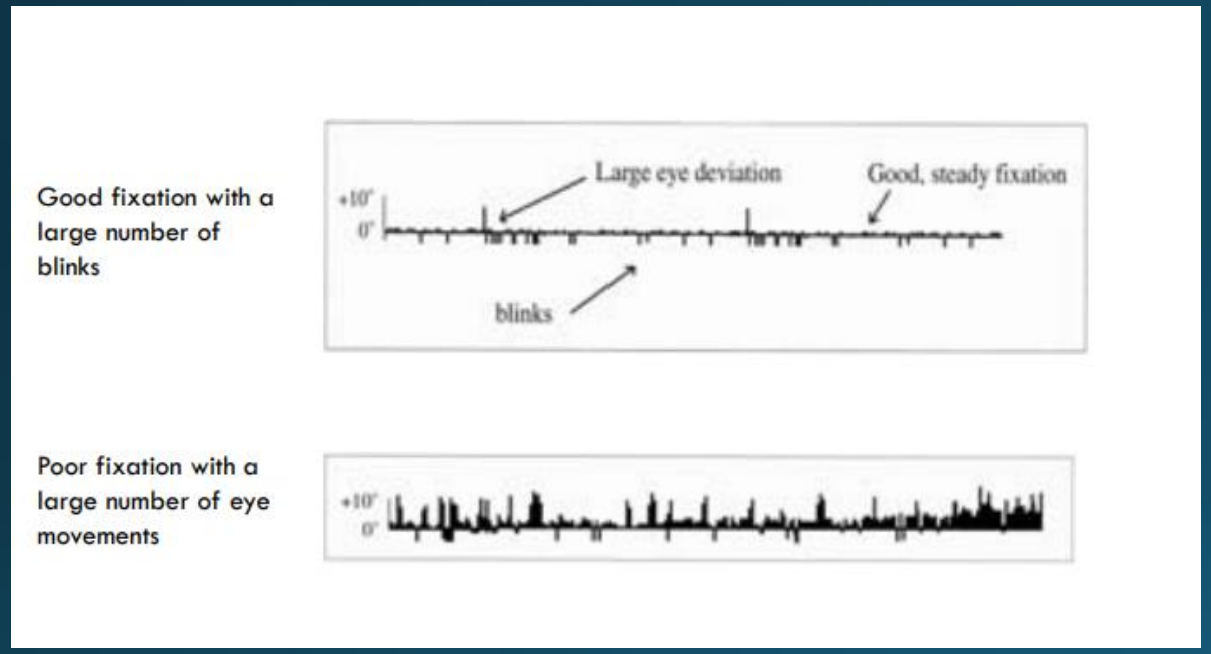


Reliability Indices

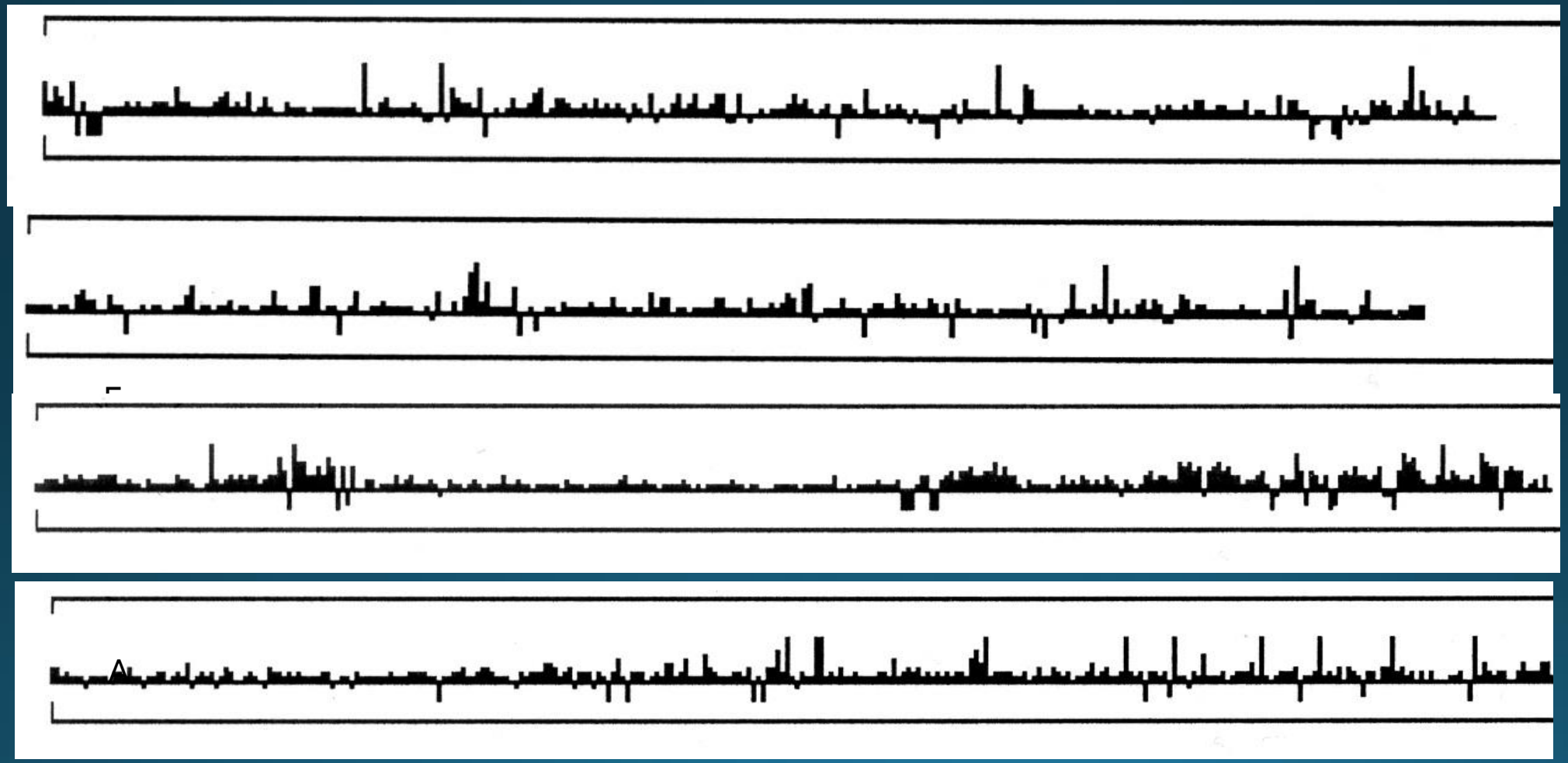
- Fixation losses
  - The FIRST thing the test does (after initiating Gaze tracker) is to map the blind spot.
  - The machine guesses where the blind spot should be and projects stimuli to that area. It maps the blind spot when the patient does NOT respond to the stimuli presented.
  - This index is skewed to the beginning of the test with ~half of the trails in the first 2-3 minutes of testing. May miss losses later in the test when patient is fatigued.
  - After the blind spot is mapped, the test begins. If the patient has good fixation (by observation) and they have 2 fixation losses within the first 3 checks, then re-map the blind spot.

Gaze tracking



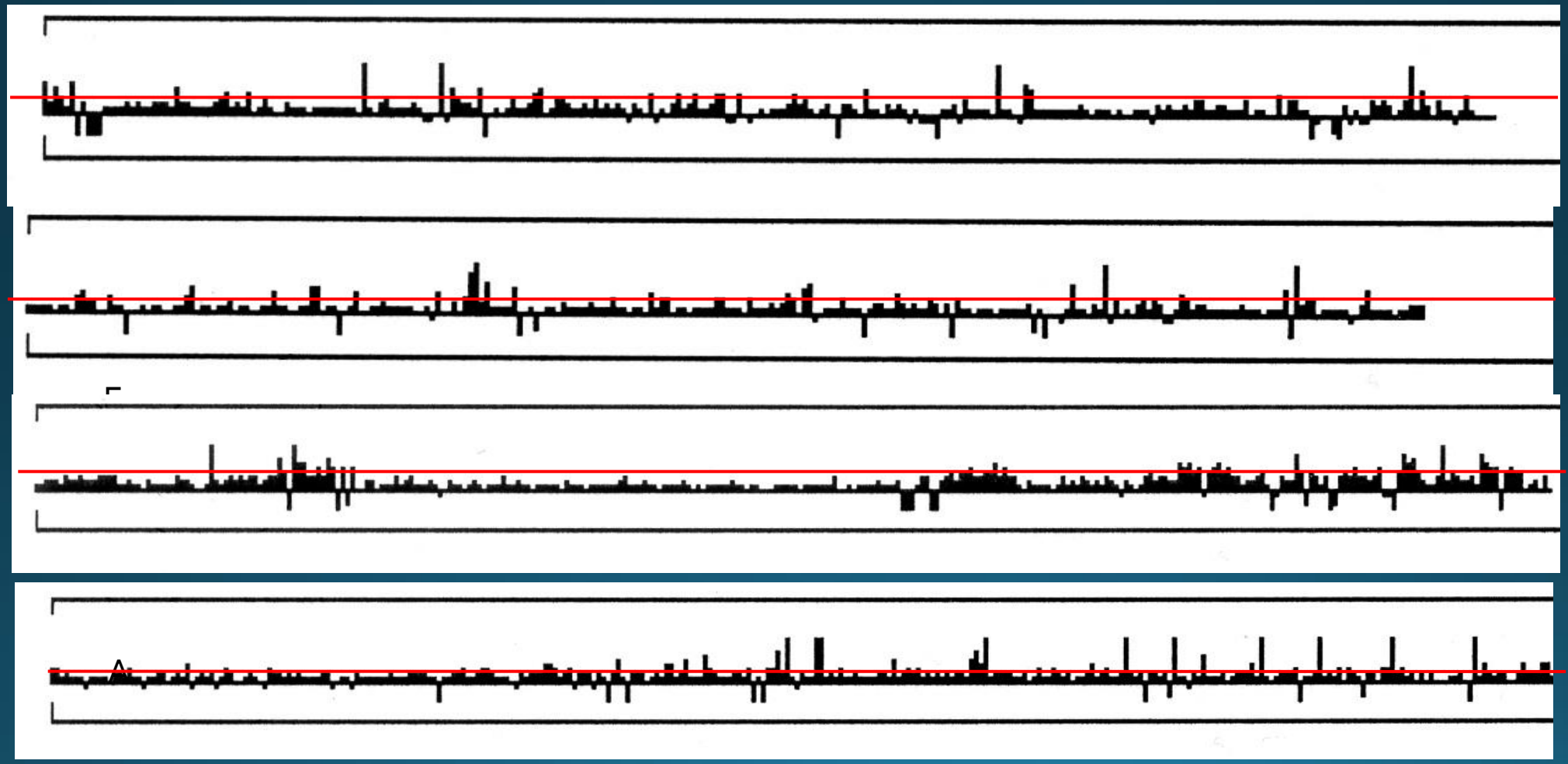
- This is an entirely subjective measure.
- No standard to dictate whether the test is reliable or unreliable.

Which Gaze tracker is the most accurate?



Courtesy of Peter Lalle, OD, FAAO

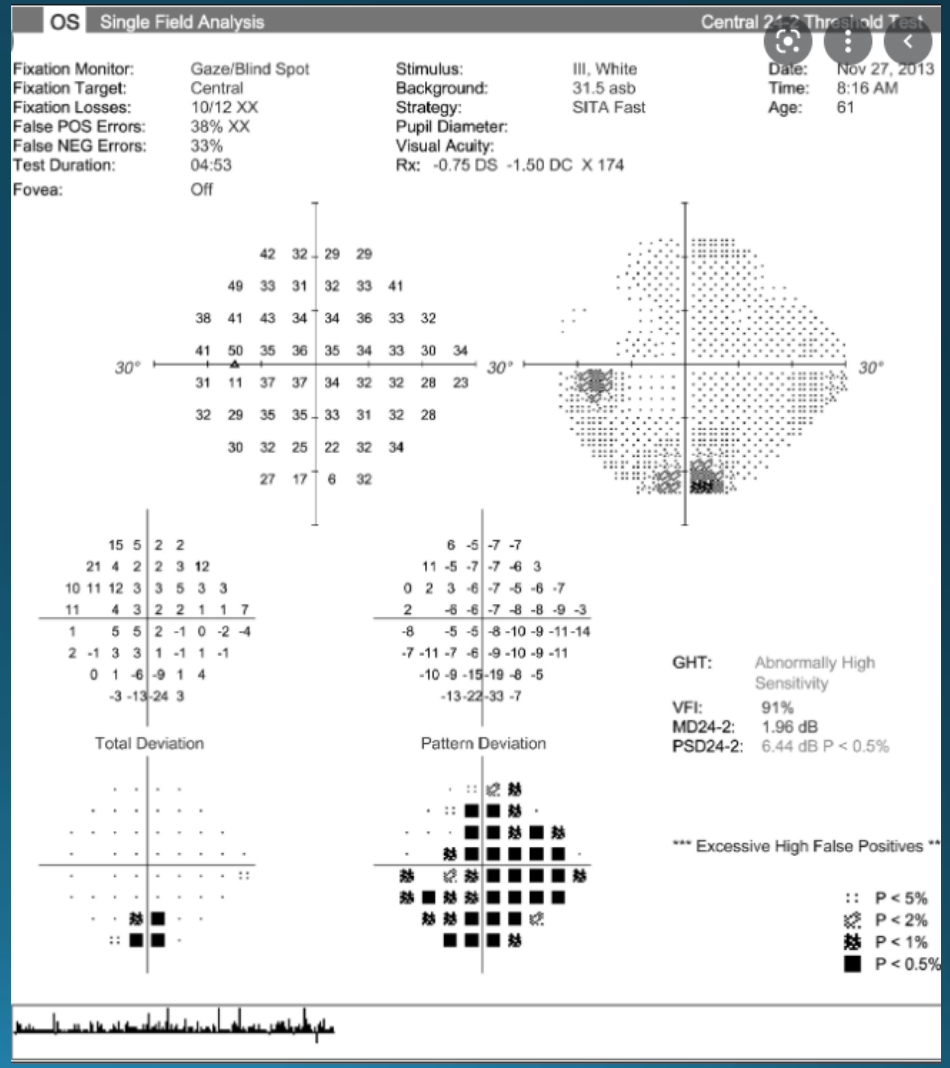
Now with 3 degree line inserted



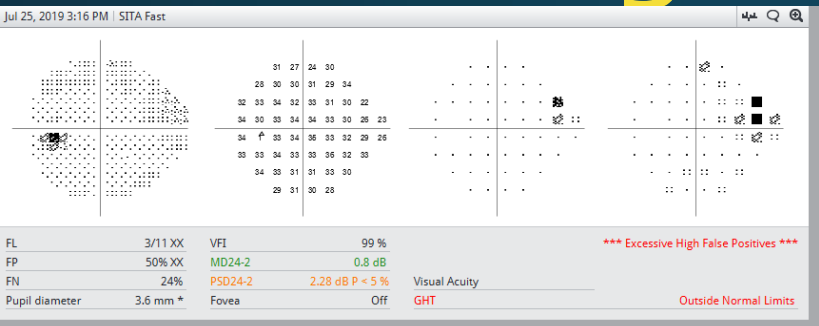
Courtesy of Peter Lalle, OD, FAAO

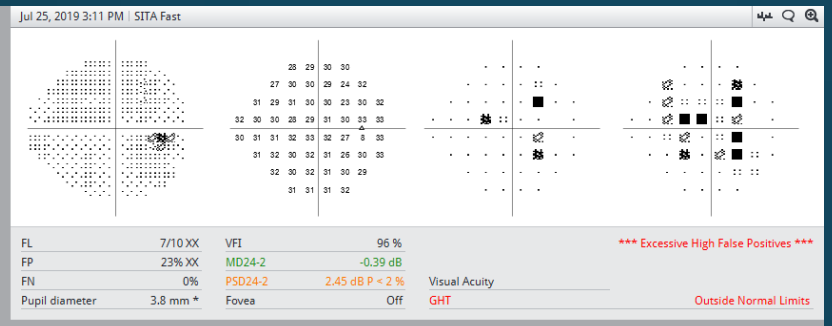
Question 2: Is it reliable? Reliability Indices

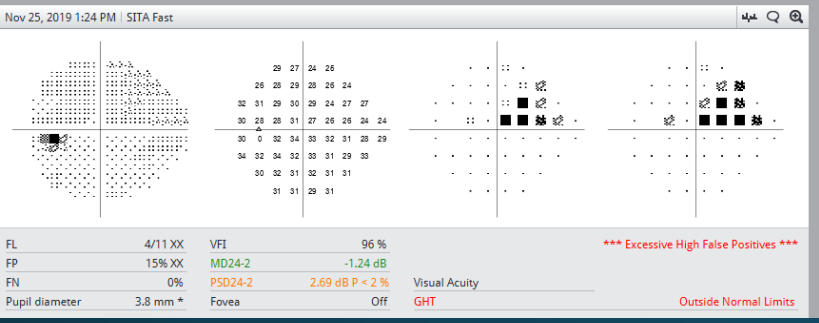
- False positives
  - The test will pause and see if the patient still presses the button without a stimulus presented.
  - Have a low threshold for high false positives as they greatly reduce the reliability of your visual fields. Most text will say over 15-20% is unacceptable, but I find anything over 10% produces a poor field.
  - Different strategies show different false positive rates:
    - Lowest: SITA standard
    - Highest: SITA Faster

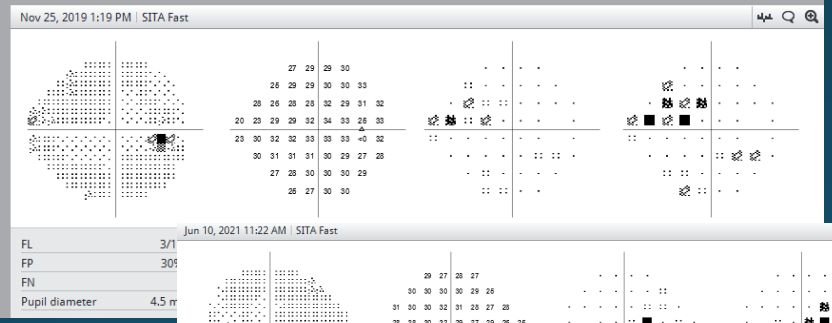


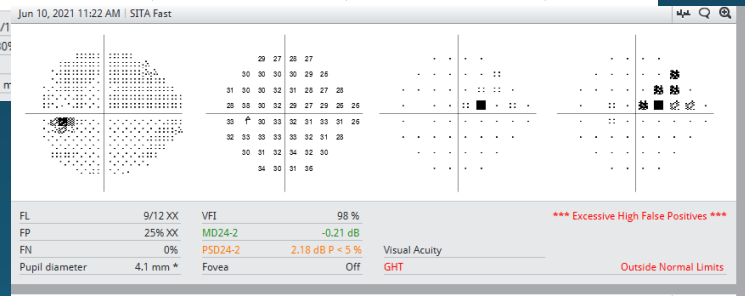
High FPs ruin the reliability

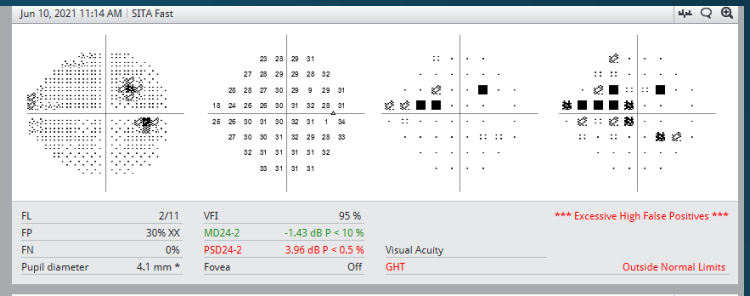


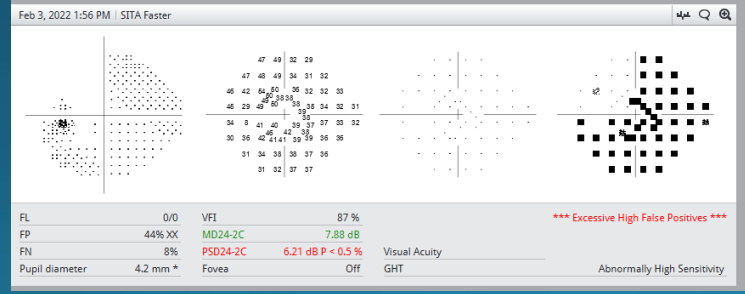


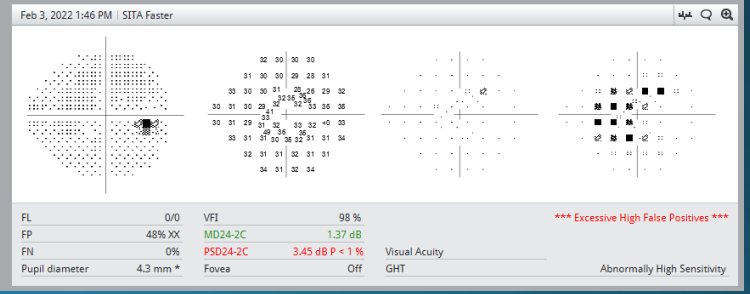




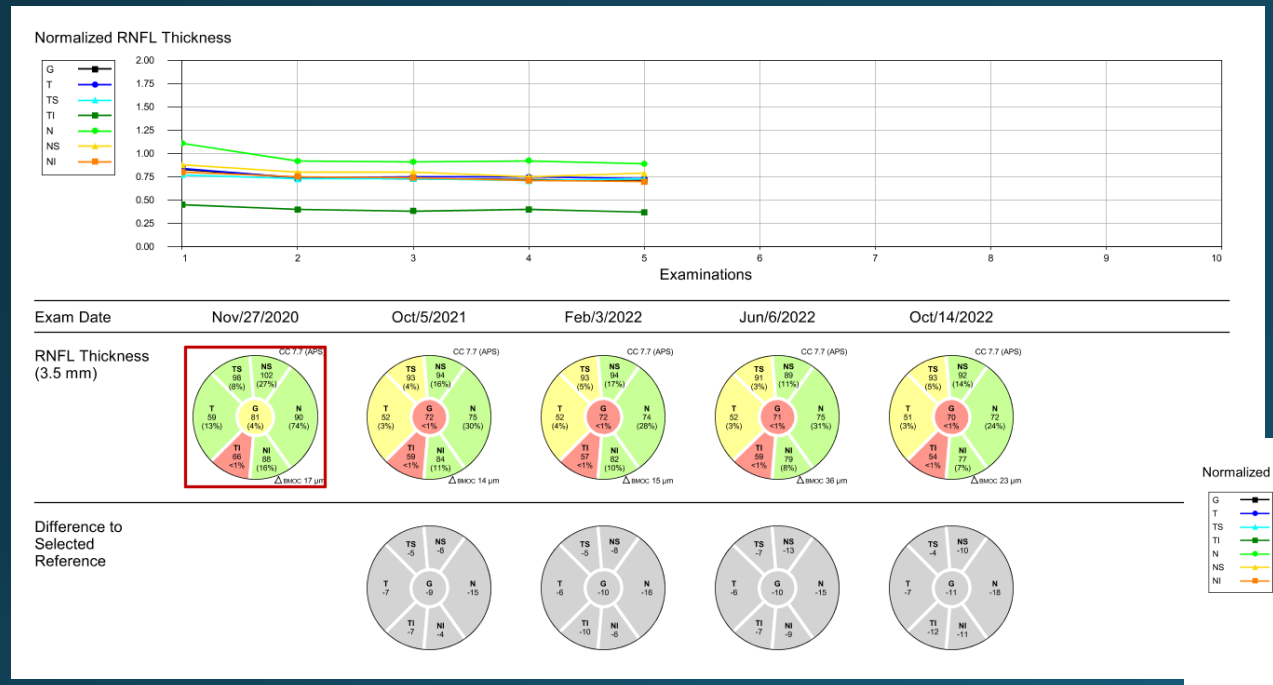


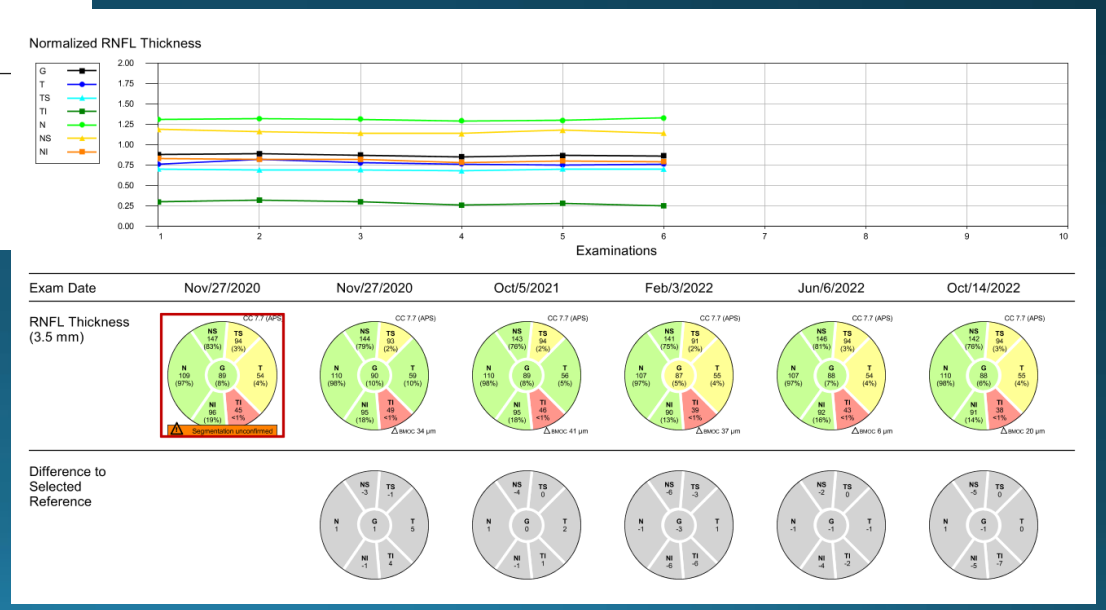






Had to follow this patient objectively





Reliability Indices

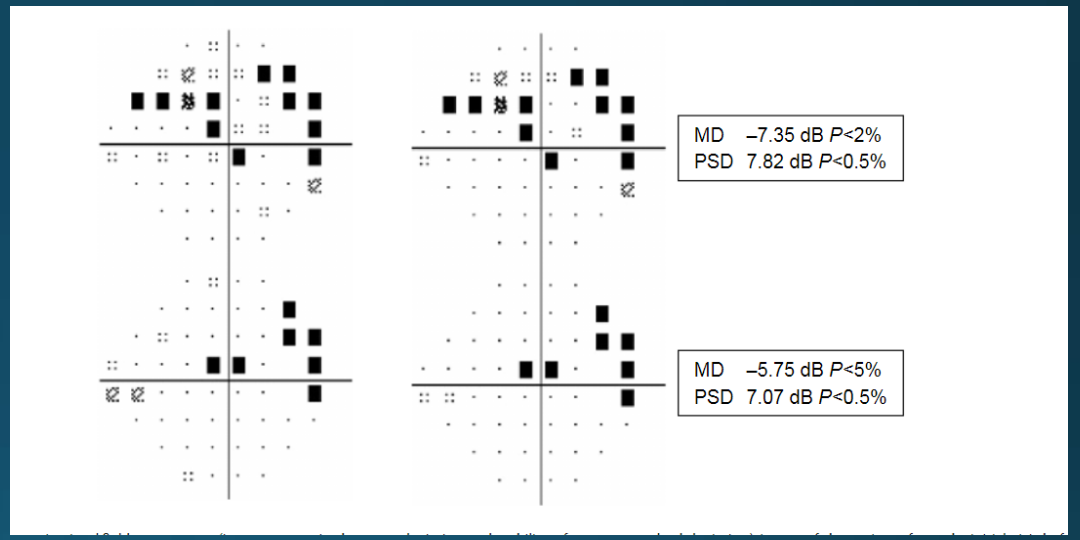
- False Negatives
  - The test will repeat a stimulus at a point where the patient had previously seen a stimulus of that same intensity
  - These can indicate that a patient has become fatigued with testing and is less attentive to stimuli
  - **High False negatives are also NORMAL to see on moderate to severe glaucomatous field loss.**
  - This is NOT tested on SITA FASTER

Global Indices

- Mean Deviation:
  - Average loss for the ENTIRE field with points closest to fixation weighted as more severe
  - Mean Deviation is o DB in normal fields and -31-35 DB in perimetrically blind fields.
  - If this number is negative, it does NOT always mean glaucoma.
    - Could be from refractive error
    - Cataract
    - Corneal opacity
    - Could be glaucoma….

Global Indices

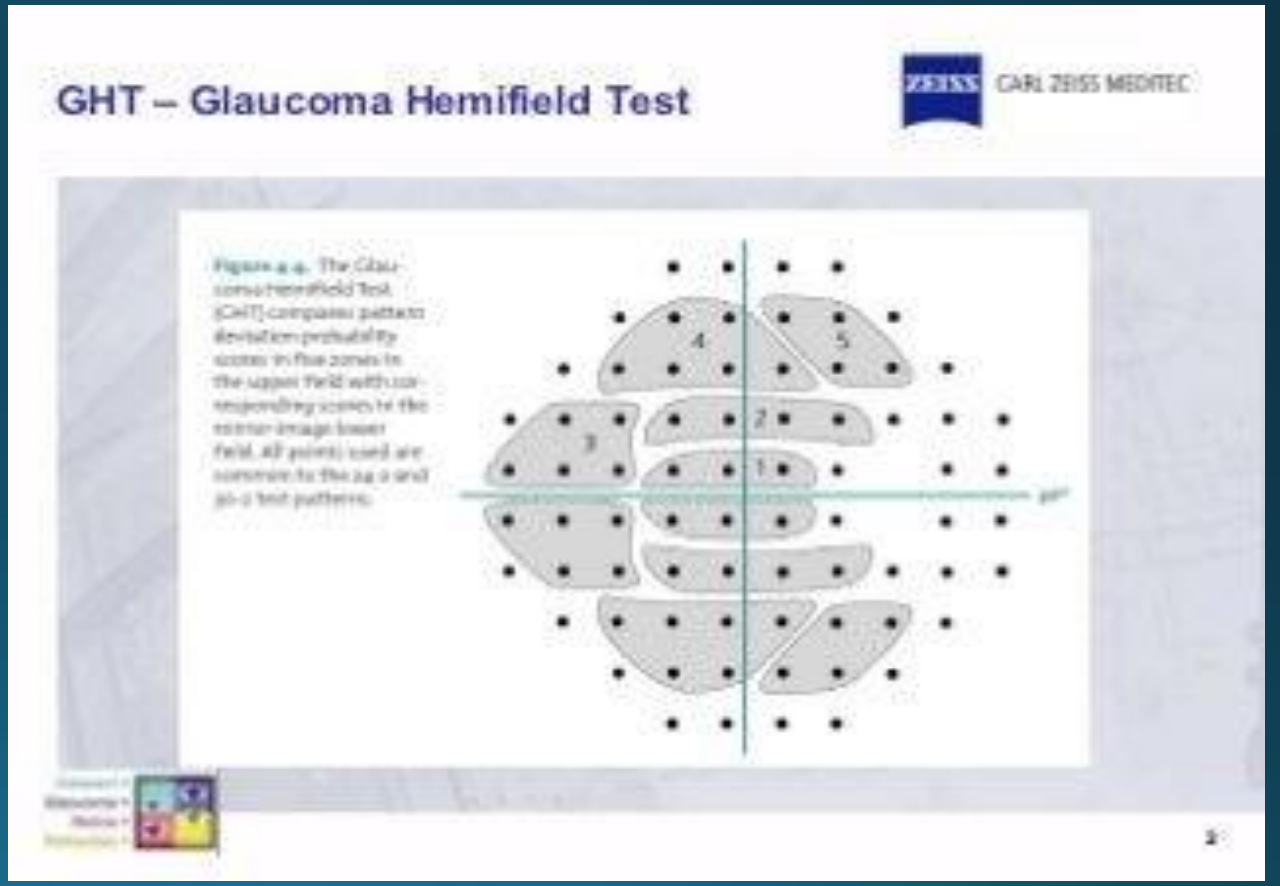
- Pattern Standard Deviation
  - A measure of focal loss in the field
  - A higher PSD indicates greater localized loss up to about 12 db.
  - PSD declines as glaucoma becomes more symmetrical.
    - PSD is zero DB in normal fields and blind fields
  - Should not be used for progression.



Maleki, Arash & Lamba, Neerav & Ma, Lina & Lee, Stacey & Schmidt, Alexander & Foster, C.. (2017). Rituximab as a monotherapy or in combination therapy for the treatment of non-paraneoplastic autoimmune retinopathy. Clinical Ophthalmology. Volume 11. 377-385. 10.2147/OPTH.S120162.

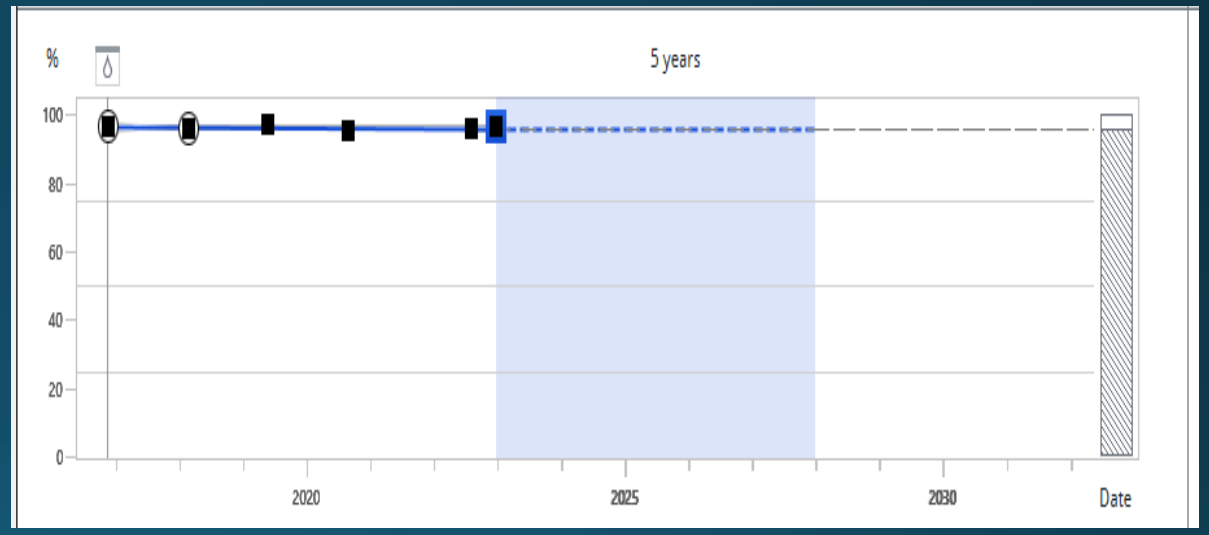
Global Indices

- Glaucoma Hemifield test (GHT):
  - Evaluates the Asymmetry between the superior and inferior visual fields.
  - Cluster of points (pre-determined) are evaluated against a normative database and will be determined to be WNL, borderline or ONL.



Global Indices

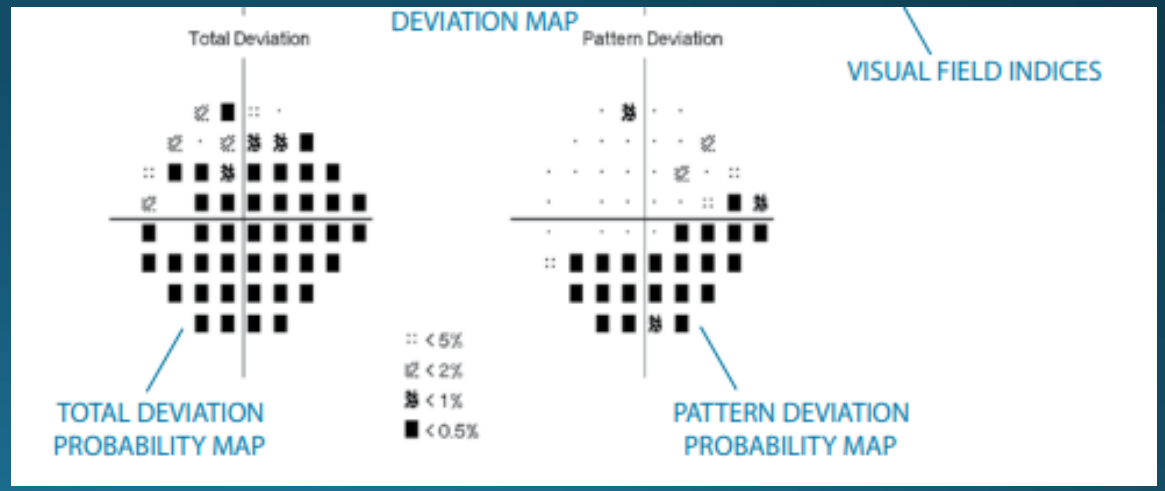
- Visual field index (VFI)
  - A global metric that represents the entire visual field as a single number
  - 100% equals a full field and 0% is a perimetrically blind eye
  - Estimated by calculating the age-corrected defect depth at the test points that are significantly depressed in the pattern deviation probability map.
  - VFI is plotted vs patient age to show progressive loss.



Total Deviation

- Identifies test locations that are outside normal limits. Threshold sensitivity is compared to age-matched normal values at each point. These are used to produce the total deviation map.

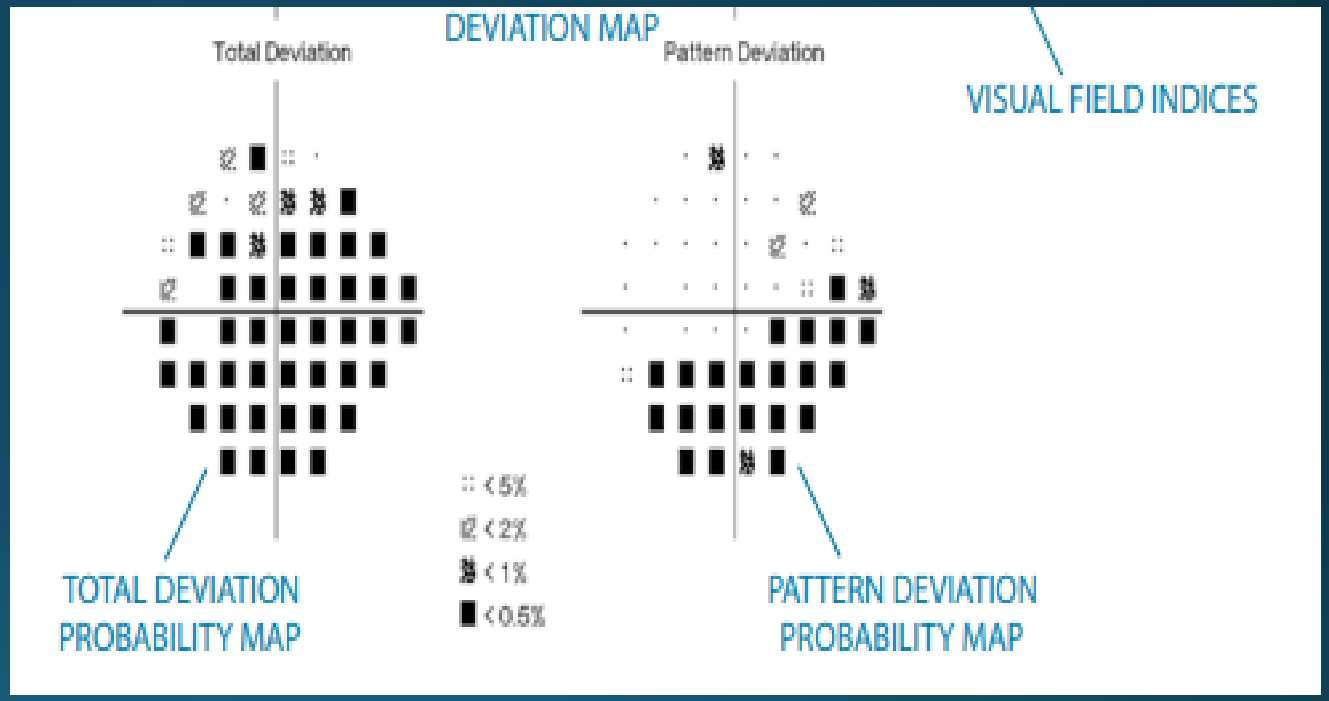
- Factors that affect total deviation:
  - Refractive error
  - Media opacities
  - Pupil size



Pattern Deviation

- Shows sensitivity losses after an adjustment has been made to remove any generalized depression or elevation in the hill of vision.

- <u>Factors out:</u>
  - Refractive error
  - Media opacities
  - Pupil size

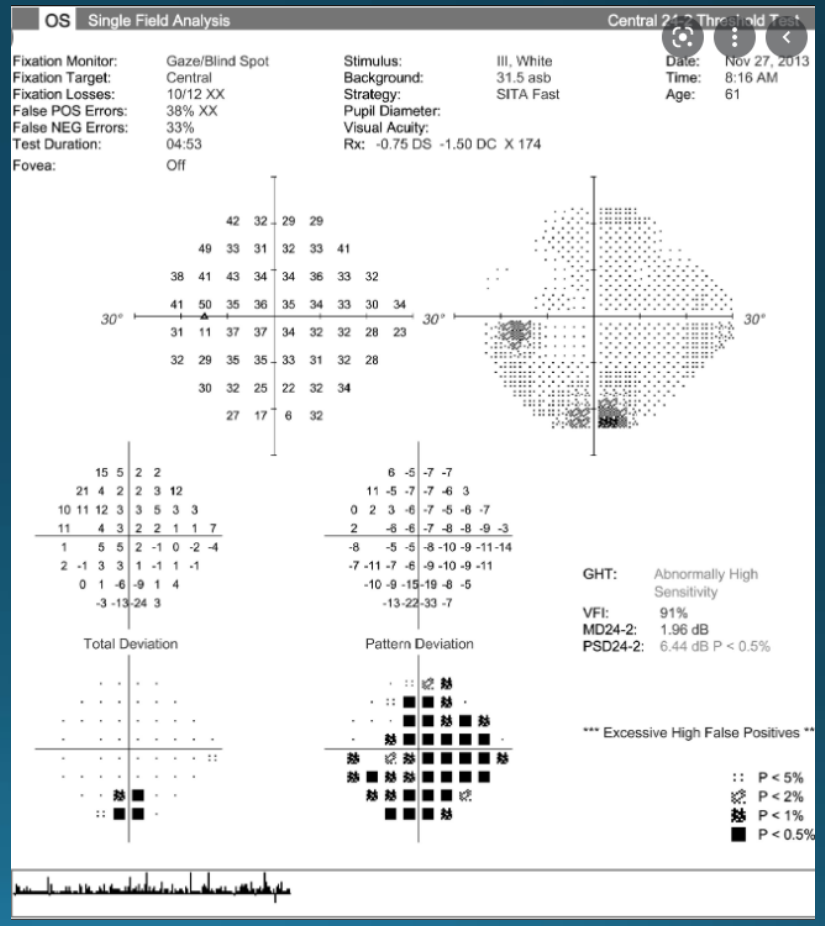


Factors affecting total vs pattern deviation

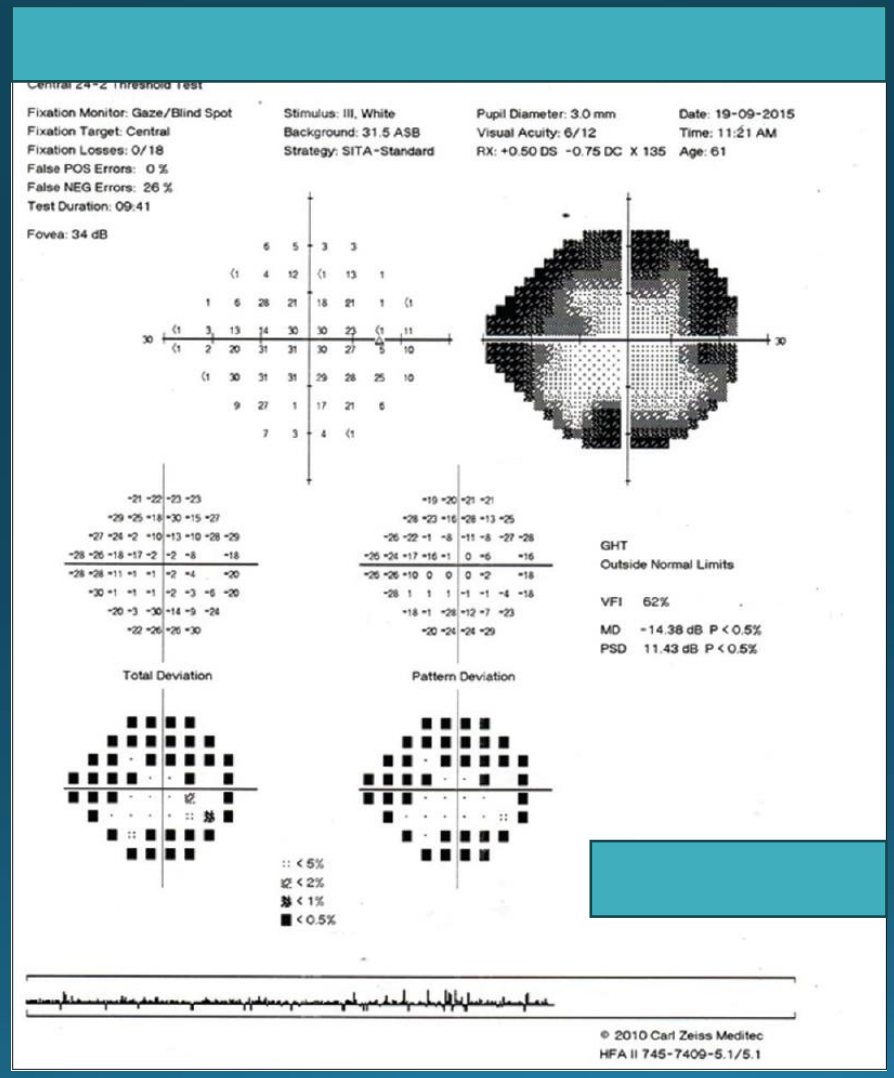
- Decreased total deviation and normal pattern deviation
  - Media opacity, refractive error, small pupil size
  - Hill of vision adjusted "up"

- Normal total deviation and decreased pattern deviation
  - High false positives on the test – "trigger happy patient"
  - Hill of vision adjusted "down"

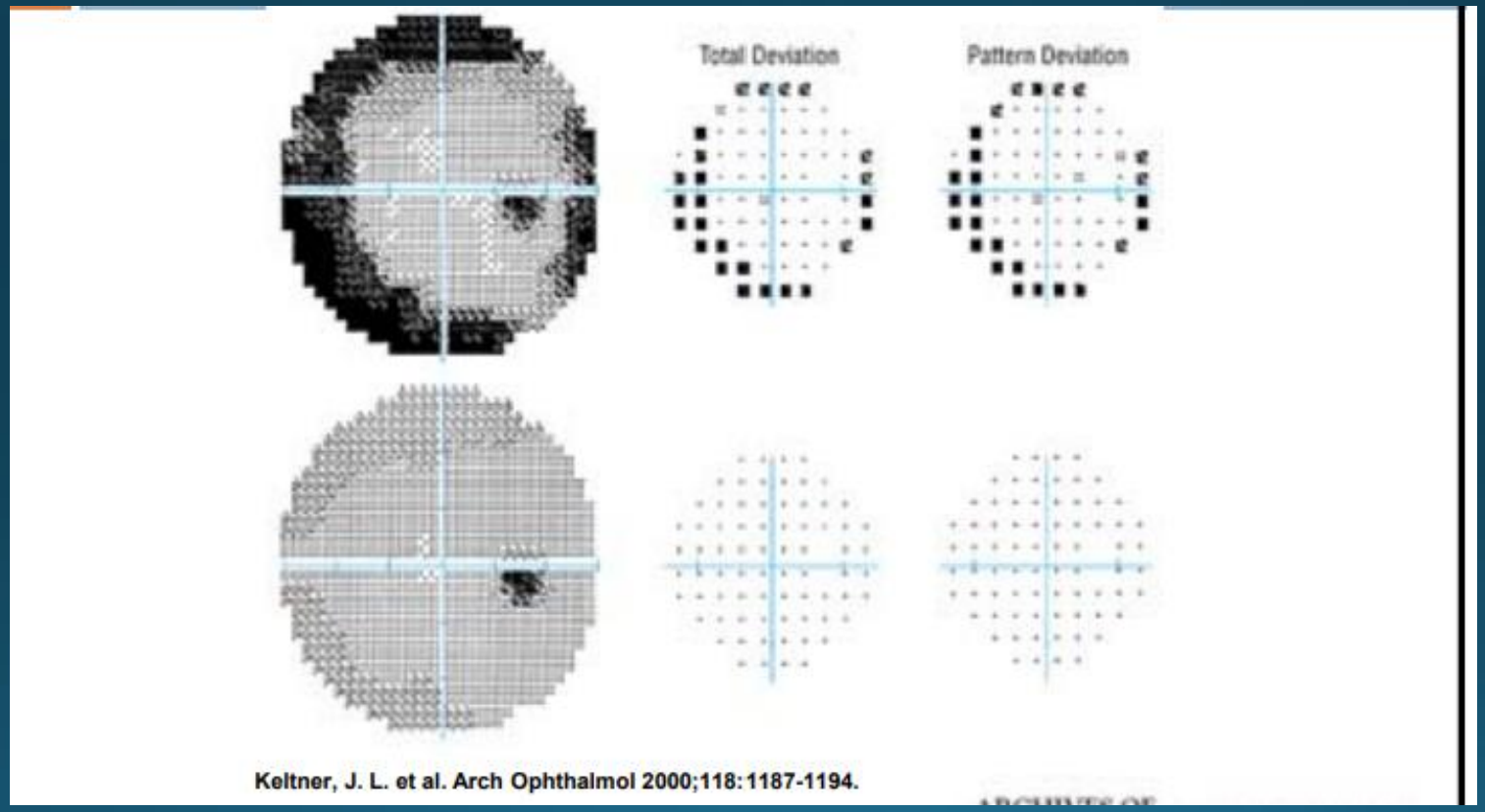
- *If your patient is pseudophakic, you can use the total deviation**



Common visual field artifacts



Common visual field artifacts



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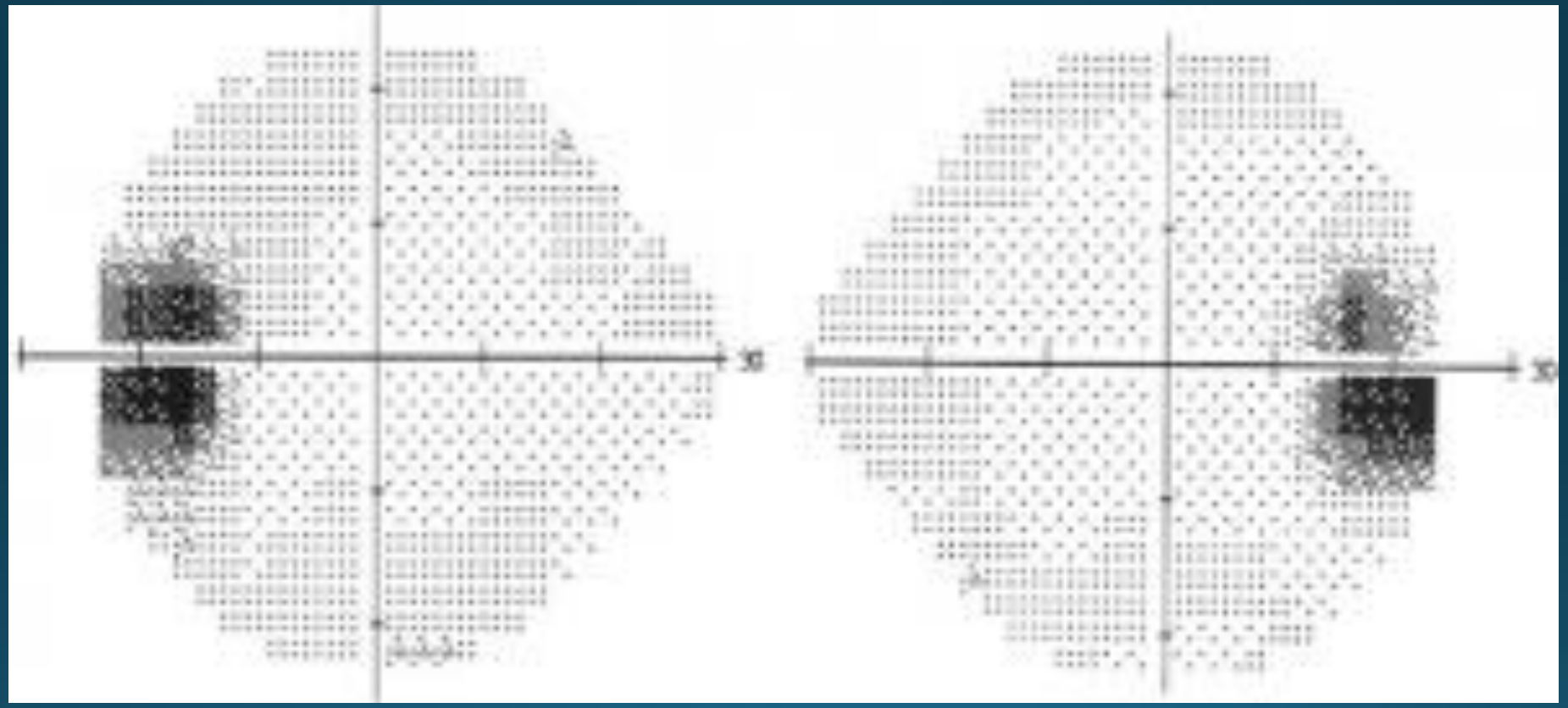

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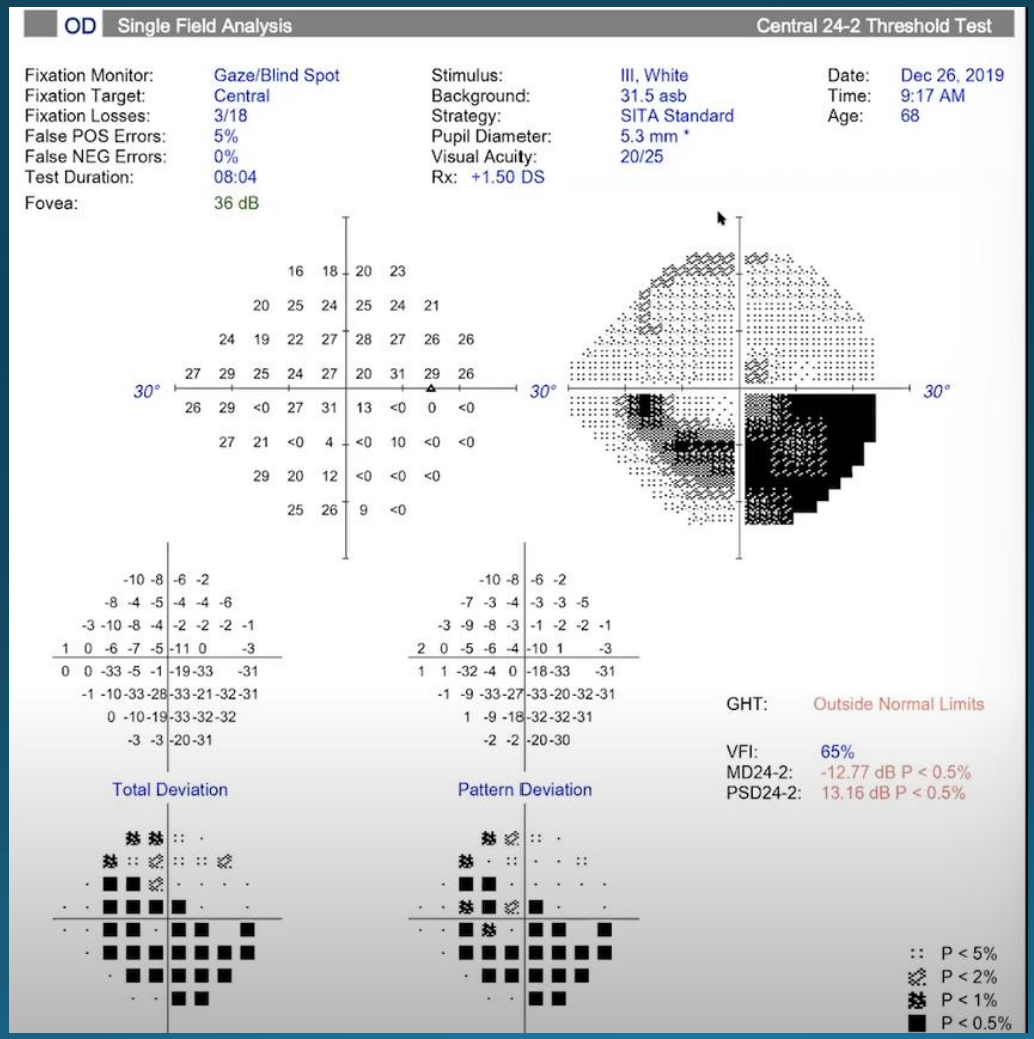

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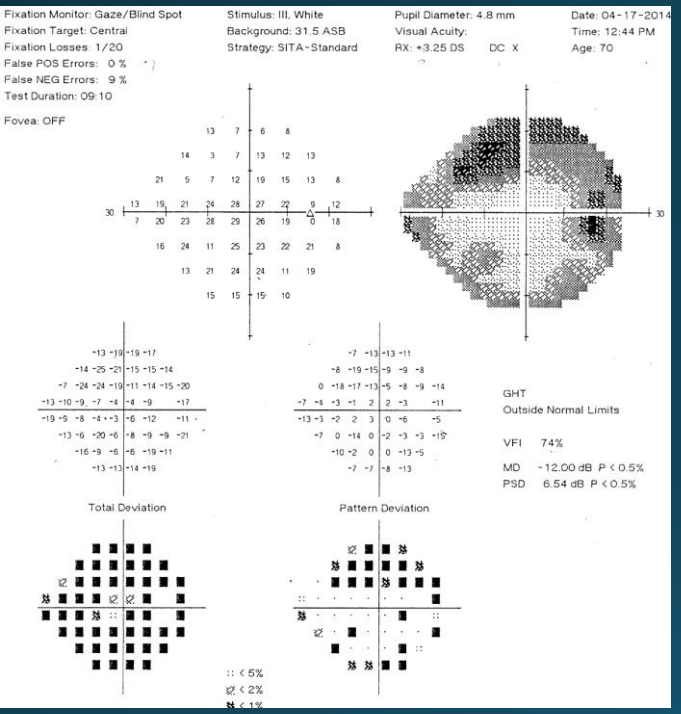
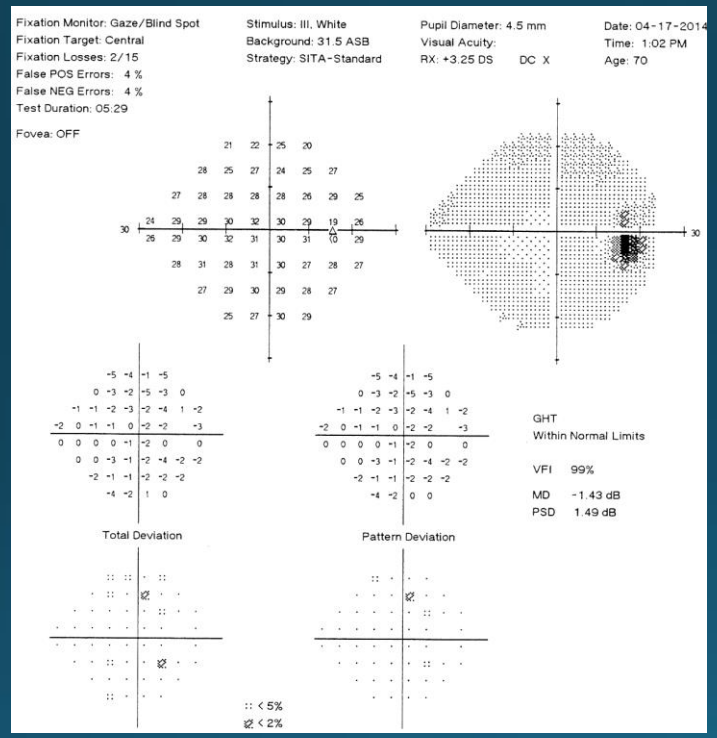
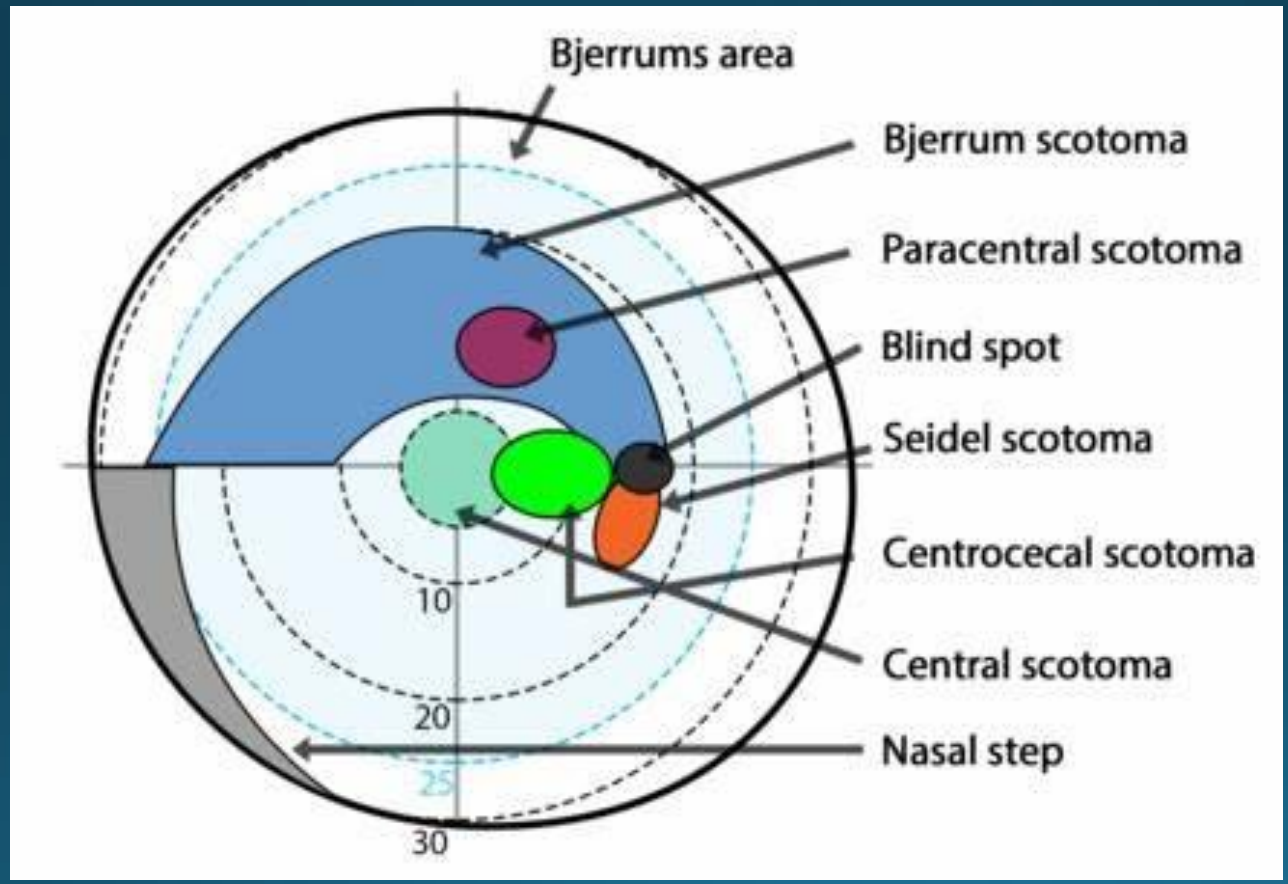




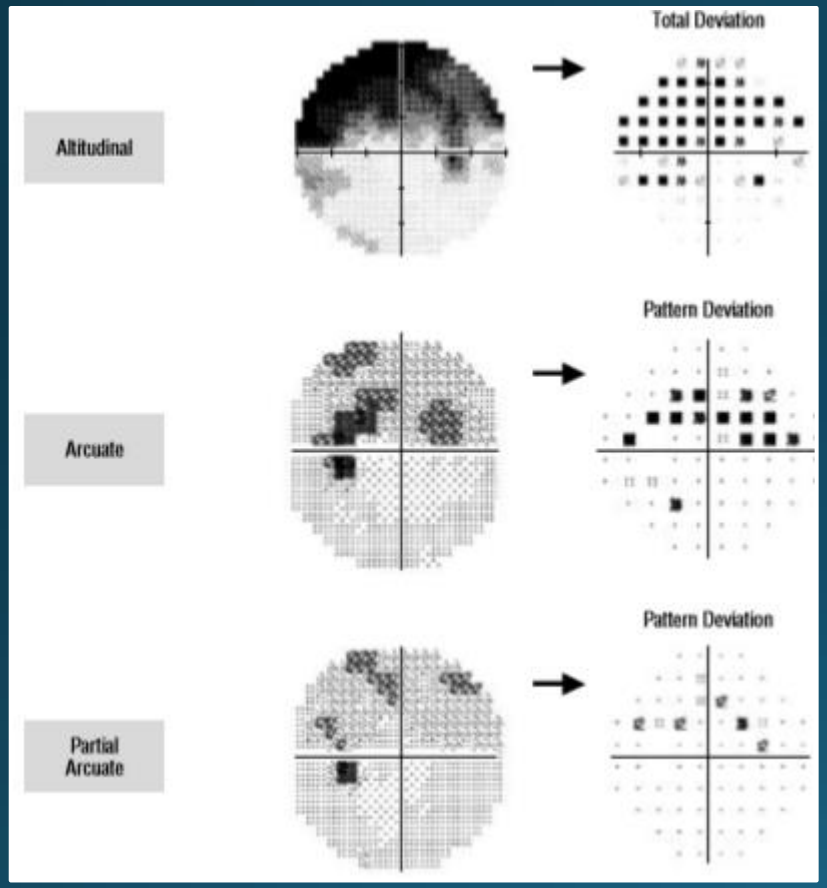
- Same patient. Same day.
- The test was run twice
- Defects on the first test were from fatigue and learning curve.

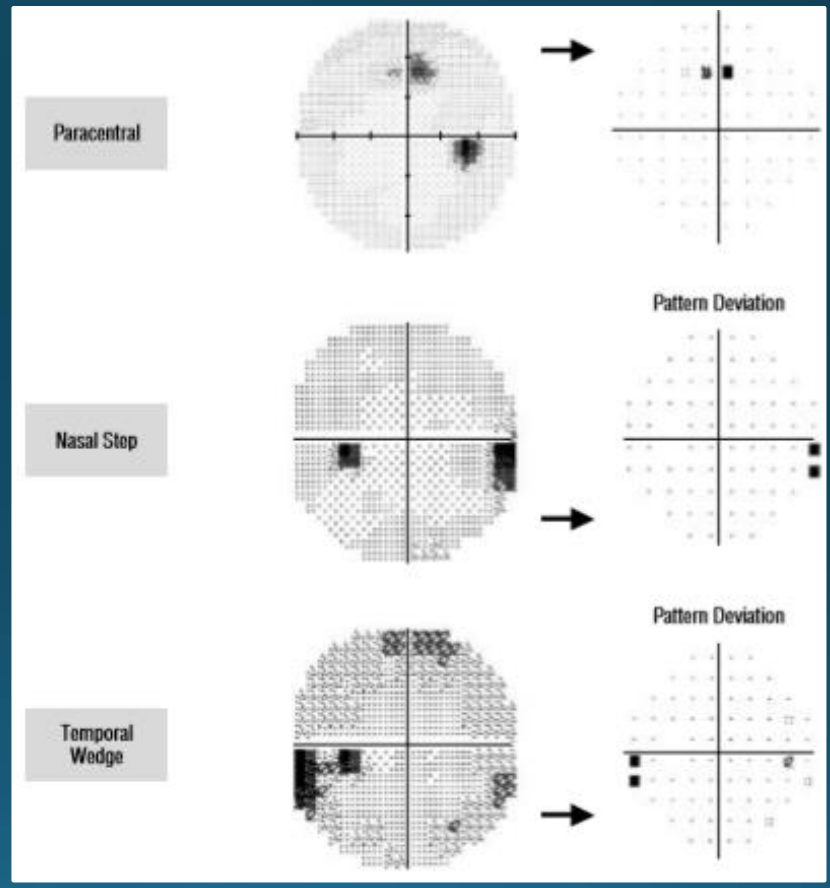
Courtesy of Peter Lalle, OD, FAAO

Question 3: Is there a defect?
Types of glaucomatous visual field defects



Visual field defects

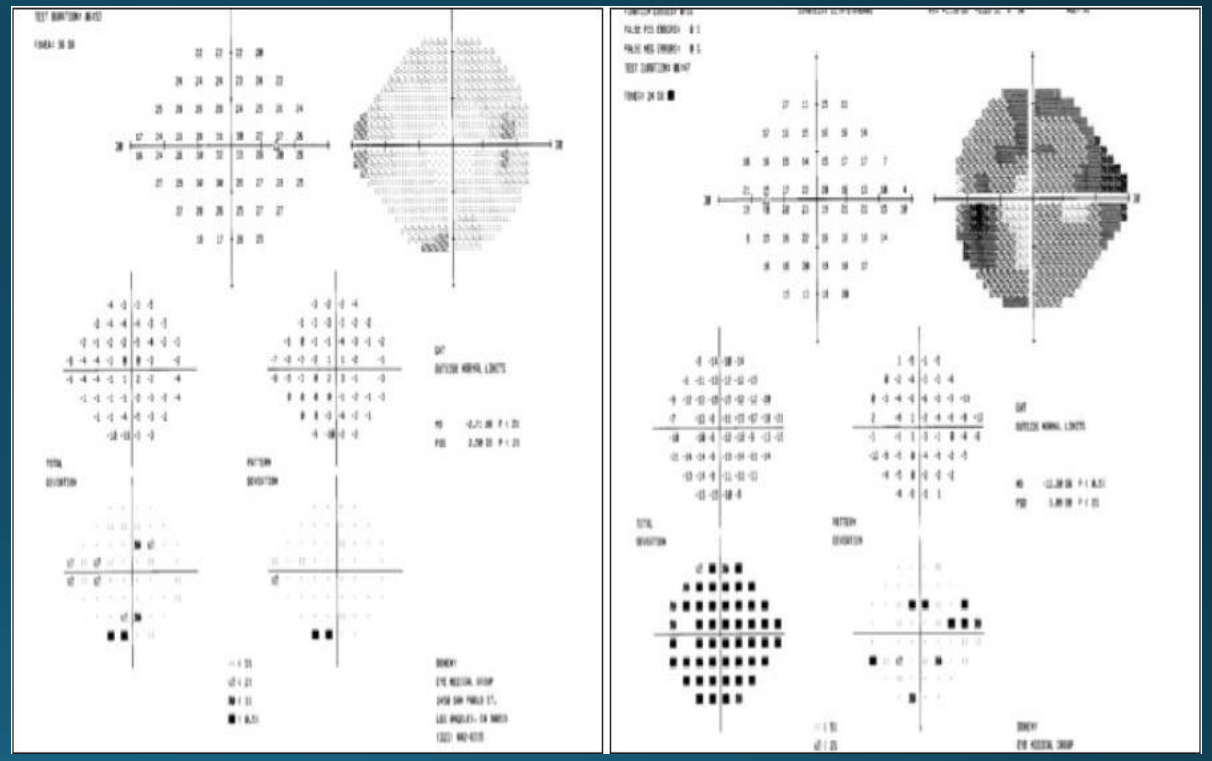




Classification of VF Defects in OHTS Keltner,Johnson, Cello et al.
Arch Ophthalmol. 2003;121:643-650

Visual field defects

- Cluster defects –
  - Katz cluster criteria: 3 adjacent points on the pattern deviation in a single hemifield, one of which must have a P value of <1
  - Using cluster defects can help spot glaucomatous VF loss earlier, but be wary of over-calling glaucomatous loss using this method.



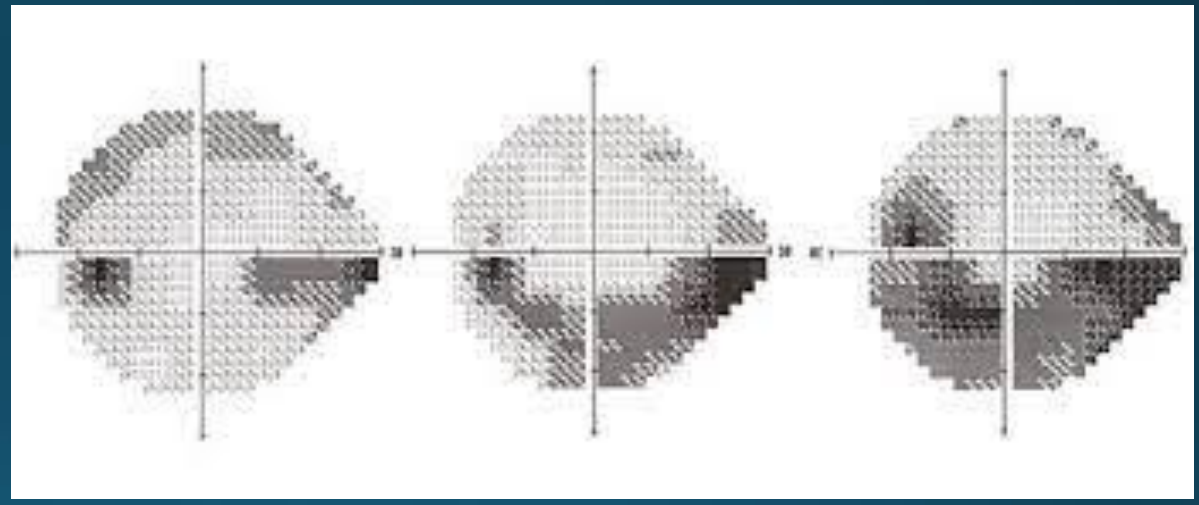
Wu Z, et al Br. J Ophthalmol 2020;104:822-826.

Question 4: Is the defect progressing? Visual field progression

Ways visual field progress

- New defect
- Defect gets deeper
- Defect gets wider

- Which method of field progression is the MOST common

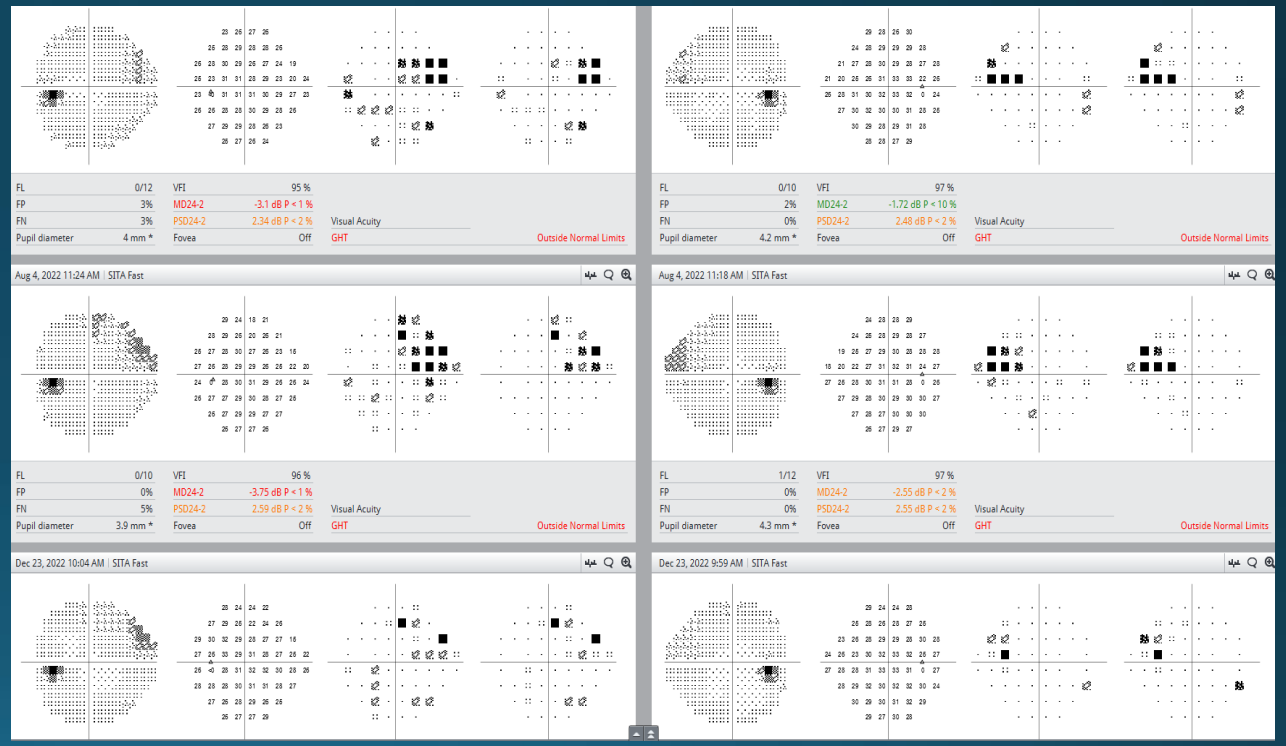


Glaucoma Specialists | University Eye Specialist (universityeyespecialists.com)

Visual field progression

- Questions to ask in progression:

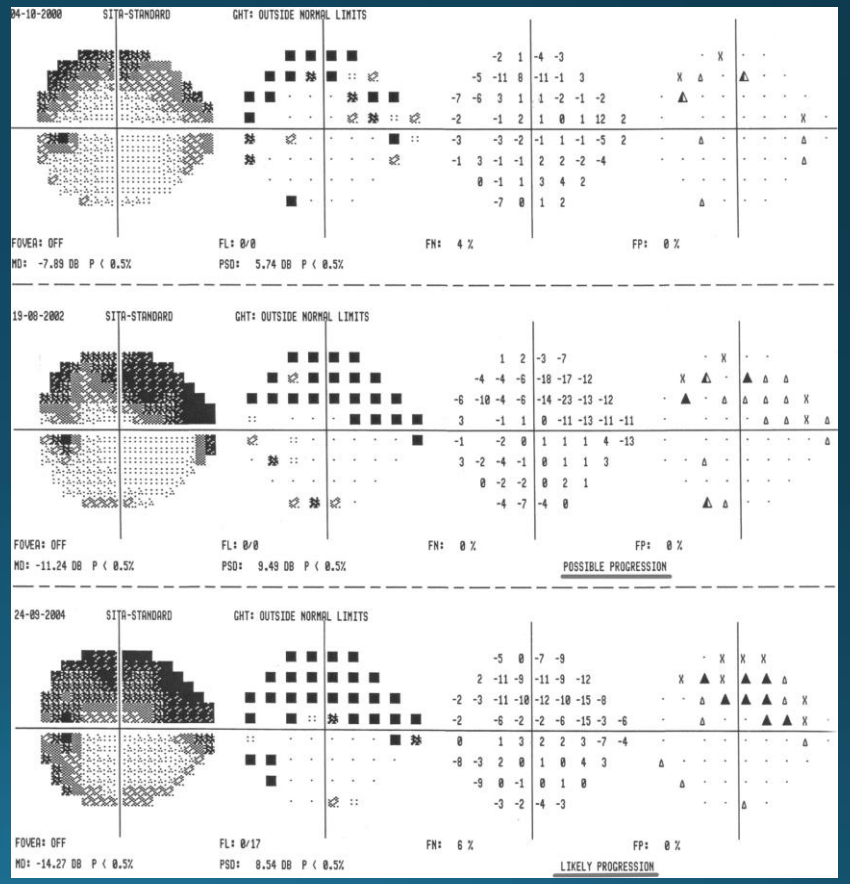
1. Is this repeatable?
   - Visual fields are a SUBJECTIVE test. You should confirm progression with at least one more field prior to changing therapy.
2. What baseline am I using?
   - If treatment is initiated, then the baselines MUST be re-set. Otherwise, you are measuring progression from an untreated or under-treated eye



Variable depth nasal step OU

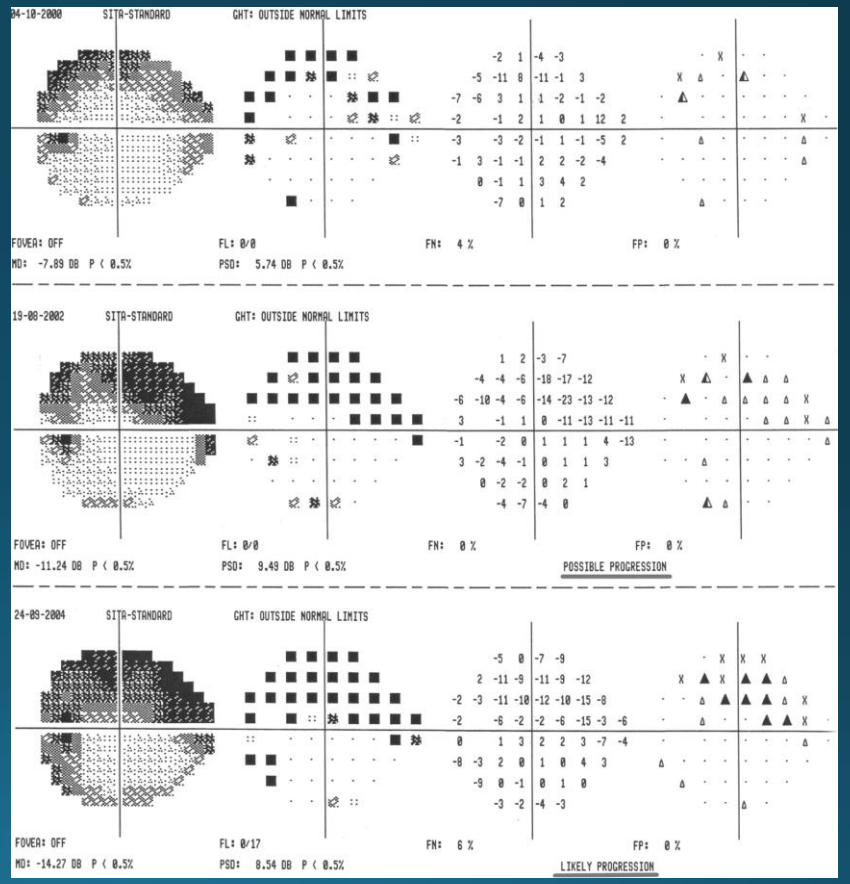
Visual field progression – Event Analysis

- Guided progression analysis (GPA) is EVENT analysis
  - The first two fields are averaged and used as a baseline. So remember TWO fields are needed for baseline.
  - The machine will look at the deviation of the field from baseline in the pattern deviation
  - Points are then classified as:
    - One time significant progression (open triangle)
    - Two-times significant progression (half-filled triangle)
    - Three or more times significant progression (filled triangle.



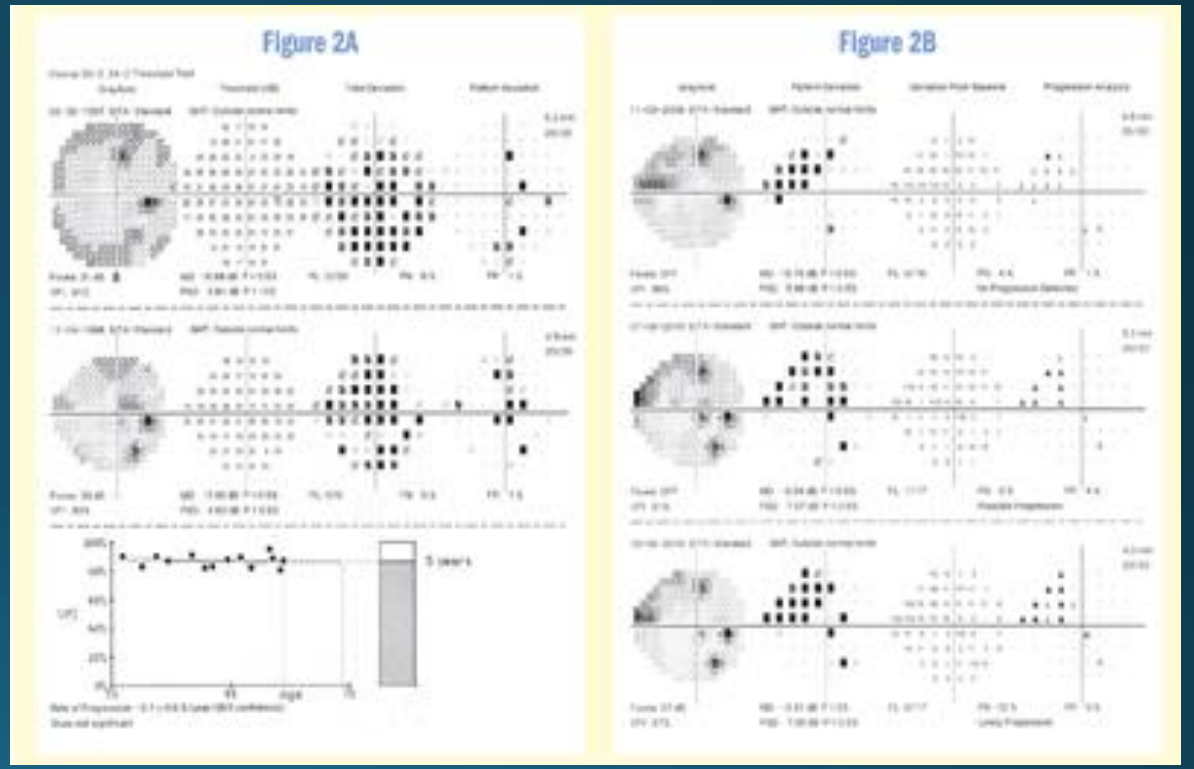
Visual field progression – Event Analysis

- Guided progression analysis (GPA) is EVENT analysis
  - A GPA alert: “possible progression” will be on the field when the same three or more points are flagged two tests in a row
  - A GPA alert: “Likely progression” will be on the field when the same three or more points are flagged three or more tests in a row



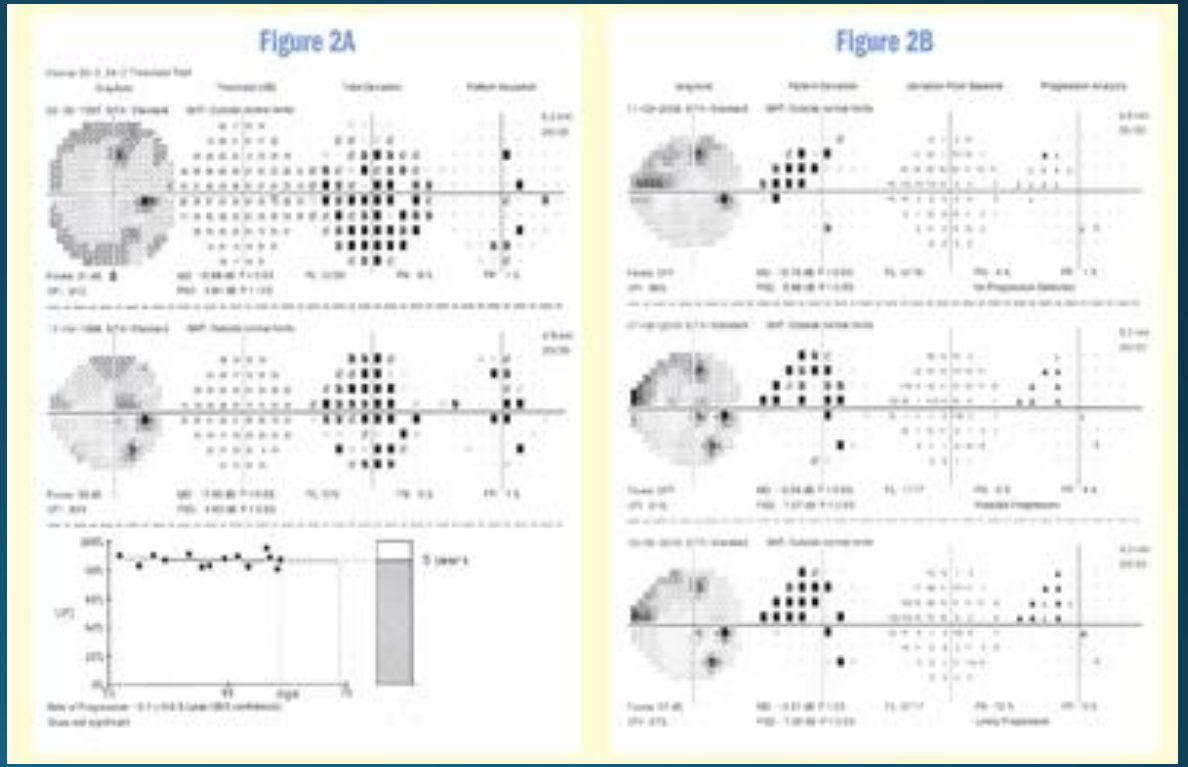
Visual field progression – Trend Analysis

- Visual field index (VFI) is TREND analysis
  - Remember that VFI is a global metric that represents the entire visual field as a single number
  - The VFI is plotted against the patient's age.
  - After 5 fields in at least a 2 year time period, a trend analysis plot will be established using linear regression.



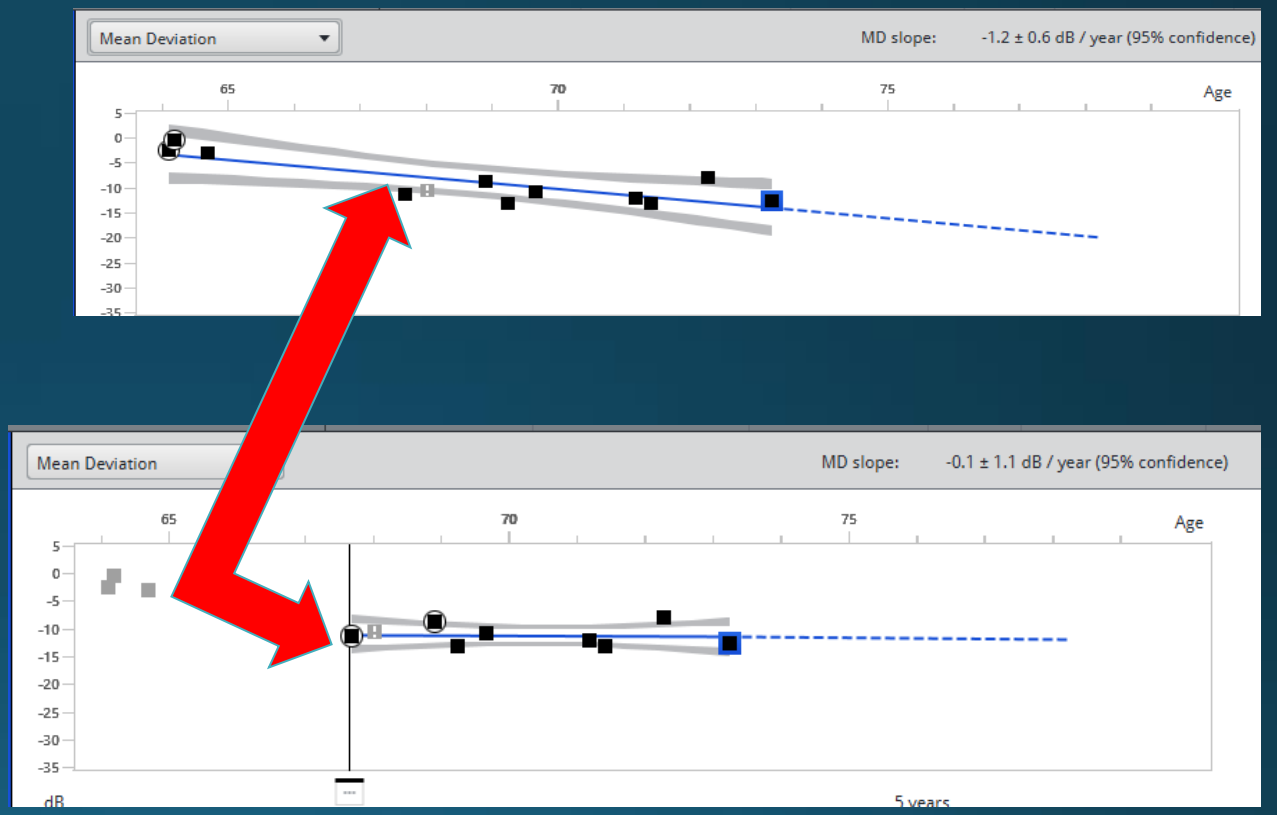
Visual field progression – Trend Analysis

- Visual field index (VFI) is TREND analysis
  - The purpose of trend analysis is to determine how quickly the field is changing
  - This helps identify patients who are fast progressors and are likely to lose vision in their lifetime.



Re-baselining provides perspective

- A new baseline must be defined following significant change in management
- The last two VF (good quality) used to confirm progression can be used in the new baseline

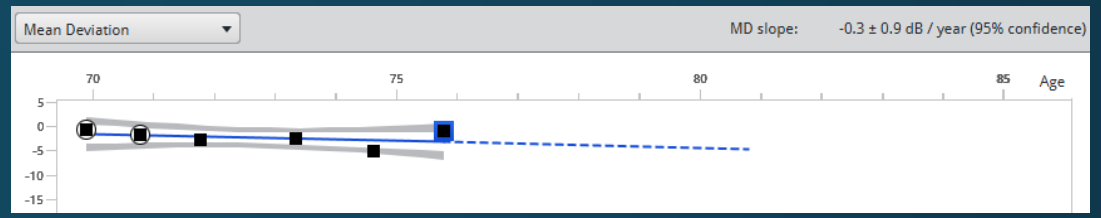


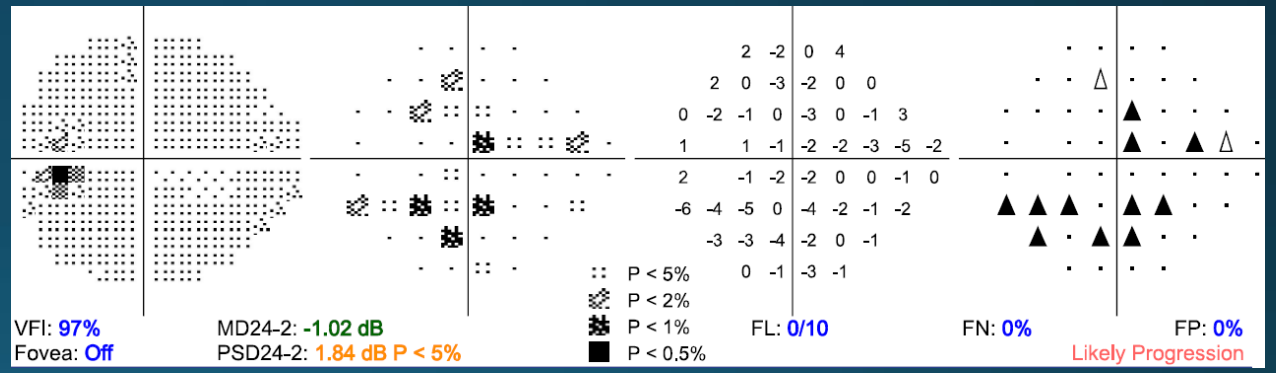
Slide Courtesy of Andrew Rixon, OD, FAAO

1) WGA Consensus Series 8. Progression of Glaucoma. 2011

Trend Vs Event Analysis for progression

- GPA event analysis has been shown to detect progression 6.8 months prior to VFI[1]
- Wu et al. found similar sensitivity between trend and event when matched for specificity[2]
- Complimentary pieces, when combined perform better than individually[3]





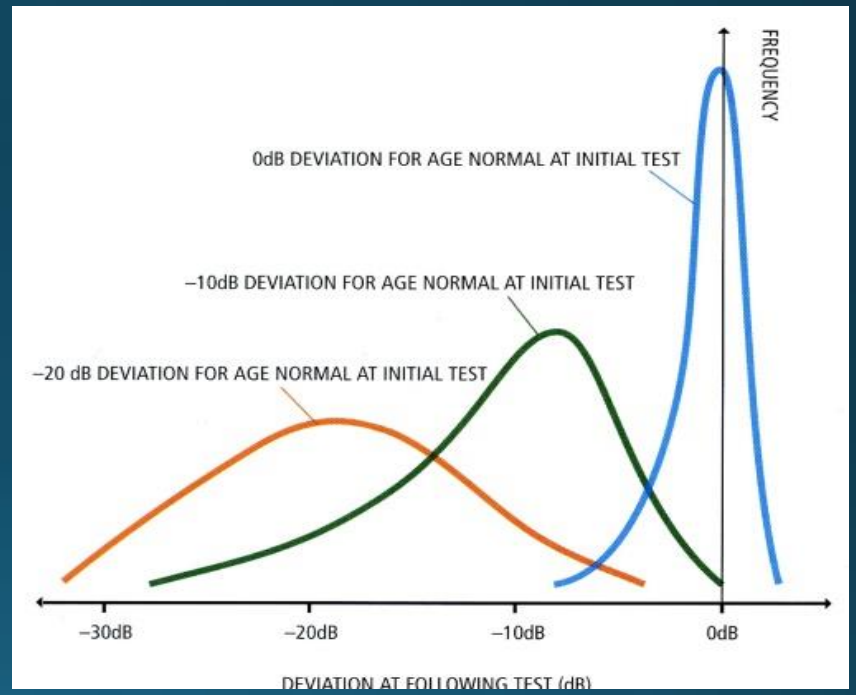
Slide Courtesy of Andrew Rixon, OD, FAAO

1) Casas-Llera P, et al. *Br J Ophthalmol*. 2009 Dec;93(12):1576-9.
2) Zhichao Wu, Felipe A. Medeiros. *Trans. Vis. Sci. Tech.* 2018;7(4):20.
3) Hu R, Racette L, Chen KS, Johnson CA. *Surv Ophthalmol*. 2020 Nov-Dec;65(6):639-661

Long Term Fluctuation

INITIAL DEVIATION	***"NL" FLUCTUATION***
0	+3 TO -7 db
-6	-1 TO -16 db
-8 to -18	NL TO BLIND

ESTABLISHED GLAUCOMA PTS

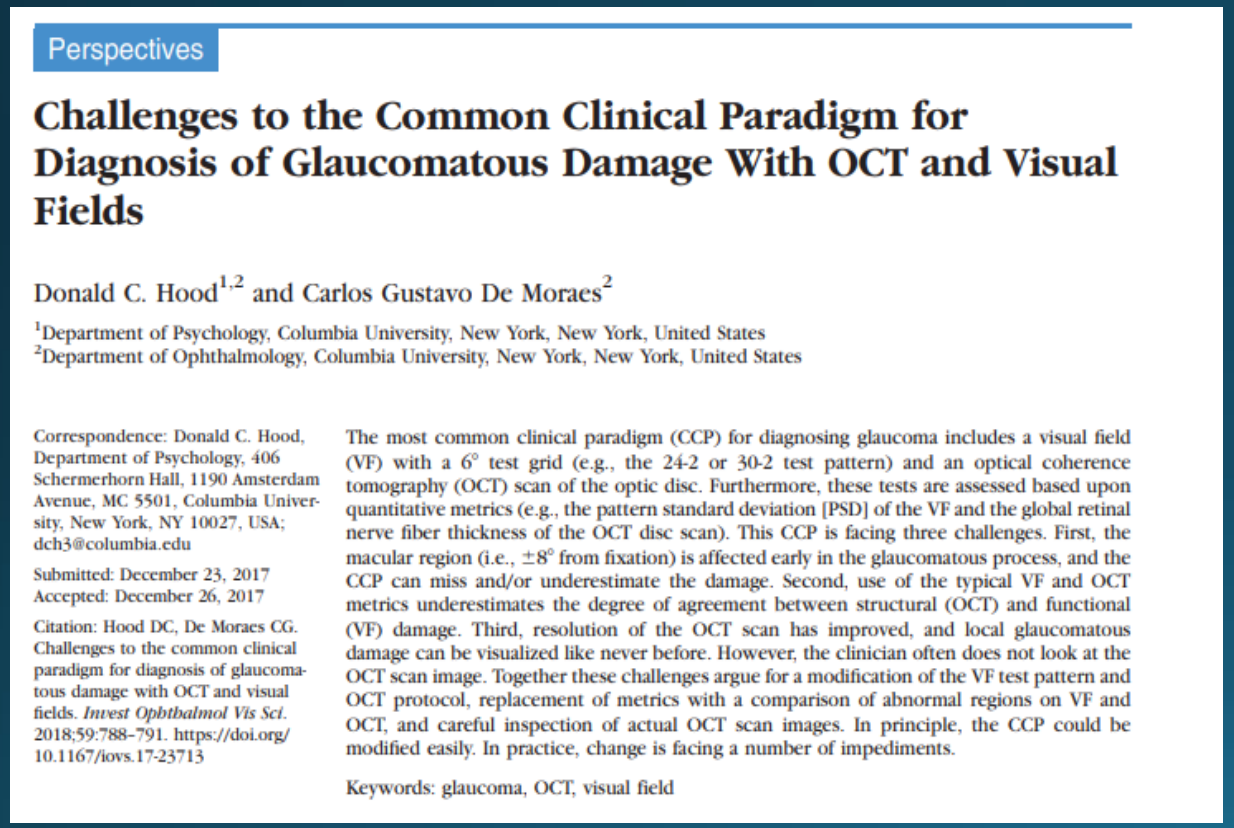


Heijl, AJO, 108:p130, 8-89
(FULL THRESHOLD STRATEGY)

ANOTHER reason to repeat fields to confirm progression

Courtesy of Peter Lalle, OD, FAAO

Glaucoma and central VF loss



Perspectives

Challenges to the Common Clinical Paradigm for Diagnosis of Glaucomatous Damage With OCT and Visual Fields

Donald C. Hood[1,2] and Carlos Gustavo De Moraes[2]

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Citation: Hood DC, De Moraes CG. Challenges to the common clinical paradigm for diagnosis of glaucomatous damage with OCT and visual fields. *Invest Ophthalmol Vis Sci*. 2018;59:788–791. https://doi.org/10.1167/iovs.17-23713

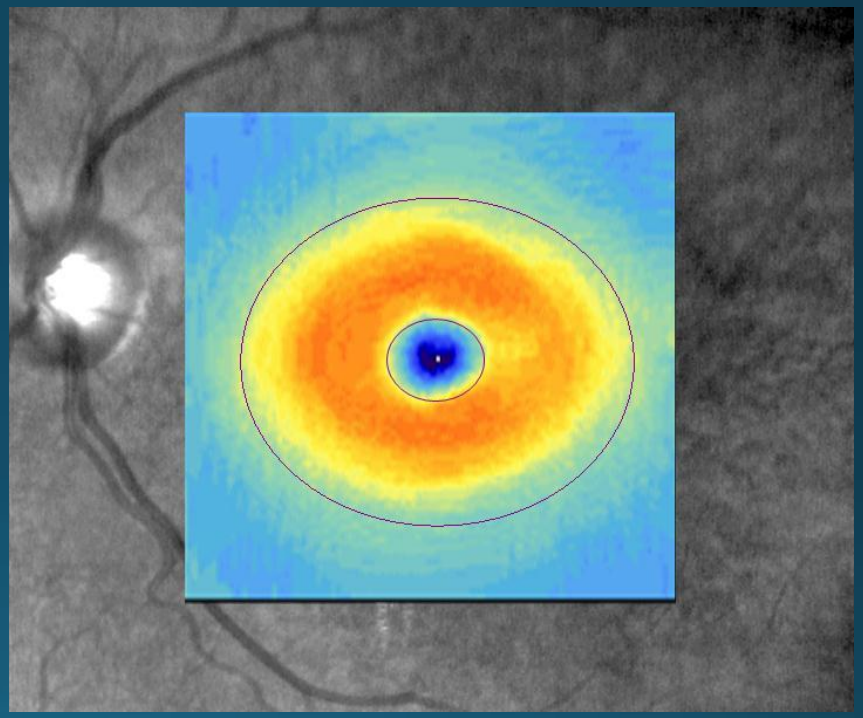
The most common clinical paradigm (CCP) for diagnosing glaucoma includes a visual field (VF) with a 6° test grid (e.g., the 24-2 or 30-2 test pattern) and an optical coherence tomography (OCT) scan of the optic disc. Furthermore, these tests are assessed based upon quantitative metrics (e.g., the pattern standard deviation [PSD] of the VF and the global retinal nerve fiber thickness of the OCT disc scan). This CCP is facing three challenges. First, the macular region (i.e., ±8° from fixation) is affected early in the glaucomatous process, and the CCP can miss and/or underestimate the damage. Second, use of the typical VF and OCT metrics underestimates the degree of agreement between structural (OCT) and functional (VF) damage. Third, resolution of the OCT scan has improved, and local glaucomatous damage can be visualized like never before. However, the clinician often does not look at the OCT scan image. Together these challenges argue for a modification of the VF test pattern and OCT protocol, replacement of metrics with a comparison of abnormal regions on VF and OCT, and careful inspection of actual OCT scan images. In principle, the CCP could be modified easily. In practice, change is facing a number of impediments.

Keywords: glaucoma, OCT, visual field

- Early glaucomatous damage can involve the macula and central vision.
- The region within 8 degrees of fixation contains 30% of the retinal ganglion cells
- 10-2 visual fields and macular scans are necessary to find earlier glaucoma.

How does the macula figure in Glaucoma?

- The majority of the ganglion cell population is present in the macula
- Glaucoma is a disease with marked loss of the retinal ganglion cells.
- Macular damage in glaucoma may be more common than previously realized.
- Macular damage is typically arcuate and associated with local RNFL thinning in the macular vulnerability zone.



Macular Vulnerability Zone

Published in final edited form as:
Prog Retin Eye Res. 2013 January ; 32C: 1–21. doi:10.1016/j.preteyeres.2012.08.003.

Glaucomatous damage of the macula

Donald C. Hood[a,b,*,1], **Ali S. Raza**[a,c,1], **Carlos Gustavo V. de Moraes**[d,e,1], **Jeffrey M. Liebmann**[d,e,1], and **Robert Ritch**[d,f,1]

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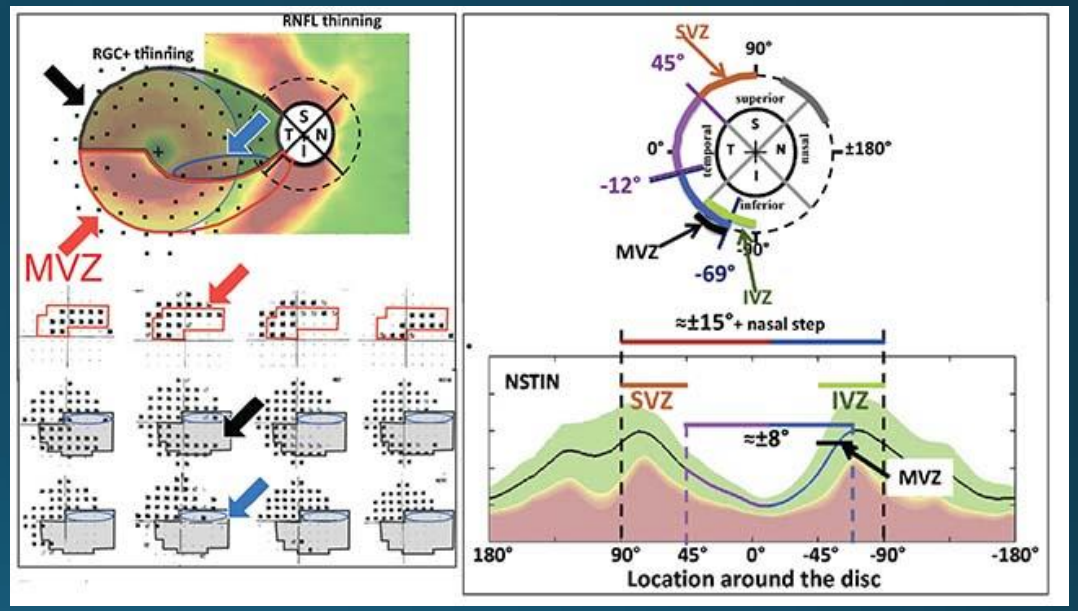
[f]Department of Ophthalmology and Visual Science, New York Medical College, Valhalla, NY, USA

Abstract

There is a growing body of evidence that early glaucomatous damage involves the macula. The anatomical basis of this damage can be studied using frequency domain optical coherence tomography (fdOCT), by which the local thickness of the retinal nerve fiber layer (RNFL) and local retinal ganglion cell plus inner plexiform (RGC+) layer can be measured. Based upon averaged fdOCT results from healthy controls and patients, we show that: 1. For healthy controls, the average RGC+ layer thickness closely matches human histological data; 2. For glaucoma patients and suspects, the average RGC+ layer shows greater glaucomatous thinning in the inferior retina (superior visual field (VF)); and 3. The central test points of the 6° VF grid (24-2 test pattern) miss the region of greatest RGC+ thinning. Based upon fdOCT results from individual patients, we have learned that: 1. Local RGC+ loss is associated with local VF sensitivity loss as long as the displacement of RGCs from the foveal center is taken into consideration; and 2. Macular damage is typically arcuate in nature and often associated with local RNFL thinning in a narrow region of the disc, which we call the macular vulnerability zone (MVZ). According to our schematic model of macular damage, most of the inferior region of the macula projects to the MVZ, which is located largely in the inferior quadrant of the disc, a region that is particularly susceptible to glaucomatous damage. A small (cecocentral) region of the inferior macula, and all of the superior macula (inferior VF), project to the temporal quadrant, a region that is less susceptible to damage. The overall message is clear; clinicians need to be aware that glaucomatous damage to the macula is common, can occur early in the disease, and can be missed and/or underestimated with standard VF tests that use a 6° grid, such as the 24-2 VF test.

Keywords

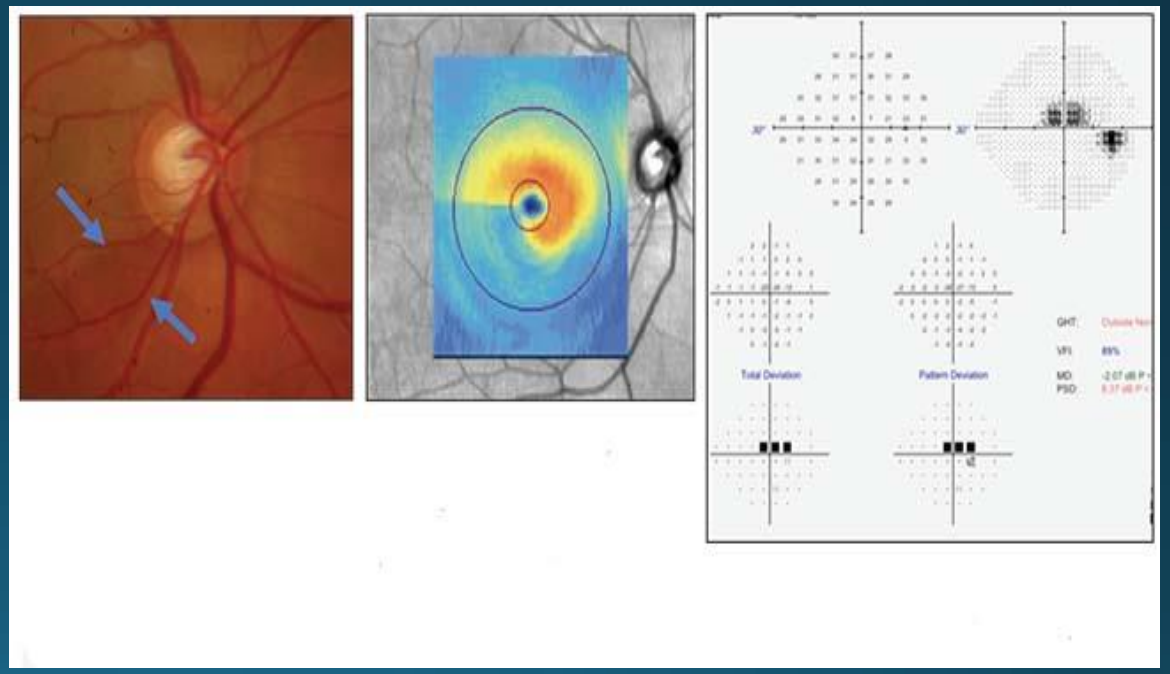
Glaucoma; OCT; Macula; Retinal ganglion cell; Visual field



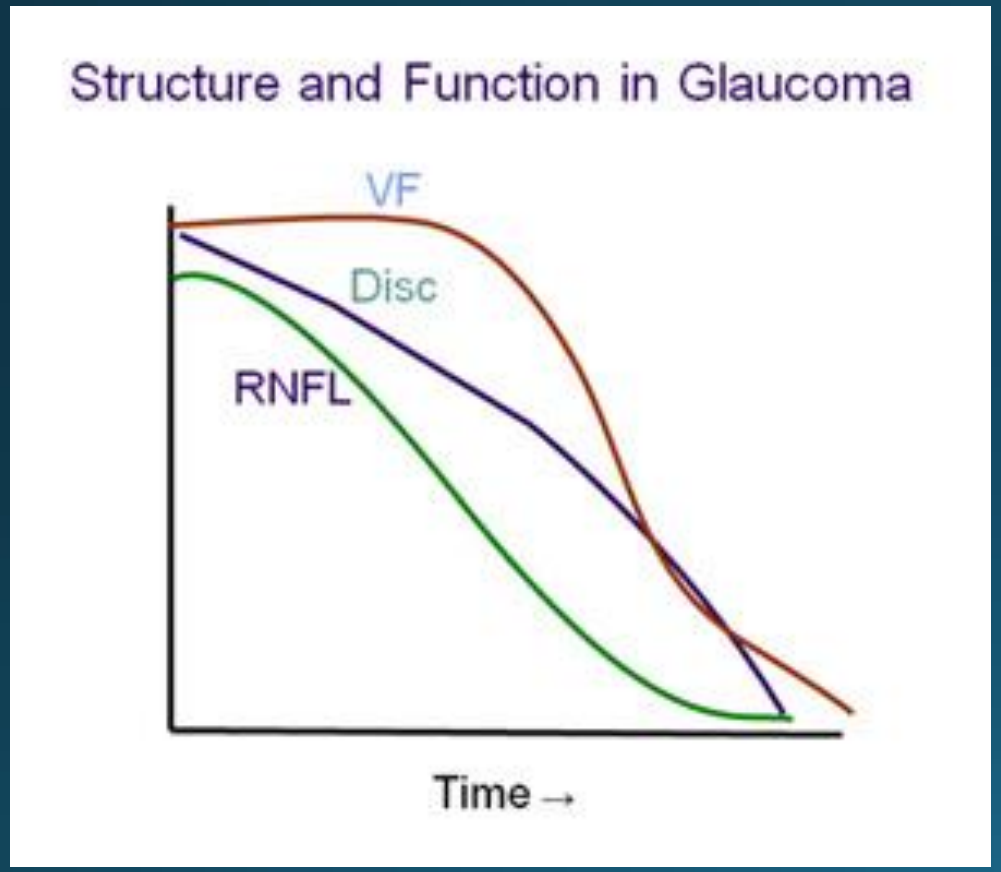
High-tech Mythbusting: Glaucoma and the Macula (reviewofophthalmology.com)

Macular Vulnerability Zone

- Because the fovea is located inferior to the ONH, there are more ganglion cells projecting to the superior ONH than the inferior ONH. This is thinnest in the inferior temporal region of the ONH
- This area is susceptible to cecocentral visual field defects that may be missed by 24-2 or 30-2 testing as the test points are 6 degrees apart.



Classic structure/function curve



- We may not be testing patients appropriately.
  - 24-2 and 30-2 strategy misses a lot of the central visual field
  - Central field loss can be missed with those strategies as they use a 6-degree grid.

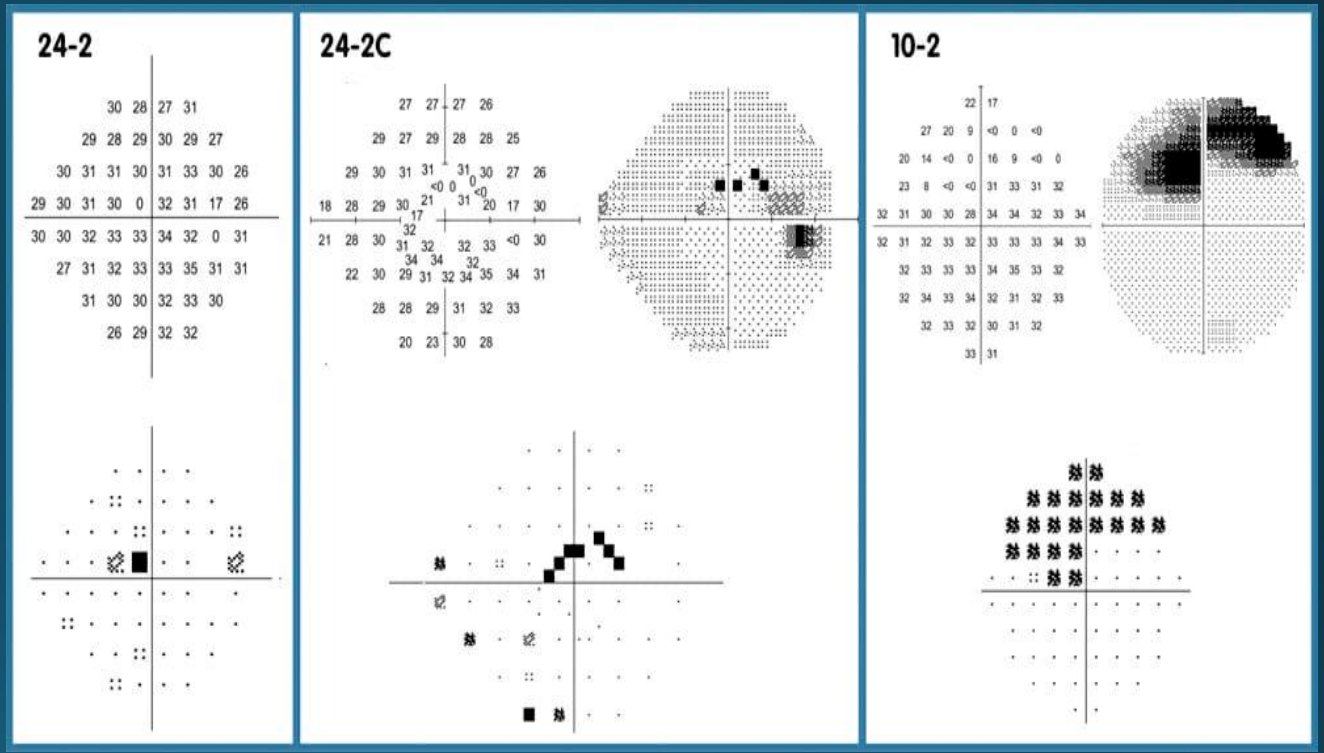
  If the patient has a clear 24-2 and you still suspect visual field loss, run a 10-2 field.

- VF loss can happen in early disease
  - Previously it was thought only to occur in later stages

- This is why structure AND function must BOTH be monitored.

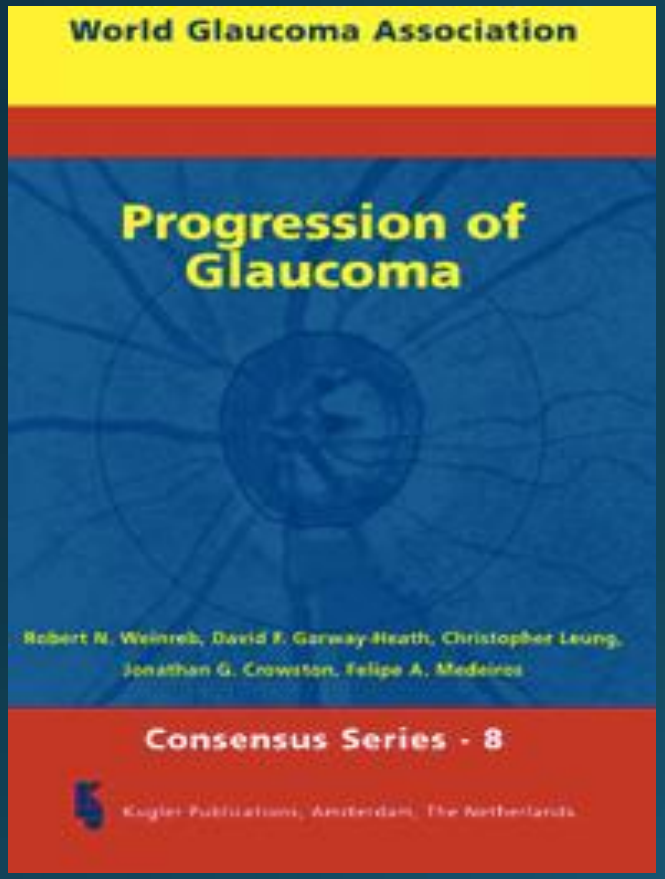
24C visual field strategy

- Run with a SITA Faster algorithm
- Contains SOME central points that were designed to pick up glaucomatous loss. Not as many central points as a 10-2 visual field.
- If central points are found, it is best to run a 10-2 test to ascertain the extent of the central defect



24-2C Visual Field Testing: Glaucoma Management's Paradigm Shift? - mivision

Conventional Recommendations-How many fields per year?



Baseline

- 2 reliable fields in the first 6 months
- At least 2 VF in the next 18 months if low risk of disability
- 4 in the next 18 mnths if high risk of disability[1,2]

Longitudinal

- Employ an "Adaptive" test strategy
  -Adapt testing based on the context of the patient
  i.e. test intervals shortened if progression suspected
  -Increasing testing >2 VFs/yr has not decreased time to detection

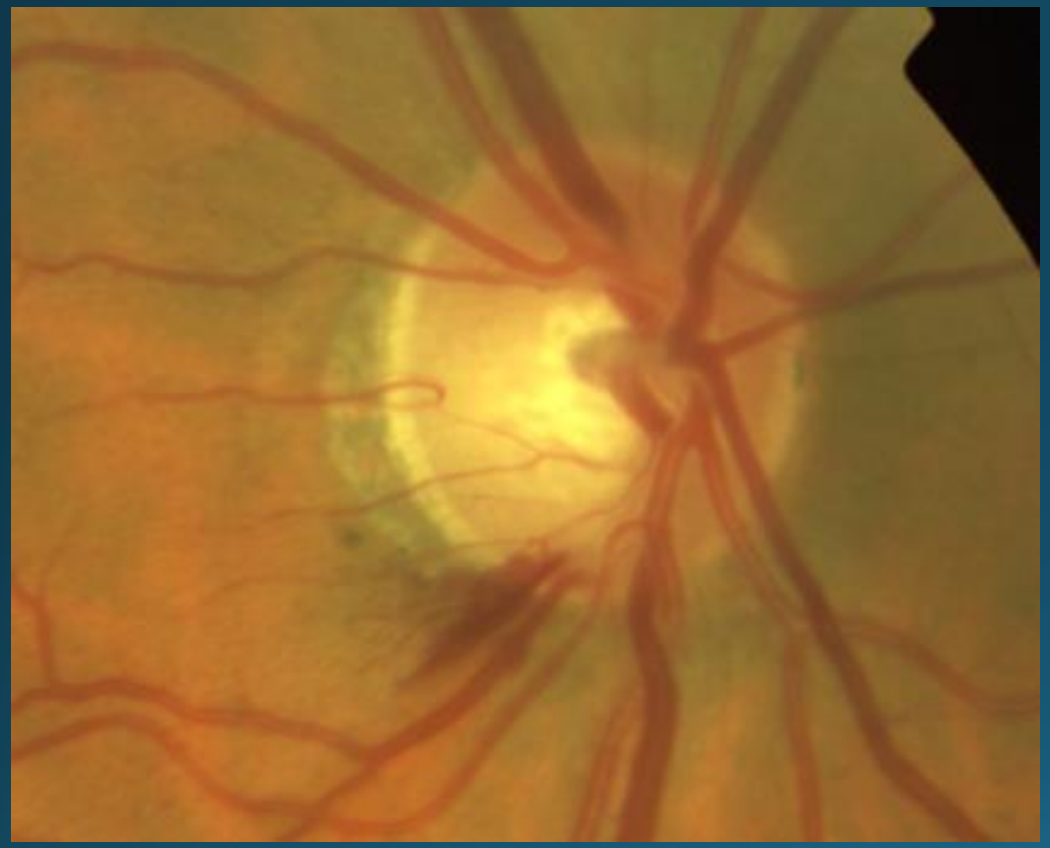
Slide Courtesy of Andrew Rixon, OD, FAAO

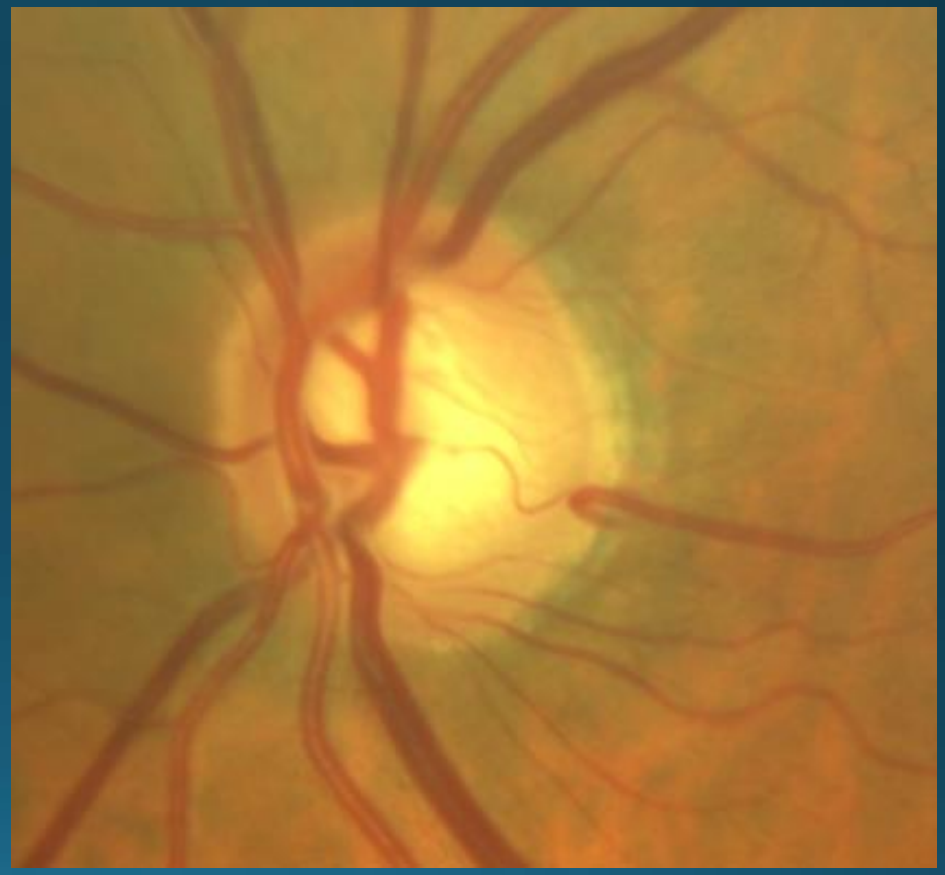
1) WGA Consensus Series 8. Progression of Glaucoma. 2011 2)Wu Z et al. *Ophthalmology* 2017;124:786-792
3) Chauhan B, et al. *Br J Ophthalmol.* 2008;92:569–573 4) Melchior B, et al. *J Glaucoma*. 2023 Sep 1;32(9):721-724
5) Sabouri S, et al. *J Glaucoma*. 2023 May 1;32(5):355-360

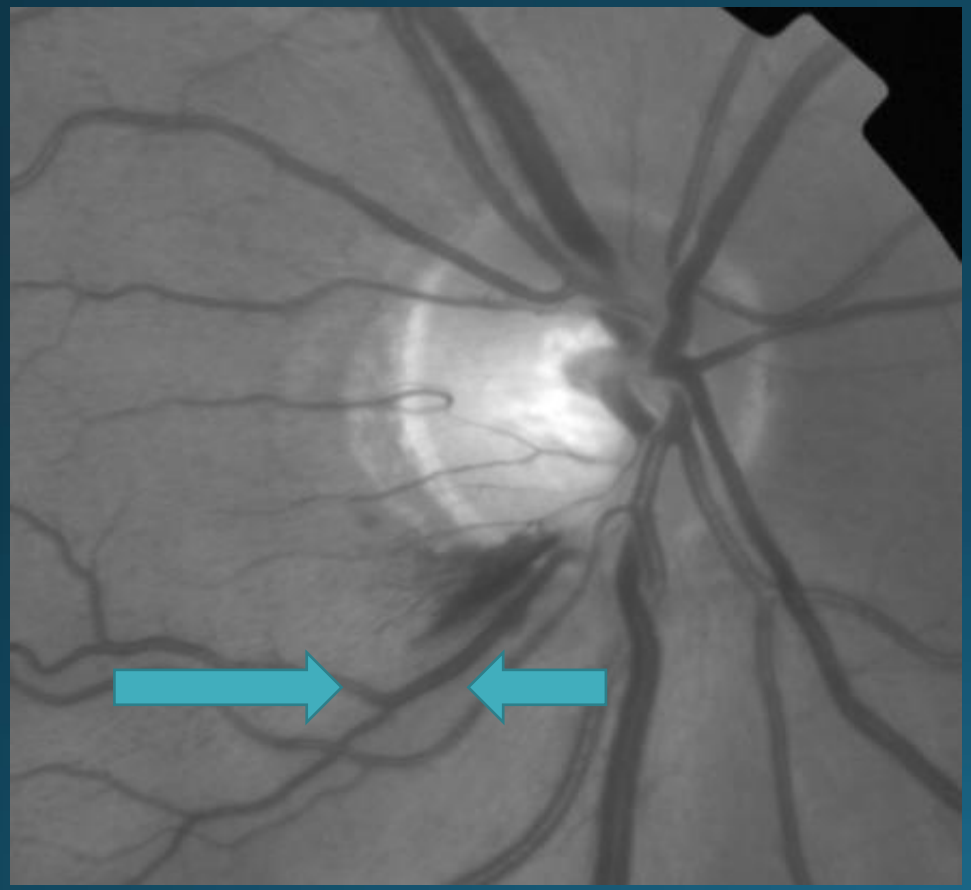
Case 1

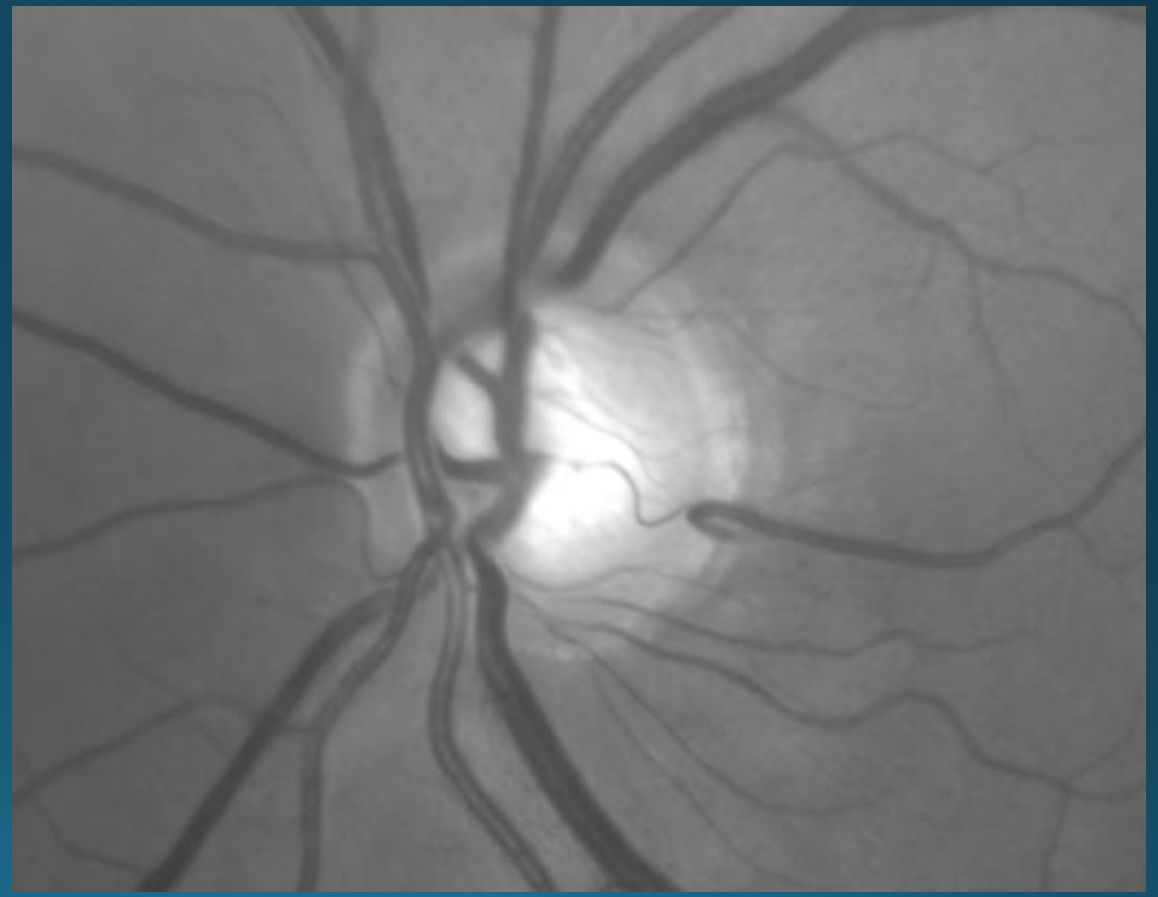
- 55 year old white male.
- Presents for his first eye exam in our clinic
- Medical history: HTN
- Ocular history: None
- Entering acuity: 20/20 OD/OS
- Entrance testing normal
- IOP: 17/18 @ 2:20 pm
- Pt was dilated…….

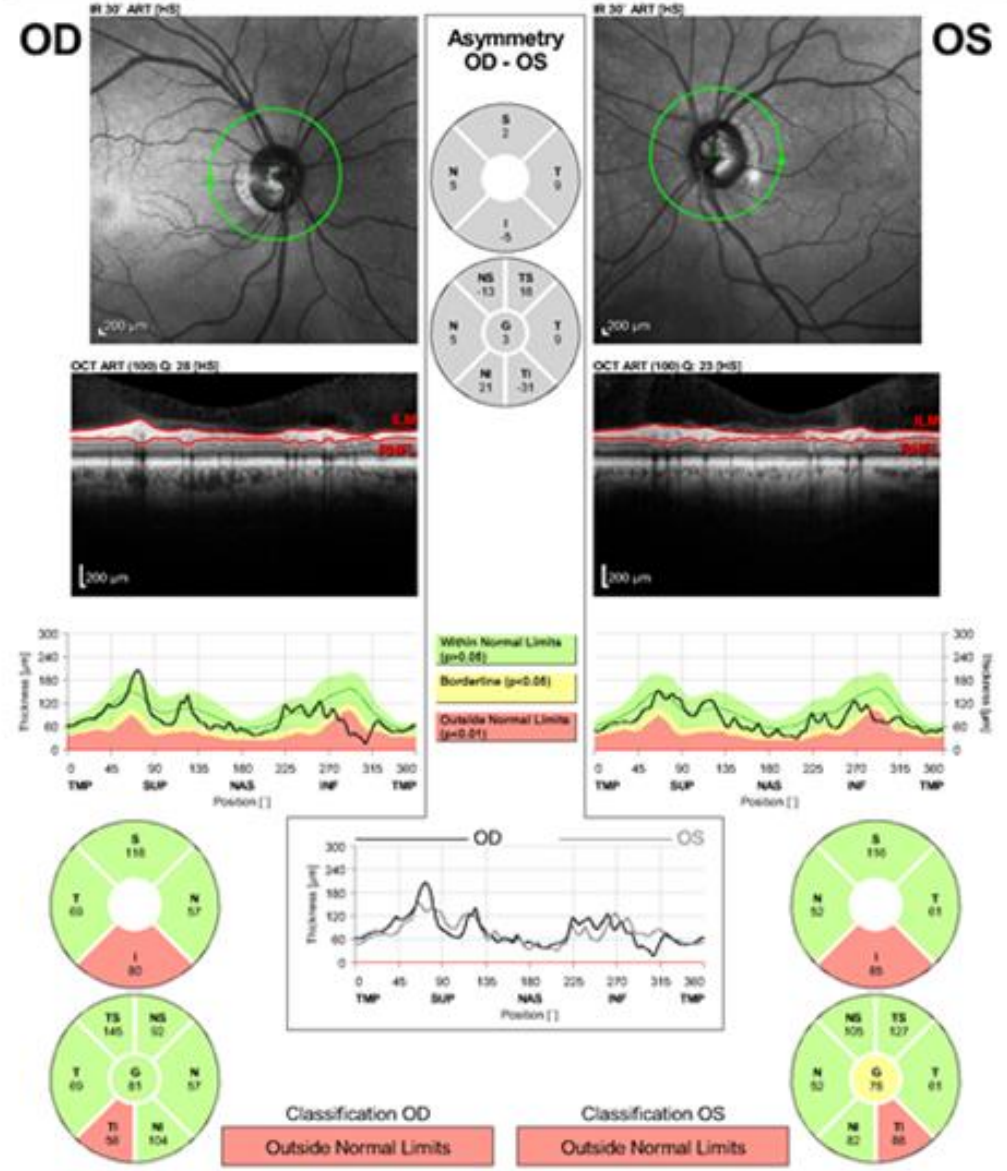
Case 1

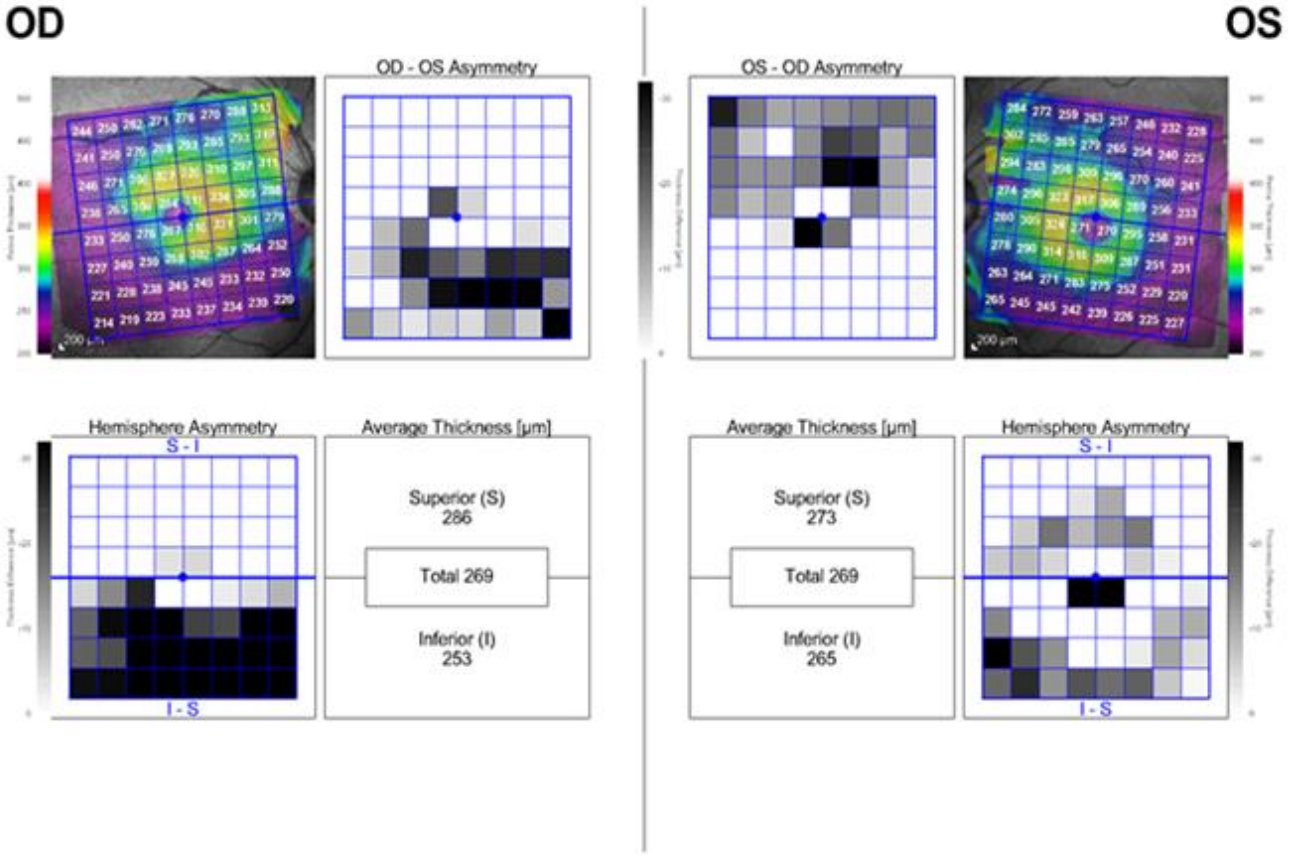






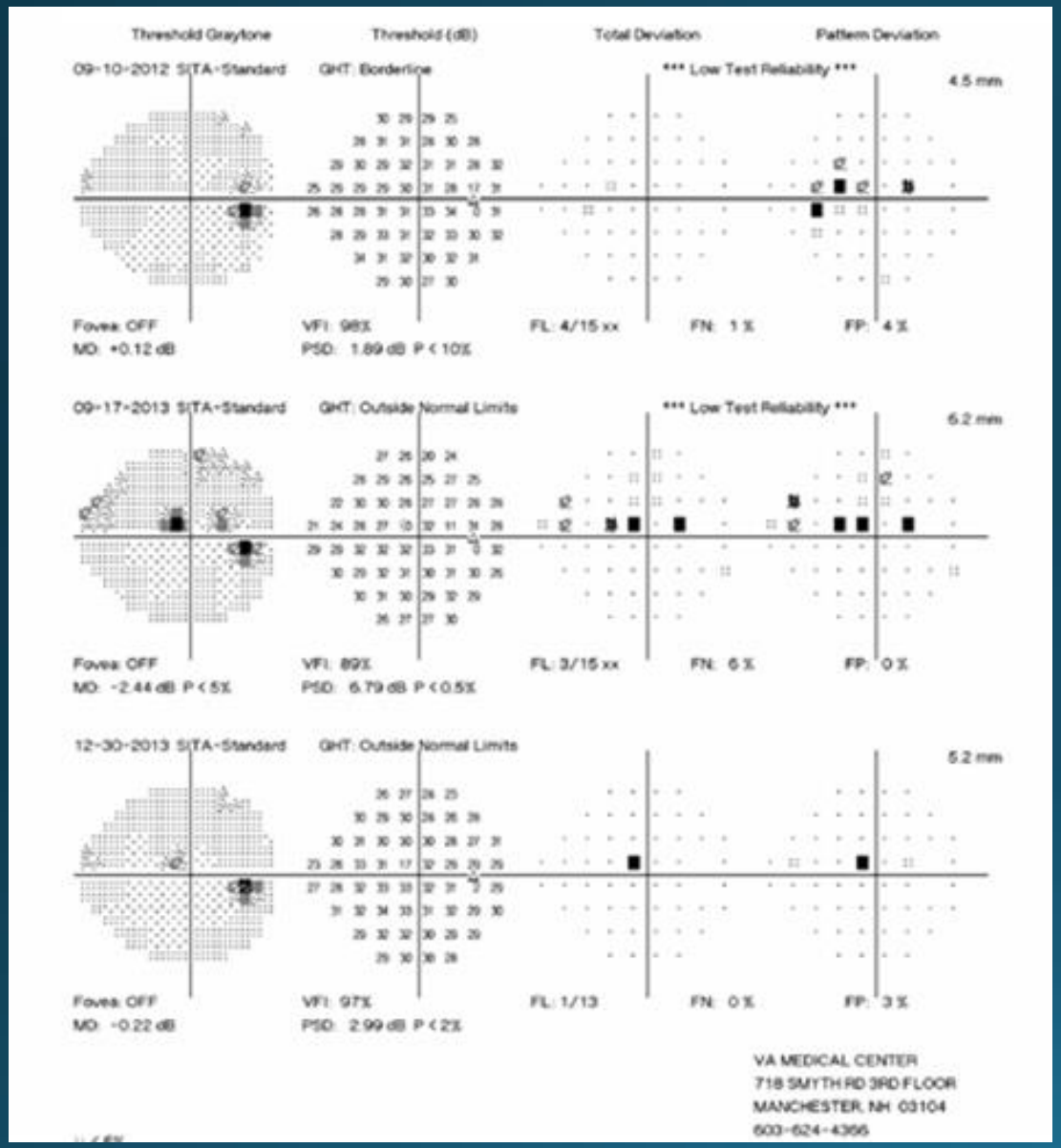


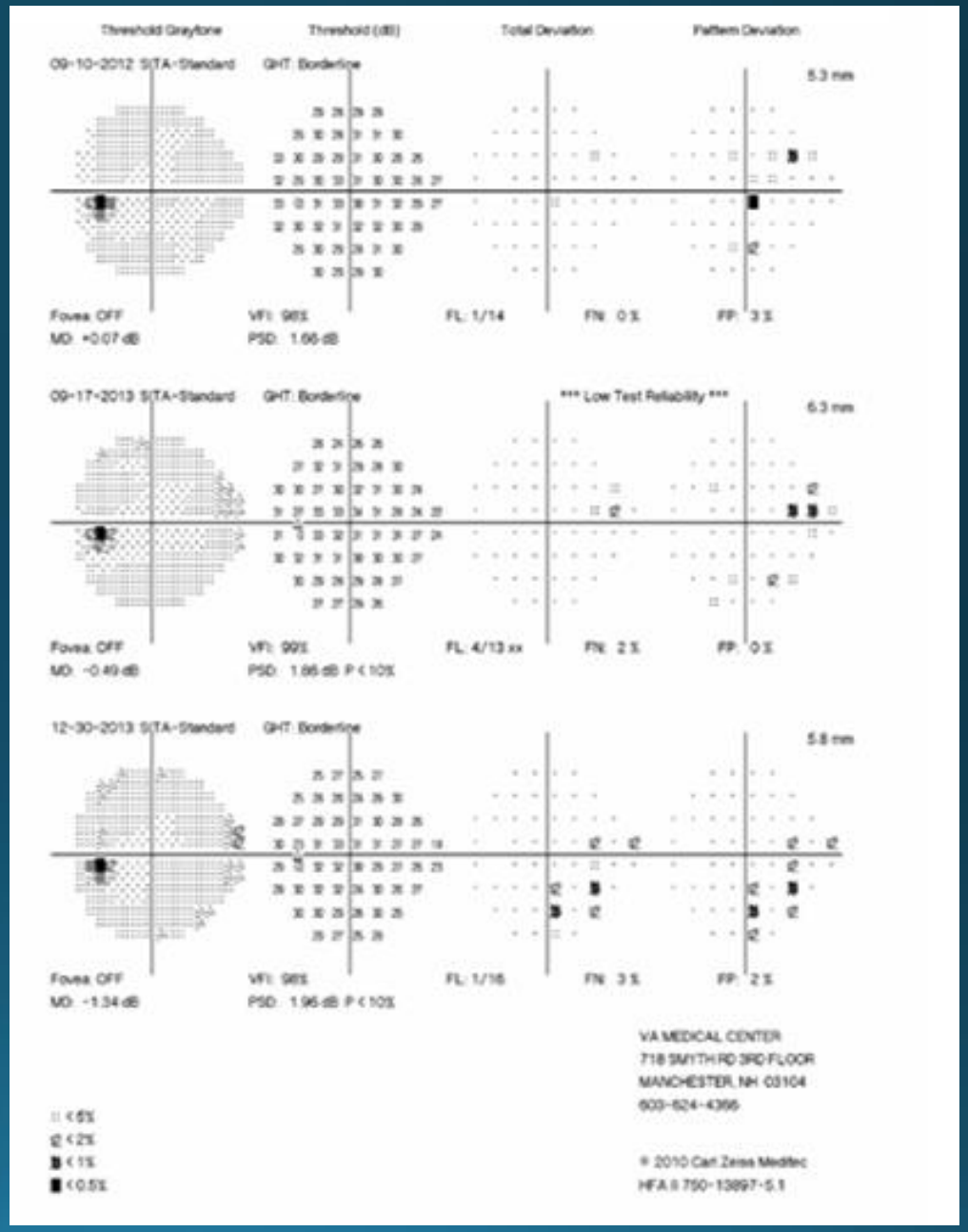

OD
OS
Asymmetry
OD - OS
IR 30° ART [HS]
OCT ART (100) Q: 28 [HS]
OCT ART (100) Q: 23 [HS]
200 µm
Within Normal Limits (p>0.05)
Borderline (p<0.05)
Outside Normal Limits (p<0.01)
TMP
SUP
NAS
INF
Position [°]
Thickness [µm]
Classification OD
Outside Normal Limits
Classification OS
Outside Normal Limits
Warning: Classification results valid for Caucasian eyes only.
Notes:
Date: 10/14/2014
Signature:



Notes:

Date: 10/14/2014 Signature:


Threshold Greytone
Threshold (dB)
Total Deviation
Pattern Deviation
09-10-2012 S(TA-Standard
GHT: Borderline
*** Low Test Reliability ***
4.5 mm
Fovea: OFF
MD: +0.12 dB
VFI: 98%
PSD: 1.89 dB P < 10%
FL: 4/15 xx
FN: 1 %
FP: 4 %
09-17-2013 S(TA-Standard
GHT: Outside Normal Limits
*** Low Test Reliability ***
6.2 mm
Fovea: OFF
MD: -2.44 dB P < 5%
VFI: 89%
PSD: 6.79 dB P < 0.5%
FL: 3/15 xx
FN: 6 %
FP: 0 %
12-30-2013 S(TA-Standard
GHT: Outside Normal Limits
5.2 mm
Fovea: OFF
MD: -0.22 dB
VFI: 97%
PSD: 2.99 dB P < 2%
FL: 1/13
FN: 0 %
FP: 3 %
VA MEDICAL CENTER
718 SMYTH RD 3RD FLOOR
MANCHESTER, NH 03104
603-624-4366


Threshold Greytone
Threshold (dB)
Total Deviation
Pattern Deviation
09-10-2012 S(TA-Standard
GHT: Borderline
5.3 mm
Fovea: OFF
MD: +0.07 dB
VFI: 98%
PSD: 1.66 dB
FL: 1/14
FN: 0 %
FP: 3 %
09-17-2013 S(TA-Standard
GHT: Borderline
*** Low Test Reliability ***
6.3 mm
Fovea: OFF
MD: -0.49 dB
VFI: 99%
PSD: 1.66 dB P < 10%
FL: 4/13 xx
FN: 2 %
FP: 0 %
12-30-2013 S(TA-Standard
GHT: Borderline
5.8 mm
Fovea: OFF
MD: -1.34 dB
VFI: 98%
PSD: 1.96 dB P < 10%
FL: 1/16
FN: 3 %
FP: 2 %
< 5%
< 2%
< 1%
< 0.5%
VA MEDICAL CENTER
718 SMYTH RD 3RD FLOOR
MANCHESTER, NH 03104
603-624-4366
© 2010 Carl Zeiss Meditec
HFA II 750-13897-5.1

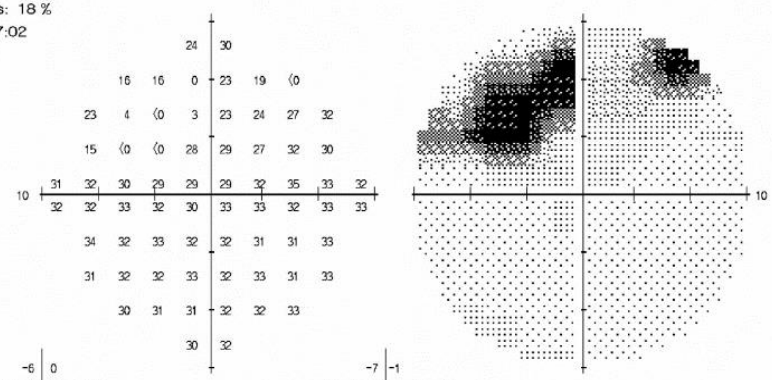
Fixation Monitor: Blind Spot
Fixation Target: Central
Fixation Losses: 5/18 xx
False POS Errors: 0 %
False NEG Errors: 18 %
Test Duration: 07:02

Fovea: OFF

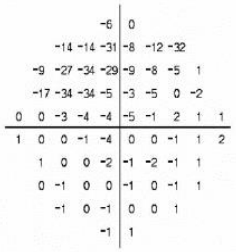
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter: 5.2 mm
Visual Acuity:
RX: +3.00 DS DC X

Date: 01-08-2015
Time: 8:44 AM
Age: 67

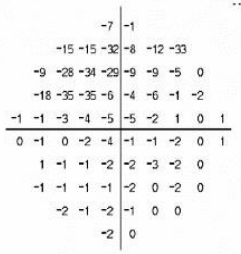


*** Low Test Reliability ***

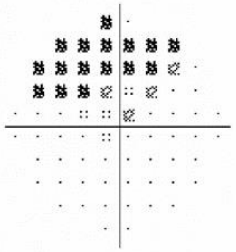


MD -5.15 dB P < 1%
PSD 10.02 dB P < 1%

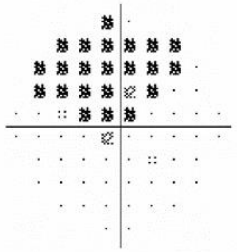
Total Deviation



Pattern Deviation



:: < 5%
▒ < 2%
▓ < 1%



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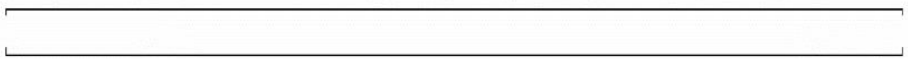


HFA II 750-13897-5.1/5.1

Central 10-2 Threshold Test

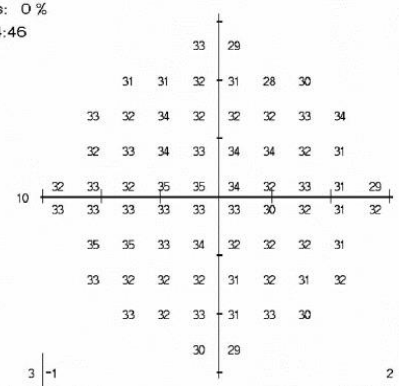
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 1/15
False POS Errors: 1 %
False NEG Errors: 0 %
Test Duration: 04:46

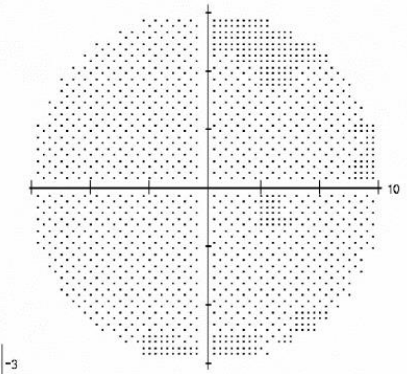
Fovea: OFF

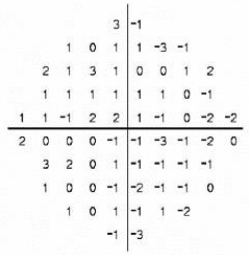
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

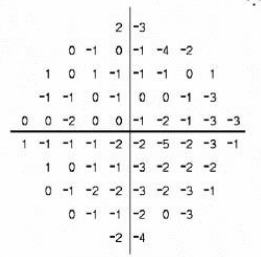
Pupil Diameter: 5.7 mm
Visual Acuity:
RX: +3.00 DS DC X

Date: 01-08-2015
Time: 8:54 AM
Age: 67



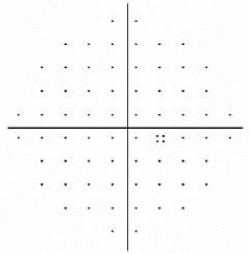




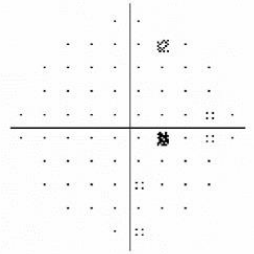


MD +0.09 dB
PSD 1.34 dB

Total Deviation



Pattern Deviation



:: < 5%
▒ < 2%
▓ < 1%

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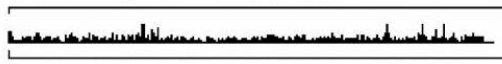
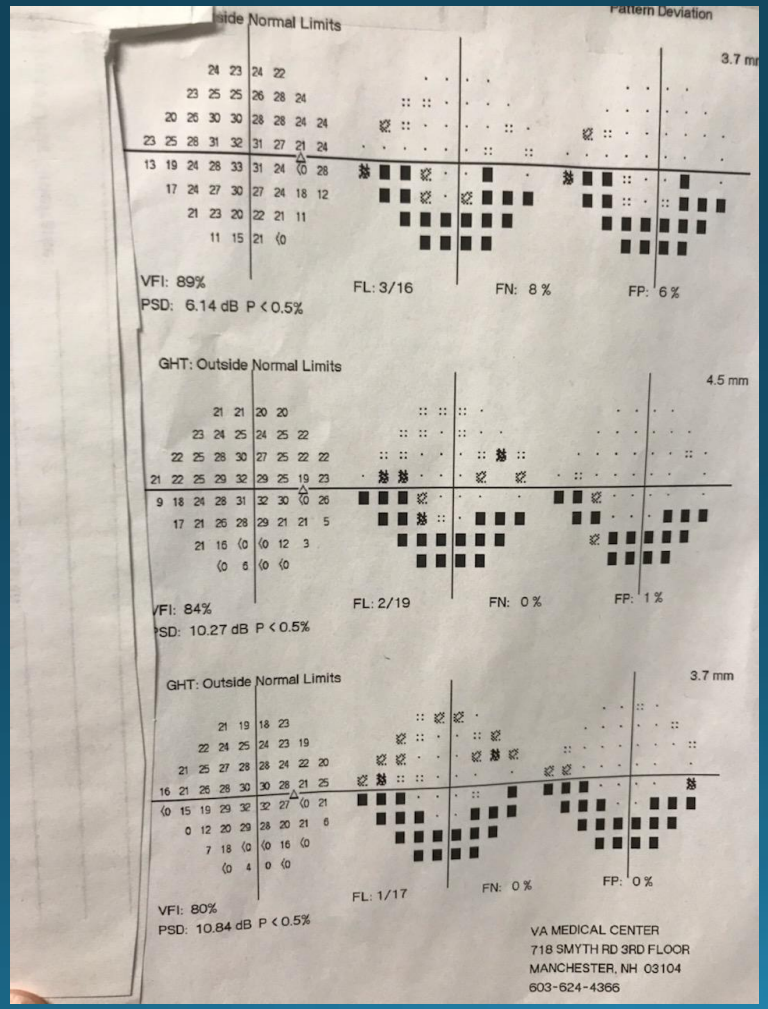
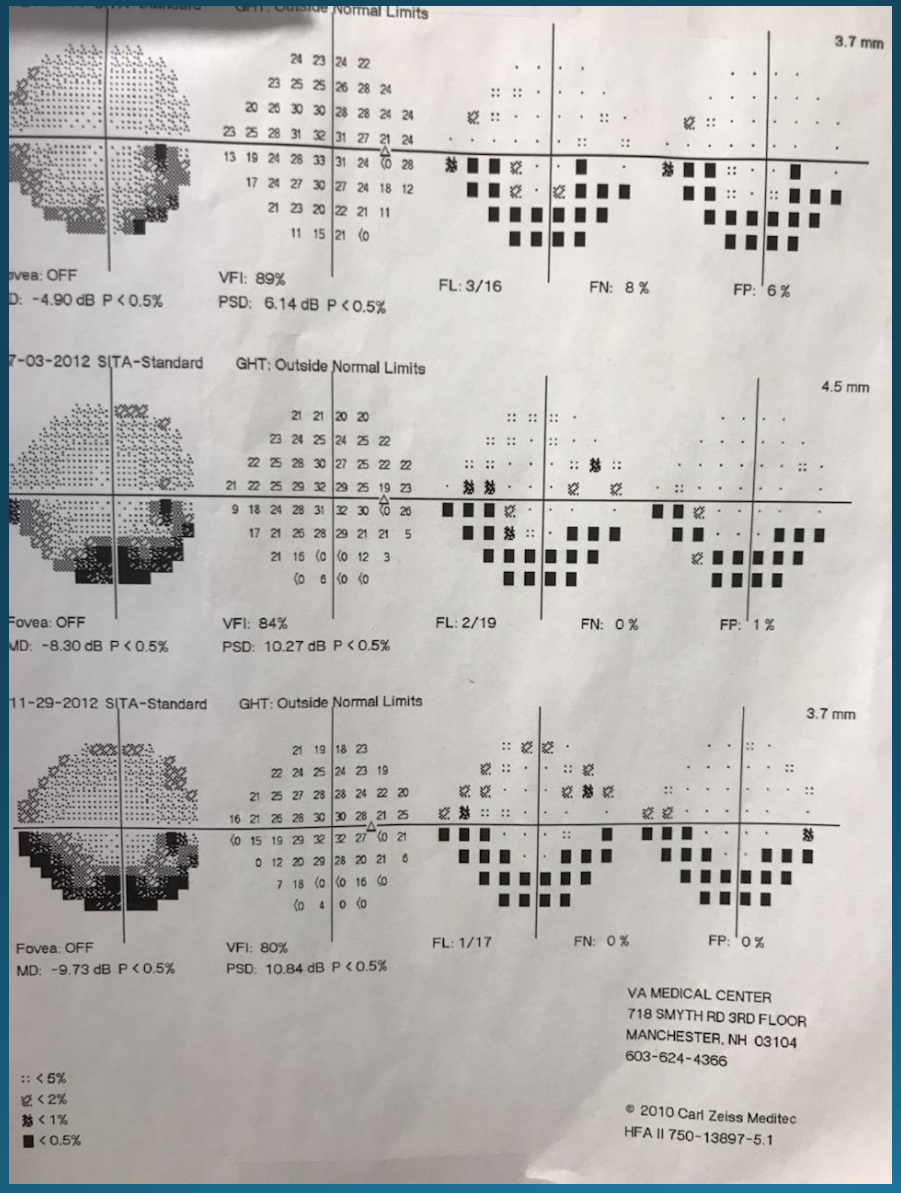


HFA II 750-13897-5.1/5.1

Know when to use the Grayscale!




GHT: Outside Normal Limits
3.7 mm
24 23 24 22
23 25 25 26 28 24
20 26 30 30 28 28 24 24
23 25 28 31 32 31 27 21 24
13 19 24 28 33 31 24 28
17 24 27 30 27 24 18 12
21 23 20 22 21 11
11 15 21
ovea: OFF
D: -4.90 dB P < 0.5%
VFI: 89%
PSD: 6.14 dB P < 0.5%
FL: 3/16
FN: 8 %
FP: 6 %
7-03-2012 S(TA-Standard
GHT: Outside Normal Limits
4.5 mm
21 21 20 20
23 24 25 24 25 22
22 25 28 30 27 25 22 22
21 22 25 29 32 29 25 19 23
9 18 24 28 31 32 30 26
17 21 26 28 29 21 21 5
21 15 12 3
6
Fovea: OFF
MD: -8.30 dB P < 0.5%
VFI: 84%
PSD: 10.27 dB P < 0.5%
FL: 2/19
FN: 0 %
FP: 1 %
11-29-2012 S(TA-Standard
GHT: Outside Normal Limits
3.7 mm
21 19 18 23
22 24 25 24 23 19
21 25 27 28 28 24 22 20
16 21 26 28 30 30 28 21 25
15 19 29 32 32 27 21
0 12 20 29 28 20 21 6
7 18 16
4 0
Fovea: OFF
MD: -9.73 dB P < 0.5%
VFI: 80%
PSD: 10.84 dB P < 0.5%
FL: 1/17
FN: 0 %
FP: 0 %
:: < 5%
< 2%
< 1%
< 0.5%
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