Correlate Clinically: Fusing Form and Function

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Eye Institute

Financial Disclosures

- none

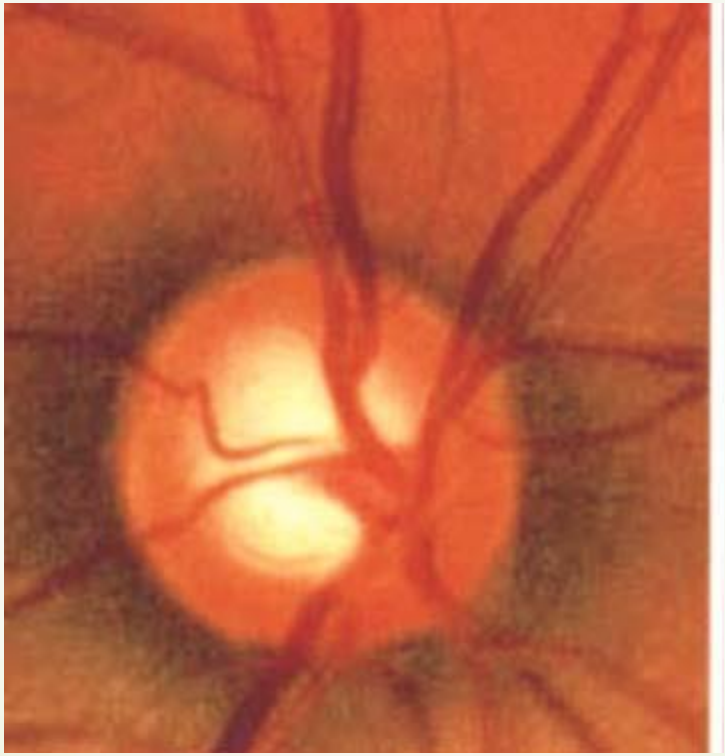
Objectives

- Understand how to analyze OCT and HVF in the context of the clinical exam and history
- Understand the technical limitations of OCT and HVF
- Be exposed to how non-optic nerve related pathology can affect the OCT and HVF findings


POORMD.COM
...appears to be a possible, borderline, indeterminate, equivocal, suspected pixel, probably of questionable significance. Clinical correlation needed... maybe...


It's a Fan!
It's a Spear!
It's a Wall!
It's a Rope!
It's a Snake!
It's a Tree!

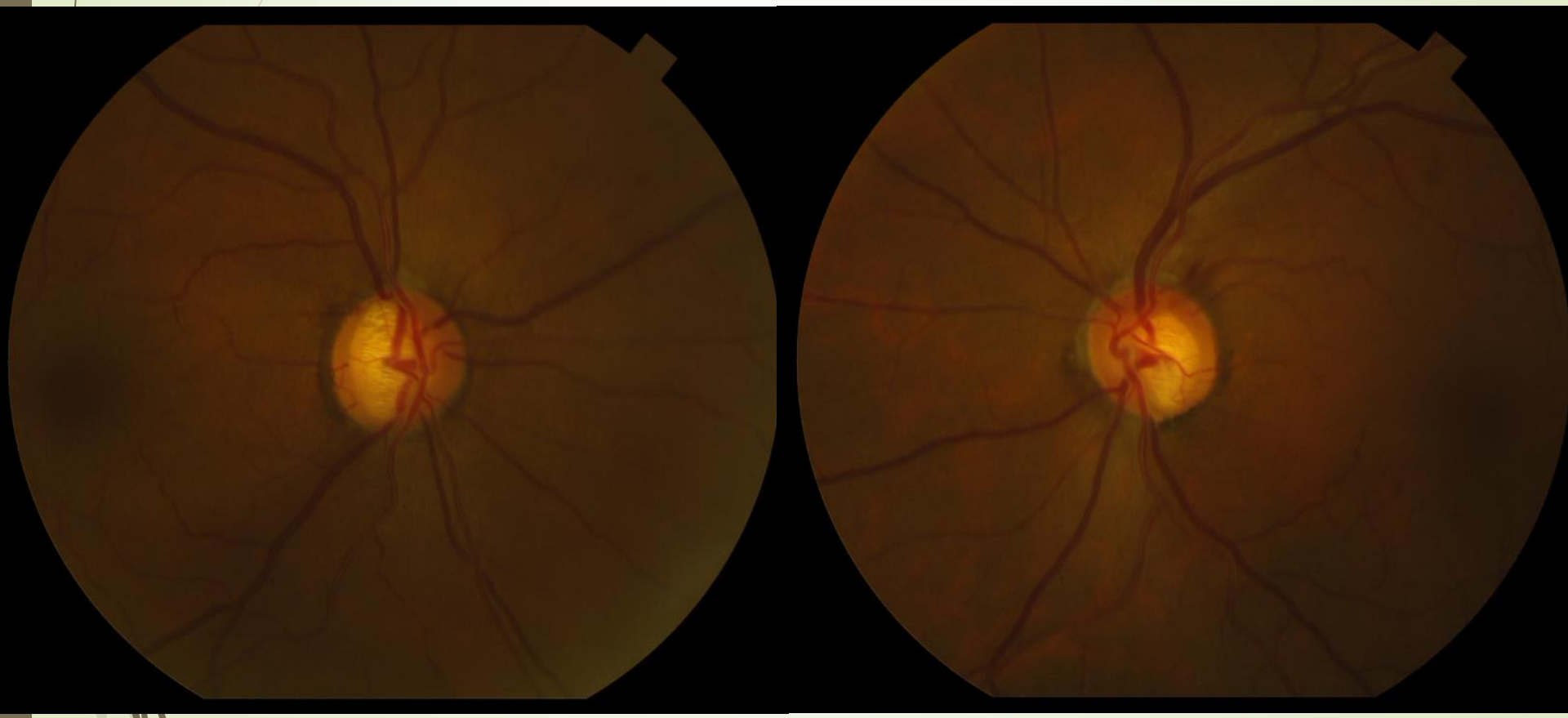
Glaucoma or Not-glaucoma?



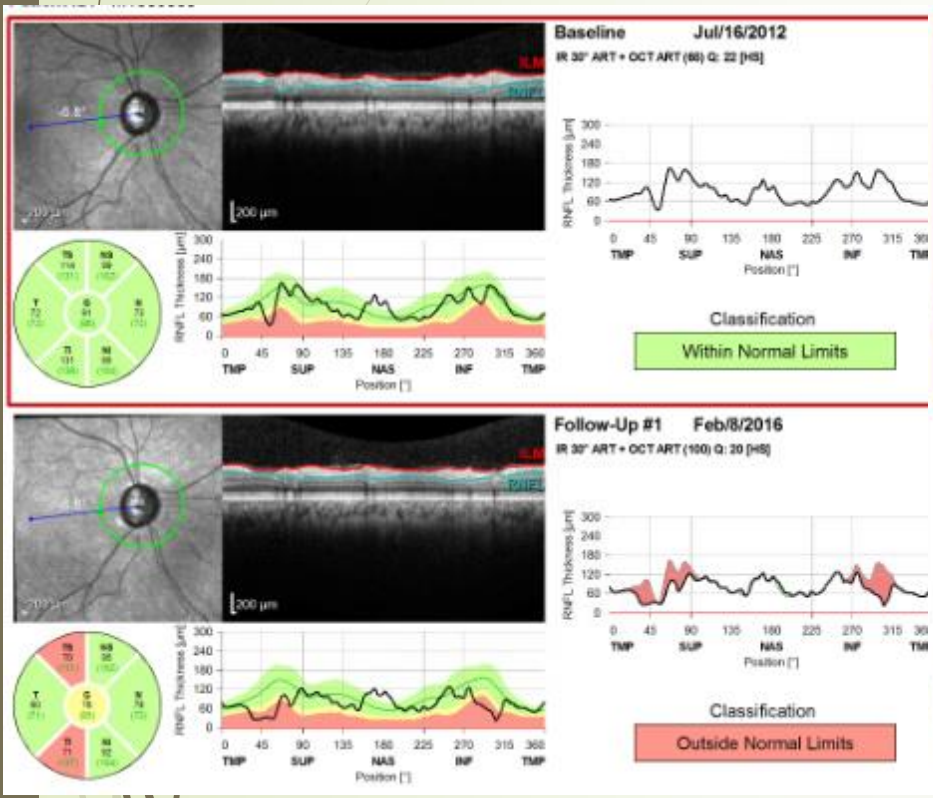

Risk Factors
IOP, Family history,
CCT, ethnicity, etc
Form
Optic nerve structure (OCT)
Function
HVF

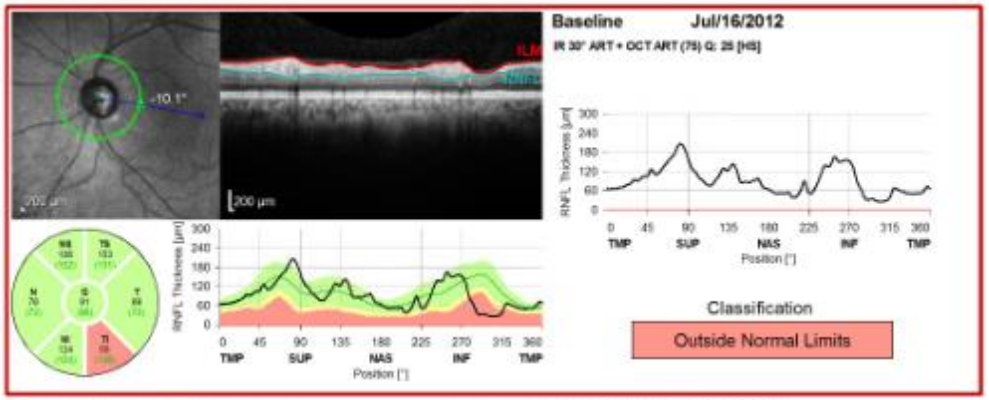
Case 1

64 yo M with IOP 15

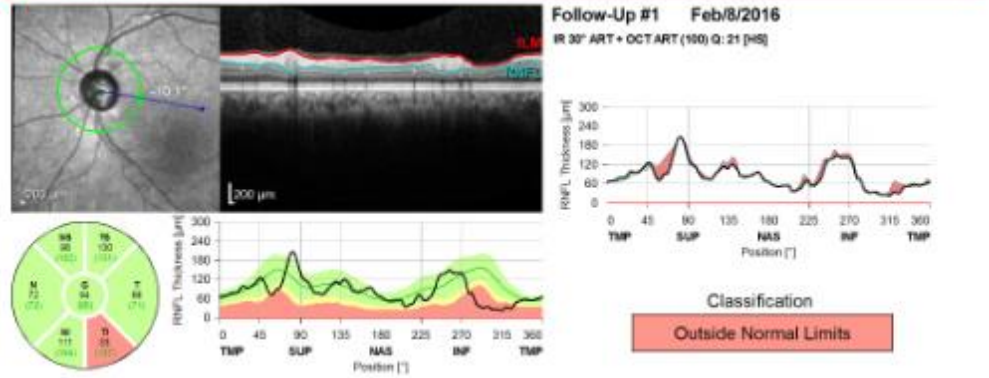


Case 1

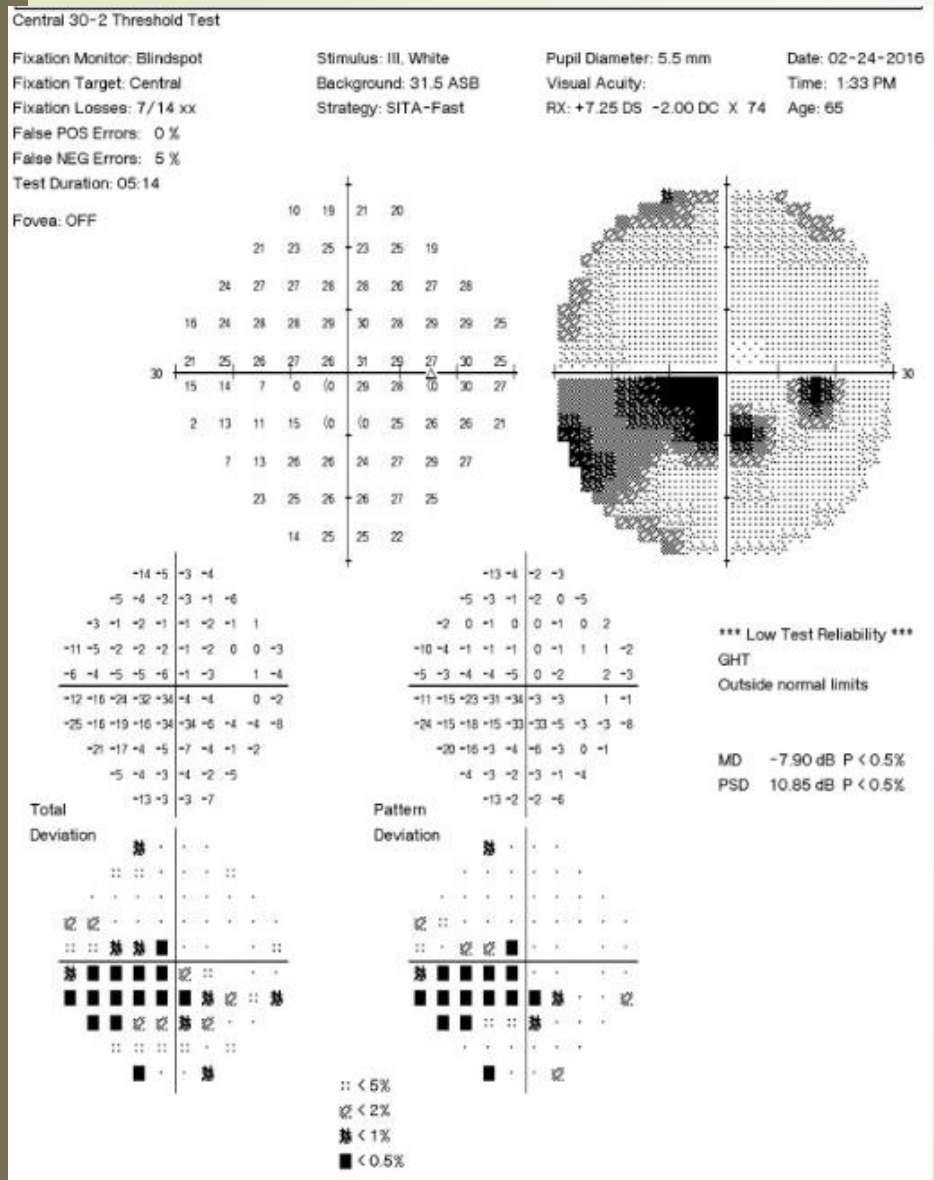

Baseline Jul/16/2012
IR 30° ART + OCT ART (66) Q: 22 [HS]
RNFL Thickness [µm]
TMP SUP NAS INF TMP
Position [°]
Classification
Within Normal Limits

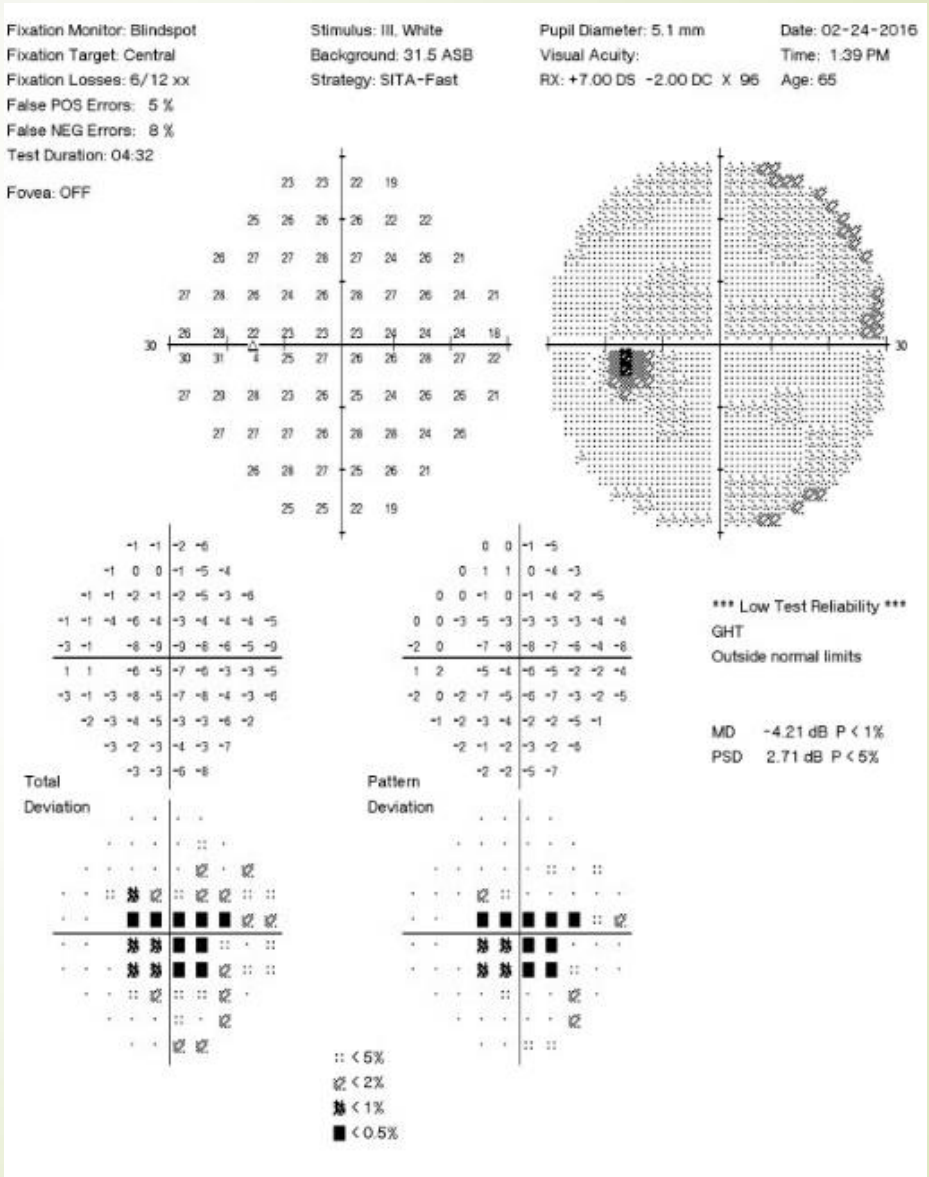

Baseline Jul/16/2012
IR 30° ART + OCT ART (75) Q: 25 [HS]
RNFL Thickness [µm]
TMP SUP NAS INF TMP
Position [°]
Classification
Outside Normal Limits

Follow-Up #1 Feb/8/2016
IR 30° ART + OCT ART (100) Q: 20 [HS]
RNFL Thickness [µm]
TMP SUP NAS INF TMP
Position [°]
Classification
Outside Normal Limits


Follow-Up #1 Feb/8/2016
IR 30° ART + OCT ART (100) Q: 21 [HS]
RNFL Thickness [µm]
TMP SUP NAS INF TMP
Position [°]
Classification
Outside Normal Limits

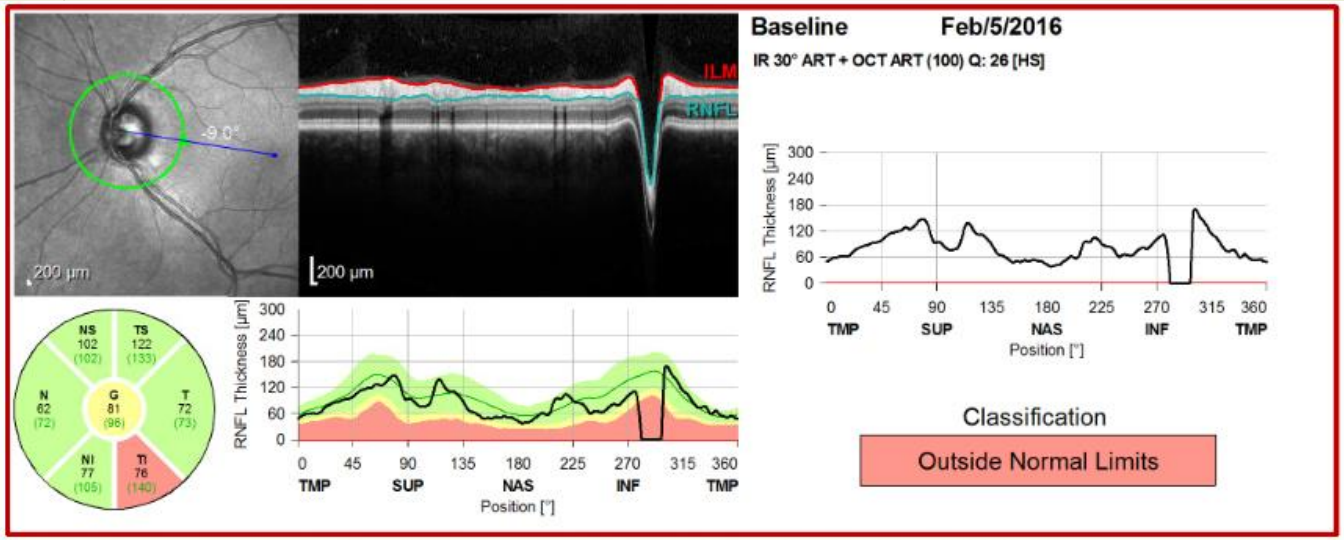
Case 1

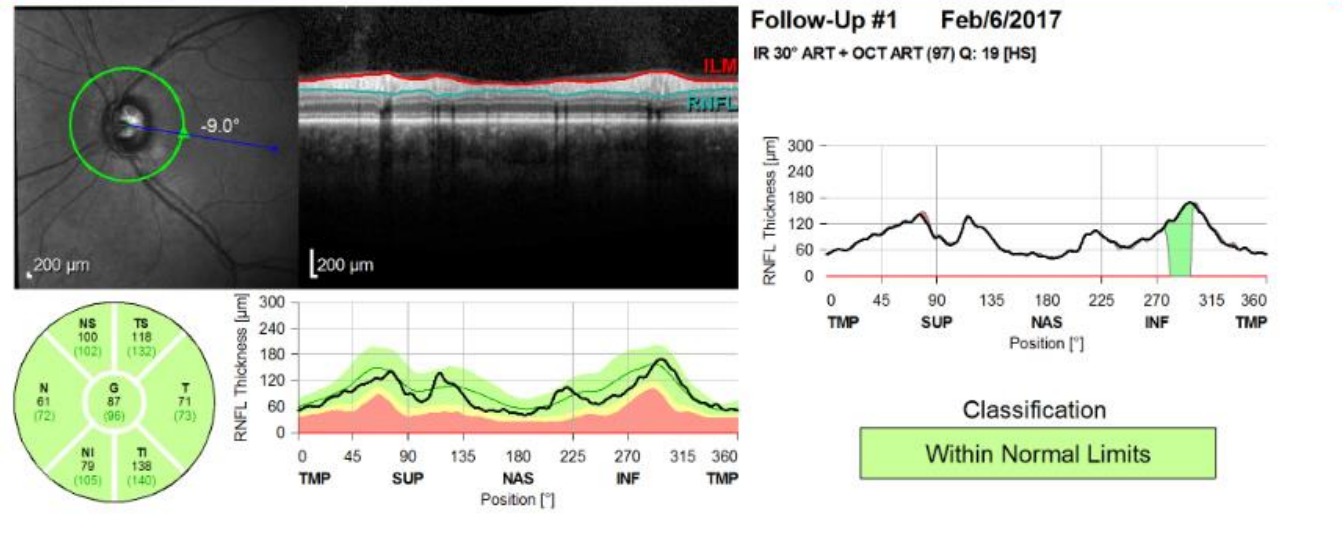

Central 30-2 Threshold Test
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 7/14 xx
False POS Errors: 0 %
False NEG Errors: 5 %
Test Duration: 05:14
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast
Pupil Diameter: 5.5 mm
Visual Acuity:
RX: +7.25 DS -2.00 DC X 74
Date: 02-24-2016
Time: 1:33 PM
Age: 65
Fovea: OFF
Total Deviation
Pattern Deviation
:: < 5%
< 2%
< 1%
< 0.5%
*** Low Test Reliability ***
GHT
Outside normal limits
MD -7.90 dB P < 0.5%
PSD 10.85 dB P < 0.5%


Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 6/12 xx
False POS Errors: 5 %
False NEG Errors: 8 %
Test Duration: 04:32
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast
Pupil Diameter: 5.1 mm
Visual Acuity:
RX: +7.00 DS -2.00 DC X 96
Date: 02-24-2016
Time: 1:39 PM
Age: 65
Fovea: OFF
Total Deviation
Pattern Deviation
:: < 5%
< 2%
< 1%
< 0.5%
*** Low Test Reliability ***
GHT
Outside normal limits
MD -4.21 dB P < 1%
PSD 2.71 dB P < 5%

Case 2

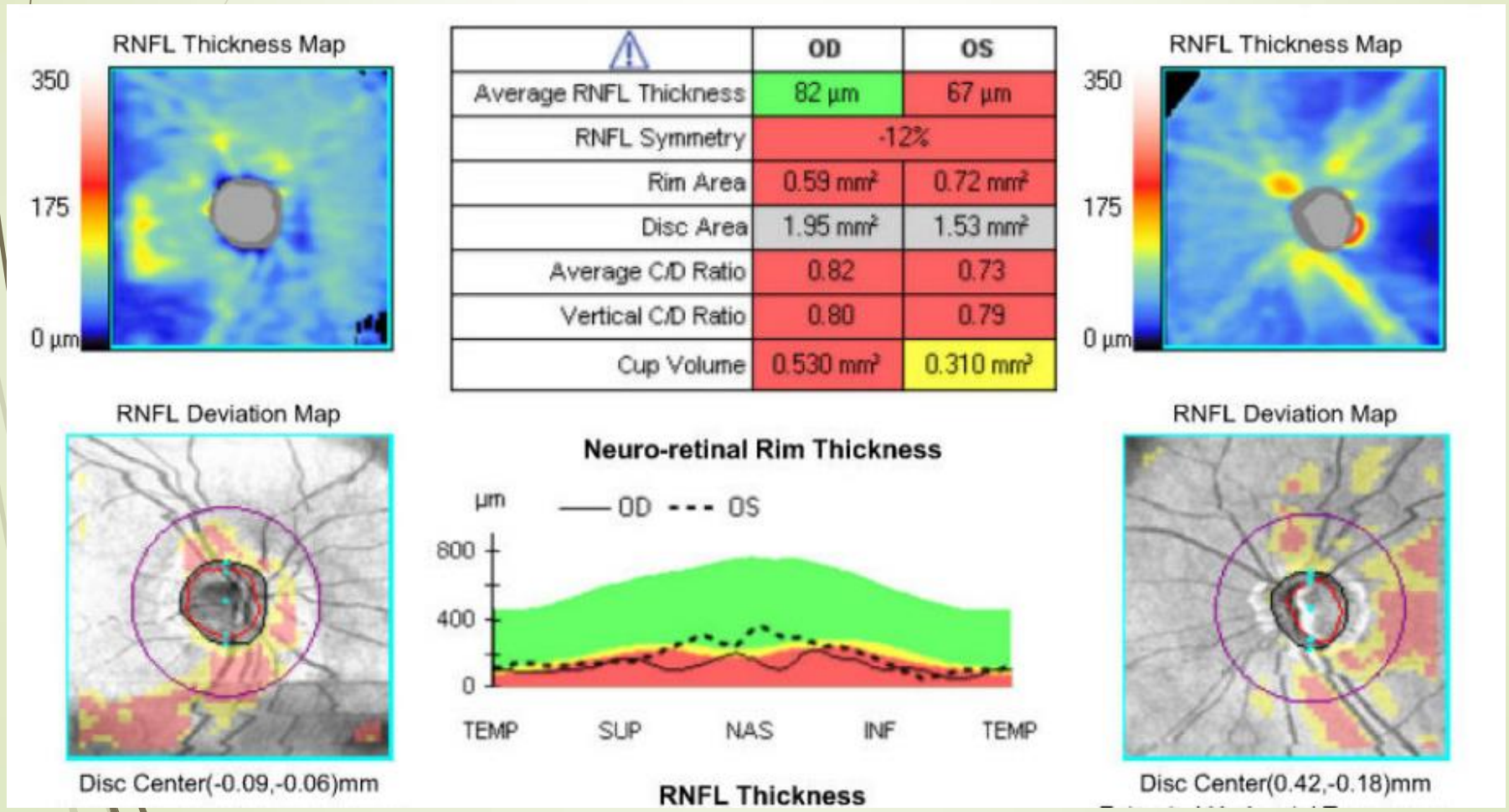
56 M with plateau iris





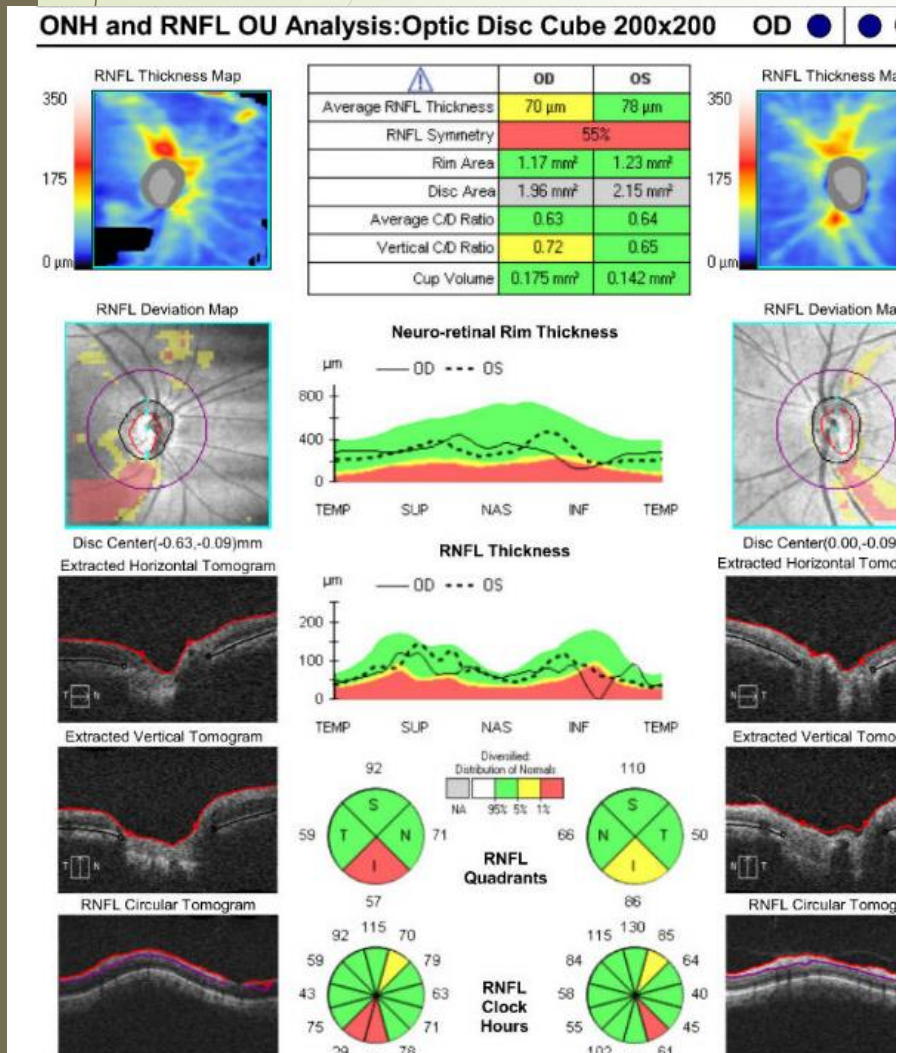
Examples of OCT artifacts

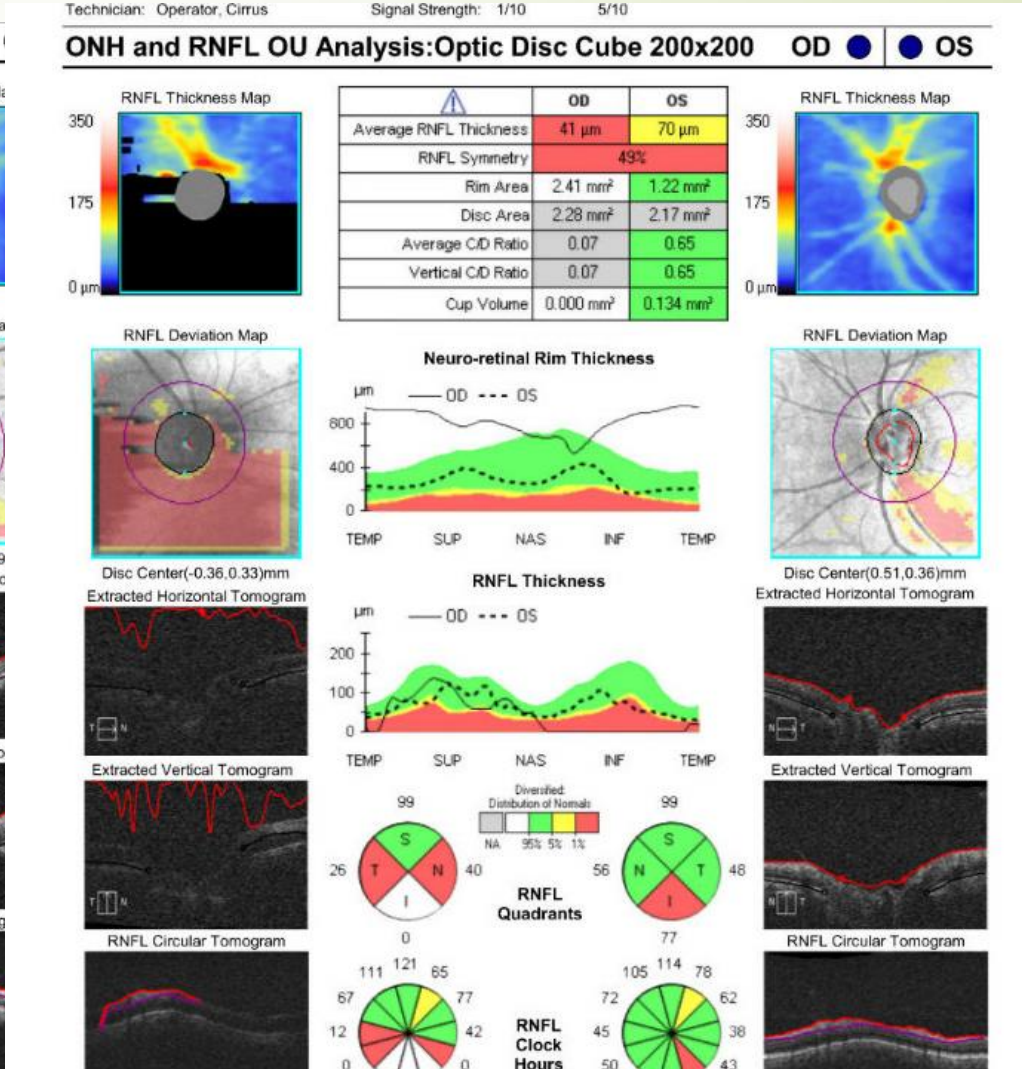
Motion artifact



Examples of OCT artifacts

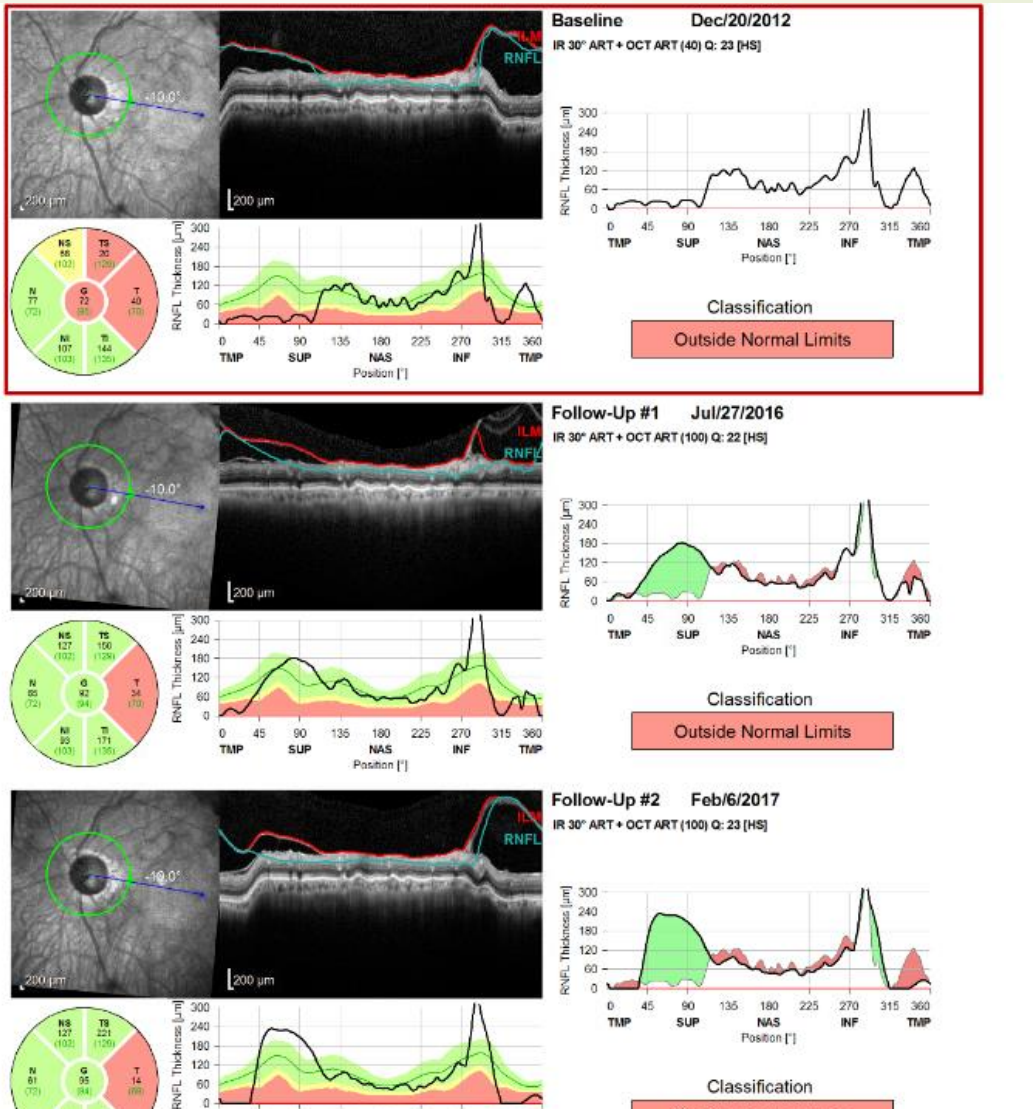
Media opacities



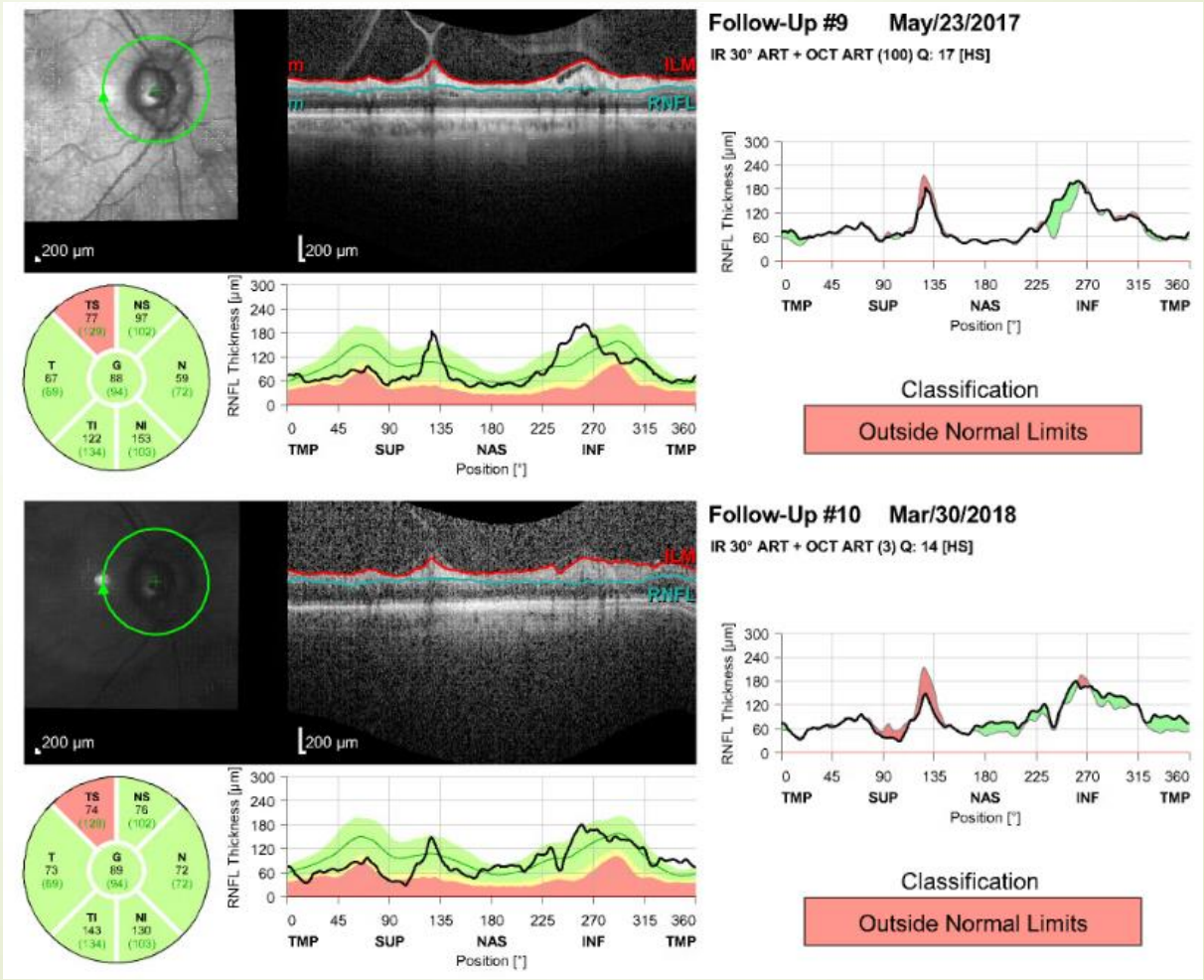


Examples of OCT artifacts

Segmentation errors

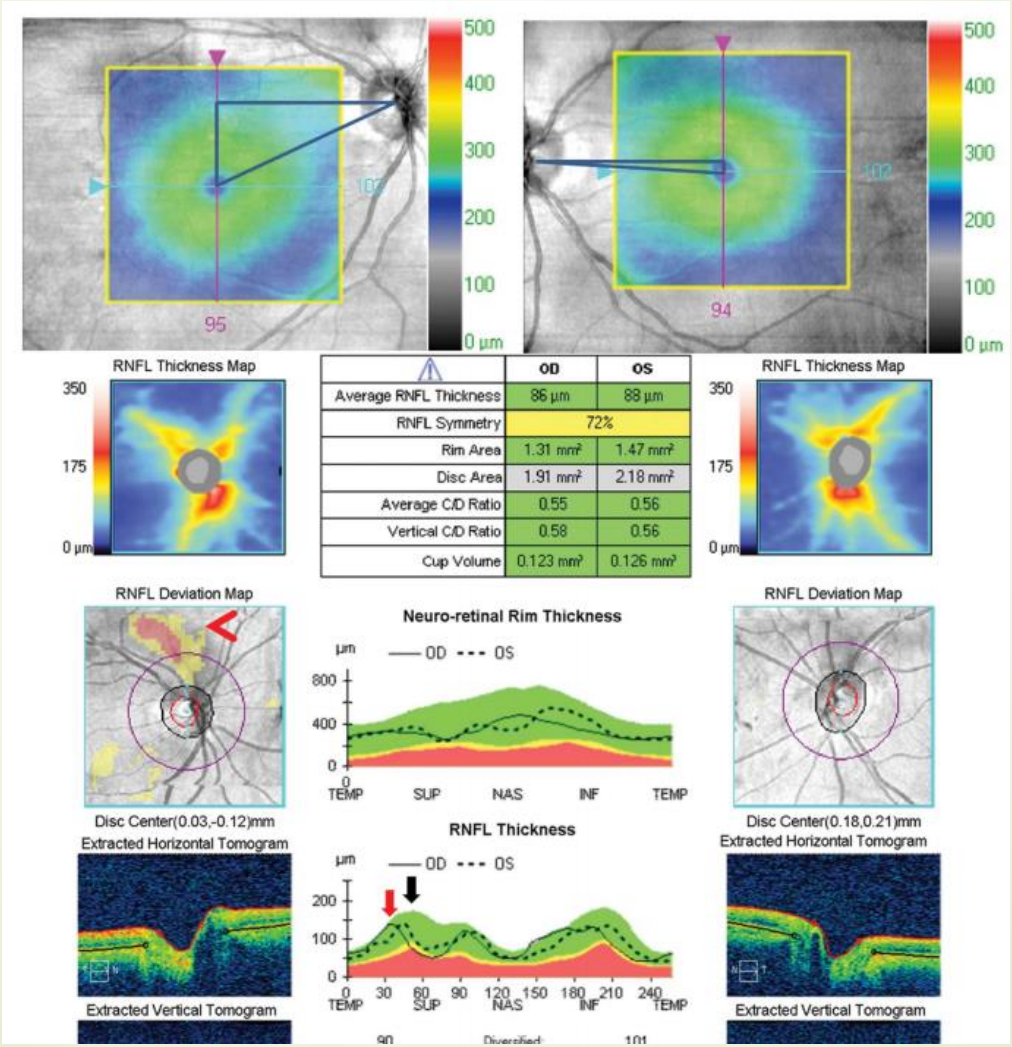


Examples of OCT artifacts



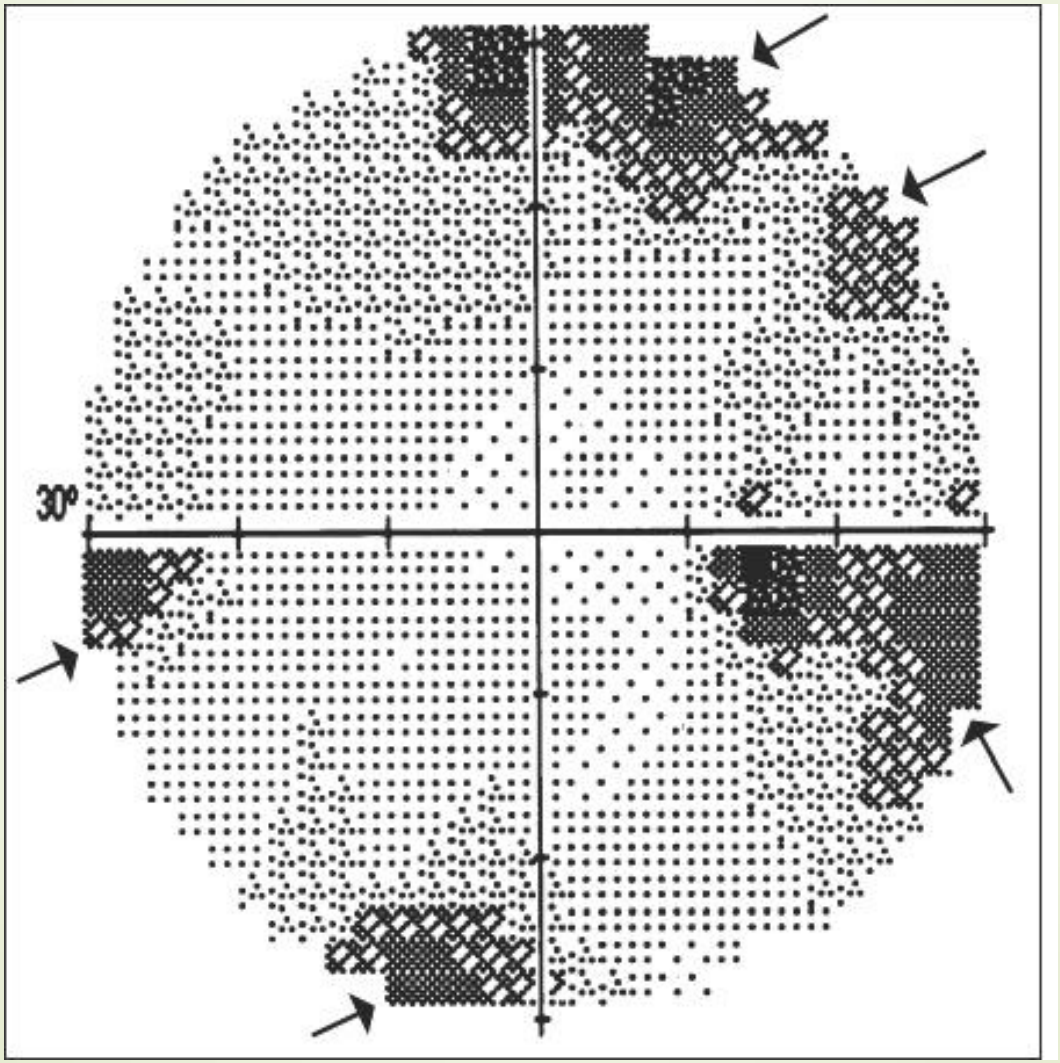
Examples of OCT artifacts

Rotational errors



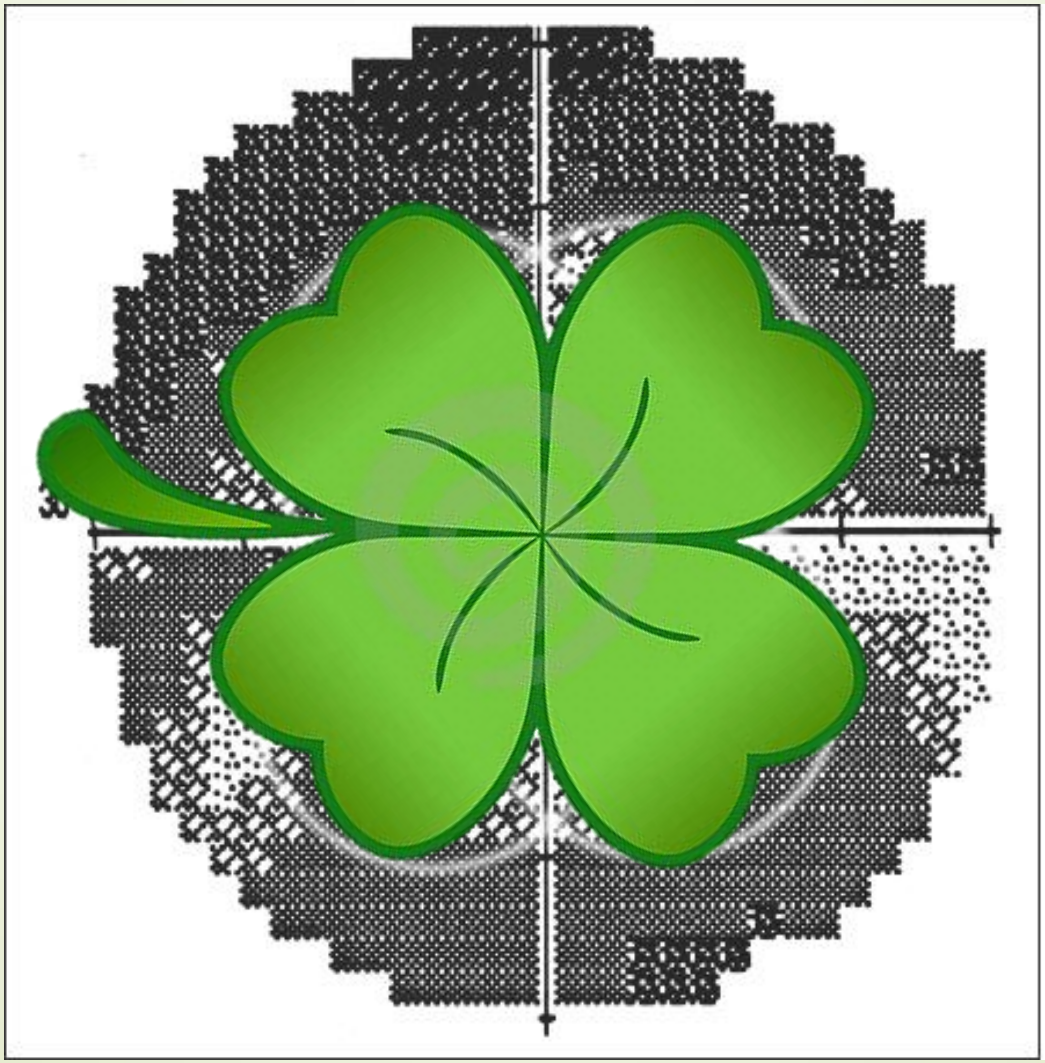
Visual Field Artifacts

Cloverleaf



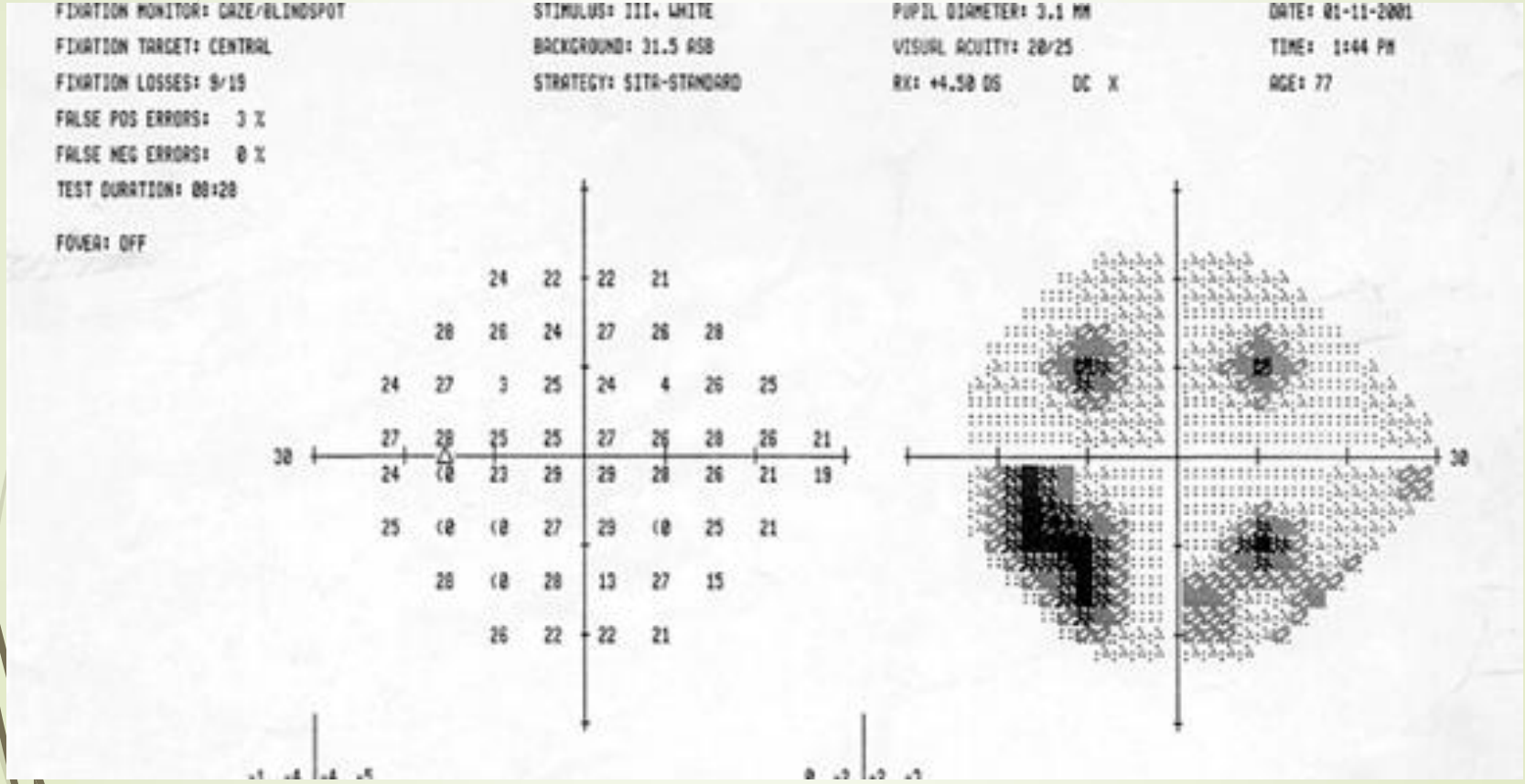
Visual Field Artifacts

Cloverleaf



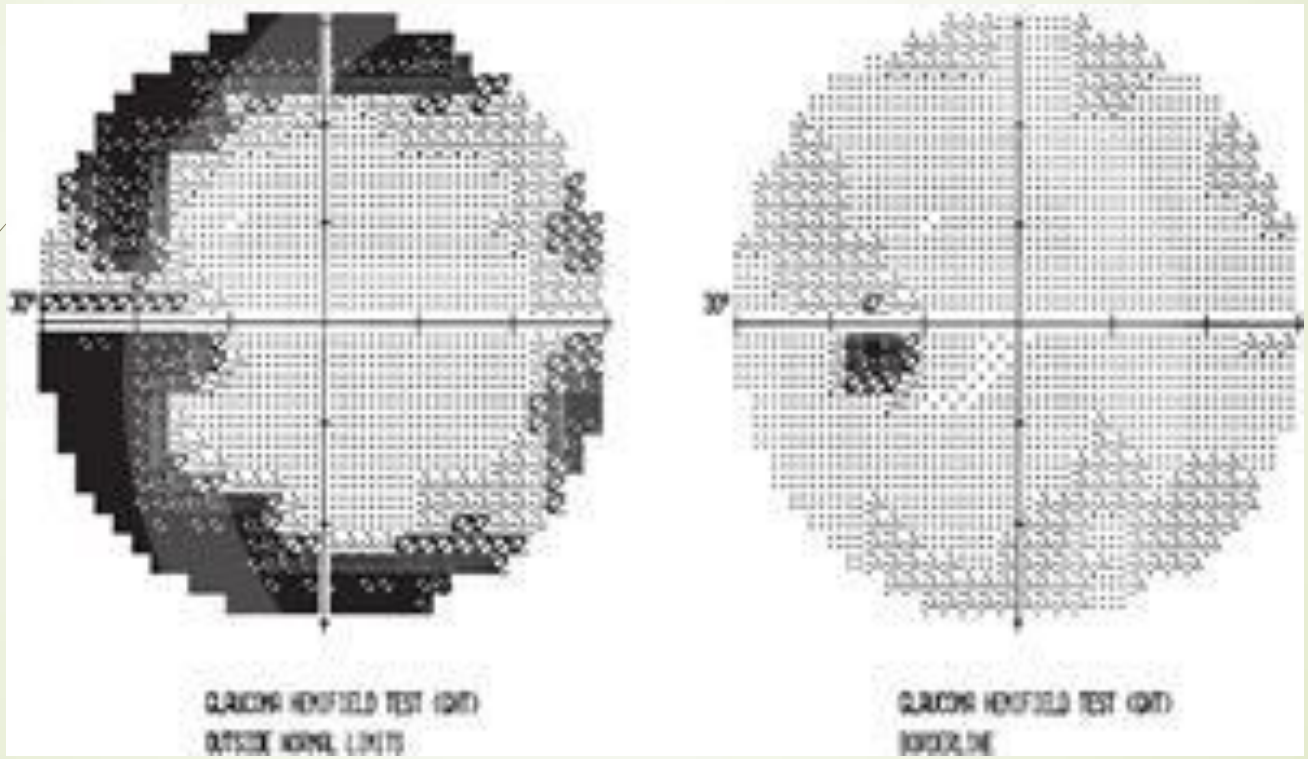
Visual Field Artifacts

Reverse Cloverleaf



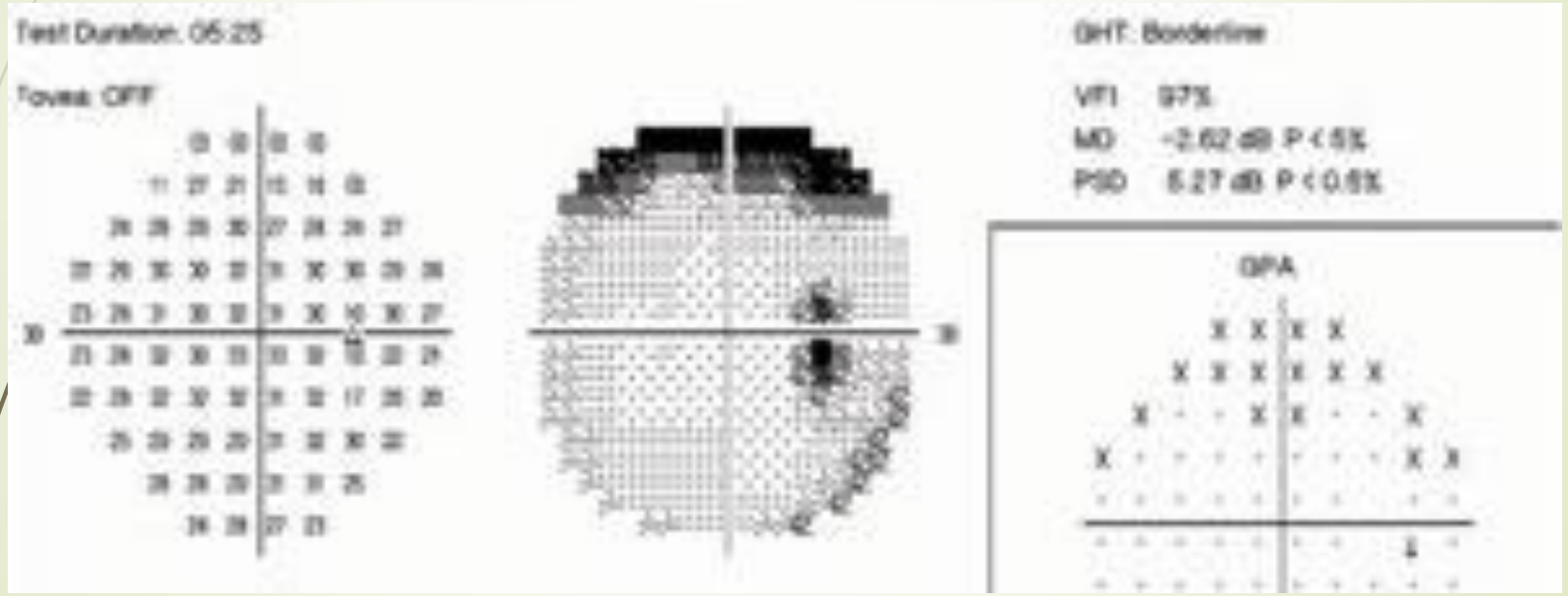
Visual Field Artifacts

Rim artifact



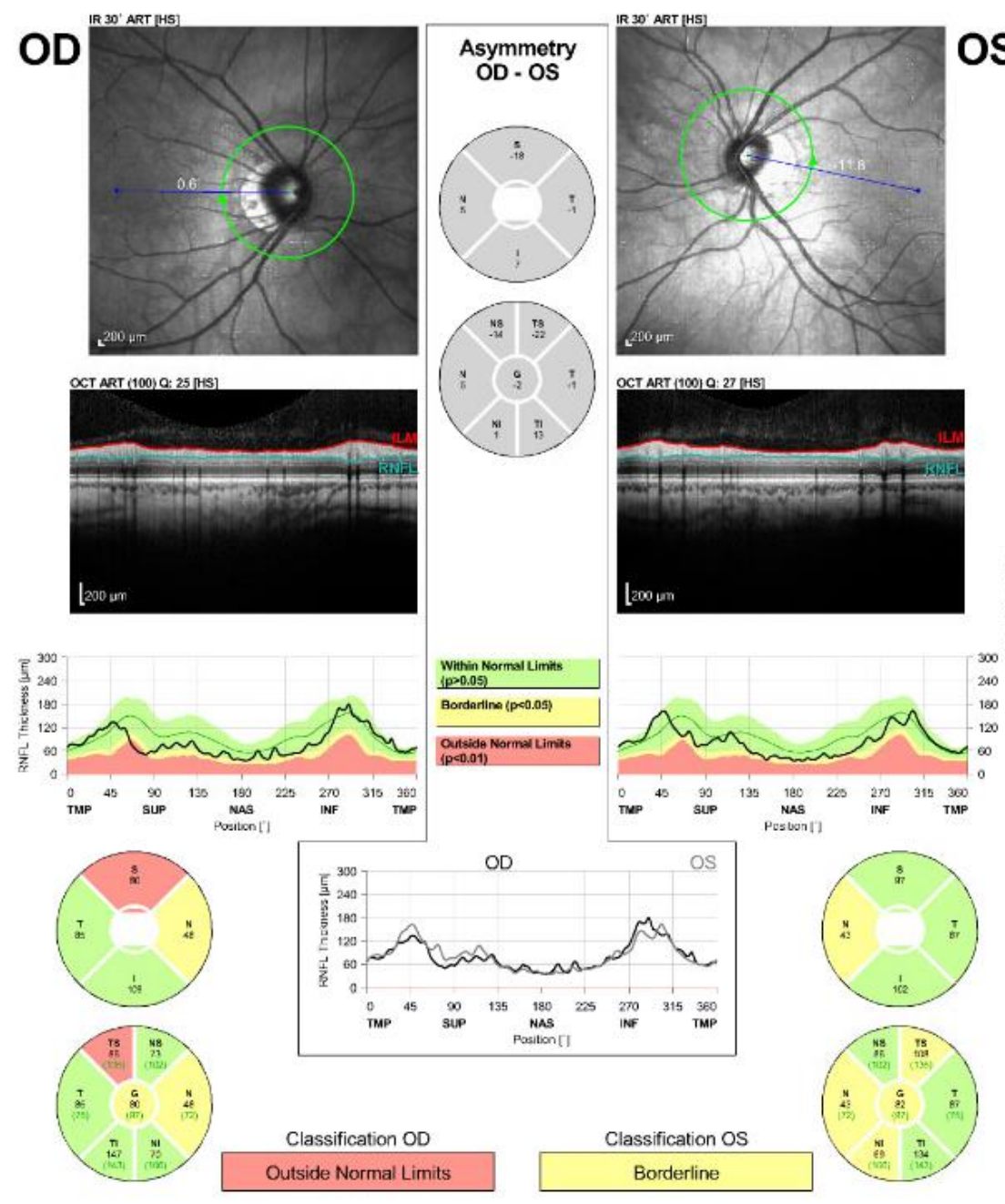
Visual Field Artifacts

Lid artifact



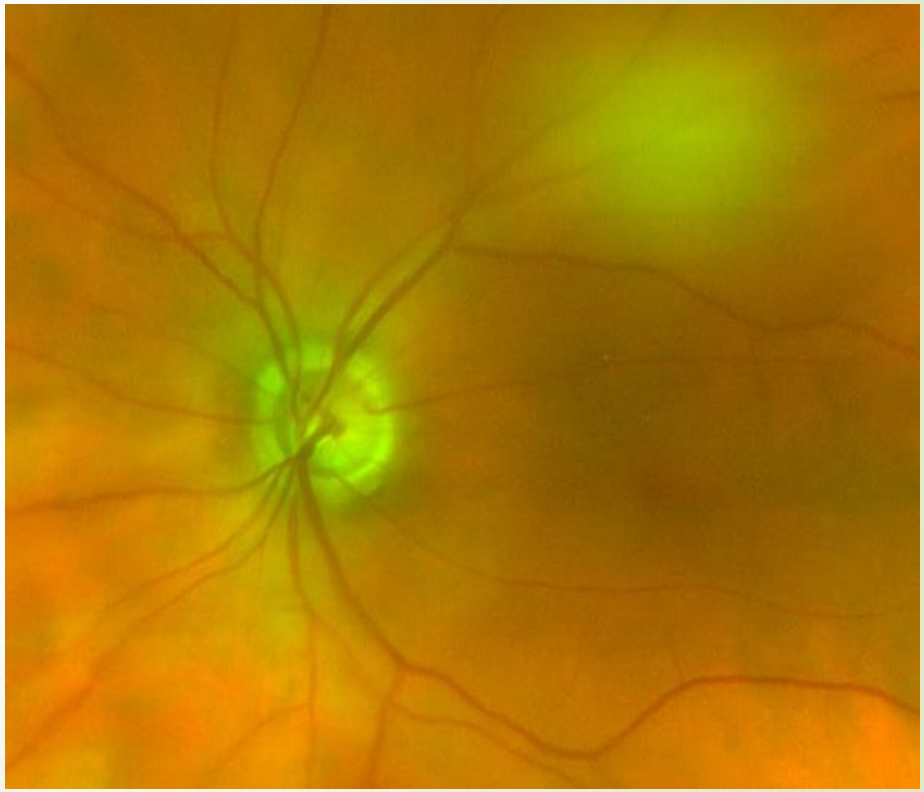
Case 3

38 yo F with h/o LASIK
IOP 17/18
CCT 482/520
HVF wnl

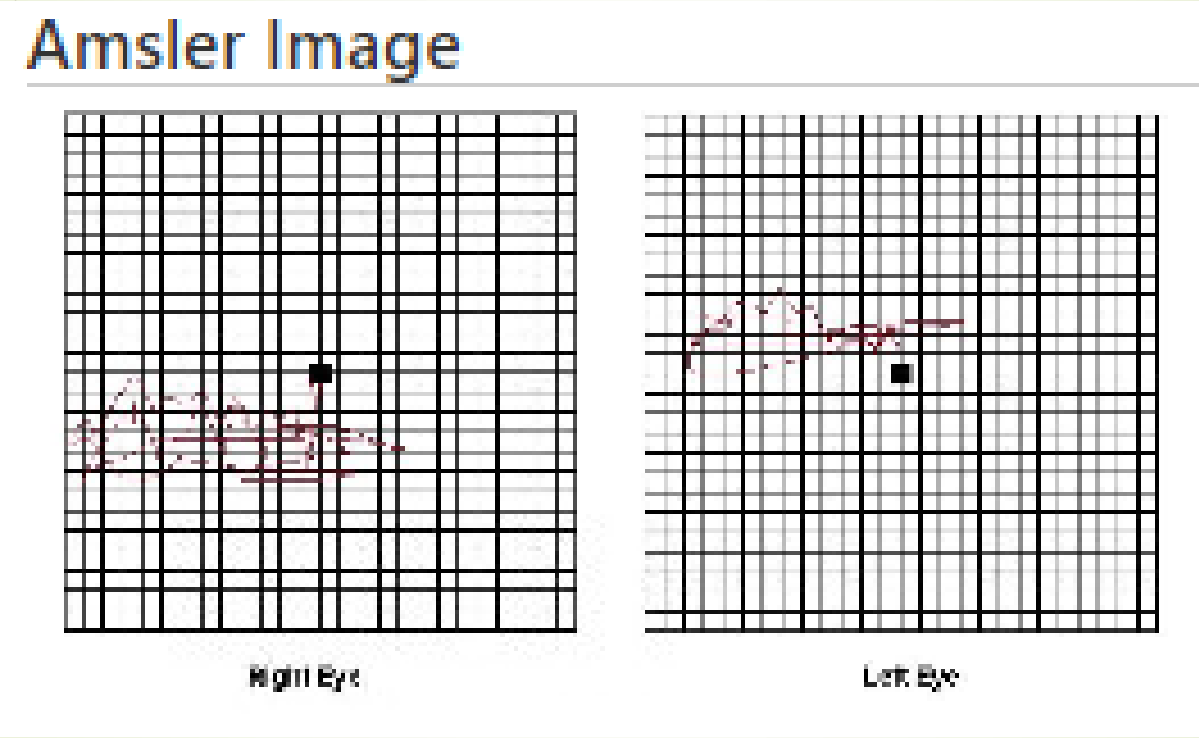


Case 4

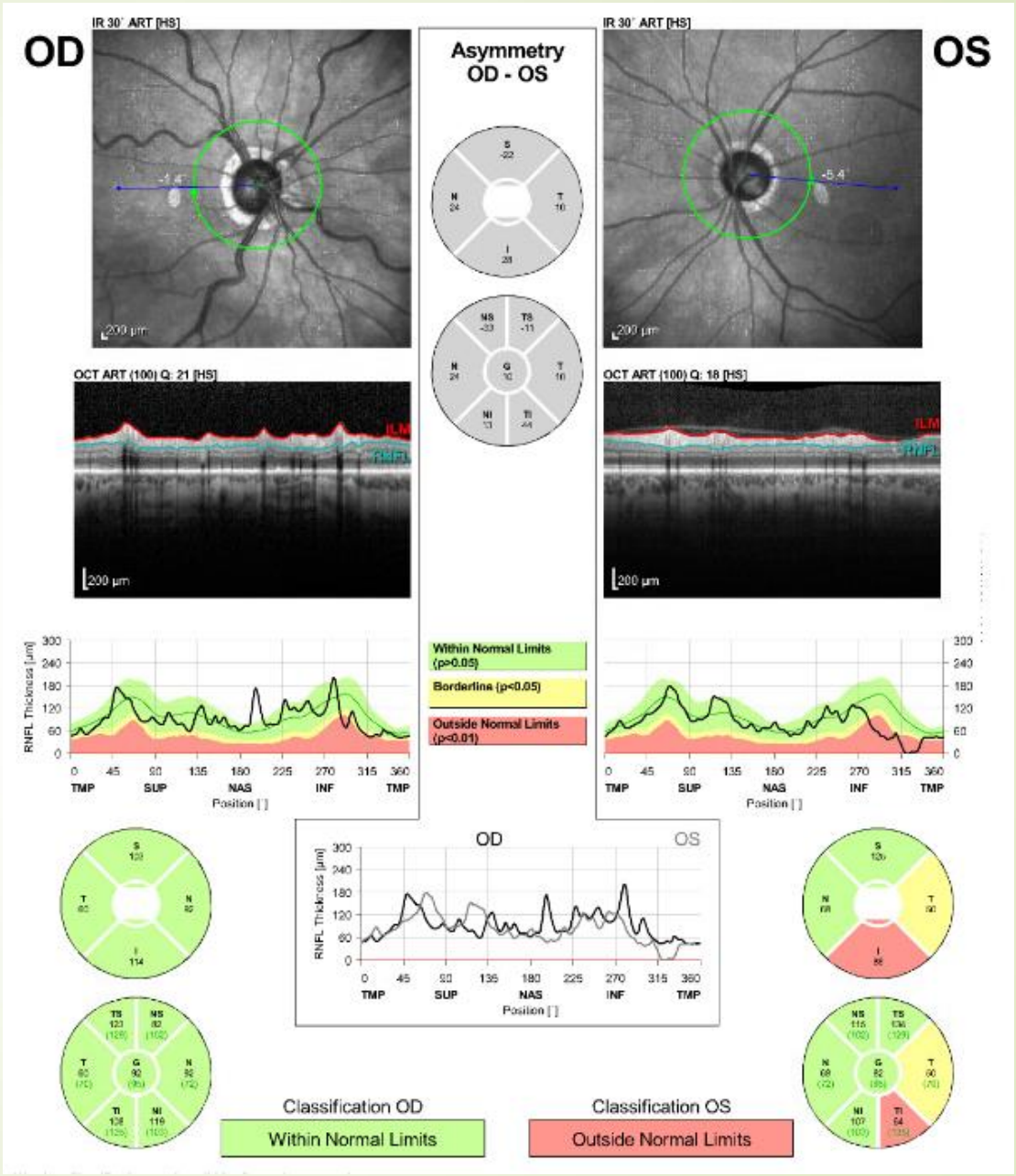
74 yo M with NTG, c/o progressive blurry spots OU



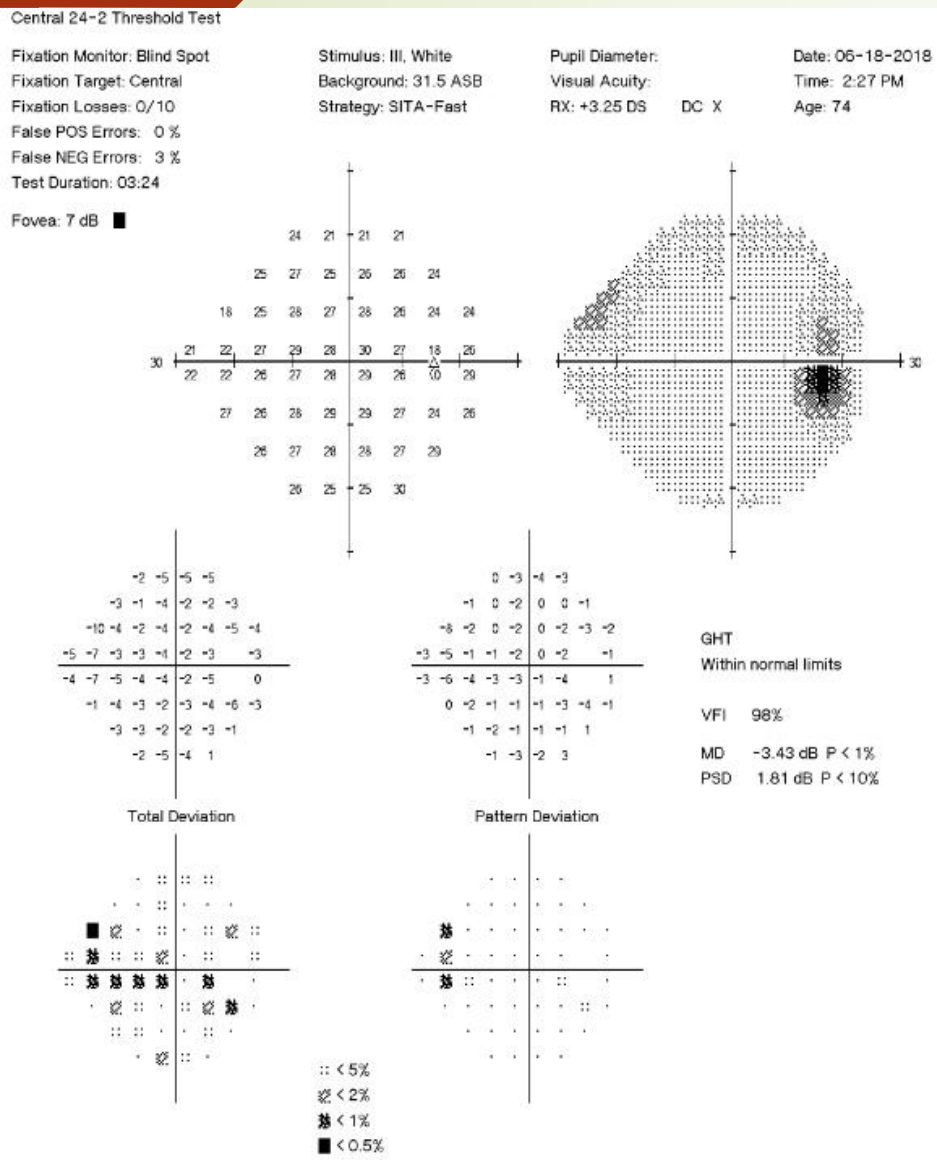
Case 4

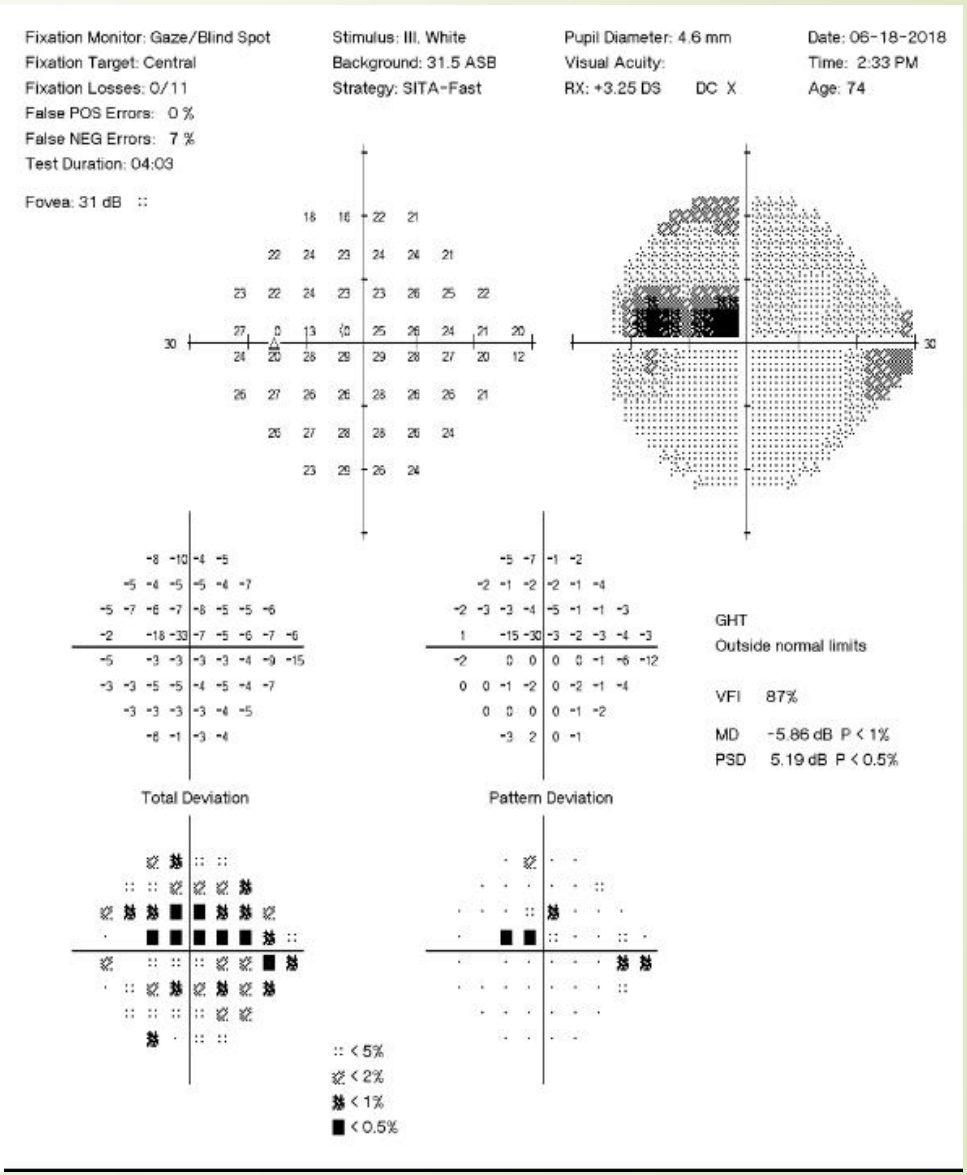


Case 4

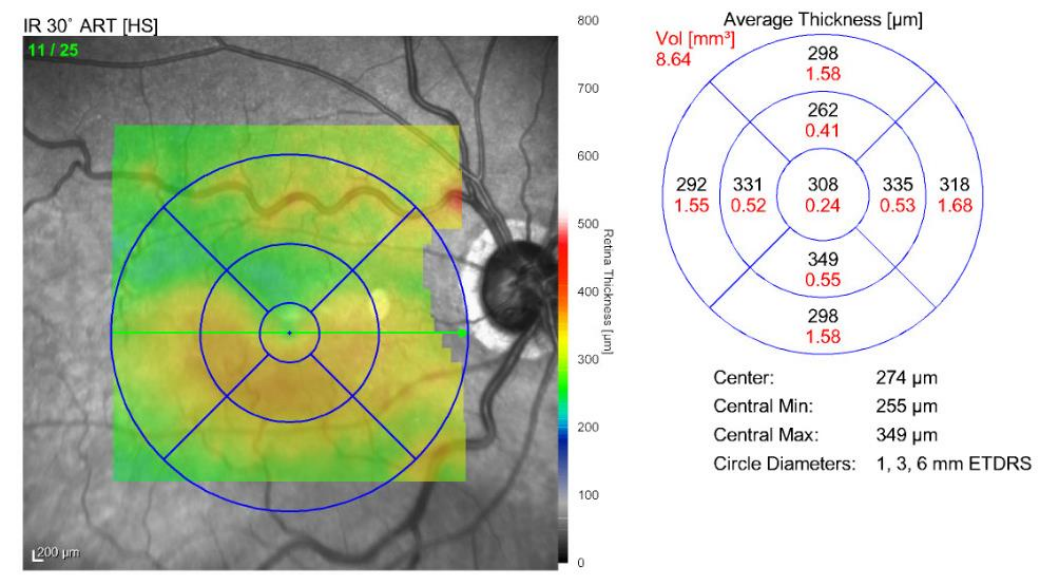

OD
IR 30° ART [HS]
Asymmetry
OD - OS
IR 30° ART [HS]
OS
OCT ART (100) Q: 21 [HS]
OCT ART (100) Q: 18 [HS]
ILM
RNFL
200 µm
RNFL Thickness [µm]
TMP
SUP
NAS
INF
TMP
Position [°]
Within Normal Limits (p>0.05)
Borderline (p<0.05)
Outside Normal Limits (p<0.01)
OD
OS
Classification OD
Within Normal Limits
Classification OS
Outside Normal Limits

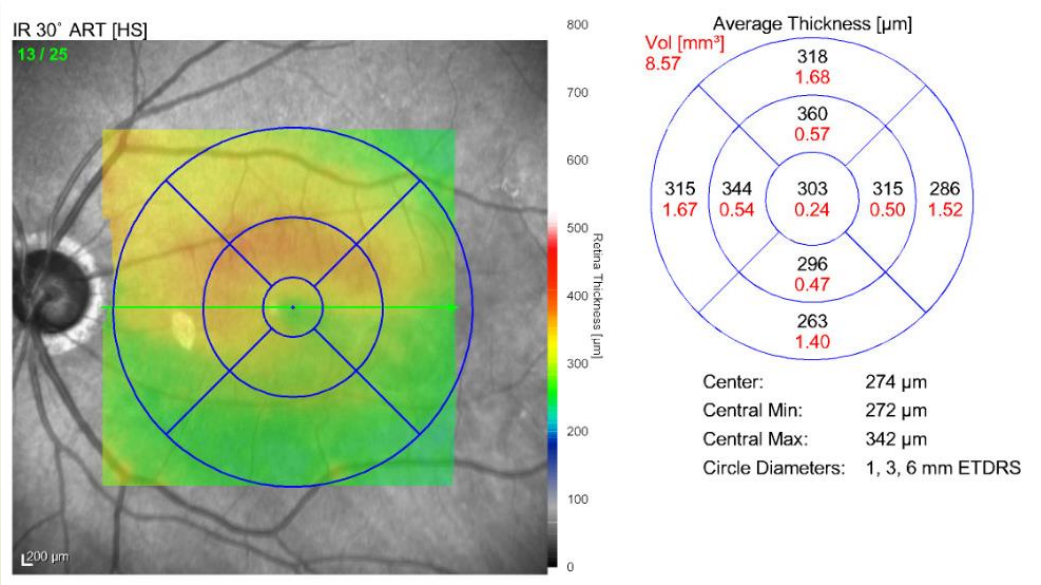
Case 4


Central 24-2 Threshold Test
Fixation Monitor: Blind Spot
Fixation Target: Central
Fixation Losses: 0/10
False POS Errors: 0 %
False NEG Errors: 3 %
Test Duration: 03:24
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast
Pupil Diameter:
Visual Acuity:
RX: +3.25 DS DC X
Date: 06-18-2018
Time: 2:27 PM
Age: 74
Fovea: 7 dB
GHT
Within normal limits
VFI 98%
MD -3.43 dB P < 1%
PSD 1.81 dB P < 10%
Total Deviation
Pattern Deviation
:: < 5%
< 2%
< 1%
< 0.5%

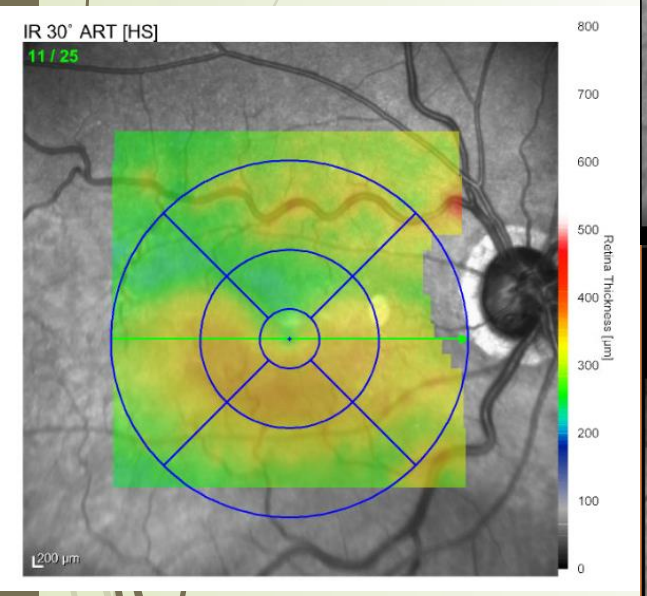

Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/11
False POS Errors: 0 %
False NEG Errors: 7 %
Test Duration: 04:03
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast
Pupil Diameter: 4.6 mm
Visual Acuity:
RX: +3.25 DS DC X
Date: 06-18-2018
Time: 2:33 PM
Age: 74
Fovea: 31 dB
GHT
Outside normal limits
VFI 87%
MD -5.86 dB P < 1%
PSD 5.19 dB P < 0.5%
Total Deviation
Pattern Deviation
:: < 5%
< 2%
< 1%
< 0.5%

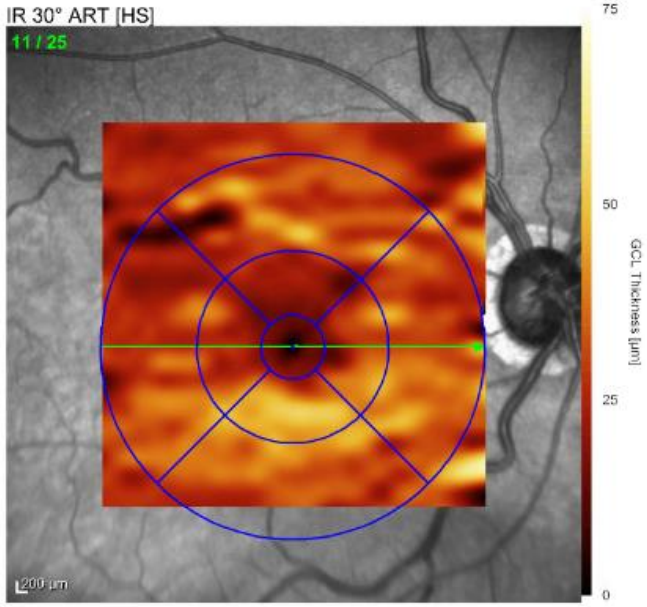
Case 4

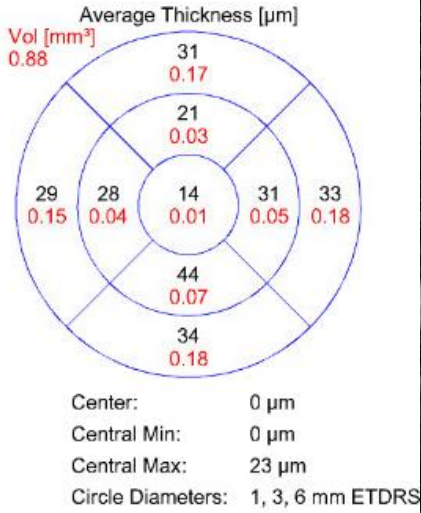

IR 30° ART [HS]
11 / 25
200 µm
800
700
600
500
400
300
200
100
0
Retina Thickness [µm]
Average Thickness [µm]
Vol [mm³]
8.64
298
1.58
262
0.41
292
1.55
331
0.52
308
0.24
335
0.53
318
1.68
349
0.55
298
1.58
Center: 274 µm
Central Min: 255 µm
Central Max: 349 µm
Circle Diameters: 1, 3, 6 mm ETDRS

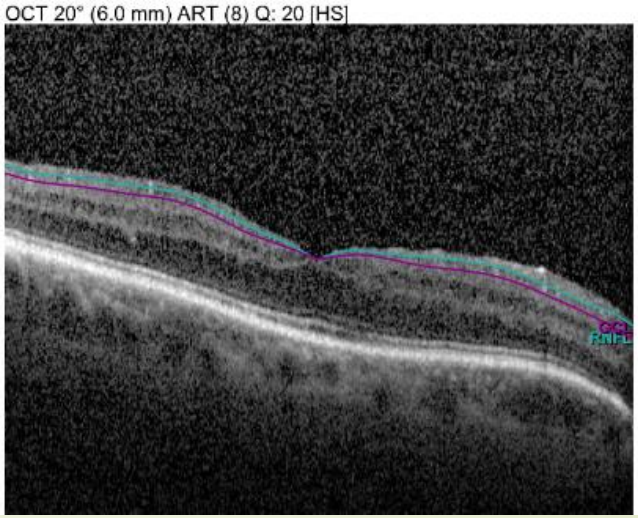

IR 30° ART [HS]
13 / 25
200 µm
800
700
600
500
400
300
200
100
0
Retina Thickness [µm]
Average Thickness [µm]
Vol [mm³]
8.57
318
1.68
360
0.57
315
1.67
344
0.54
303
0.24
315
0.50
286
1.52
296
0.47
263
1.40
Center: 274 µm
Central Min: 272 µm
Central Max: 342 µm
Circle Diameters: 1, 3, 6 mm ETDRS

Case 4

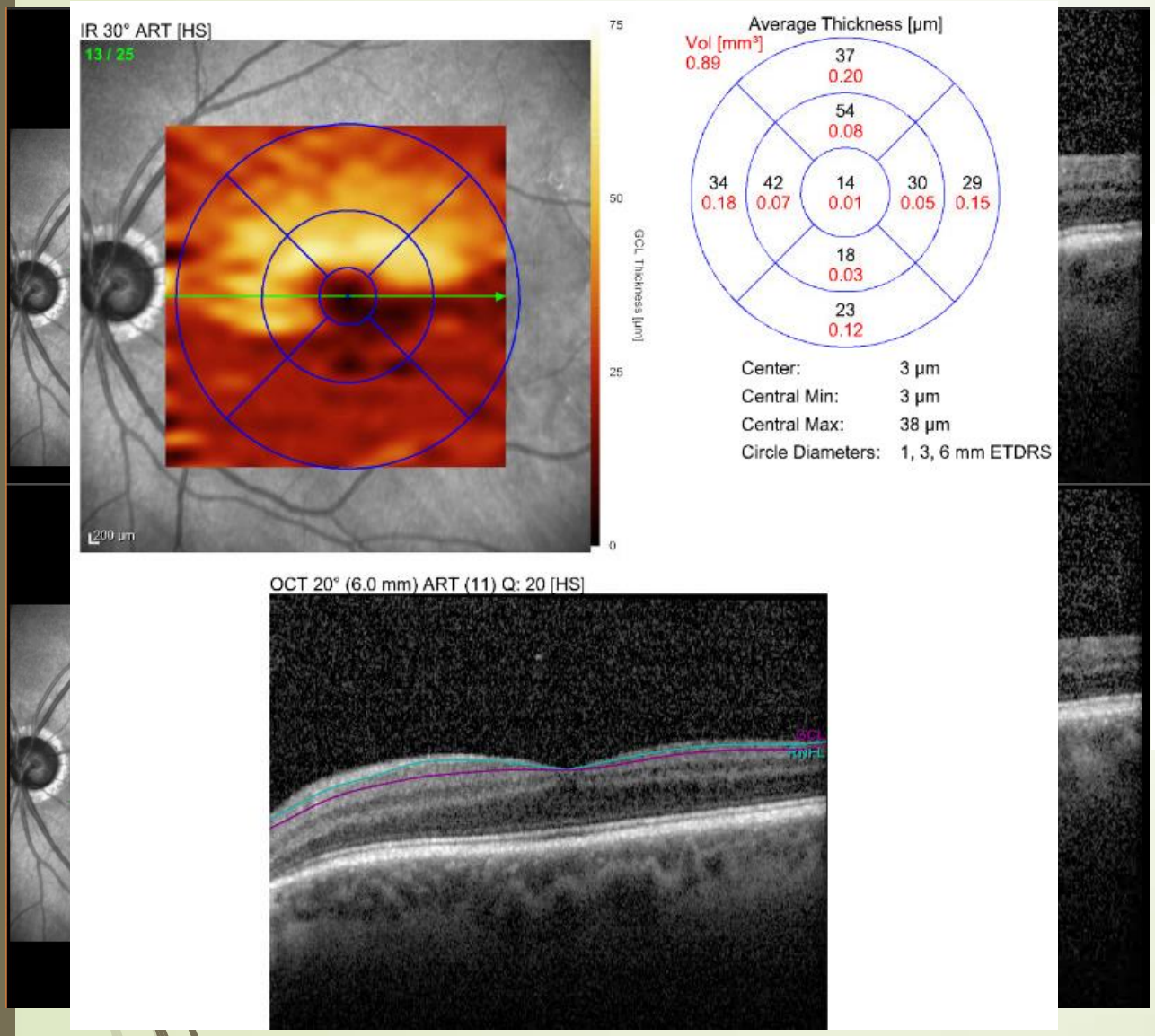

IR 30° ART [HS]
11 / 25
800
700
600
500
400
300
200
100
0
Retina Thickness [µm]
200 µm

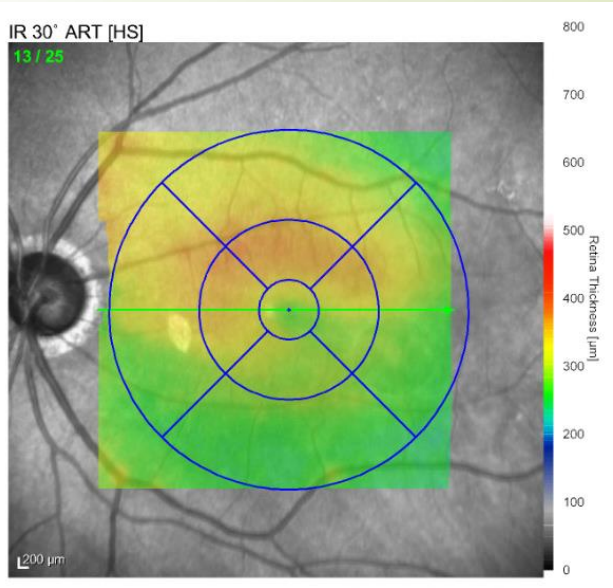

IR 30° ART [HS]
11 / 25
75
50
25
0
GCL Thickness [µm]
200 µm


Average Thickness [µm]
Vol [mm³]
0.88
31
0.17
21
0.03
29
0.15
28
0.04
14
0.01
31
0.05
33
0.18
44
0.07
34
0.18
Center: 0 µm
Central Min: 0 µm
Central Max: 23 µm
Circle Diameters: 1, 3, 6 mm ETDRS


OCT 20° (6.0 mm) ART (8) Q: 20 [HS]
GCL
RNFL

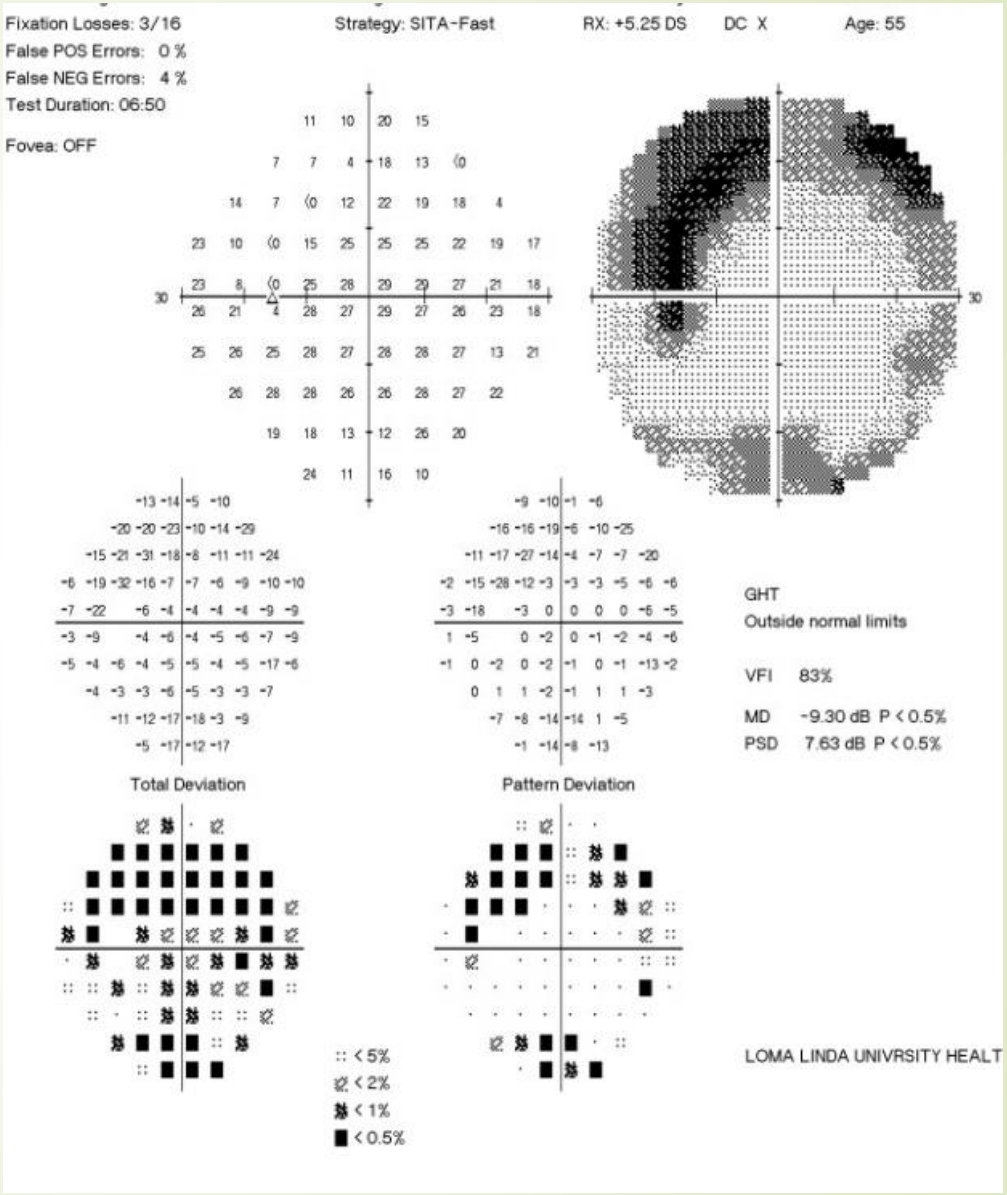
Case 4


IR 30° ART [HS]
13 / 25
200 µm
75
50
25
0
GCL Thickness [µm]
Average Thickness [µm]
Vol [mm³]
0.89
37
0.20
54
0.08
34
0.18
42
0.07
14
0.01
30
0.05
29
0.15
18
0.03
23
0.12
Center: 3 µm
Central Min: 3 µm
Central Max: 38 µm
Circle Diameters: 1, 3, 6 mm ETDRS
OCT 20° (6.0 mm) ART (11) Q: 20 [HS]
GCL
RNFL

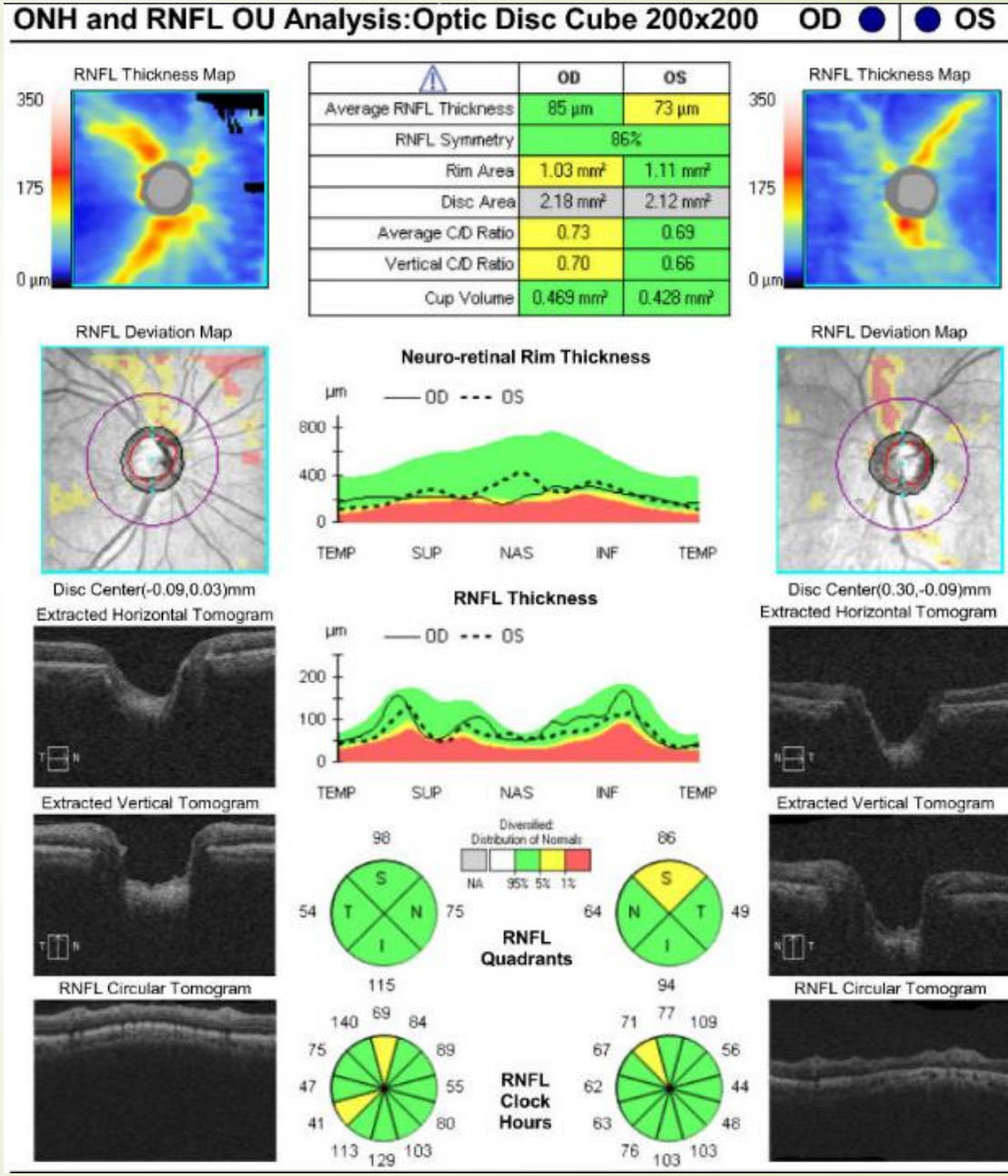

IR 30° ART [HS]
13 / 25
200 µm
800
700
600
500
400
300
200
100
0
Retina Thickness [µm]

Case 5

55 yo F with IOP in mid-teens

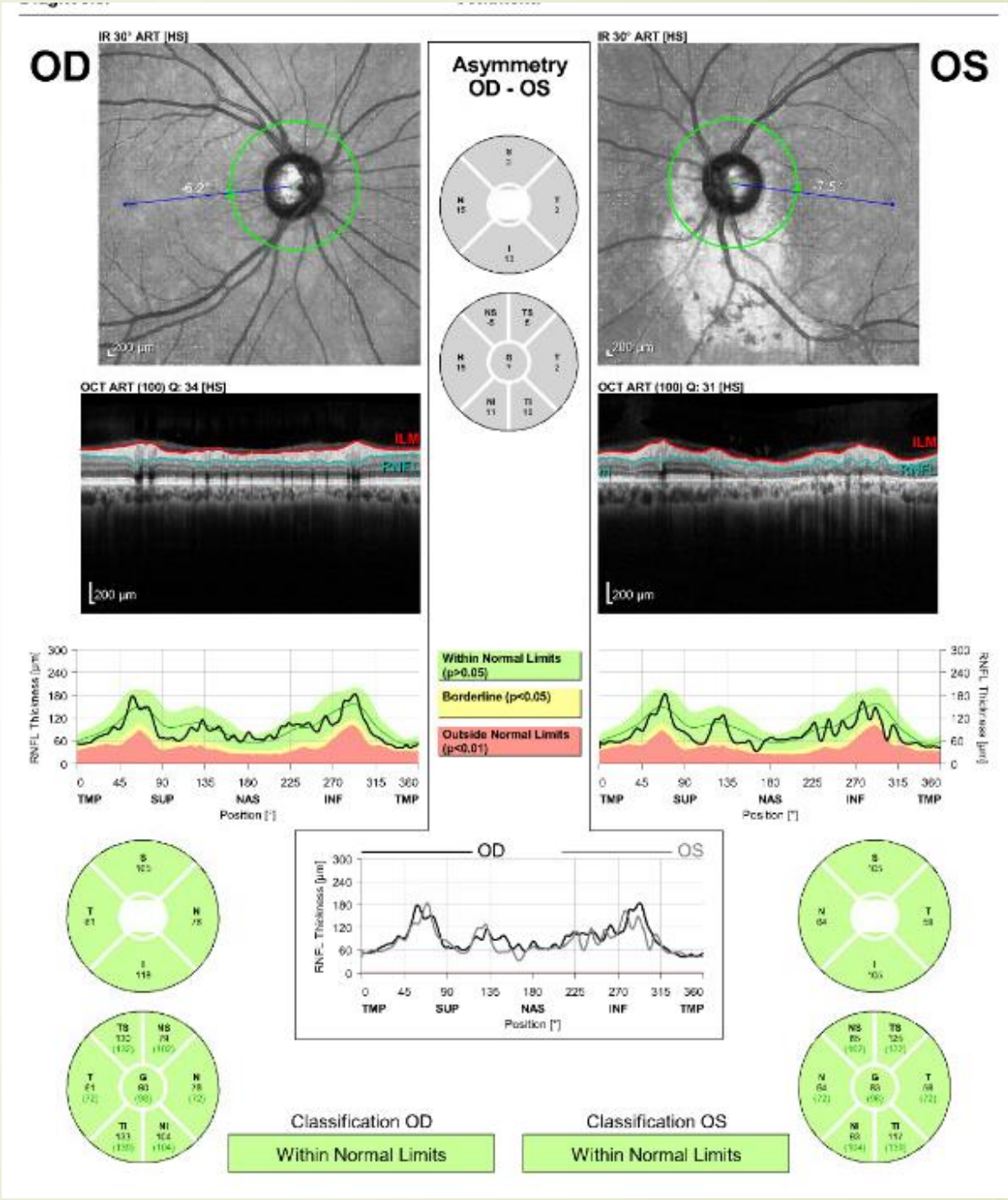


Case 5


ONH and RNFL OU Analysis:Optic Disc Cube 200x200
OD
OS
RNFL Thickness Map
350
175
0 µm
Average RNFL Thickness 85 µm 73 µm
RNFL Symmetry 86%
Rim Area 1.03 mm² 1.11 mm²
Disc Area 2.18 mm² 2.12 mm²
Average C/D Ratio 0.73 0.69
Vertical C/D Ratio 0.70 0.66
Cup Volume 0.469 mm² 0.428 mm²
RNFL Deviation Map
Neuro-retinal Rim Thickness
µm
OD --- OS
800
400
0
TEMP SUP NAS INF TEMP
Disc Center(-0.09,0.03)mm
Extracted Horizontal Tomogram
RNFL Thickness
200
100
Extracted Vertical Tomogram
Diversified Distribution of Normals
NA 95% 5% 1%
98
54
75
115
S
T
N
I
RNFL Quadrants
86
64
49
94
RNFL Circular Tomogram
140 69 84
75 89
47 55
41 80
113 129 103
RNFL Clock Hours
71 77 109
67 56
62 44
63 48
76 103 103
Disc Center(0.30,-0.09)mm

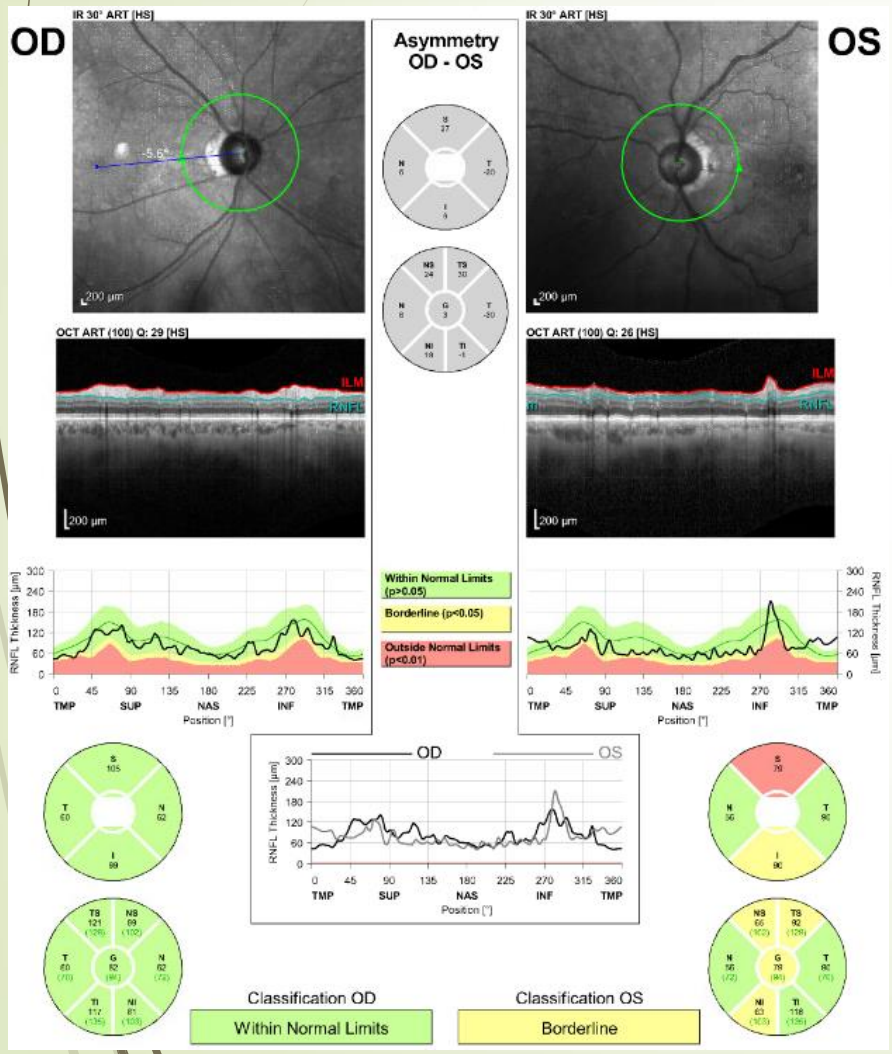
Case 5

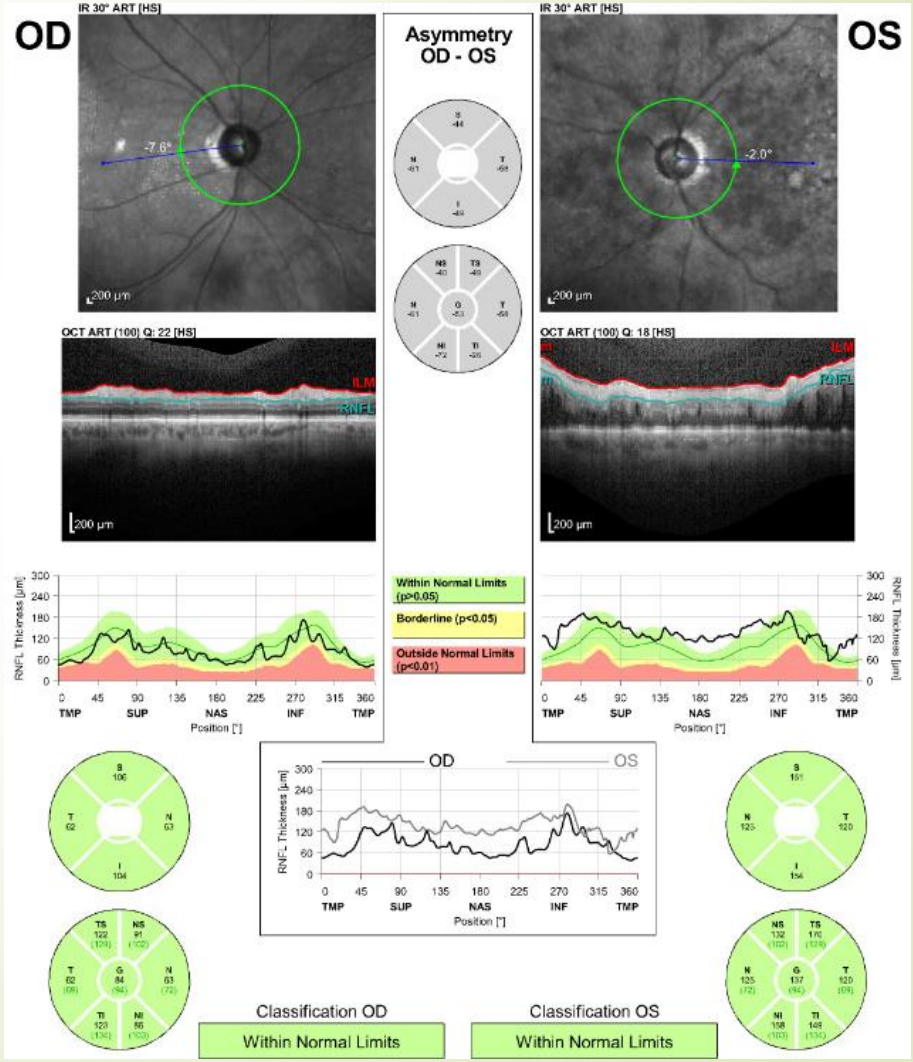
Case 5


OD
IR 30° ART [HS]
Asymmetry
OD - OS
IR 30° ART [HS]
OS
OCT ART (100) Q: 34 [HS]
OCT ART (100) Q: 31 [HS]
ILM
RNFL
200 µm
RNFL Thickness [µm]
Within Normal Limits (p>0.05)
Borderline (p<0.05)
Outside Normal Limits (p<0.01)
TMP SUP NAS INF TMP
Position [°]
OD
OS
Classification OD
Within Normal Limits
Classification OS
Within Normal Limits

Case 6

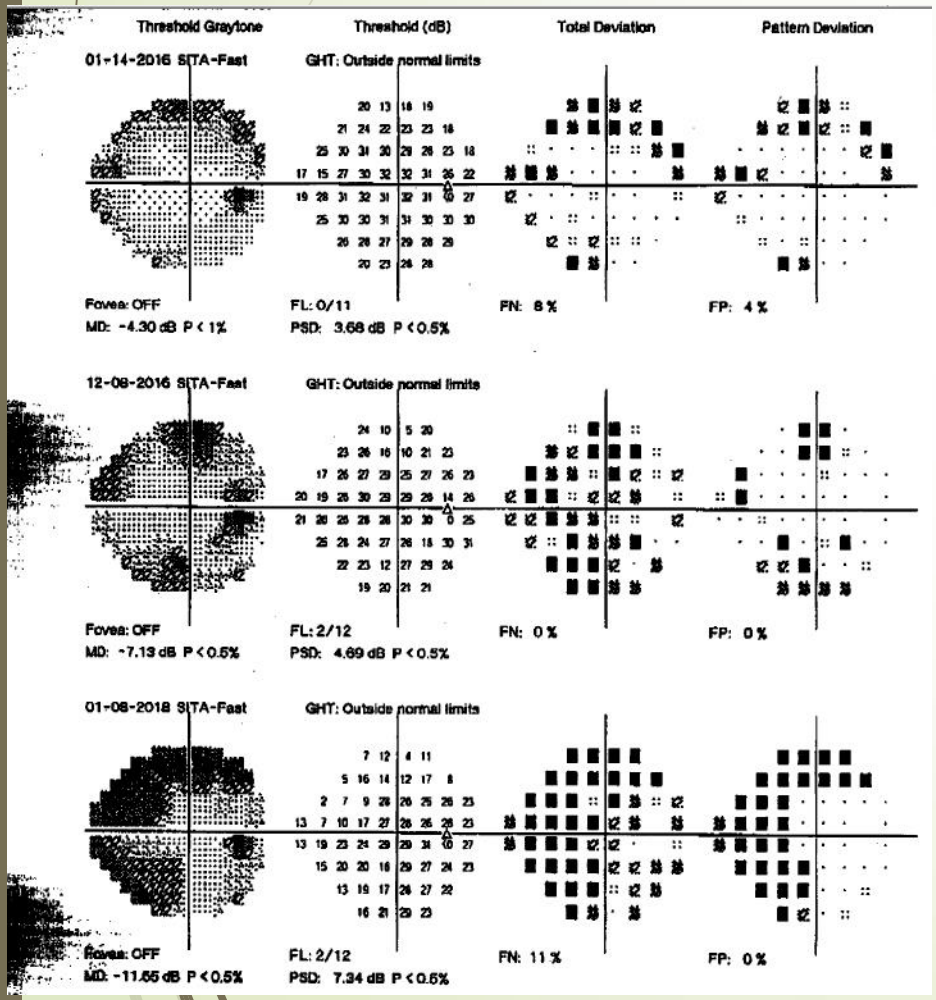
77 yo M c/o blurrier vision OS (20/100 -> CF)

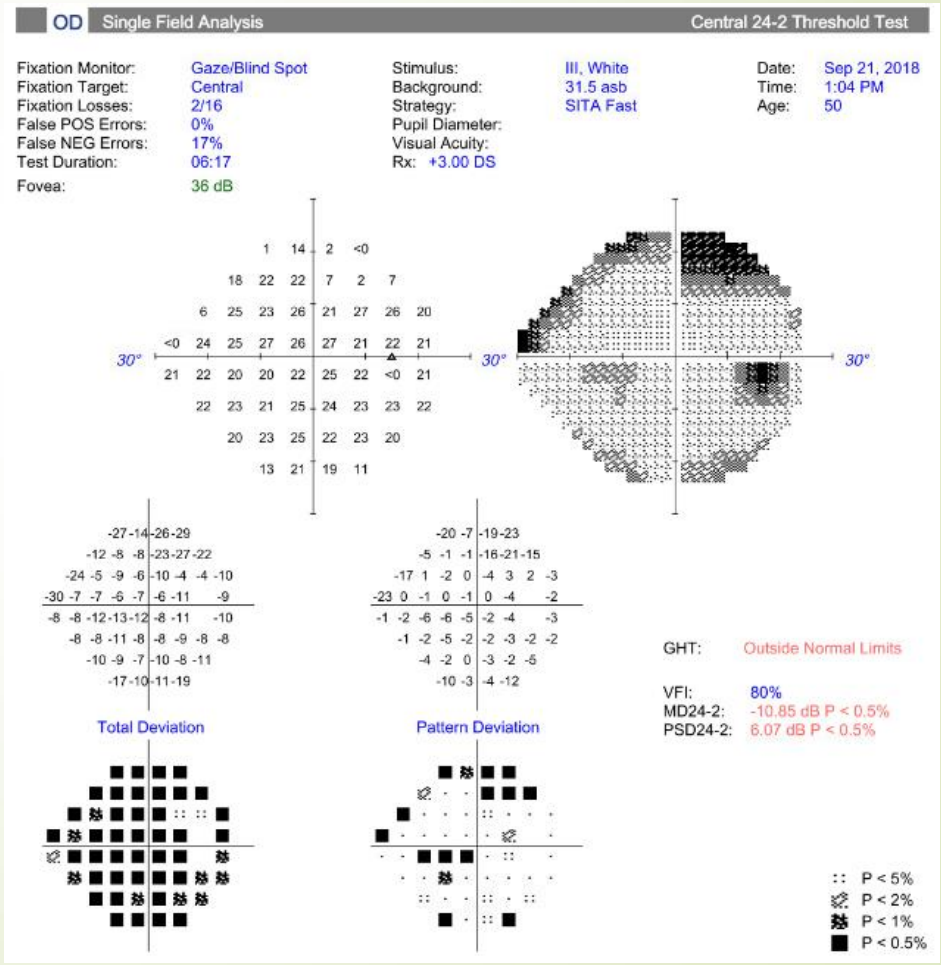




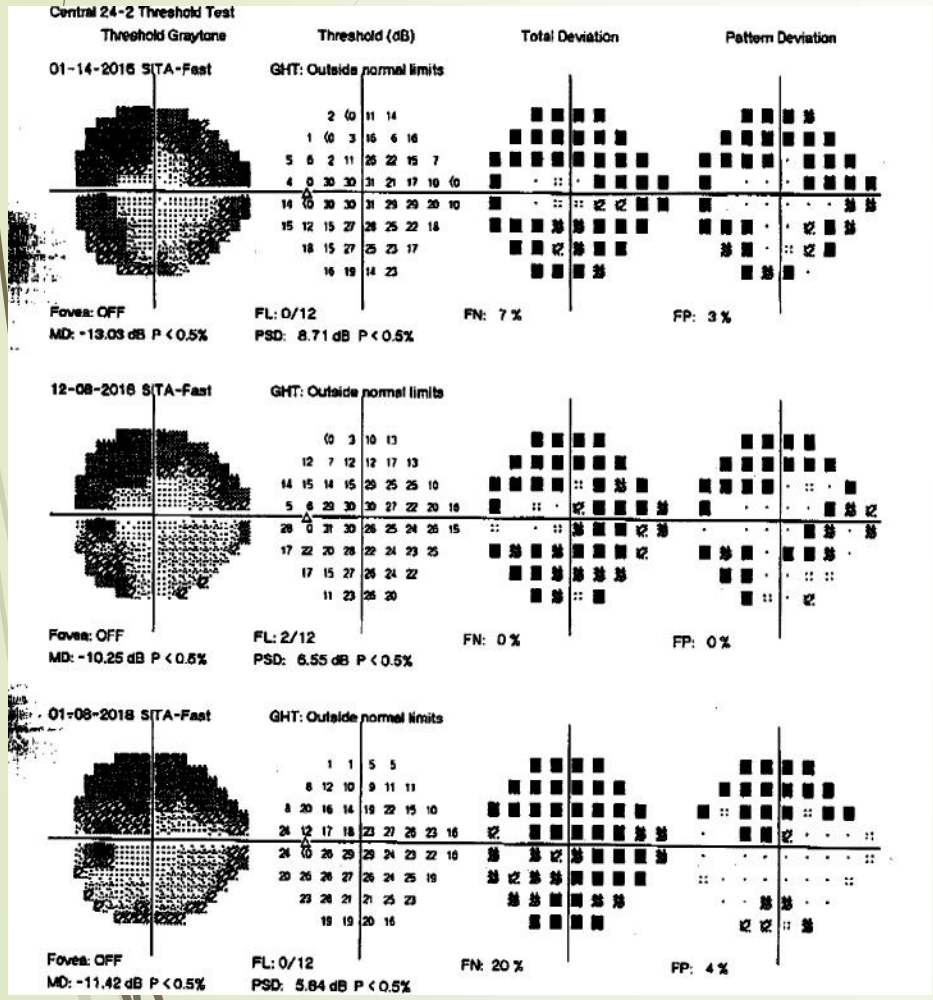
Case 7

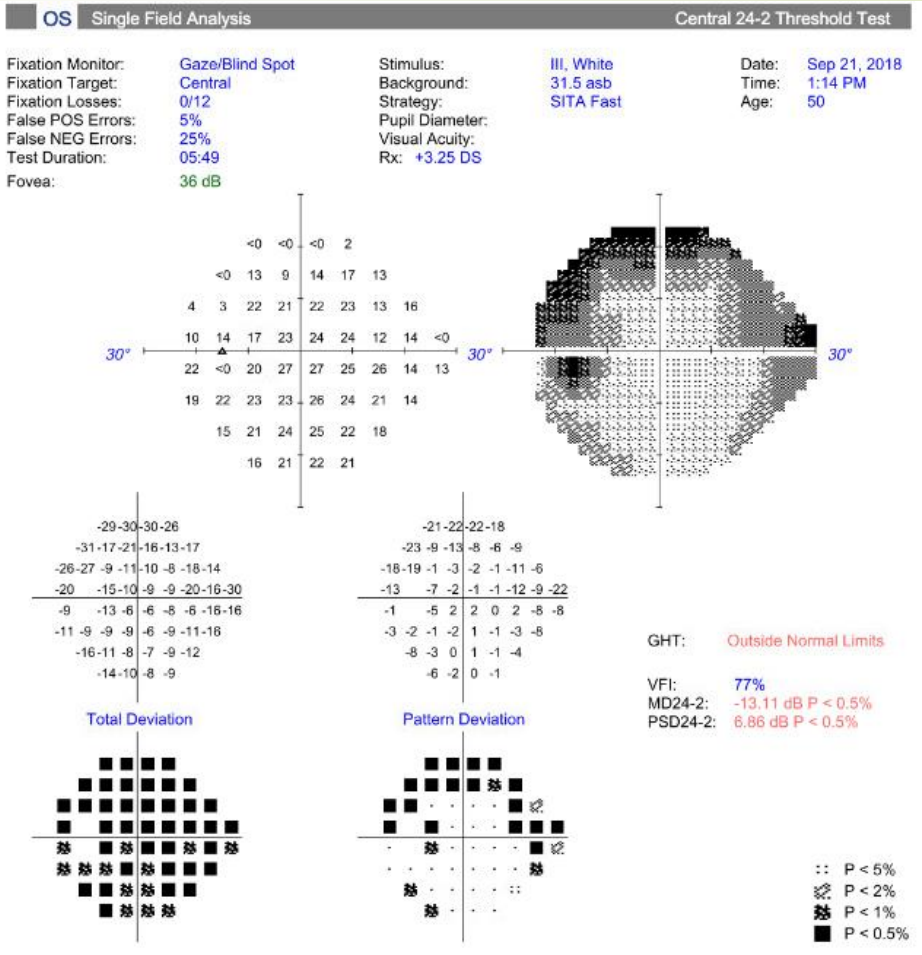
50 yo F referred for concern for HVF progression





Case 7


Central 24-2 Threshold Test
Threshold Grayscale
Threshold (dB)
Total Deviation
Pattern Deviation
01-14-2016 SITA-Fast
GHT: Outside normal limits
Fovea: OFF
MD: -13.03 dB P < 0.5%
FL: 0/12
PSD: 8.71 dB P < 0.5%
FN: 7 %
FP: 3 %
12-08-2016 SITA-Fast
GHT: Outside normal limits
Fovea: OFF
MD: -10.25 dB P < 0.5%
FL: 2/12
PSD: 6.55 dB P < 0.5%
FN: 0 %
FP: 0 %
01-08-2018 SITA-Fast
GHT: Outside normal limits
Fovea: OFF
MD: -11.42 dB P < 0.5%
FL: 0/12
PSD: 5.84 dB P < 0.5%
FN: 20 %
FP: 4 %


OS
Single Field Analysis
Central 24-2 Threshold Test
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/12
False POS Errors: 5%
False NEG Errors: 25%
Test Duration: 05:49
Fovea: 36 dB
Stimulus: III, White
Background: 31.5 asb
Strategy: SITA Fast
Pupil Diameter:
Visual Acuity:
Rx: +3.25 DS
Date: Sep 21, 2018
Time: 1:14 PM
Age: 50
30°
Total Deviation
Pattern Deviation
GHT: Outside Normal Limits
VFI: 77%
MD24-2: -13.11 dB P < 0.5%
PSD24-2: 6.86 dB P < 0.5%
P < 5%
P < 2%
P < 1%
P < 0.5%

Summary

- Visual field defects should manifest from a corresponding focal anatomical lesion
- Be aware of different types of artifacts that can appear on OCT and Visual field results
- Beware of treating “red disease” (and don’t be lulled by the green)
- Repeat testing as needed
- Understand how the normative database can skew results

Thank you