

# Optic Nerves That Will Stump the Stars

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The Glaucoma and Diabetes Eye Institute

Cincinnati, Ohio

# Financial Interests

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- Alcon - speaker
- Haag- Streit - speaker
- Optovue - speaker
- Ocuflow – consultant
- Reichert - consultant
- Diopsys - research

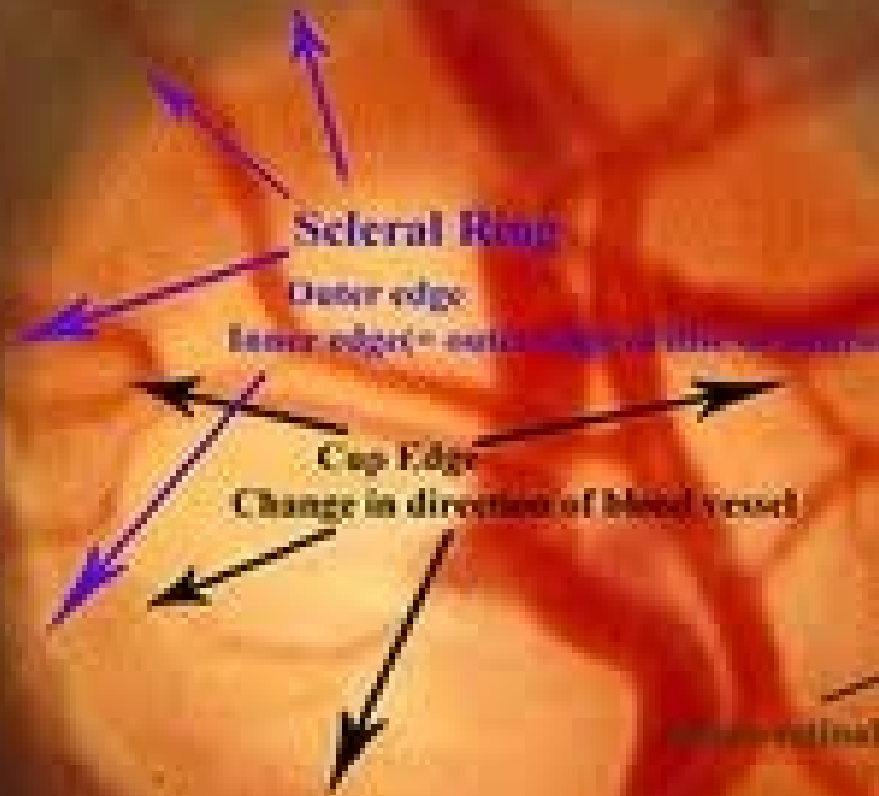


# OD's need to diagnose and treat more glaucoma

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

Paul Karpecki, OD, FAAO

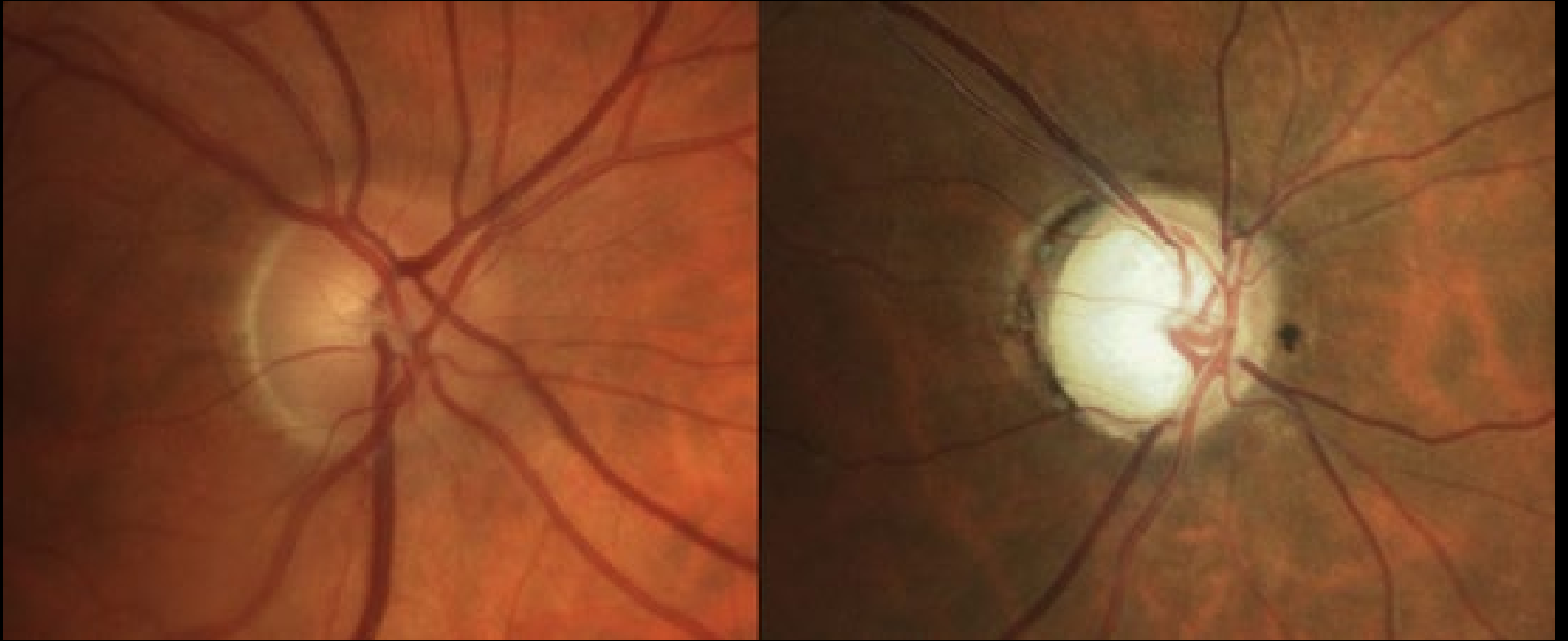




OCT  
has become  
standard of care

? Dilation  
when  
indicated ?

Glaucoma surgeons have it easy....





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# LET'S GET STARTED



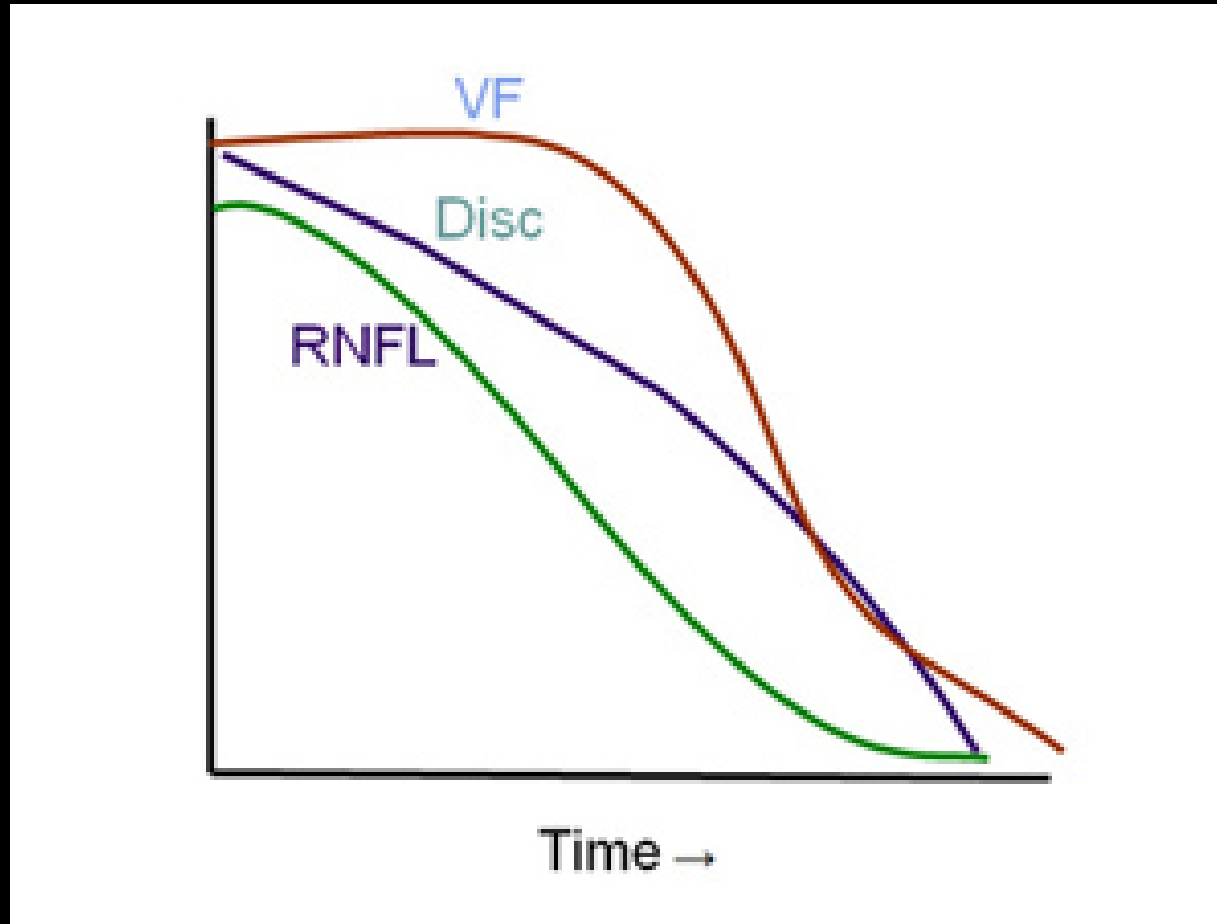
# What Changes First?

- Structure damage often precedes functional damage in glaucoma<sup>1</sup>
- RNFL loss often precedes optic disc changes<sup>2</sup>
- Can GCC change before RNFL?

1. Sommer A. et al. Clinically detected nerve fiber atrophy precedes the onset of glaucomatous field loss. Arch Ophthalmol 1991; 109:77-83.

2. Quigley HA, Katz J et al. Ophthalmology 1992; 99: 19-28.

# WHY OCT?

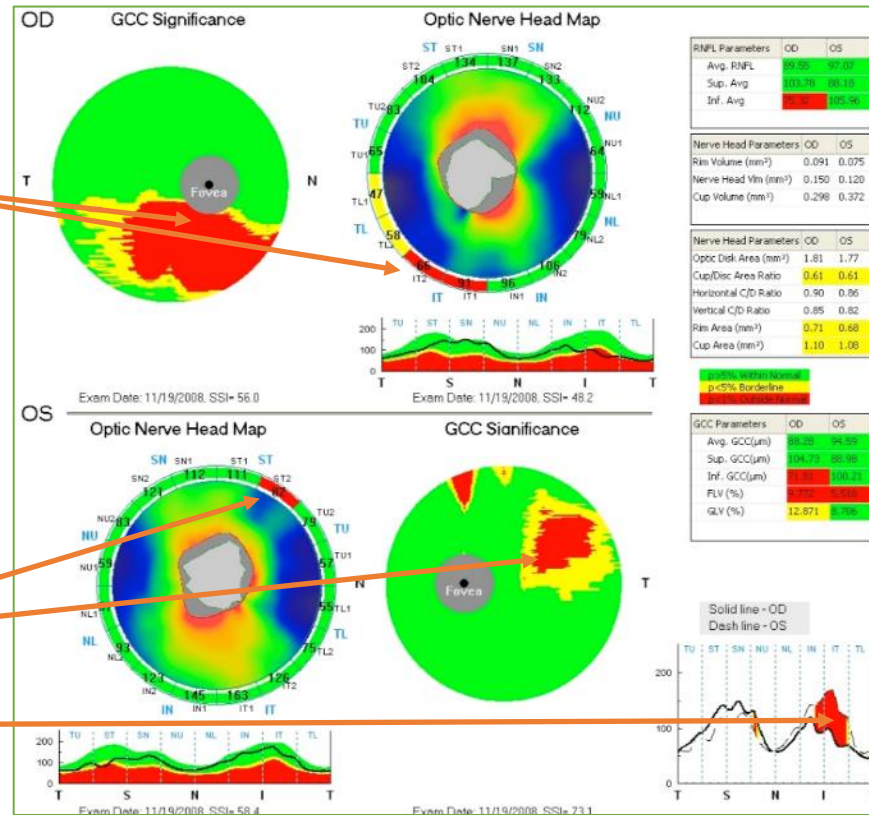


# RNFL, Optic Disc and GCC Analysis

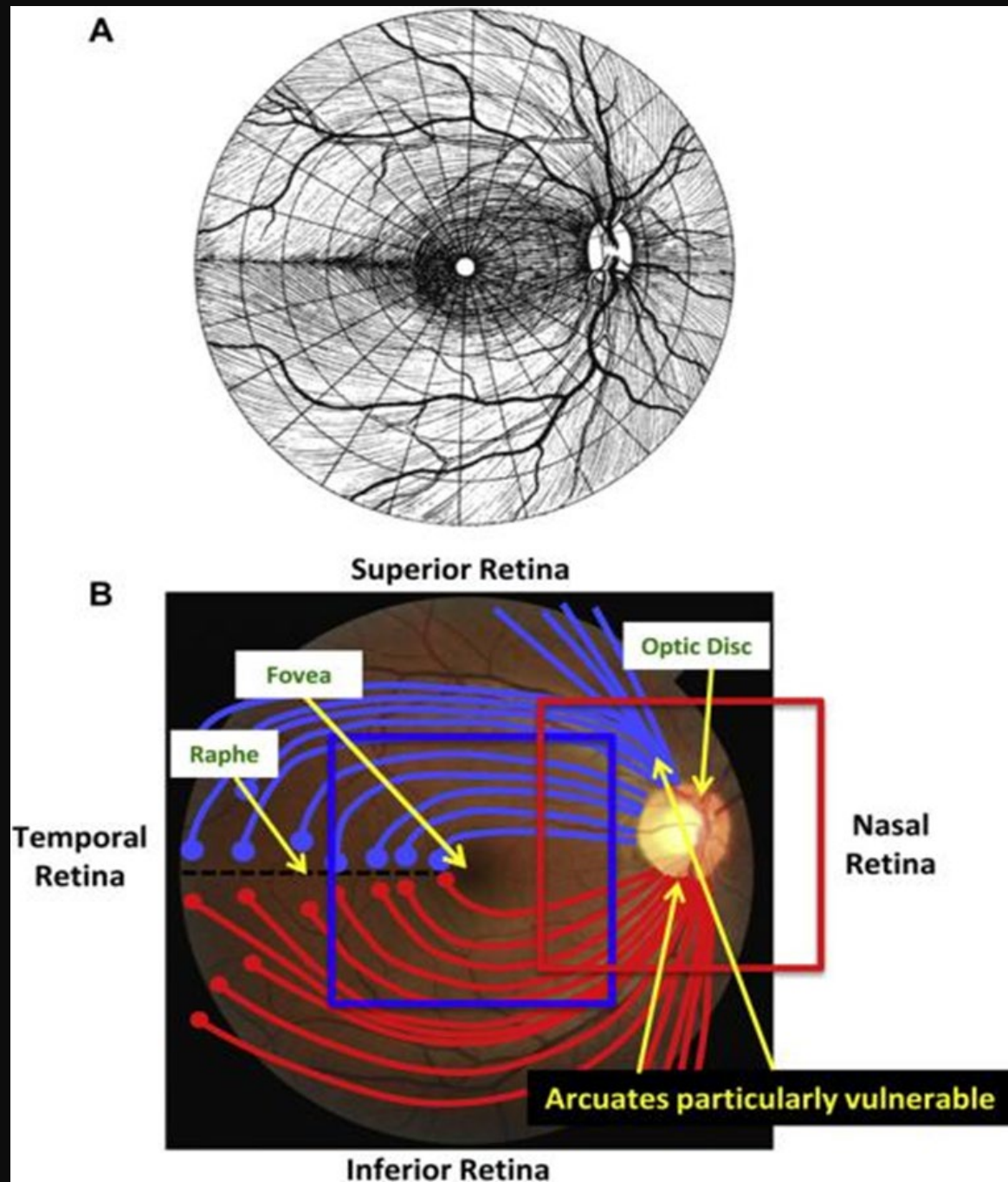
Inferior RNFL and GCC Loss OD

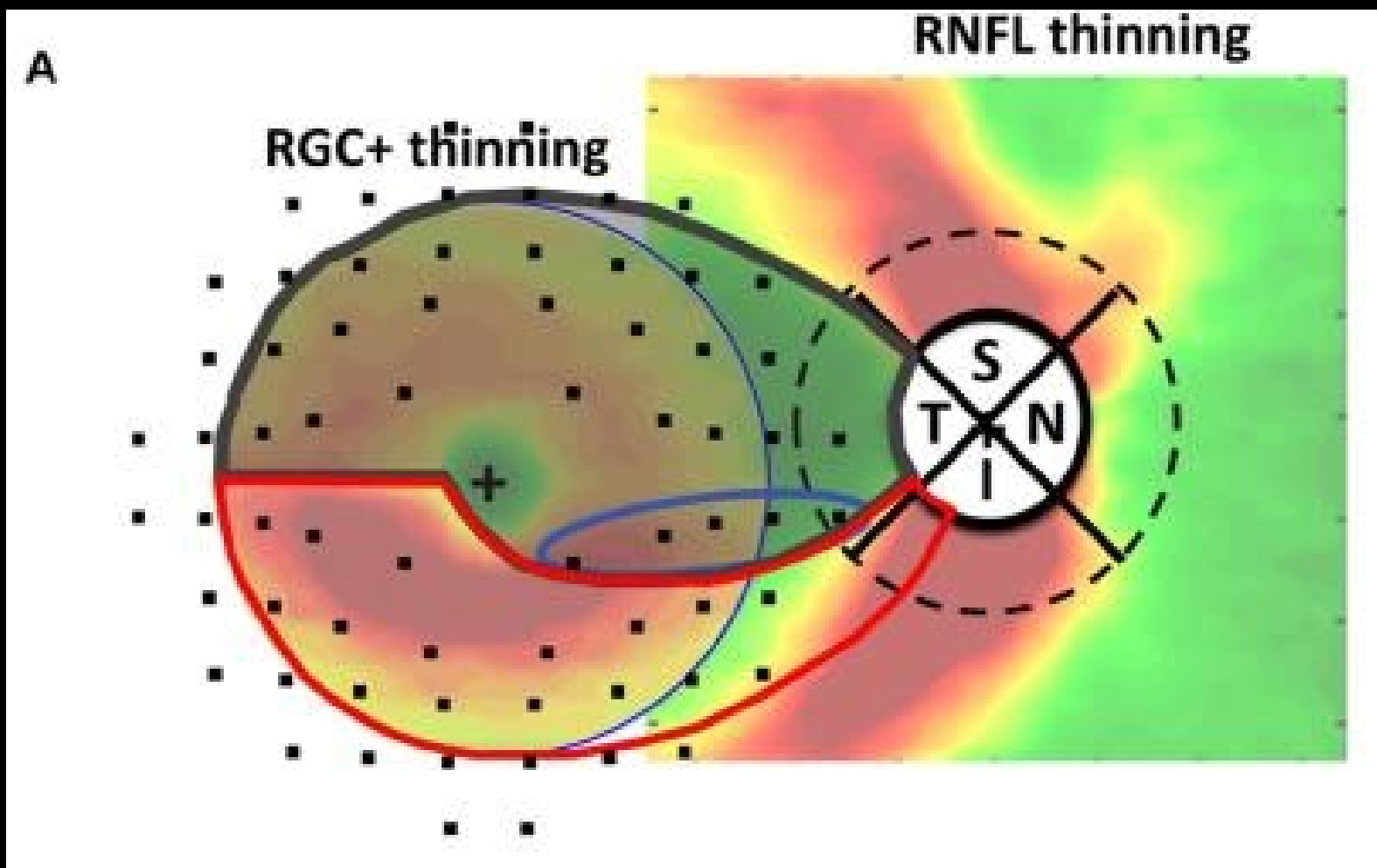
Superior RNFL and GCC Loss OS

Abnormal RNFL Asymmetry Graph



Donald C. Hood, PhD

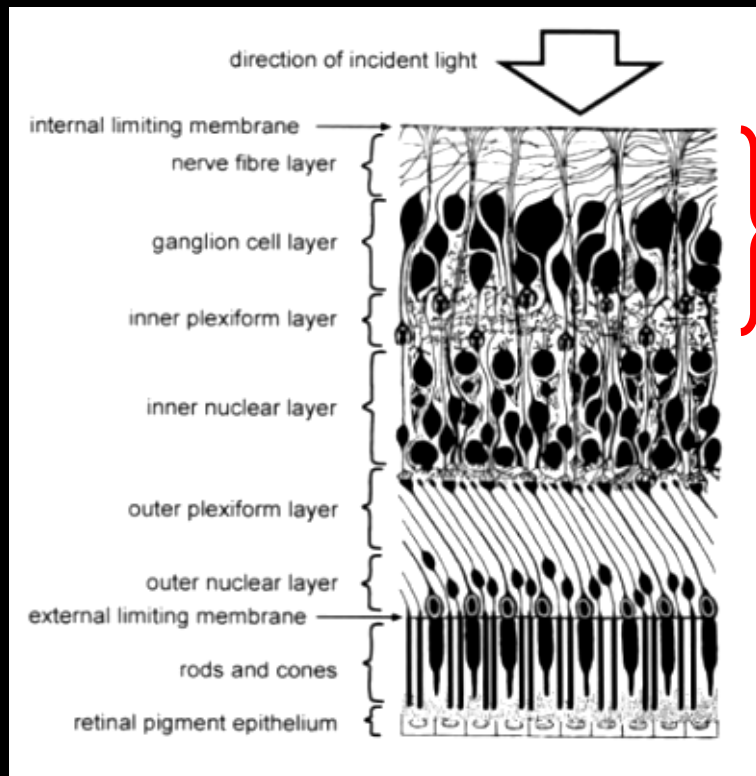




Donald C. Hood, PhD

**Harper's Point Eye Associates**

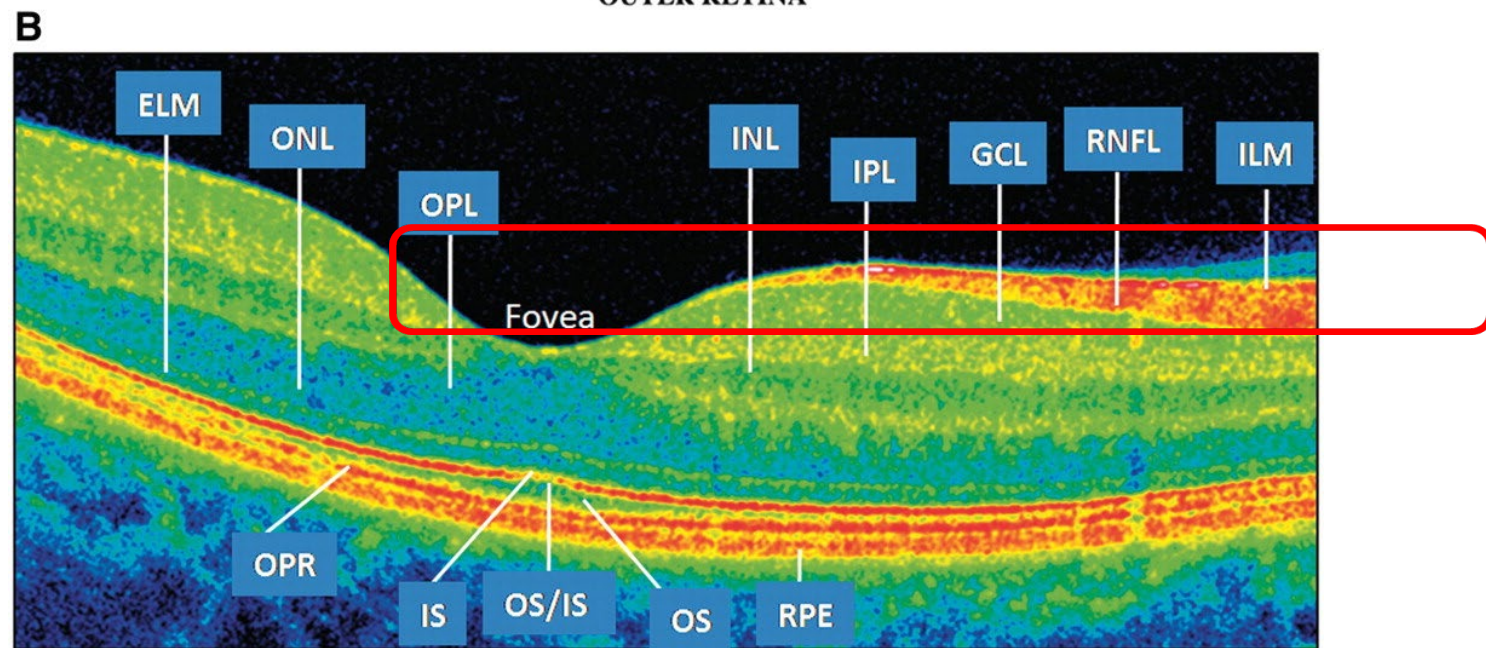
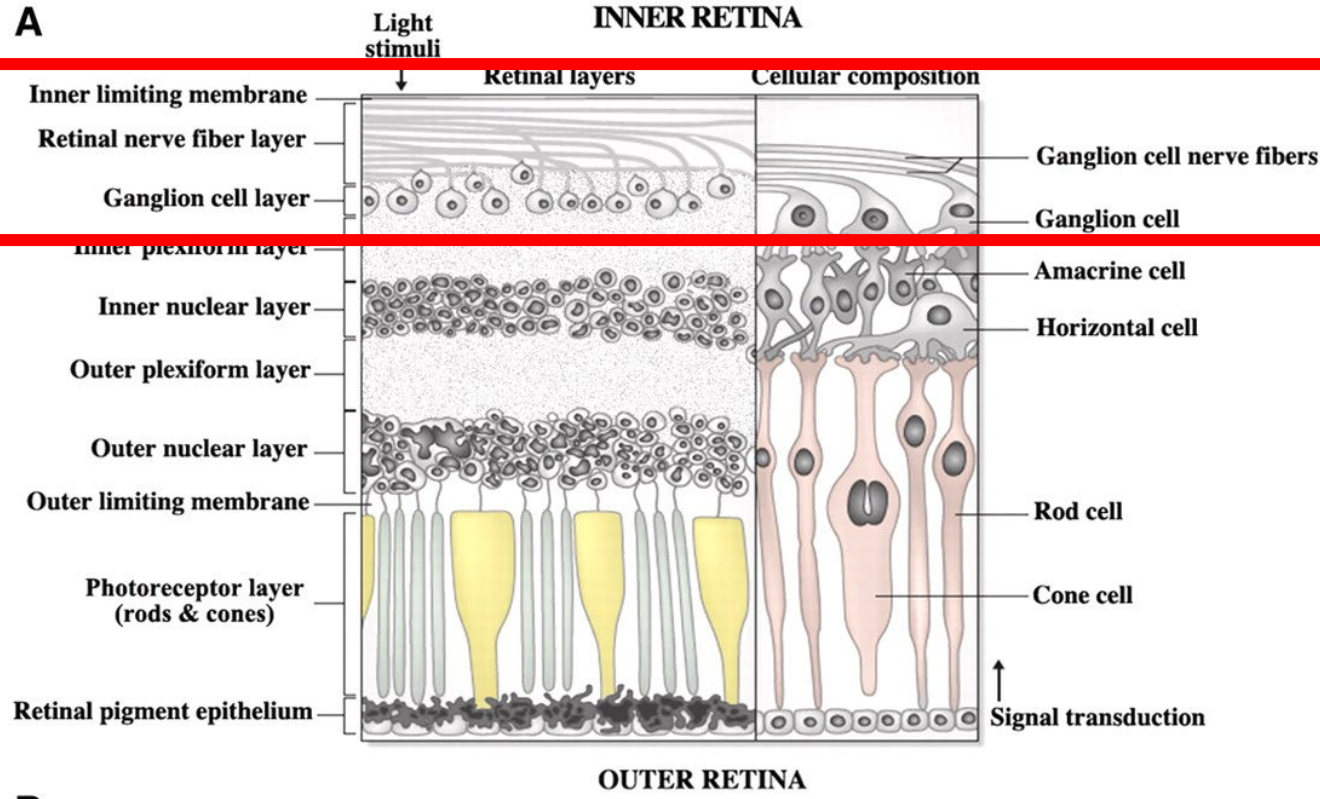
# GANGLION CELL COMPLEX



Ganglion Cell Complex

Average overall retina thickness  $\approx$  300 microns

Average GCC thickness  $\approx$  90-100 microns



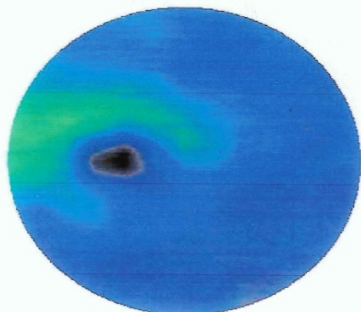
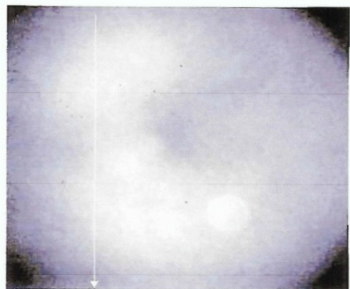
2/1967 (40)

Disease Category:  
Algorithm Version: A3, 0, 1, 14  
Gender: F

Photographer:  
Examine Date: 02/21/2008  
Primary Physician:

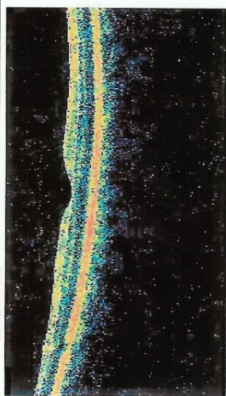
MM7 SSI= 66.4

### Thickness Map

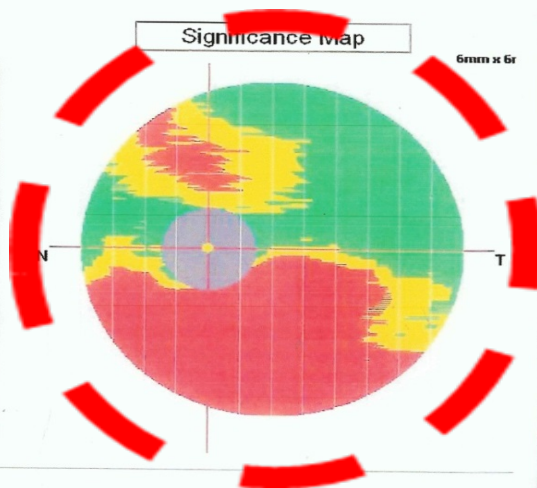


Show Lines  
Range: N/A

Thickness... Std Dev  
82.70  
19.96 21.17



### Significance map



GCC Thickness  
○ Deviation  
● Significance  
Boundary Curves

Monday February 25 20:01:00 2008

### SINGLE FIELD ANALYSIS

NAME: ID: 2589 EYE: LEFT  
DOB: 08-02-1967

CENTRAL 24-2 THRESHOLD TEST

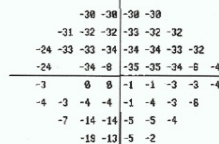
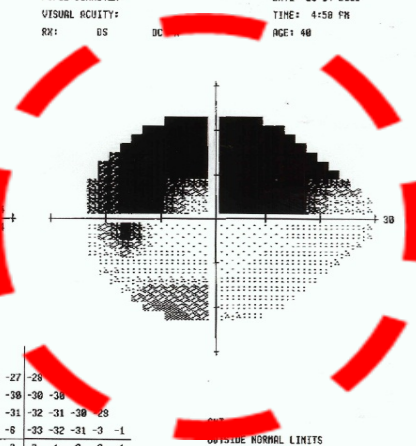
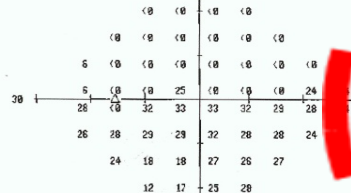
FIXATION MONITOR: GAZE/BLINDSPOT  
FIXATION TARGET: CENTRAL  
FIXATION LOSSES: 1/15  
FALSE POS ERRORS: 1 %  
FALSE NEG ERRORS: 28 %  
TEST DURATION: 06:53

STIMULUS: III, WHITE  
BACKGROUND: 31.5 ASD  
STRATEGY: SITA-STANDARD

PUPIL DIAMETER:  
VISUAL ACUITY:  
RX: DS DC

DATE: 01-04-2008  
TIME: 4:58 PM  
AGE: 40

FOVER: OFF

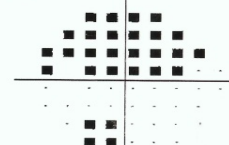
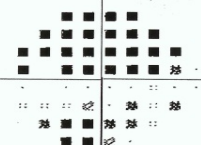


OUTSIDE NORMAL LIMITS

MD -16.14 DB P < 0.5%  
PSD 15.10 DB P < 0.5%

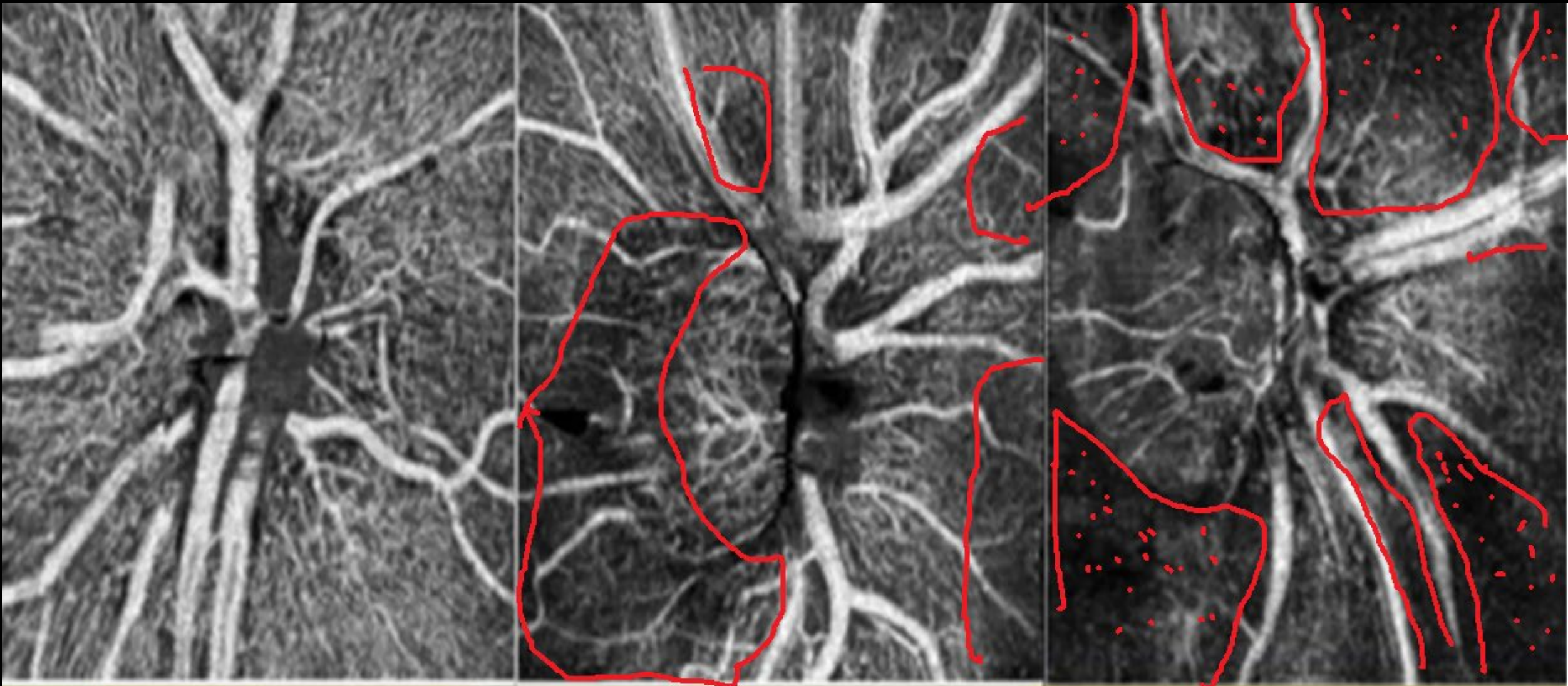
TOTAL DEVIATION

PATTERN DEVIATION



■ < 5%  
■ < 2%  
■ < 1%  
■ < 0.5%





Normal

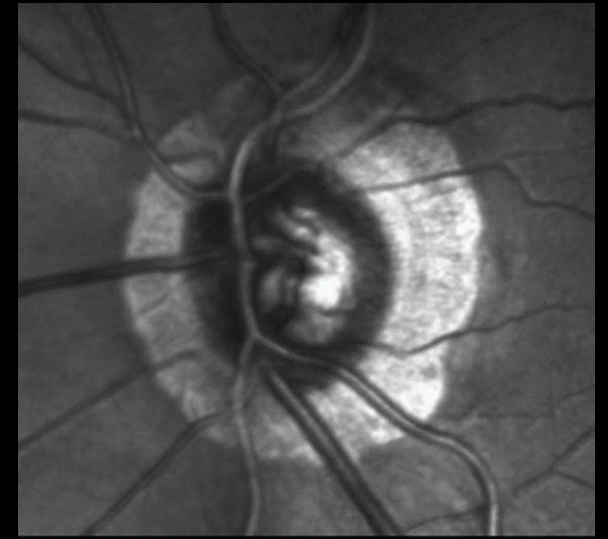
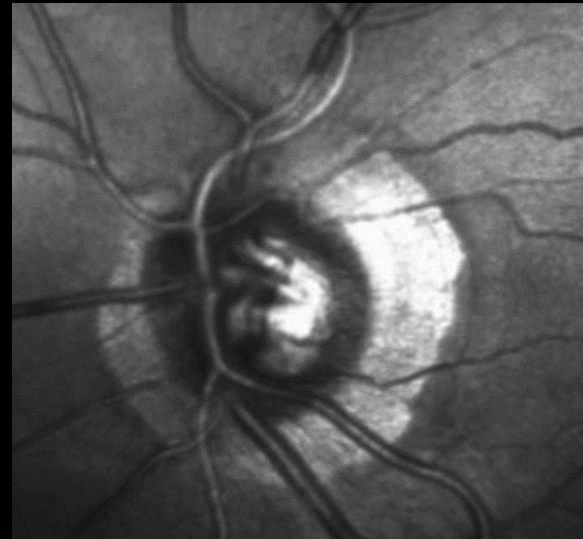
Moderate

Severe

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

# Optic Nerve

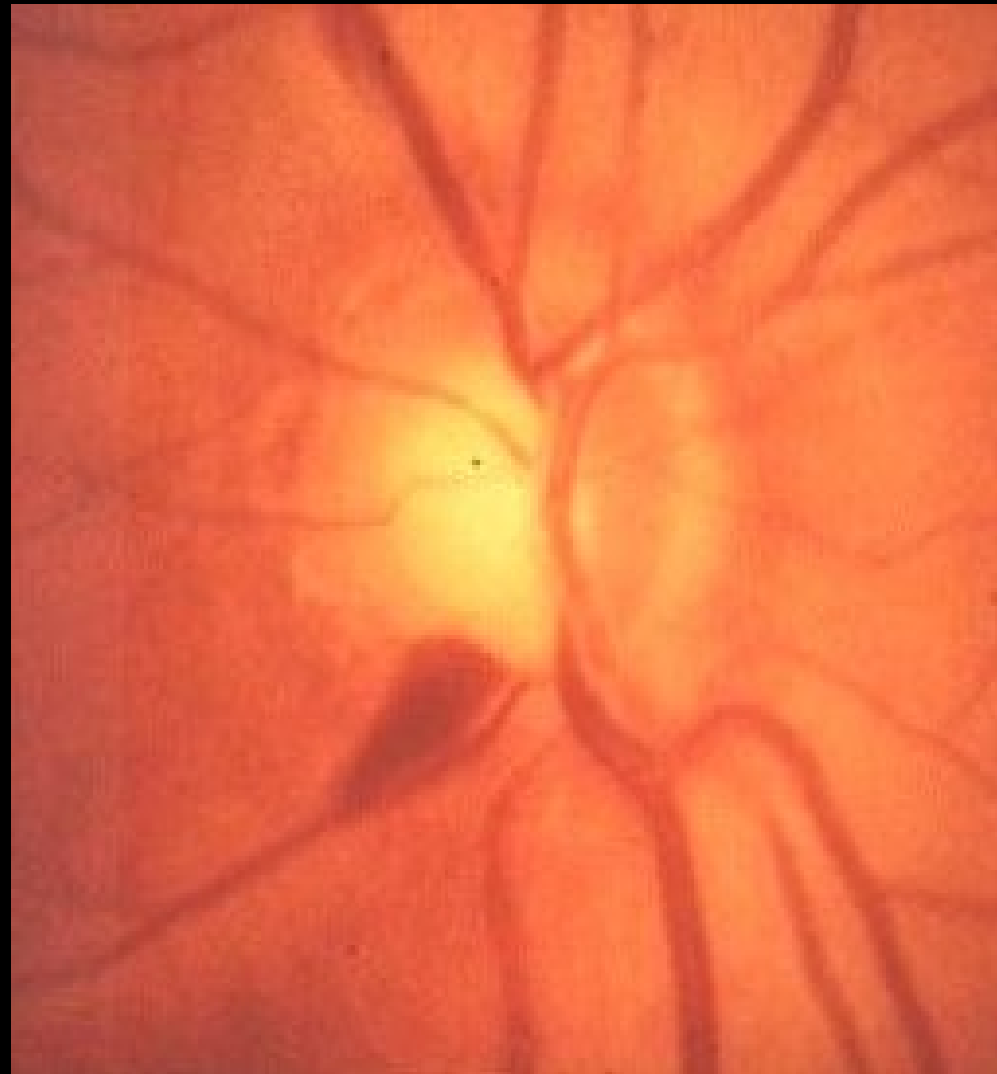
## 5 R's



# Optic Nerve

5 R's

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



# Widening of RNFL Defect



**Initial Visit**



**Two Years Later**

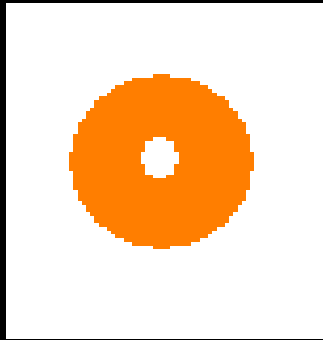
# The Disc Damage Likelihood Scale

Using the optic disc to diagnose and manage glaucoma.  
By **George L. Spaeth, MD, FACS**

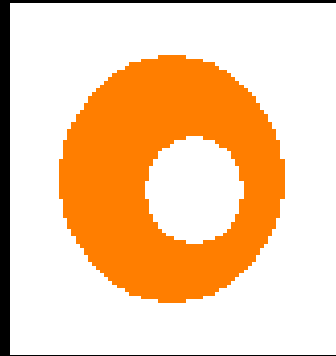
DDLS Stage	Narrowest width of rim (rim/disc ratio)			DDLS Stage	Examples		
	For Small Disc <1.50 mm	For Average Size Disc 1.50-2.00 mm	For Large Disc >2.00 mm		1.25 mm optic nerve	1.75 mm optic nerve	2.25 mm optic nerve
1	.5 or more	.4 or more	.3 or more	0a			
2	.4 to .49	.3 to .39	.2 to .29	0b			
3	.3 to .39	.2 to .29	.1 to .19	1			
4	.2 to .29	.1 to .19	less than .1	2			
5	.1 to .19	less than .1	0 for less than 45°	3			
6	less than .1	0 for less than 45°	0 for 46° to 90°	4			
7	0 for less than 45°	0 for 46° to 90°	0 for 91° to 180°	5			
8	0 for 46° to 90°	0 for 91° to 180°	0 for 181° to 270°	6			
9	0 for 91° to 180°	0 for 181° to 270°	0 for more than 270°	7a			
10	0 for more than 180°	0 for more than 270°		7b			

# Nerve Diameter

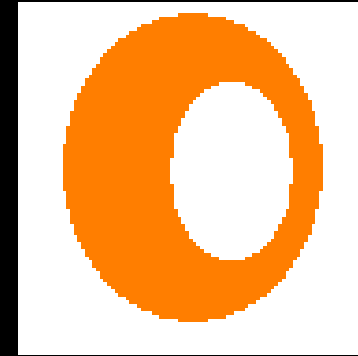
1.25 mm  
Optic Nerve



1.75 mm  
Optic Nerve



2.25 mm  
Optic Nerve



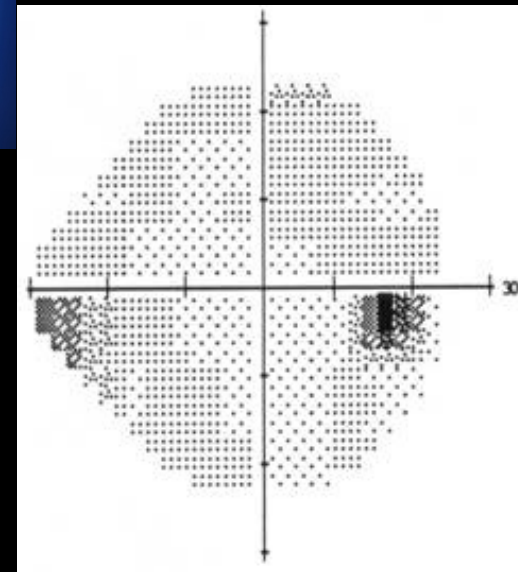
How much nerve has been lost with first repeatable threshold defect?

a) 5 – 10%

b) 30 – 40%

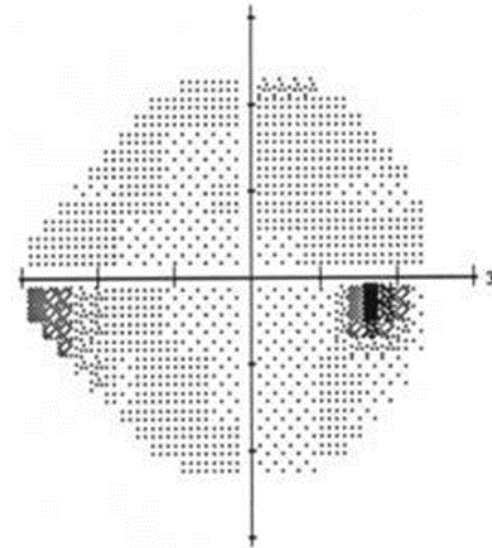
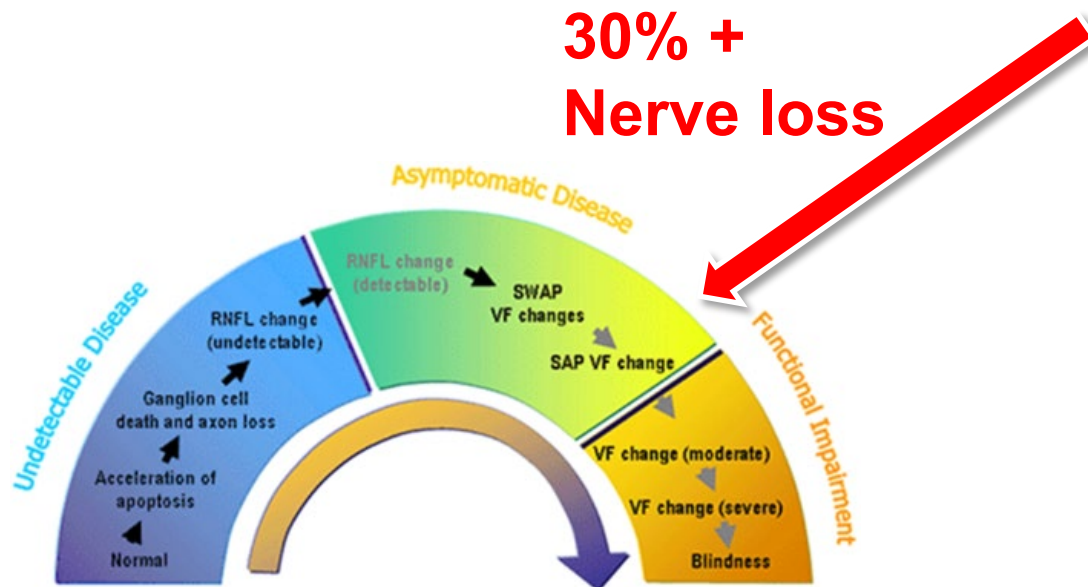
c) 50 - 60%

d) 15 – 20%



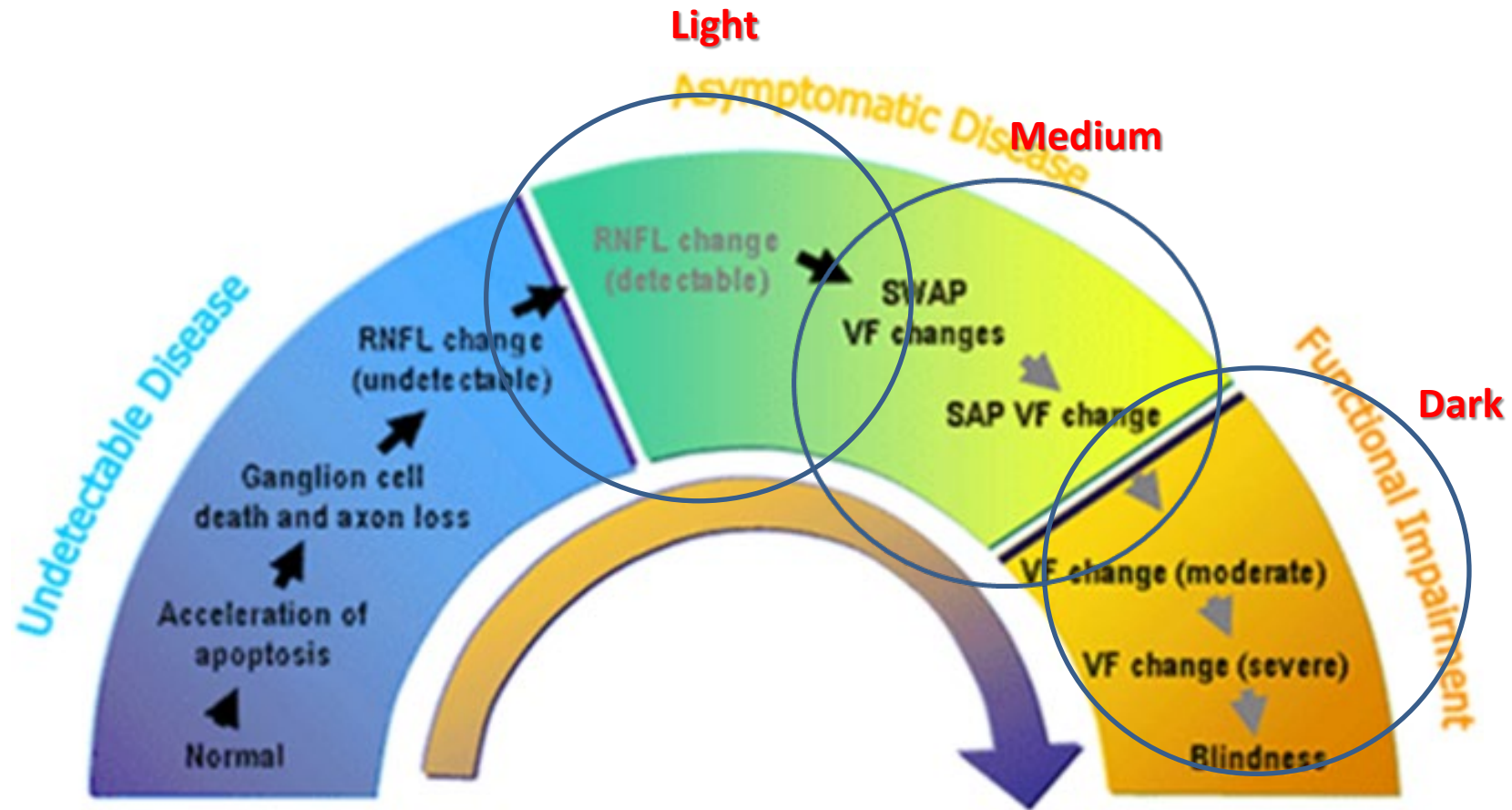
# Do you have to see a defect before you treat?

Quigley HA, Addicks EM, Green WR. Optic nerve damage in human glaucoma. III. Quantitative correlation of nerve fiber loss and visual field defect in glaucoma, ischemic neuropathy, papilledema, and toxic neuropathy. Arch Ophthalmology 1982 Jan;100(1):135-46.





# Target pressures?



# Our Clinical Decisions

- Observation vs. Treatment
- Change Treatment



# Case 1

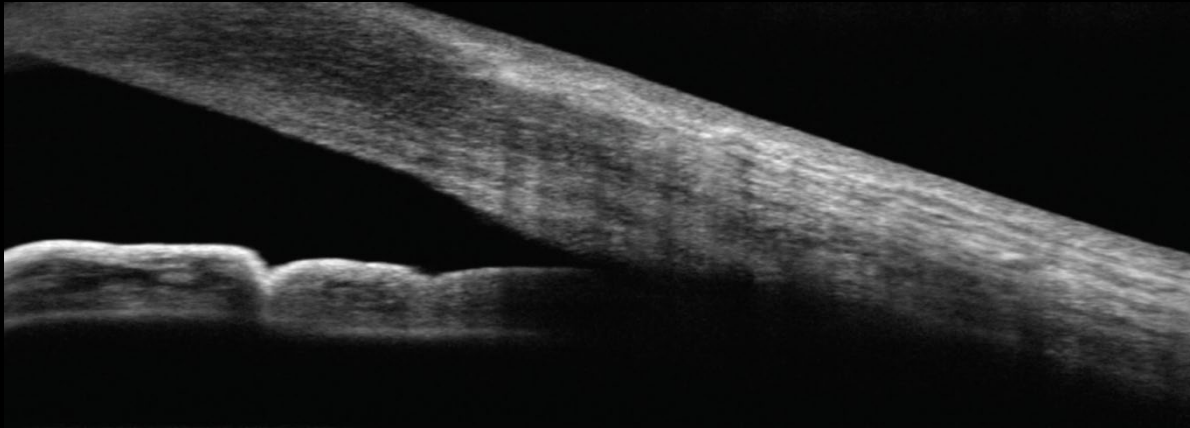
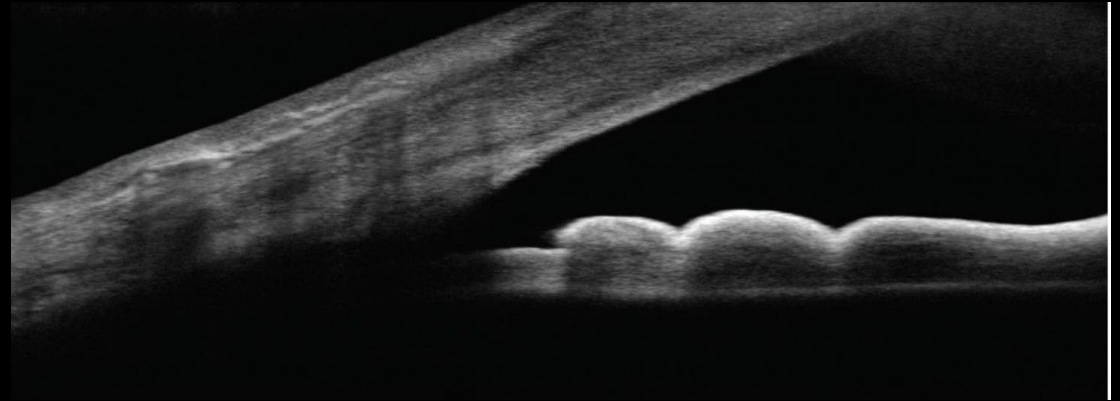
## 44 y/o African American Female

- Referred for evaluation of suspect nerves
- -700 OU = 20/20 OU
- Mother and aunt POAG
- Very slender stature
- Blood pressure 102/65

# Case 1

## 44 y/o African American Female

- IOP – 22, 21
- Open angles



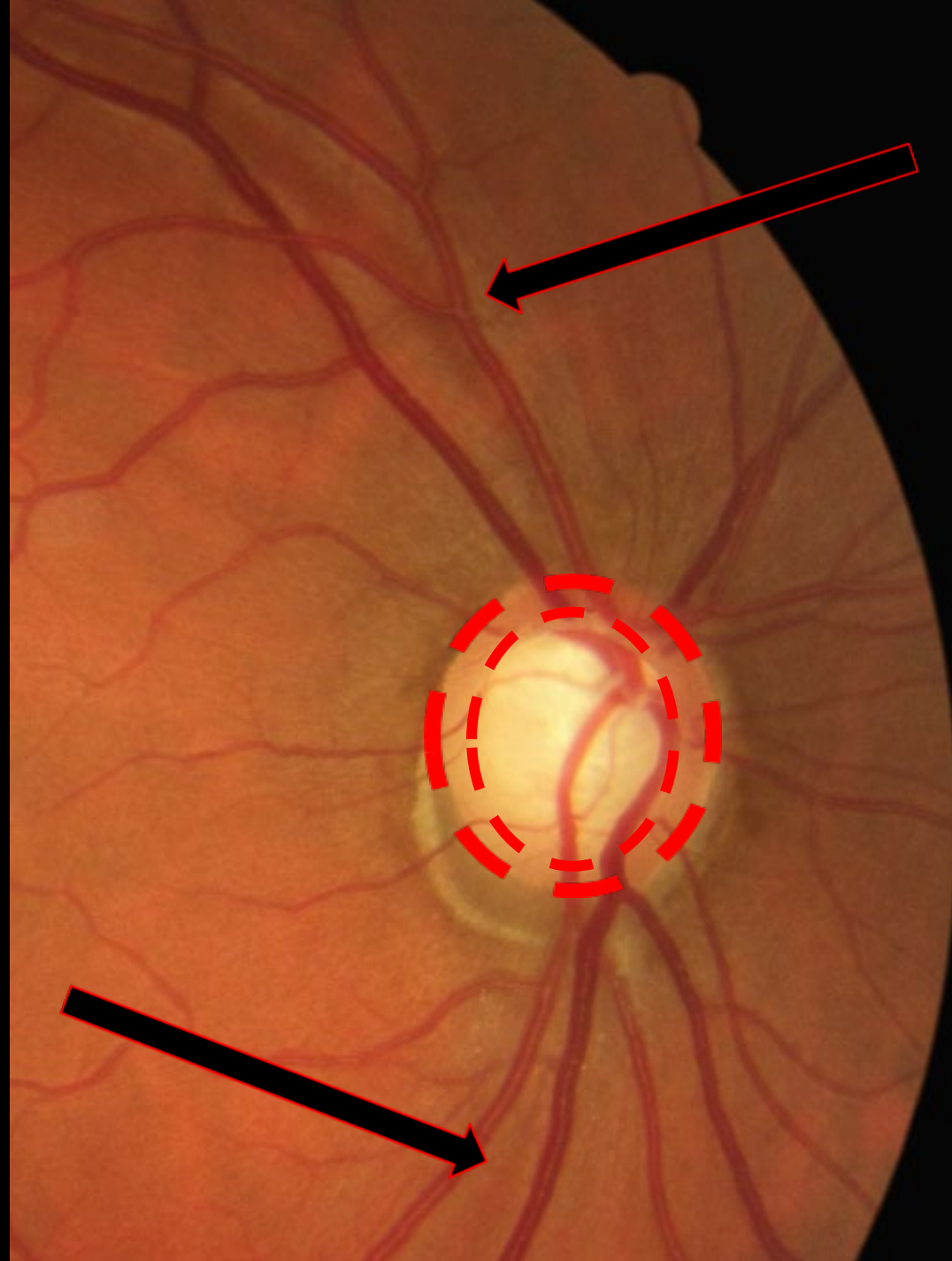
Case 1



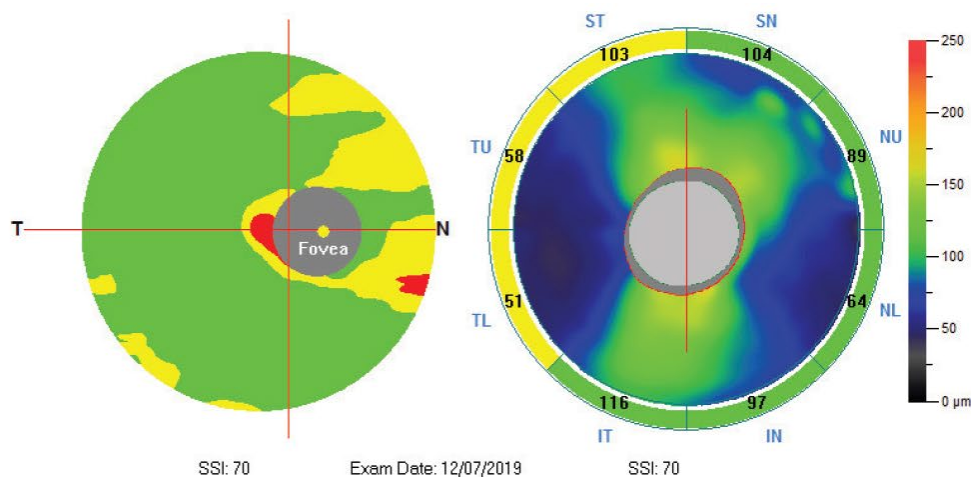
Case 1



Case 1

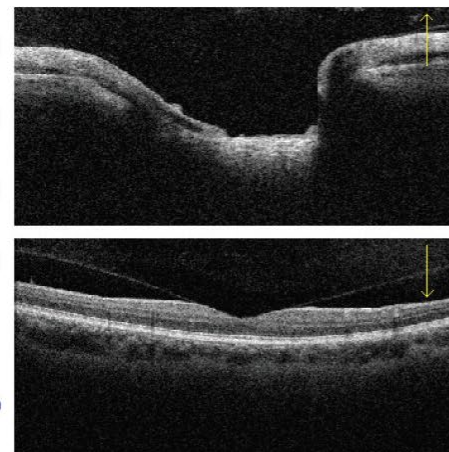


# Case 1



SSI: 70 Exam Date: 12/07/2019

SSI: 70



RNFL Analysis	OD	OS	Inter Eye (OD-OS)
Average RNFL (μm)	85	97	-12
Superior RNFL (μm)	88	105	-17
Inferior RNFL (μm)	82	89	-7
Intra Eye (S-I) (μm)	6	16	N/A

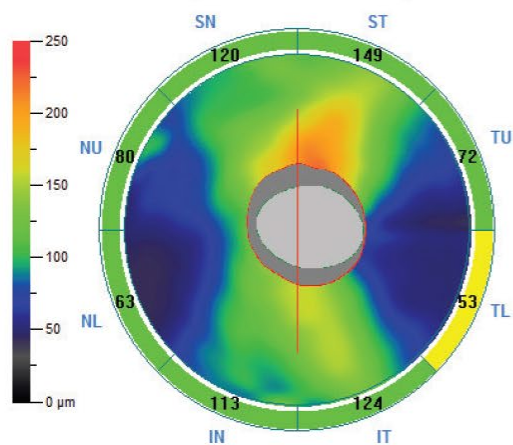
ONH Analysis	OD	OS	Inter Eye (OD-OS)
Cup/Disc Area Ratio	0.76	0.62	0.14
Cup/Disc V. Ratio	0.86	0.72	0.14
Cup/Disc H. Ratio	0.95	0.93	0.02
Rim Area (mm <sup>2</sup> )	0.56	0.85	-0.29
Disc Area (mm <sup>2</sup> )	2.37	2.22	0.15
Cup Volume (mm <sup>3</sup> )	1.041	0.601	0.440

GCC Analysis	OD	OS	Inter Eye (OD-OS)
Average GCC (μm)	86	86	0
Superior GCC (μm)	84	87	-3
Inferior GCC (μm)	88	85	3
Intra Eye (S-I) (μm)	-4	2	N/A
FLV (%)	2.23	0.50	1.73
GLV (%)	9.44	8.62	0.82

p>5% Within Normal  
 p<5% Borderline  
 p<1% Outside Normal

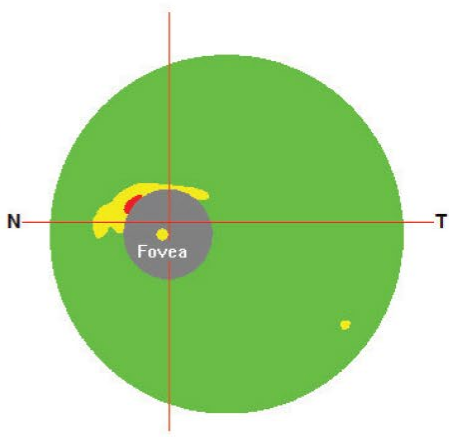
Left / OS

Optic Nerve Head Map



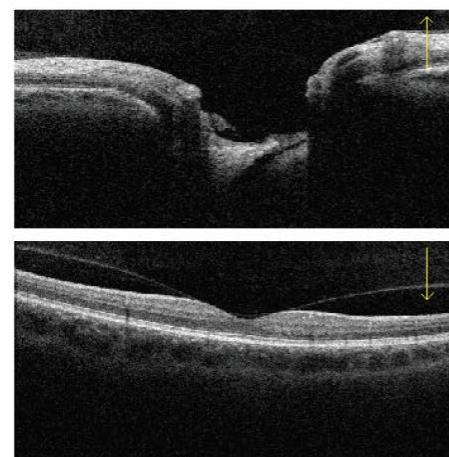
SSI: 78 Exam Date: 12/07/2019

GCC NDB Reference

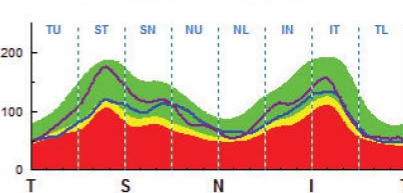


SSI: 76

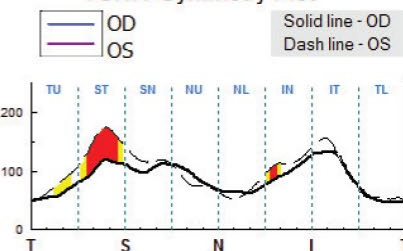
• NDB ○ Thickness



TSNIT NDB Reference



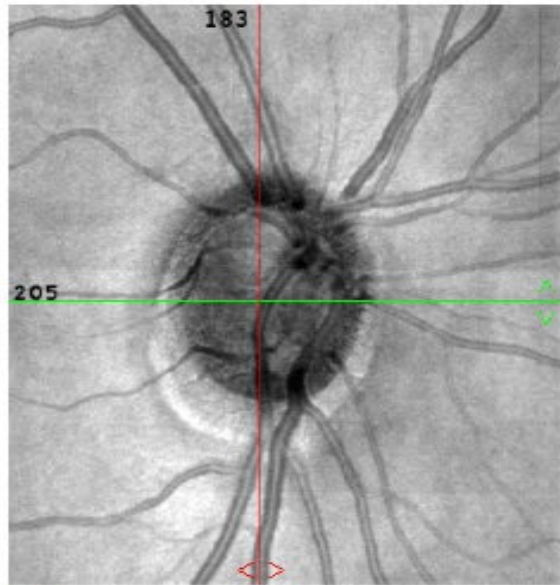
TSNIT Symmetry Plot



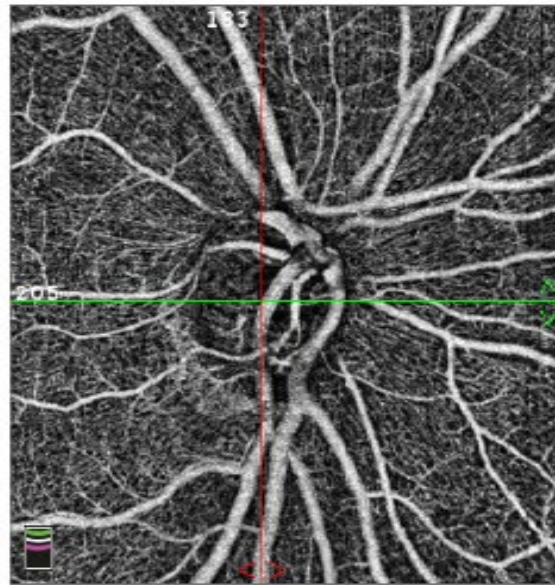


# Case 1

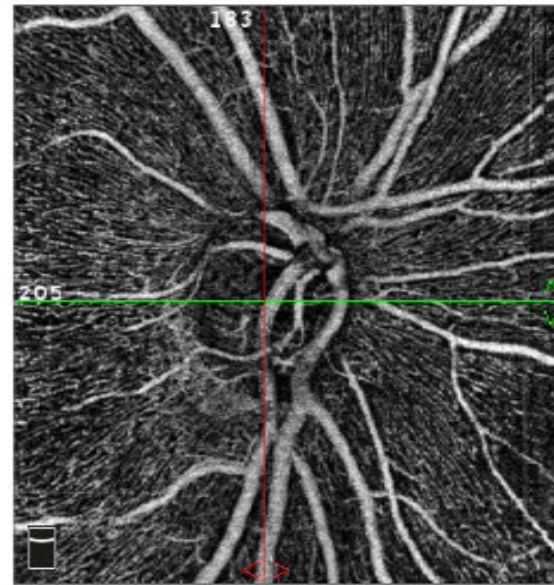
Parameters	OD	OS	Difference
Amplitude Low Contrast $\mu\text{V}$	8.5	8.0	0.5
Amplitude High Contrast $\mu\text{V}$	8.1	8.6	0.5
Latency Low Contrast ms	112.3	105.5	6.8
Latency High Contrast ms	102.5	101.6	1.0



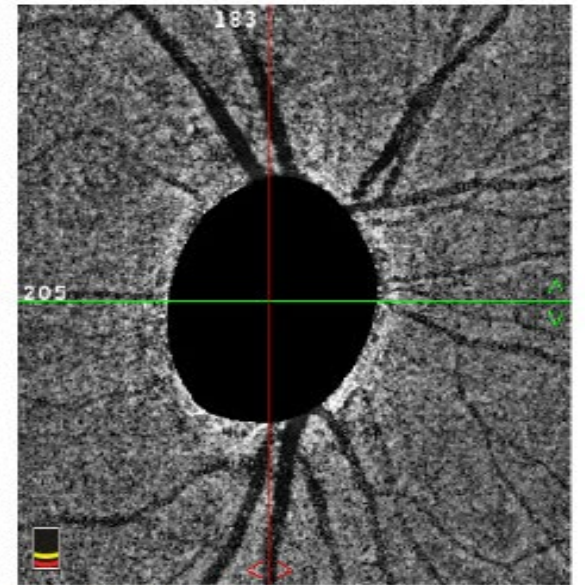
SLO



Vitreous/Retina (Above OPL)



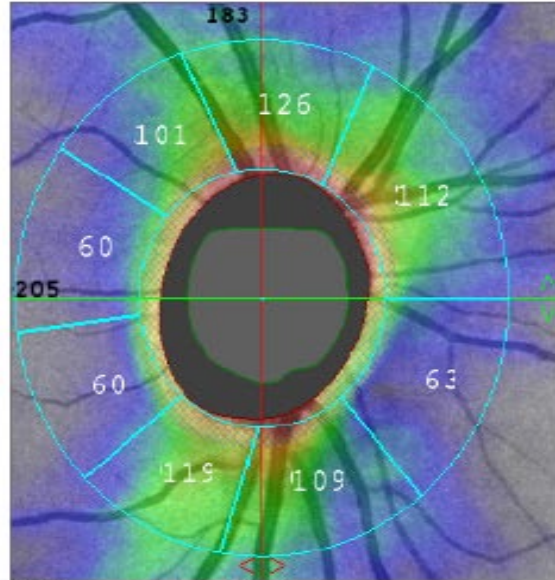
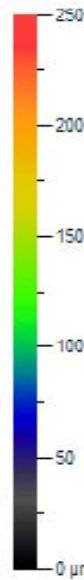
RPC (ILM - NFL)



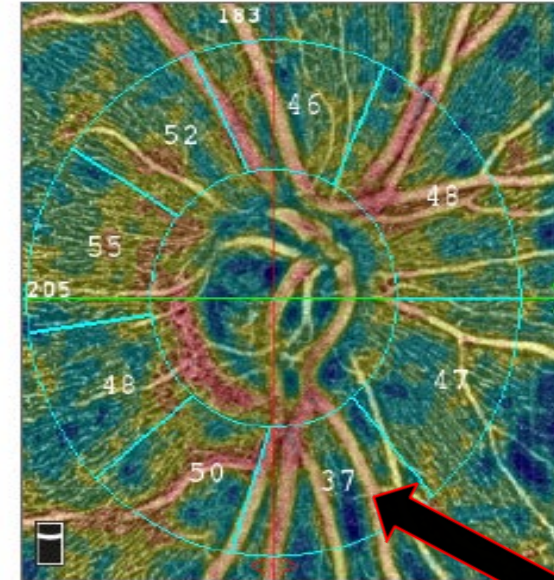
Choroid (Below RPE)

ONH Analysis	
Cup/Disc Area Ratio	0.51
Cup/Disc V. Ratio	0.69
Cup/Disc H. Ratio	0.74
Rim Area (mm <sup>2</sup> )	1.22
Disc Area (mm <sup>2</sup> )	2.51
Cup Volume (mm <sup>3</sup> )	0.512

RNFL Thickness (μm)	
Peripapillary	94



Thickness (ILM - NFL)



Vessel Density (RPC)

RPC Density (%)	Small Vessels	All
Whole Image	46.5	54.0
Whole Disc	45.6	55.5
Superior-Hemi	48.2	55.8
Inferior-Hemi	50.4	57.6
Temporal-Hemi	45.7	53.8

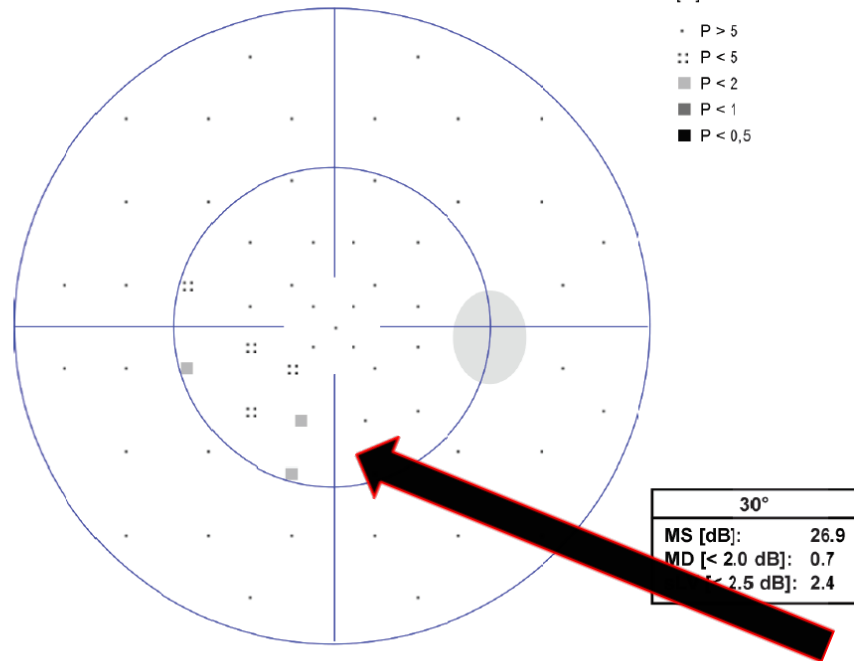
RPC Vessel Density(%) - Small Vessels



# Case 1

**Right eye (OD) / 12/07/2019 / 12:50:36**

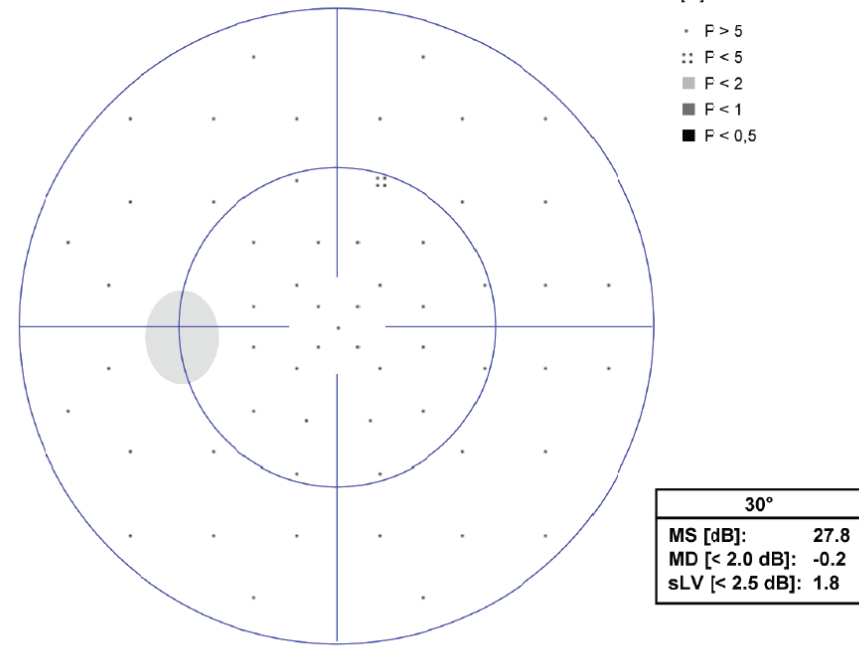
Corrected probabilities



Programs: G Standard White/White / TOP Questions / repetitions: 70 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:30  
 Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
 Trial lens: -6.0 VA [m]:  
 Pupil [mm]: 6.2 IOP [mmHg]:  
 NV: T53 V2.1

**Left eye (OS) / 12/07/2019 / 12:53:27**

Corrected probabilities



Programs: G Standard White/White / TOP Questions / repetitions: 70 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:25  
 Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
 Trial lens: -7.0 VA [m]:  
 Pupil [mm]: 4.7 IOP [mmHg]:  
 NV: T53 V2.1

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



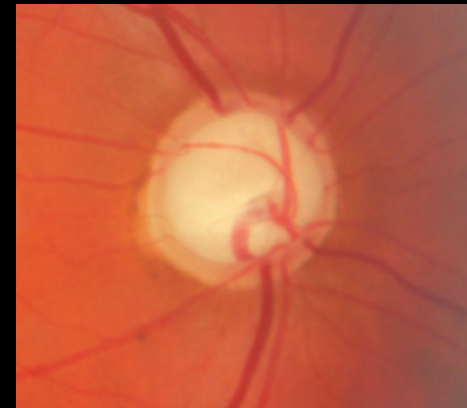
What's your plan?

Observe?

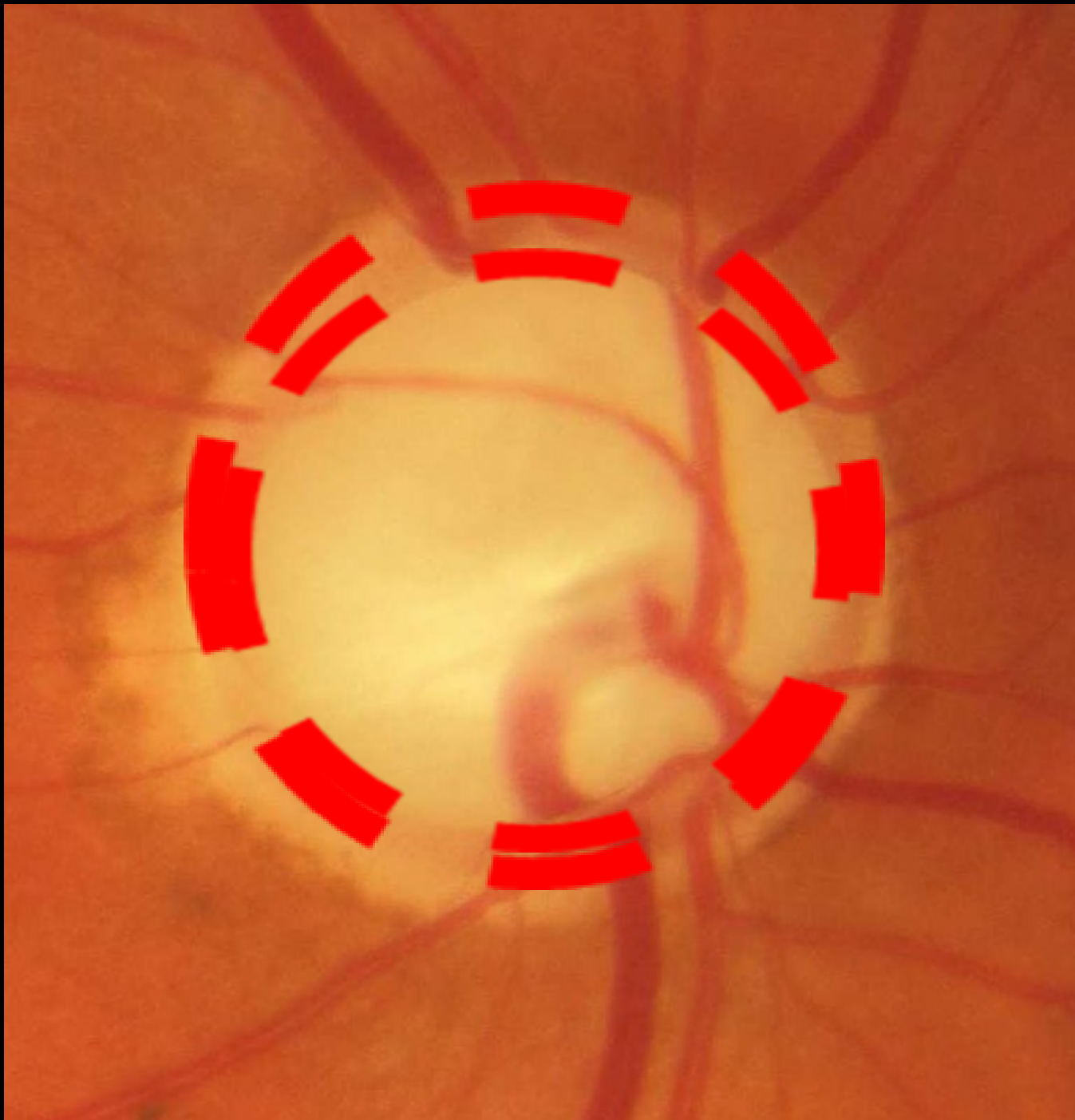
Treat?

## Case 2

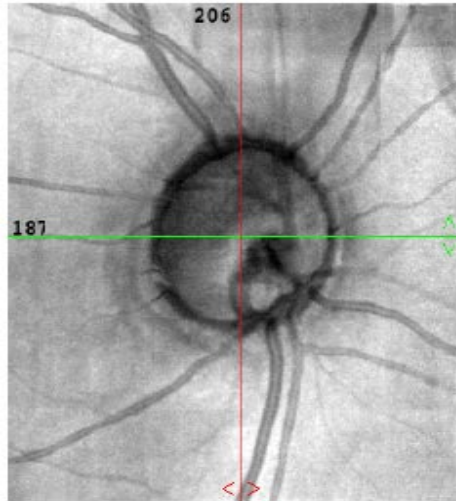
- 60 y/o Caucasian male
- No family History of POAG
- Mother used thalidomide during pregnancy
- IOP low to mid 20's
- Open angles
- Large nerve diameter



# Case 2



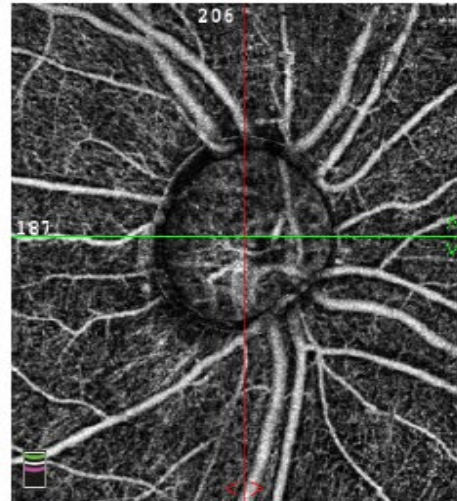
# Case 2



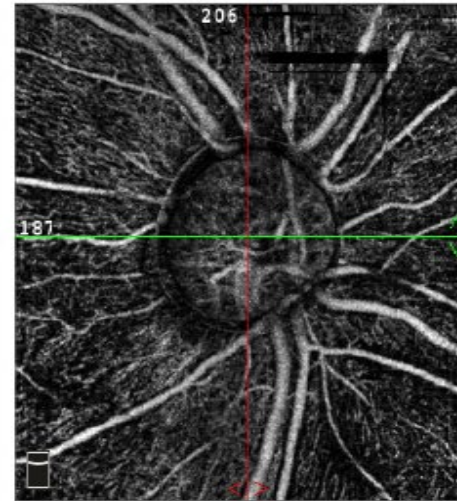
SLO

ONH Analysis	
Cup/Disc Area Ratio	0.47
Cup/Disc V. Ratio	0.97
Cup/Disc H. Ratio	0.50
Rim Area (mm <sup>2</sup> )	1.39
Disc Area (mm <sup>2</sup> )	2.61
Cup Volume (mm <sup>3</sup> )	0.617

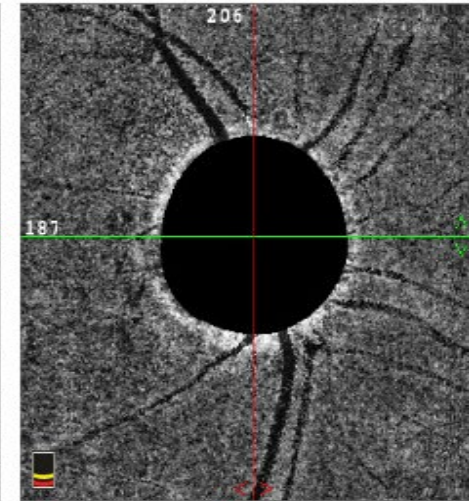
RNFL Thickness (μm)	
Peripapillary	73



Vitreous/Retina (Above OPL)



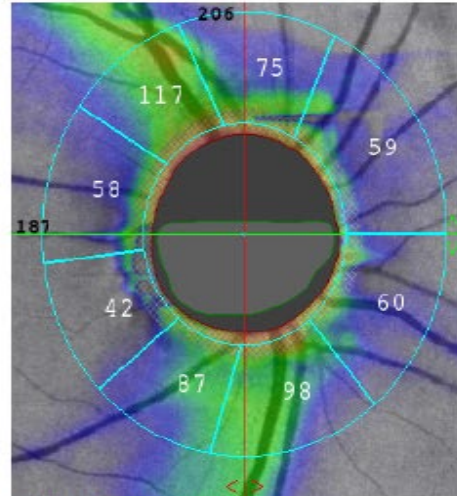
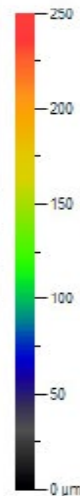
RPC (ILM - NFL)



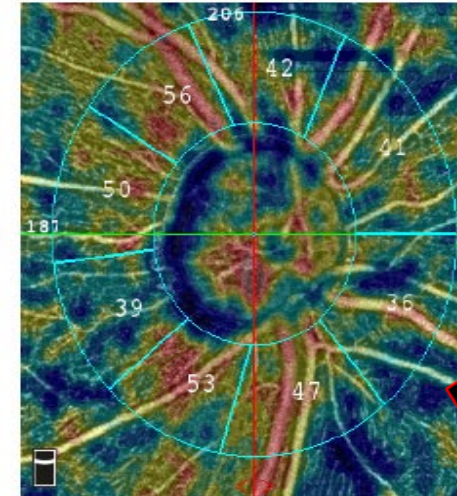
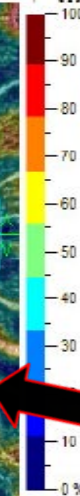
Choroid (Below RPE)

RPC Density (%)	Small Vessels	All
Whole Image	42.7	48.9
Whole Disc	42.6	45.9
Peripapillary	44.7	52.6
Superior-Hemi	46.2	54.0
Inferior-Hemi	43.0	51.0

RPC Vessel Density(%) - Small Ves



Thickness(ILM - NFL)



Vessel Density (RPC)

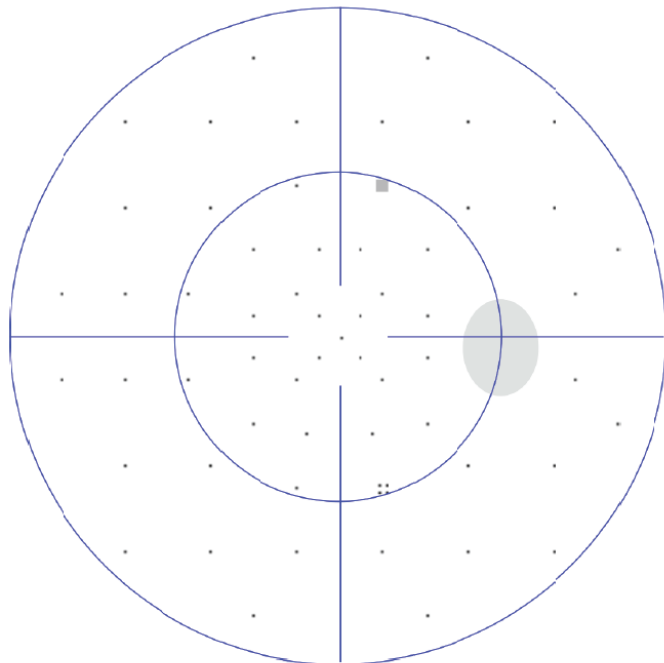




# Case 2

Right eye (OD) / 08/31/2019 / 10:49:31

Corrected probabilities



- [%]
- P > 5
  - :: P < 5
  - P < 2
  - P < 1
  - P < 0,5

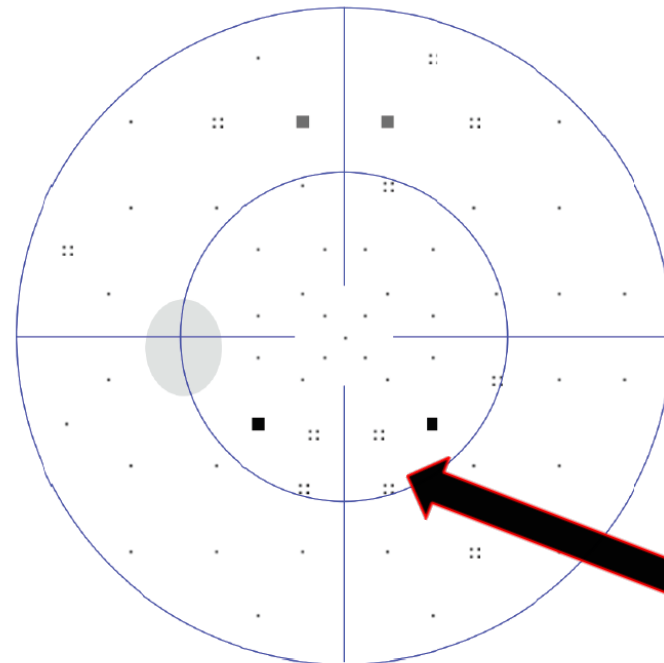
30°	
MS [dB]:	25.9
MD [< 2.0 dB]:	1.1
sLV [< 2.5 dB]:	2.4

Programs: G Standard White/White / TOP Questions / repetitions: 71 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:20  
 Catch trials: 0/7 (0%) +, 1/7 (14%) - RF: 7.1  
 Trial lens : -2.0 VA [m]:  
 Pupil [mm]: 2.9 IOP [mmHg]:  
 NV: T53 V2.1

Comment:

Left eye (OS) / 08/31/2019 / 10:52:19

Corrected probabilities



- [%]
- P > 5
  - :: P < 5
  - P < 2
  - P < 1
  - P < 0,5

30°	
MS [dB]:	22.2
MD [< 2.0 dB]:	4.8
sLV [< 2.5 dB]:	4.4

Programs: G Standard White/White / TOP Questions / repetitions: 69 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:16  
 Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
 Trial lens : -2.0 VA [m]:  
 Pupil [mm]: 4.7 IOP [mmHg]:  
 NV: T53 V2.1

Comment:

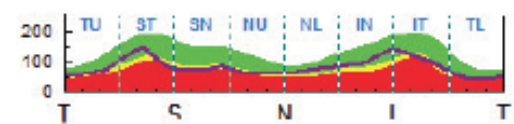
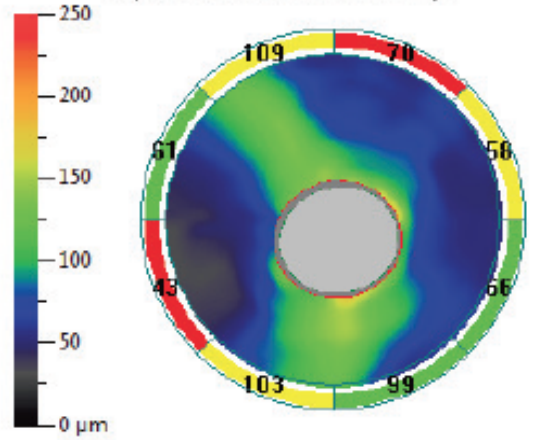
# Red Disease?

Right / OD

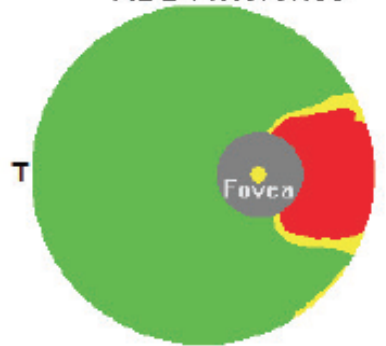
Nerve Fiber ONH/GCC OU Report

Left / OS

Exam Date: 2016-08-27 12:06:25  
Optic Nerve Head Map



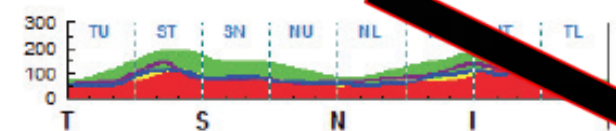
NDB Reference



Exam Date: 2016-08-27 12:06:16

Good 72 Scan Quality Index Good 72

RNFL Analysis (µm)	OD	OS	Inter Eye Diff
Avg RNFL Thickn...	76	68	
Avg Superior RNFL	74	70	4
Avg Inferior RNFL	78	66	12
Intra Eye Diff (S-I)	-4	4	N/A
ONH Analysis	OD	OS	Inter Eye Diff
Area C/D	0.85	0.66	0.19
V. C/D	0.96	0.75	0.21
H. C/D	0.98	0.98	0.00
Rim Area (mm <sup>2</sup> )	0.37	1.06	-0.69
Disc Area (mm <sup>2</sup> )	2.50	3.16	-0.66
Cup Vol (mm <sup>3</sup> )	1.434	1.011	0.423

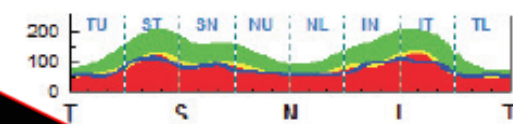
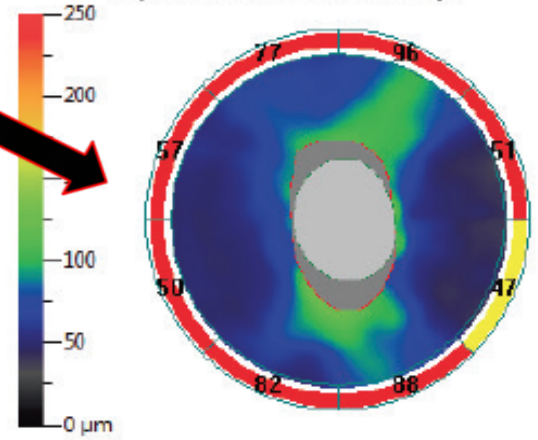


Within Normal (Green)  
Borderline (Yellow)  
Outside Normal (Red)

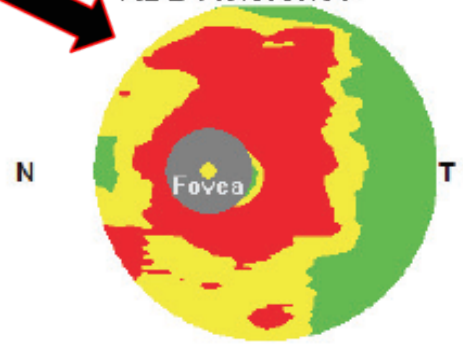
GCC Avg Thickness (µm)	OD	OS	Inter Eye Diff
Total	90	74	16
Superior	89	73	16
Inferior	90	76	14
Intra Eye Difference (S-I)	-1	-3	N/A
FLV (%)	4.202	3.833	0.369
GLV (%)	6.559	19.849	-13.290

Good 72 Scan Quality Index Good 72

Exam Date: 2016-08-27 12:06:48  
Optic Nerve Head Map



NDB Reference



Exam Date: 2016-08-27 12:06:38

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



What's your plan?

Observe?

Treat?

# Case 3

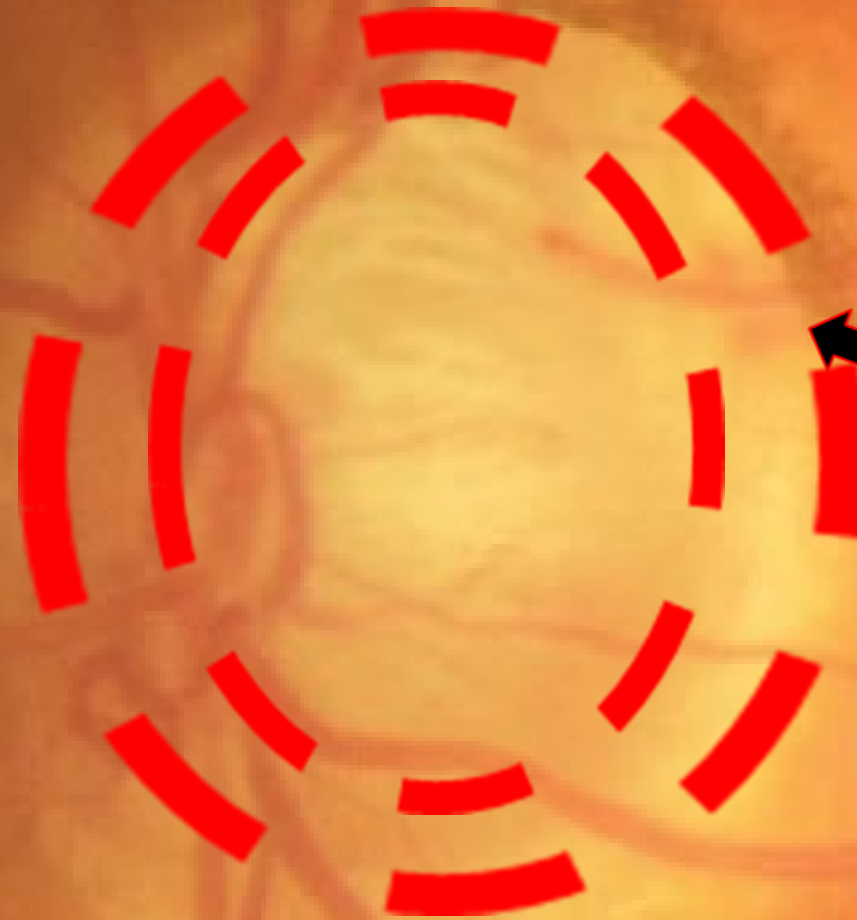
- 75 y/o Caucasian male
- V/A = 20/25- OU
- IOP's low 20's
- Vague family history
- Weight 145 lbs.
- History of heart problems – bypass surgery



# Case 3

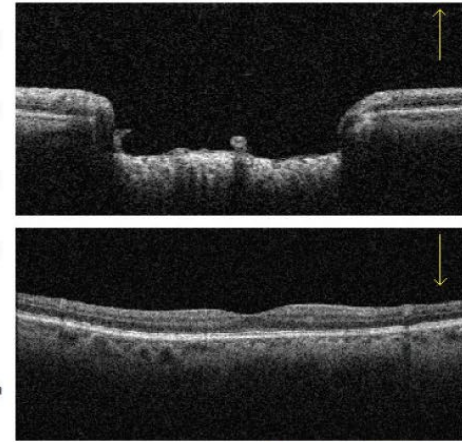
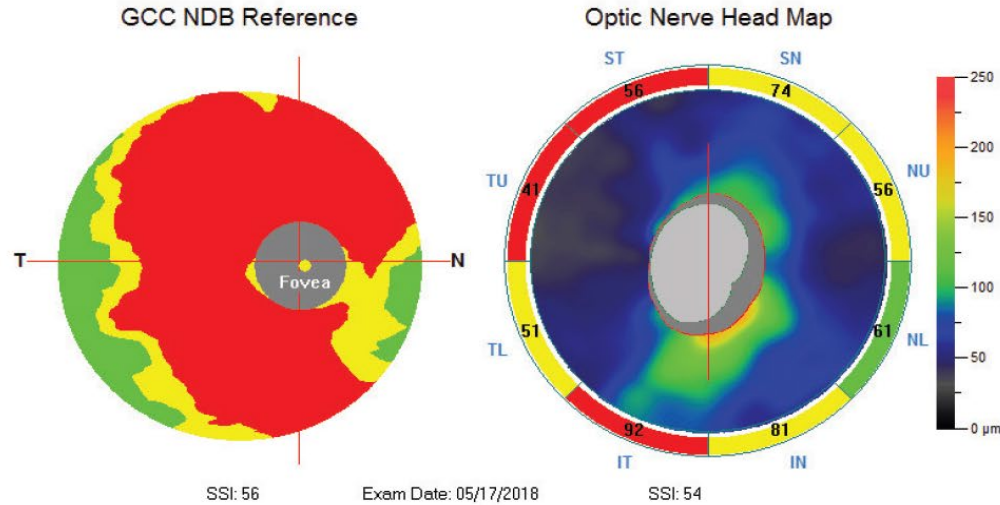


Case 3



# Case 3

Right / OD

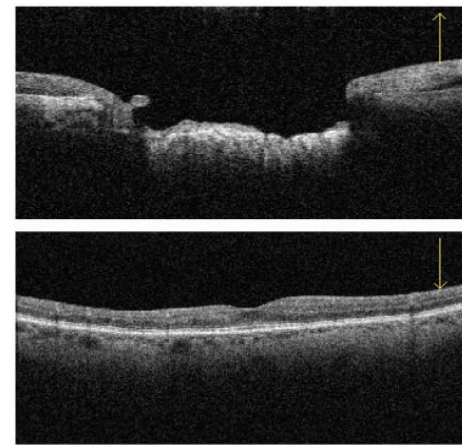
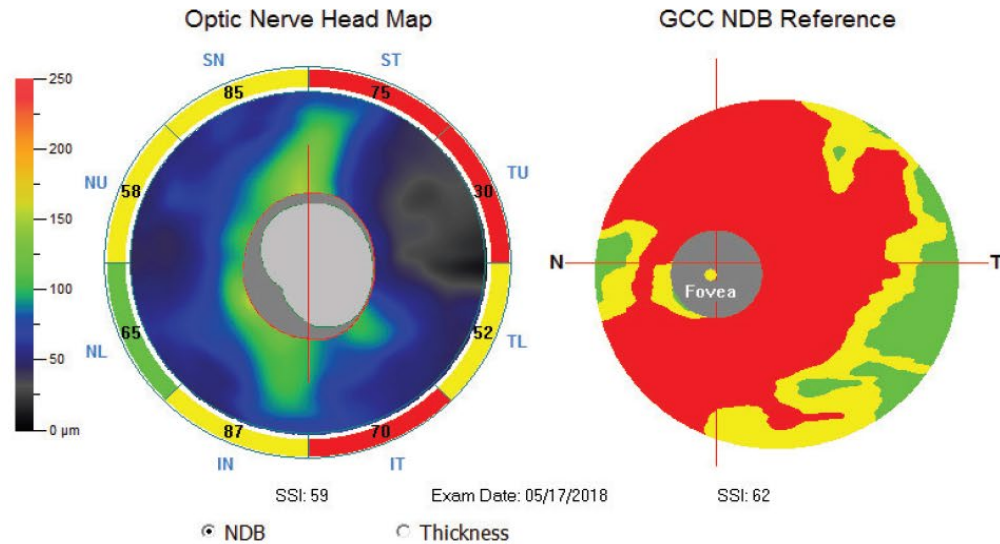


p>5% Within Normal  
p<5% Borderline  
p<1% Outside Normal

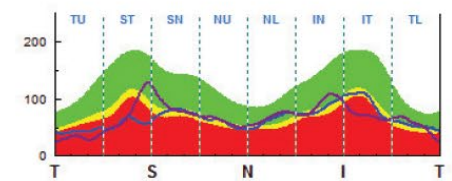
## Summary Parameters

RNFL Analysis ( $\mu\text{m}$ )			
	OD	OS	Inter Eye (OD-OS)
Avg RNFL Thickness	64	65	-1
Avg Superior RNFL	57	62	-5
Avg Inferior RNFL	71	69	2
Intra Eye (S-I)	-14	-7	N/A
ONH Analysis			
	OD	OS	Inter Eye (OD-OS)
Cup/Disc Area Ratio	0.69	0.70	-0.01
Cup/Disc V. Ratio	0.89	0.89	0.00
Cup/Disc H. Ratio	0.88	0.89	-0.01
Rim Area ( $\text{mm}^2$ )	0.79	0.90	-0.11
Disc Area ( $\text{mm}^2$ )	2.54	3.00	-0.46
Cup Volume ( $\text{mm}^3$ )	0.600	0.742	-0.142
GCC Avg ( $\mu\text{m}$ )			
	OD	OS	Inter Eye (OD-OS)
Total	67.53	66.13	1.40
Superior	63.65	62.49	1.16
Inferior	71.39	69.76	1.63
Intra Eye (S-I)	-7.74	-7.27	N/A
FLV (%)	8.541	10.366	-1.825
GLV (%)	28.114	29.141	-1.027

Left / OS

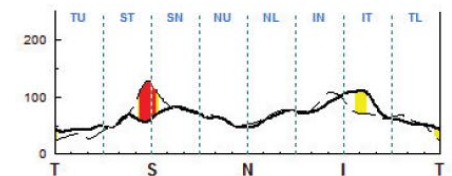


## TSNIT NDB Reference



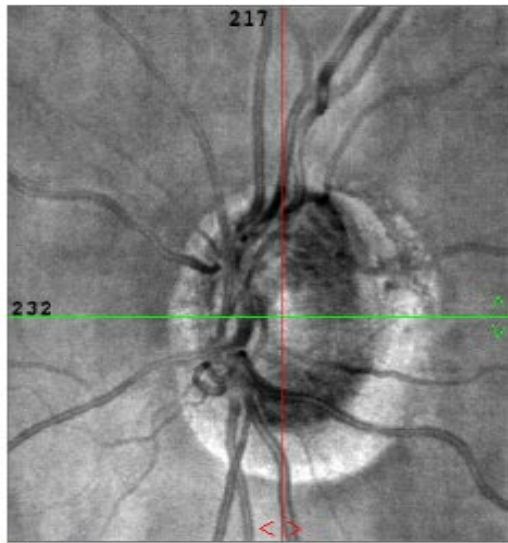
## TSNIT Symmetry Plot

Solid line - OD  
Dash line - OS

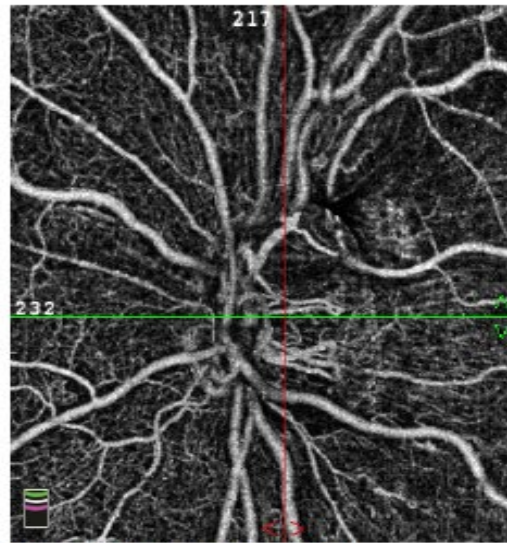




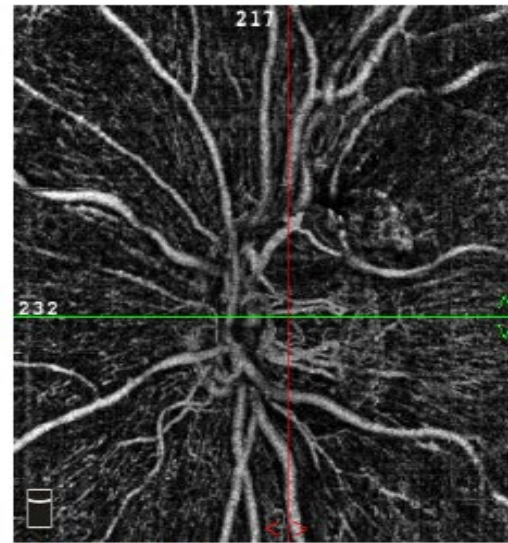
# Case 3



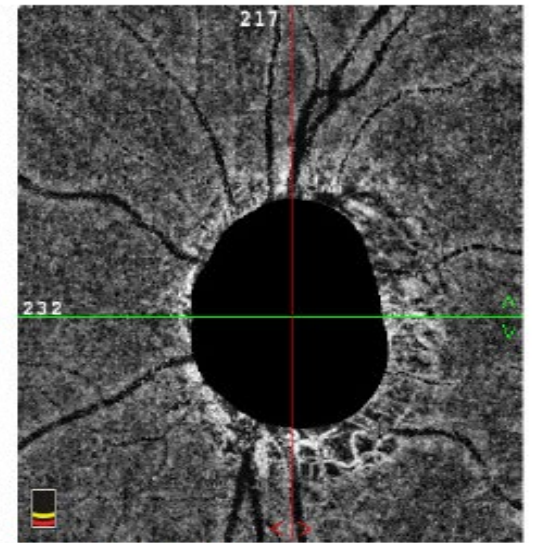
SLO



Vitreous/Retina (Above OPL)



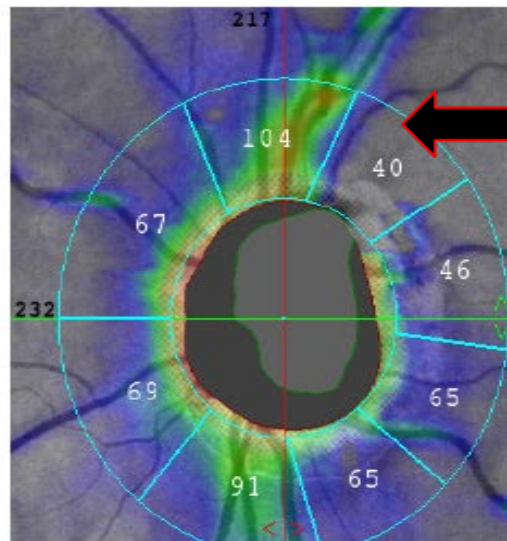
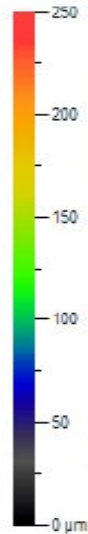
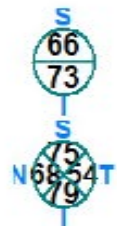
RPC (ILM - NFL)



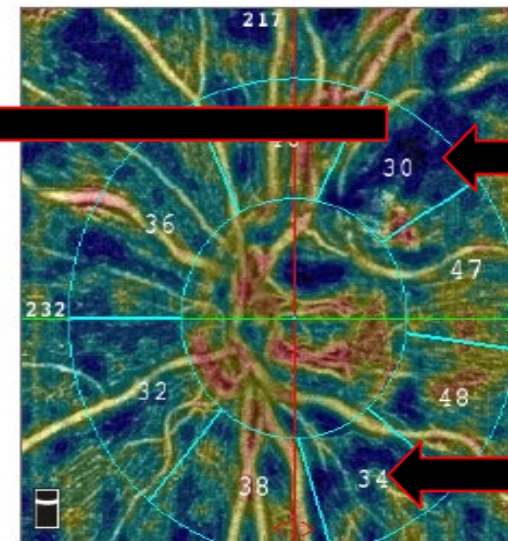
Choroid (Below RPE)

ONH Analysis	
Cup/Disc Area Ratio	0.51
Cup/Disc V. Ratio	0.81
Cup/Disc H. Ratio	0.63
Rim Area (mm <sup>2</sup> )	1.32
Disc Area (mm <sup>2</sup> )	2.67
Cup Volume (mm <sup>3</sup> )	0.264

RNFL Thickness (μm)	
Peripapillary	69



Thickness(ILM - NFL)



Vessel Density (RPC)

RPC Density (%)	Small Vessels	All
Whole Image	39.5	45.7
Whole Disc	47.7	57.0
Superior-Hemi	38.6	45.0
Inferior-Hemi	39.5	45.7
Temporal-Hemi	44.2	44.2

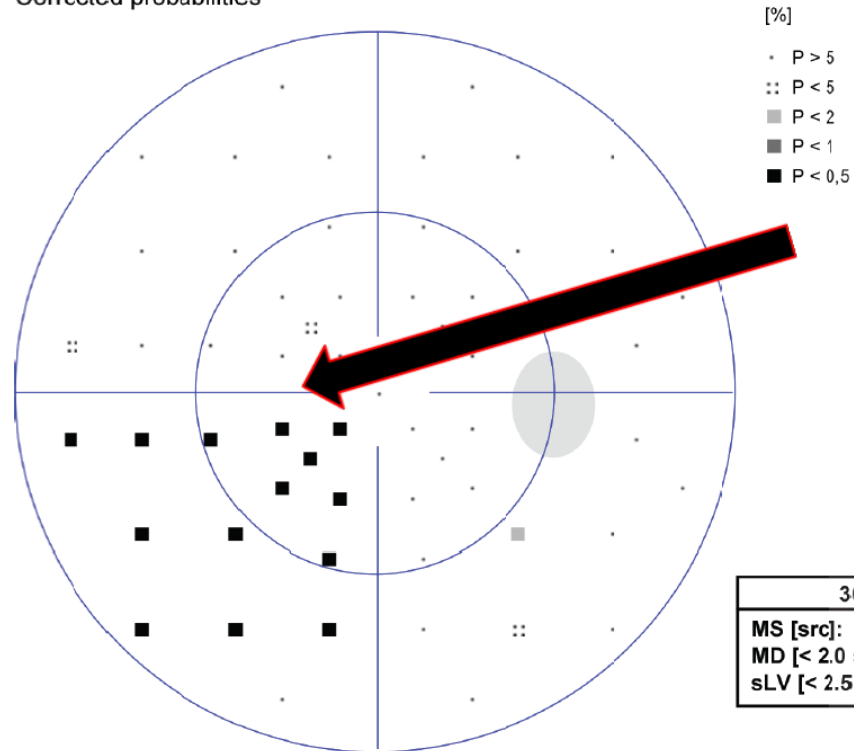
RPC Vessel Density(%) - Small Vessels



# Case 3

Right eye (OD) / 05/17/2018 / 09:21:55

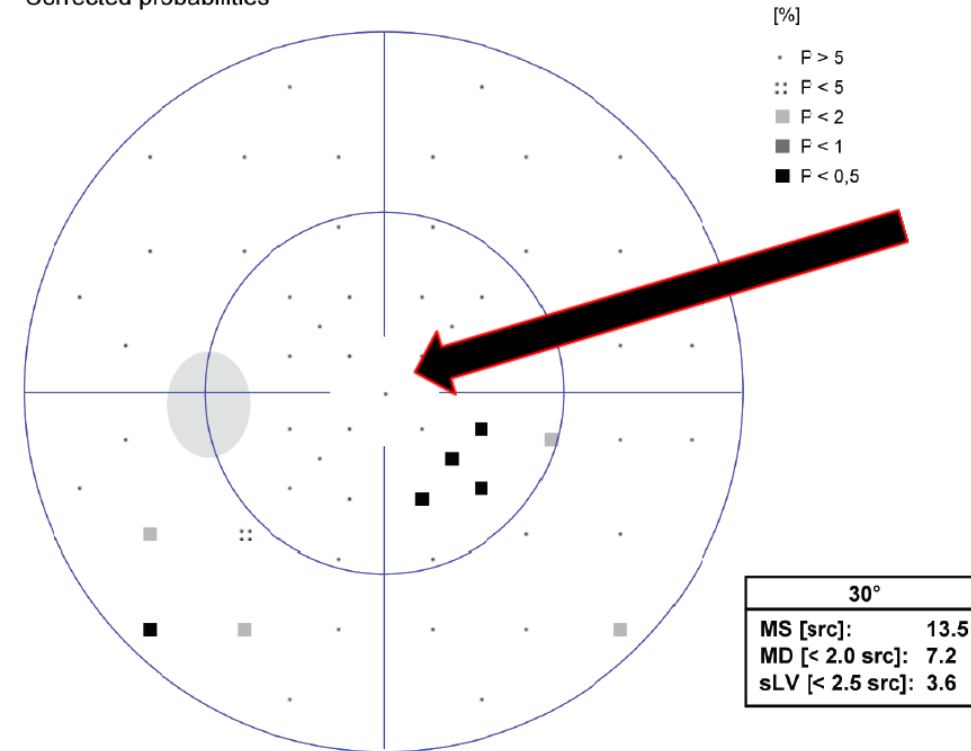
Corrected probabilities



Programs: G P Pulsar / 200 TOP Questions / repetitions: 69 / 0  
 Parameters: 100 / 200 asb 500 ms Duration: 03:16  
 Catch trials: 1/7 (14%) +, 0/7 (0%) - RF: 7.1  
 Trial lens : VA [m]:  
 Pupil [mm]: 2.4 IOP [mmHg]:  
 NV: T54 V2.1

Left eye (OS) / 05/17/2018 / 09:25:39

Corrected probabilities



Programs: G P Pulsar / 200 TOP Questions / repetitions: 69 / 0  
 Parameters: 100 / 200 asb 500 ms Duration: 03:00  
 Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
 Trial lens : VA [m]:  
 Pupil [mm]: 4.5 IOP [mmHg]:  
 NV: T54 V2.1

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



What's your plan?

Observe?

Treat?

64 y/o Caucasian  
male

When do YOU  
“chicken out”?

- IOP = 29, 30
- Positive family history POAG
- History of well controlled Epilepsy
- Open angles flat iridies light pigment
- Small nerves

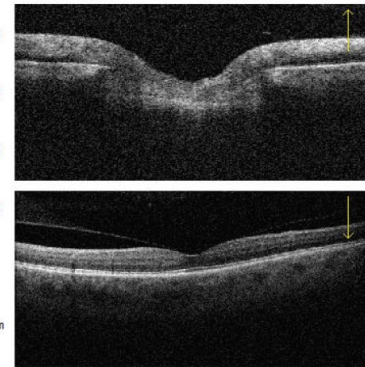
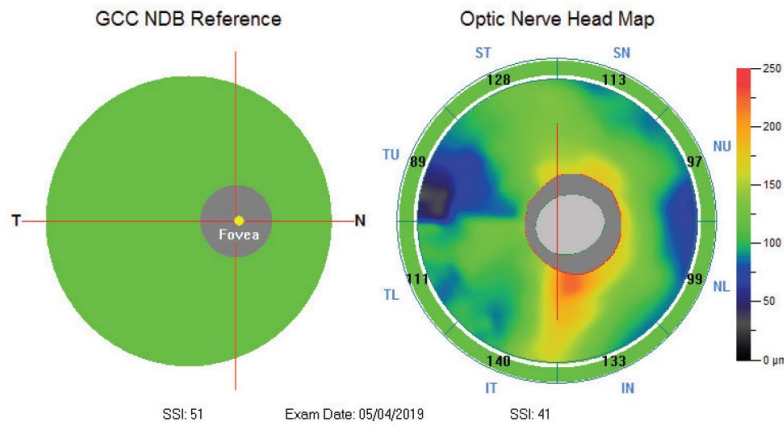


# Case 4



# Case 4

Right / OD



Summary Parameters

RNFL Analysis	OD	OS	Inter Eye (OD-OS)
Average RNFL (µm)	114	98	16
Superior RNFL (µm)	107	97	10
Inferior RNFL (µm)	121	99	22
Intra Eye (S-I) (µm)	-14	-2	N/A

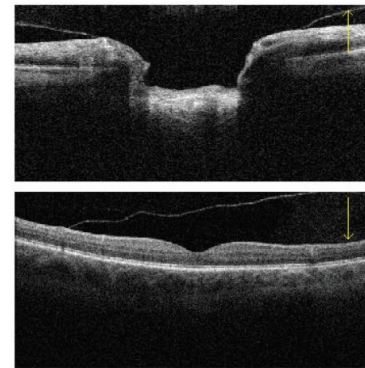
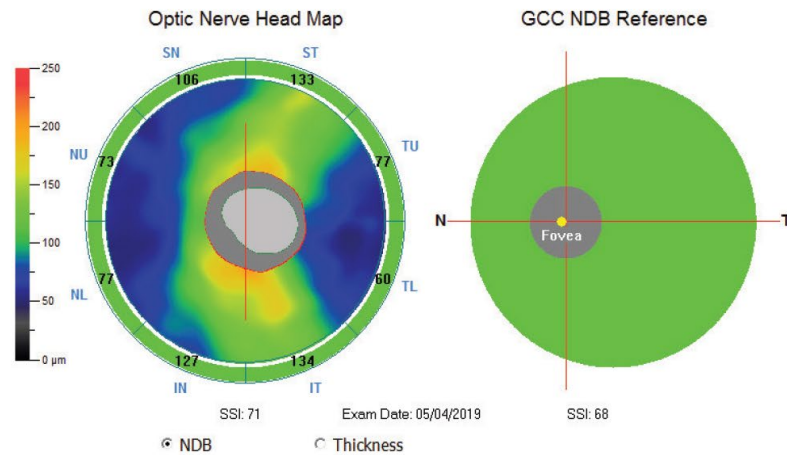
ONH Analysis	OD	OS	Inter Eye (OD-OS)
Cup/Disc Area Ratio	0.44	0.49	-0.05
Cup/Disc V. Ratio	0.61	0.69	-0.08
Cup/Disc H. Ratio	0.72	0.79	-0.07
Rim Area (mm <sup>2</sup> )	1.27	1.21	0.06
Disc Area (mm <sup>2</sup> )	2.26	2.37	-0.11
Cup Volume (mm <sup>3</sup> )	0.274	0.374	-0.100

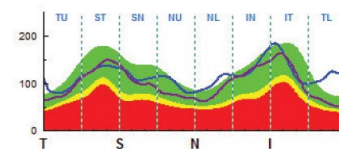
GCC Analysis	OD	OS	Inter Eye (OD-OS)
Average GCC (µm)	97	95	2
Superior GCC (µm)	98	96	2
Inferior GCC (µm)	97	94	3
Intra Eye (S-I) (µm)	1	2	N/A
FLV (%)	0.71	0.24	0.47
GLV (%)	1.42	1.57	-0.15

p>5% Within Normal  
 p<5% Borderline  
 p<1% Outside Normal

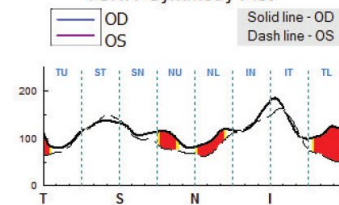
Left / OS



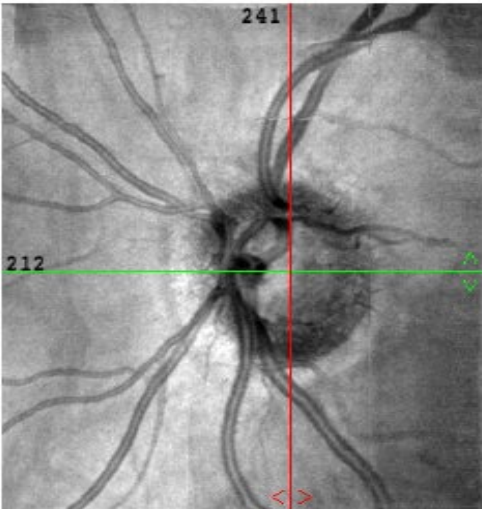
TSNIT NDB Reference



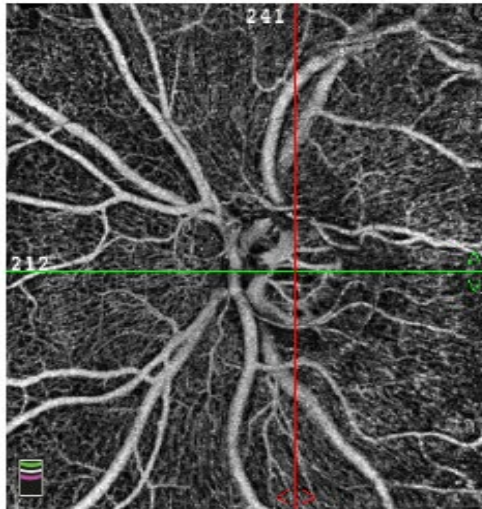
TSNIT Symmetry Plot



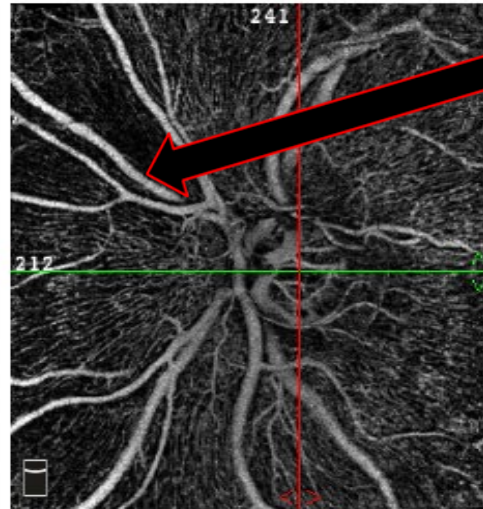
# Case 4



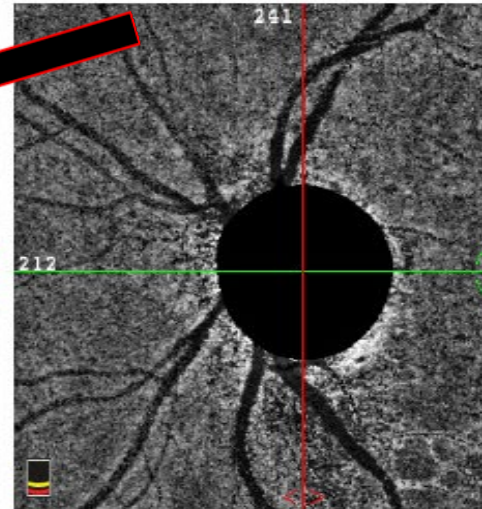
SLO



Vitreous/Retina (Above OPL)



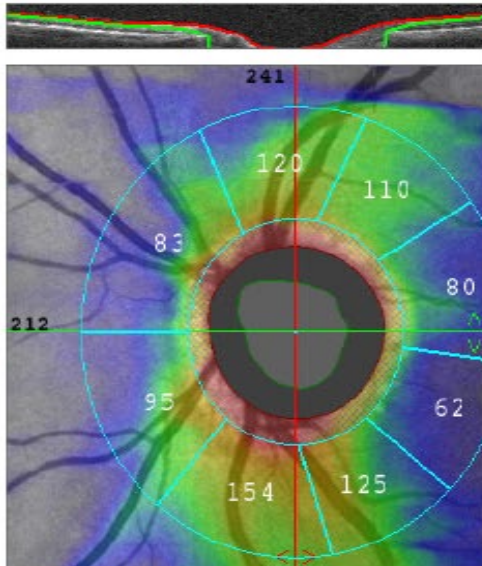
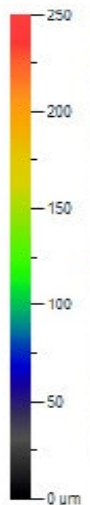
RPC (ILM - NFL)



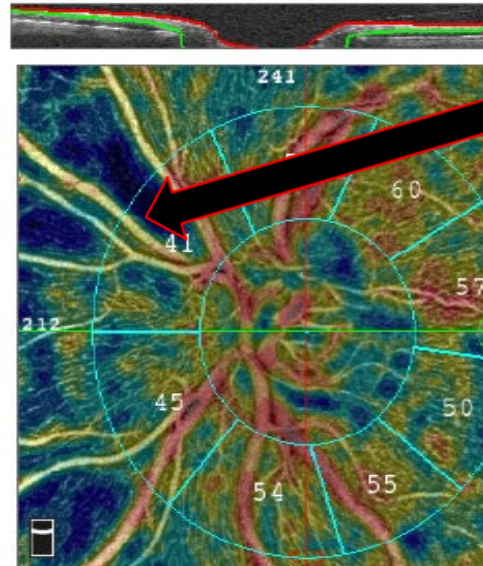
Choroid (Below RPE)

ONH Analysis	
Cup/Disc Area Ratio	0.38
Cup/Disc V. Ratio	0.66
Cup/Disc H. Ratio	0.58
Rim Area (mm <sup>2</sup> )	1.22
Disc Area (mm <sup>2</sup> )	1.97
Cup Volume (mm <sup>3</sup> )	0.160

RNFL Thickness (µm)	
Peripapillary	104



Thickness (ILM - NFL)



Vessel Density (RPC)

RPC Density (%)	Small Vessels	All
Peripapillary	45.4	52.1
Superior-Hemi	47.0	54.7
Inferior-Hemi	51.1	57.6
Superior-Hemi	51.4	58.4
Inferior-Hemi	50.9	56.7

RPC Vessel Density (%) - Small Vessels

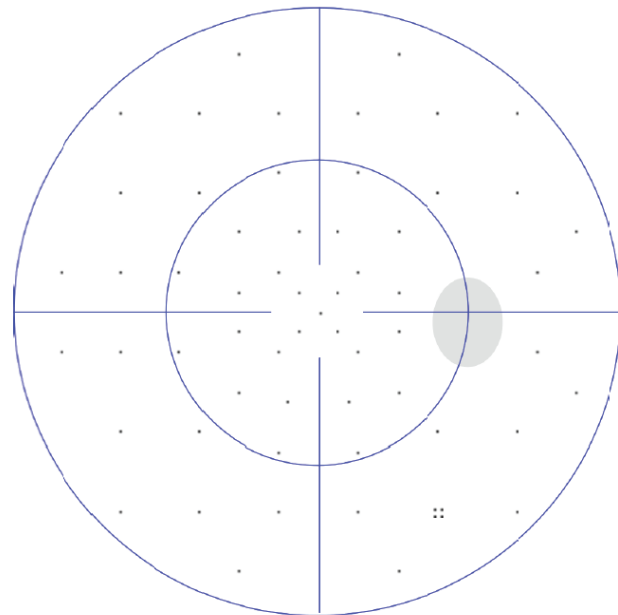




# Case 4

Right eye (OD) / 05/04/2019 / 09:53:18

Corrected probabilities



- P > 5
- :: P < 5
- P < 2
- P < 1
- P < 0,5

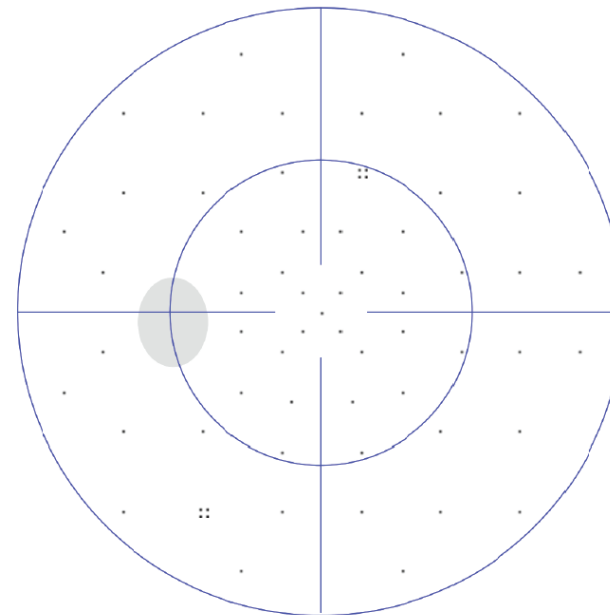
30°	
MS [dB]:	27.3
MD [< 2.0 dB]:	-0.6
sLV [< 2.5 dB]:	1.6

Programs: G Standard White/White / TOP Questions / repetitions: 70 / 1  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:06  
 Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
 Trial lens: 1.0 VA [m]:  
 Pupil [mm]: 4.9 IOP [mmHg]:  
 NV: T53 V2.1

Comment:

Left eye (OS) / 05/04/2019 / 09:55:43

Corrected probabilities



- F > 5
- :: F < 5
- F < 2
- F < 1
- F < 0,5

30°	
MS [dB]:	26.6
MD [< 2.0 dB]:	0.2
sLV [< 2.5 dB]:	1.9

Programs: G Standard White/White / TOP Questions / repetitions: 70 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:09  
 Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
 Trial lens: 1.0 VA [m]:  
 Pupil [mm]: 4.1 IOP [mmHg]:  
 NV: T53 V2.1

Comment:

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



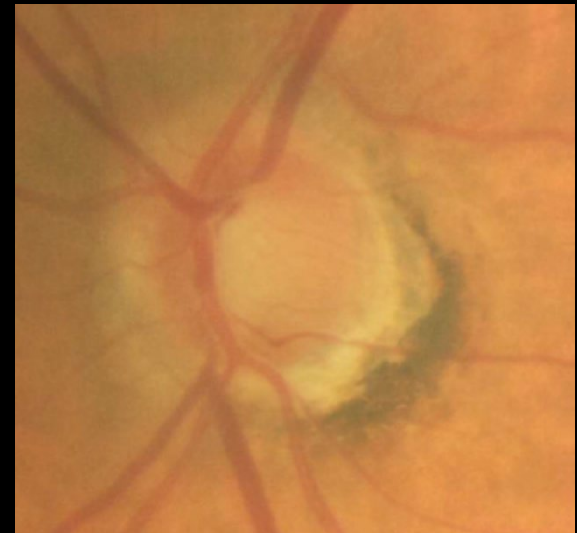
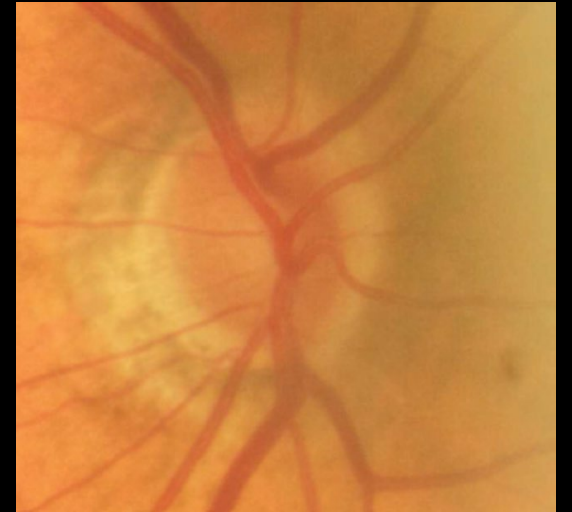
What's your plan?

Observe?

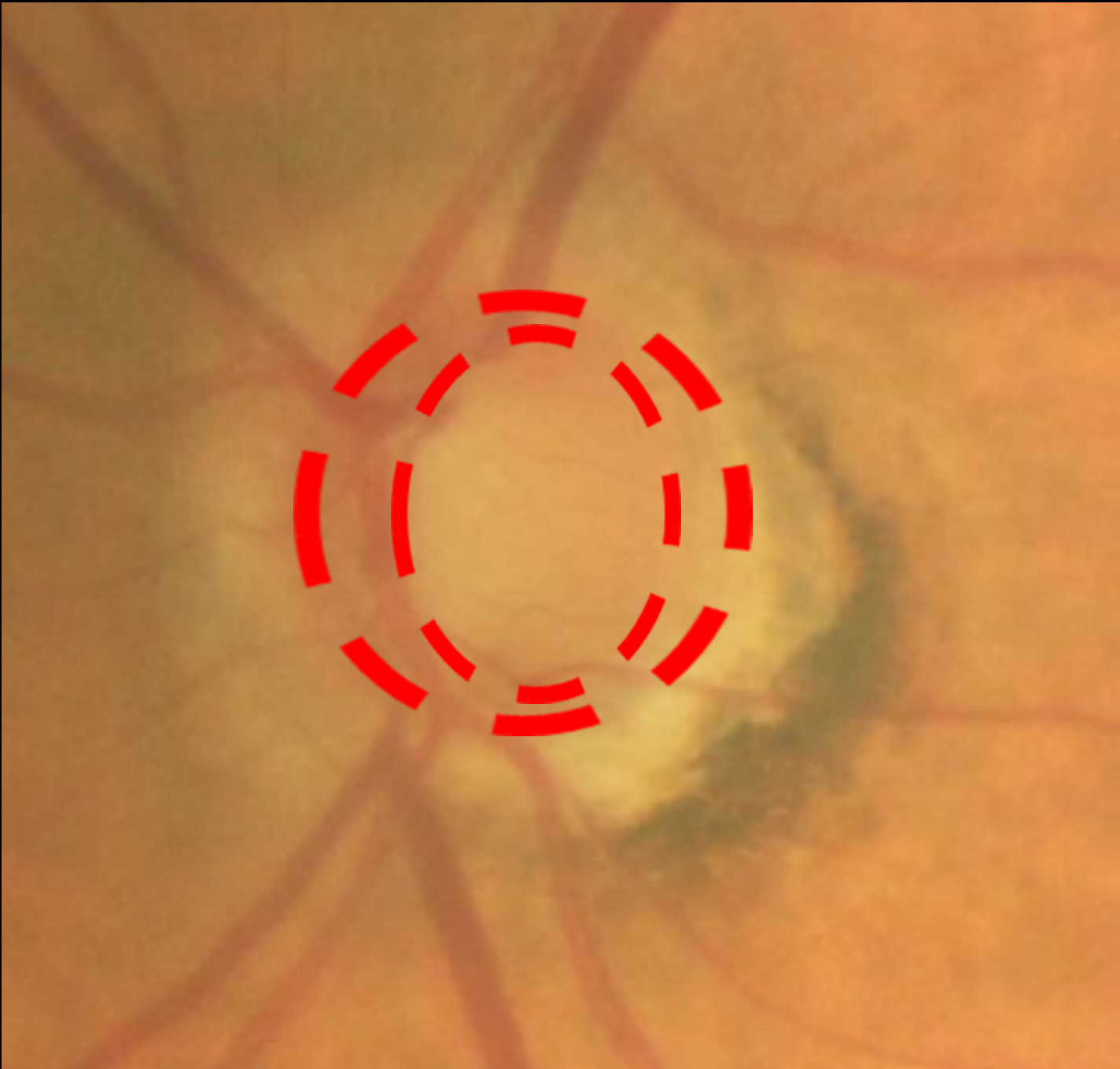
Treat?

## Case 5

- Slender 65 y/o Caucasian female
- -700 OU = 20/20-
- IOP max = 21mm Hg
- B/P – 101 / 64
- Glaucoma history sisters and mother
- Small deceptive nerves



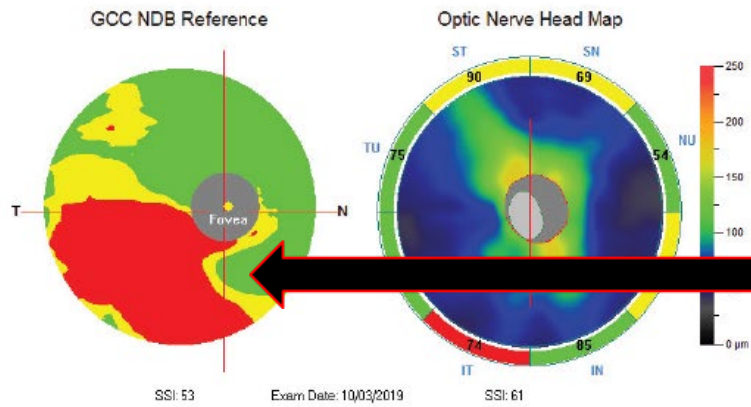
# Case 5



# Case 5

## ONH/GCC OU Report

Right / OD

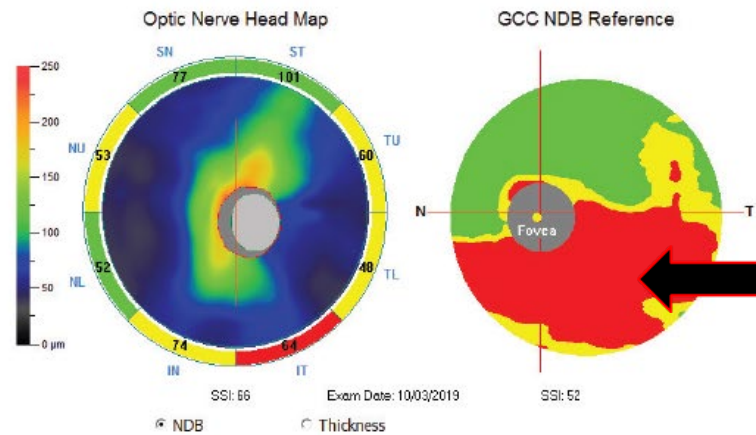


### Summary Parameters

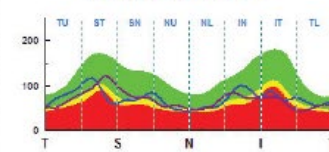
Parameter	OD	OS	Inter Eye (OD-OS)
<b>RNFL Analysis</b>			
Average RNFL ( $\mu\text{m}$ )	69	66	3
Superior RNFL ( $\mu\text{m}$ )	72	73	-1
Inferior RNFL ( $\mu\text{m}$ )	67	60	7
Intra Eye (S-I) ( $\mu\text{m}$ )	5	13	N/A
<b>ONH Analysis</b>			
Cup/Disc Area Ratio	0.38	0.65	-0.27
Cup/Disc V. Ratio	0.70	0.81	-0.17
Cup/Disc H. Ratio	0.55	0.77	-0.22
Rim Area ( $\text{mm}^2$ )	0.60	0.41	0.28
Disc Area ( $\text{mm}^2$ )	1.11	1.16	-0.05
Cup Volume ( $\text{mm}^3$ )	0.064	0.118	-0.054
<b>GCC Analysis</b>			
Average GCC ( $\mu\text{m}$ )	78	74	4
Superior GCC ( $\mu\text{m}$ )	84	85	-1
Inferior GCC ( $\mu\text{m}$ )	73	83	8
Intra Eye (S-I) ( $\mu\text{m}$ )	13	22	N/A
FLV (%)	19.22	9.28	0.94
GLV (%)	19.47	22.15	-2.68

■ p>5% Within Normal  
■ p<5% Borderline  
■ p<1% Outside Normal

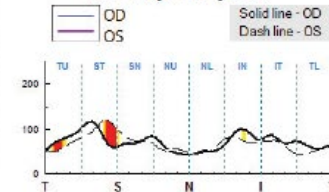
Left / OS



### TSNIT NDB Reference

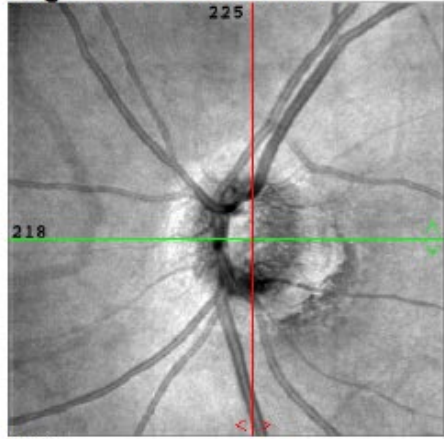


### TSNIT Symmetry Plot



● NDB  
○ Thickness

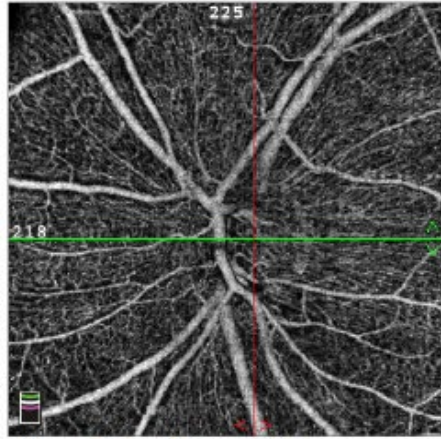
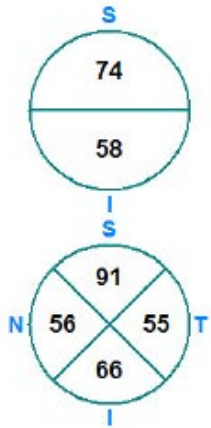
# Angio Disc QuickVue



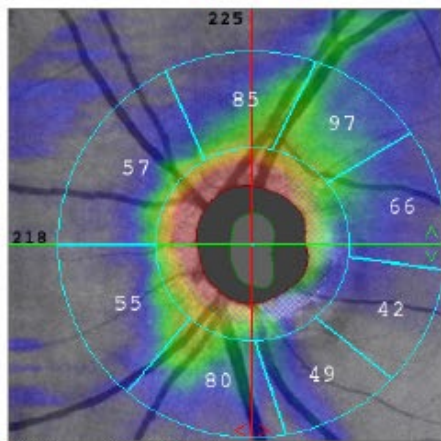
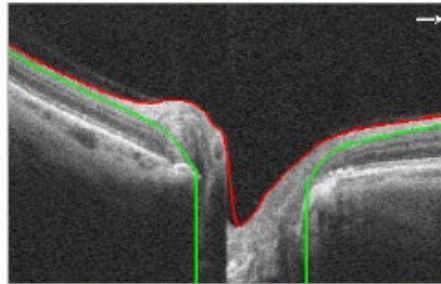
SLO

ONH Analysis	
Cup/Disc Area Ratio	0.27
Cup/Disc V. Ratio	0.66
Cup/Disc H. Ratio	0.40
Rim Area (mm <sup>2</sup> )	0.82
Disc Area (mm <sup>2</sup> )	1.11
Cup Volume (mm <sup>3</sup> )	0.039

RNFL Thickness (μm)	
Peripapillary	66

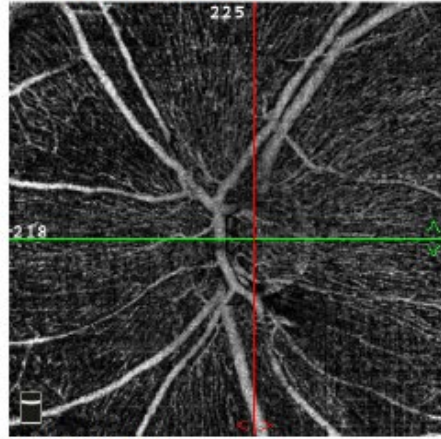


Vitreous/Retina (Above OPL)

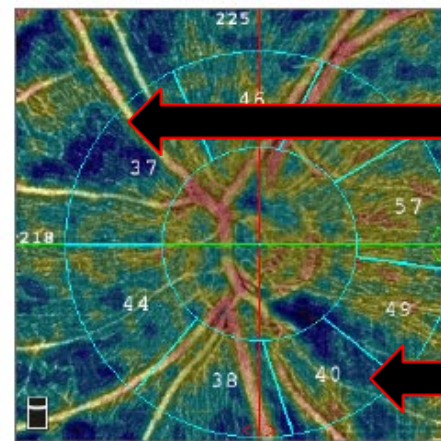
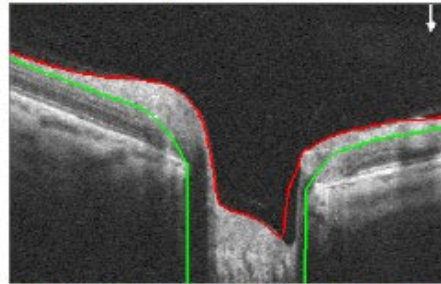


Thickness(ILM - NFL)

Scan Quality 8/10

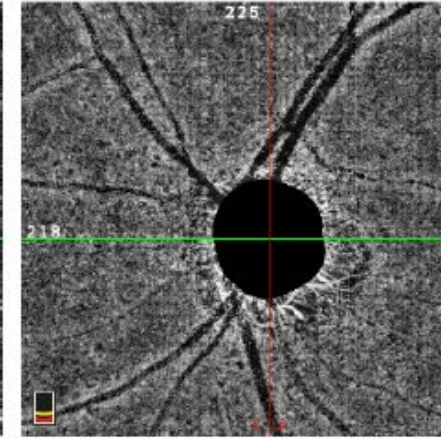


RPC (ILM - NFL)



Vessel Density (RPC)

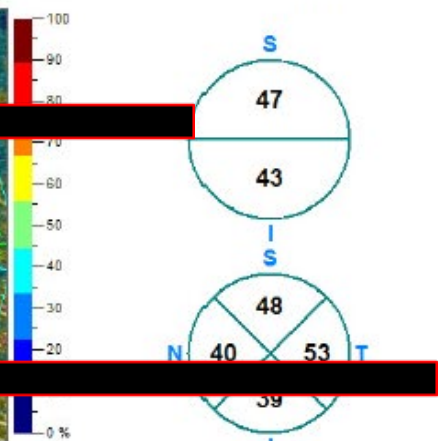
4.5 x 4.5 Scan Size (mm)



Choroid (Below RPE)

RPC Density (%)	Small Vessels	All
Whole Image	42.9	48.1
Inside Disc	50.5	58.5
Peripapillary	44.9	49.3
- Superior-Hemi	46.7	51.2
- Inferior-Hemi	42.8	47.2

RPC Vessel Density(%) - Small Vessels



Left / OS

- 
- 
- 

Show Lines

Show Bnd

Angio Overlay

Auto Zoom



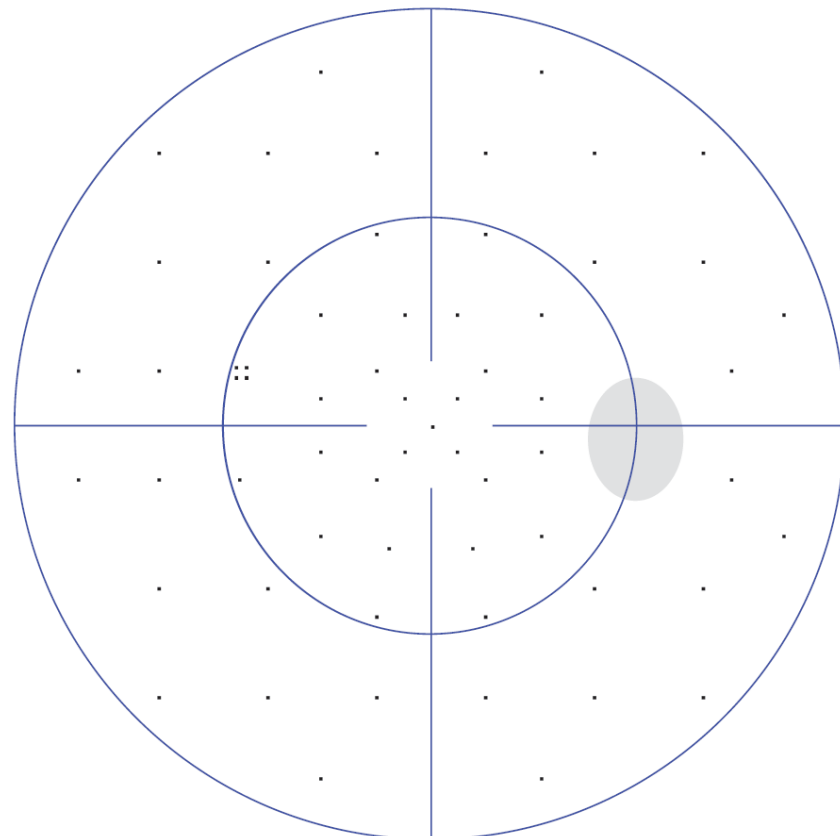
Overlay

# Case 5

# Case 5

Right eye (OD) / 10/03/2019 / 12:38:32

Corrected probabilities

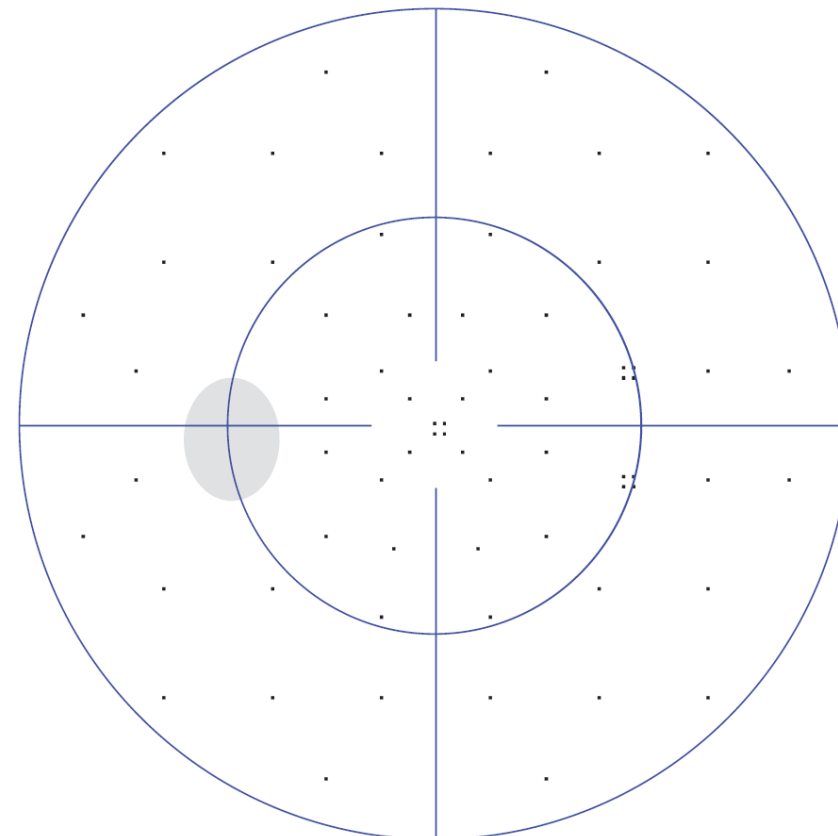


- [%]
- P > 5
  - ∴ P < 5
  - P < 2
  - P < 1
  - P < 0,5

30°	
MS [dB]:	25.8
MD [< 2.0 dB]:	0.9
sLV [< 2.5 dB]:	1.5

Left eye (OS) / 10/03/2019 / 12:43:53

Corrected probabilities



- [%]
- P > 5
  - ∴ P < 5
  - P < 2
  - P < 1
  - P < 0,5

30°	
MS [dB]:	26.0
MD [< 2.0 dB]:	0.7
sLV [< 2.5 dB]:	2.4



No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?

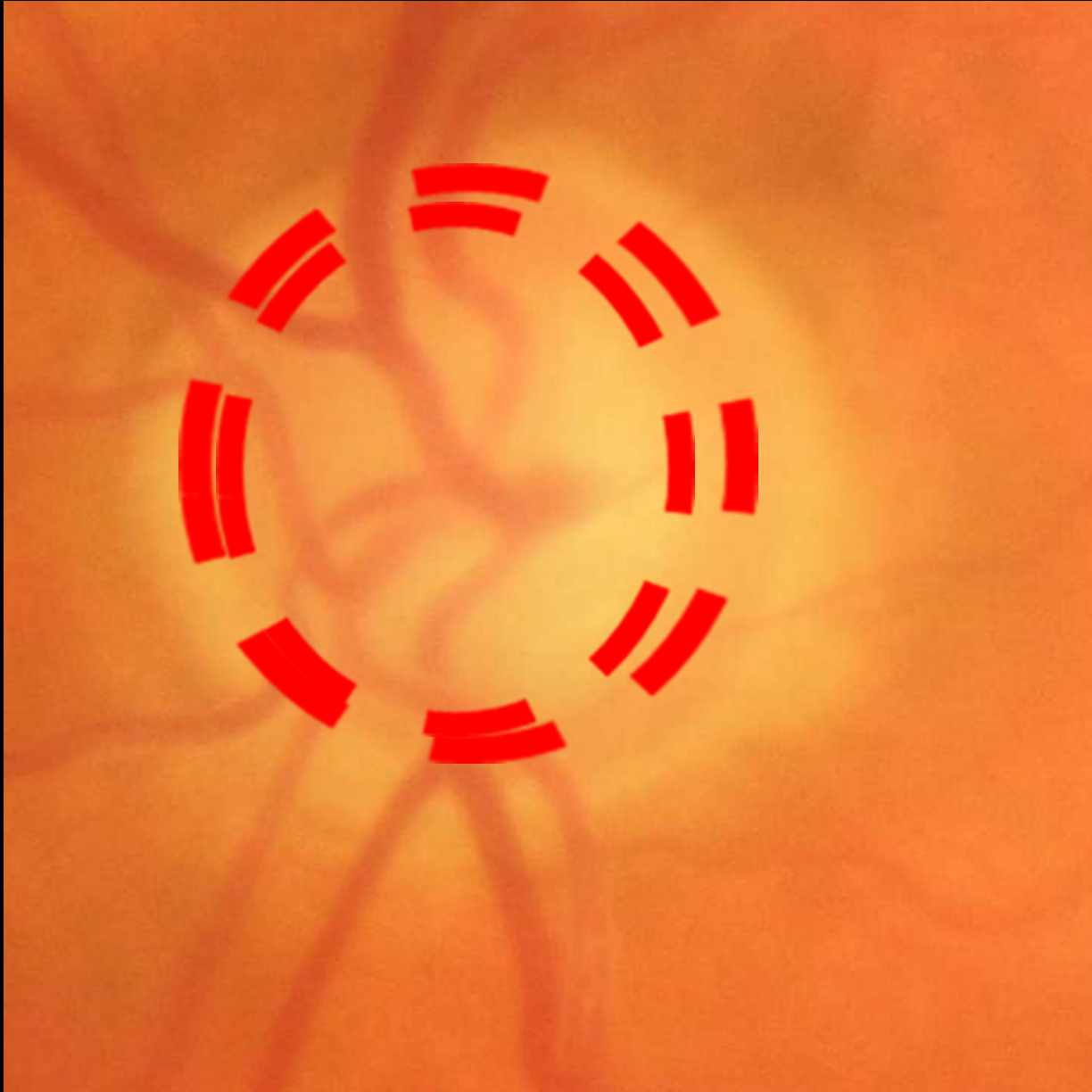


What's your plan?

Observe?

Treat?

## Case 6

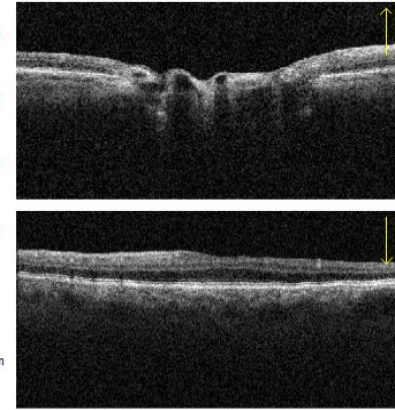
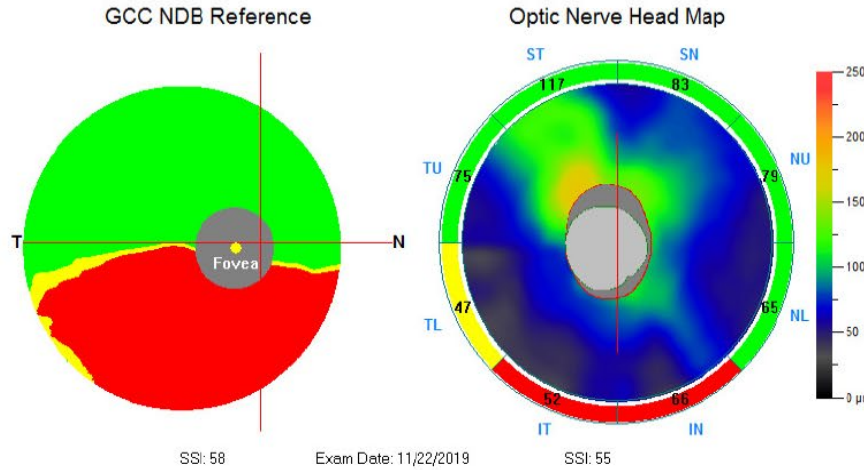


- 82 y/o Caucasian female
- Untreated IOP's high 20's
- Unknown family history

# Case 6

## ONH/GCC OU Report

Right / OD



■ p>5% Within Normal  
■ p<5% Borderline  
■ p<1% Outside Normal

### Summary Parameters

RNFL Analysis	OD	OS	Inter Eye (OD-OS)
Average RNFL (μm)	73	73	0
Superior RNFL (μm)	88	85	3
Inferior RNFL (μm)	57	62	-5
Intra Eye (S-I) (μm)	31	23	N/A

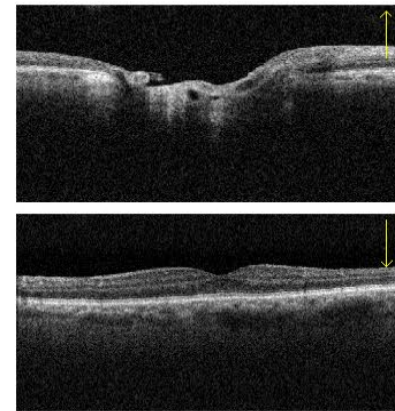
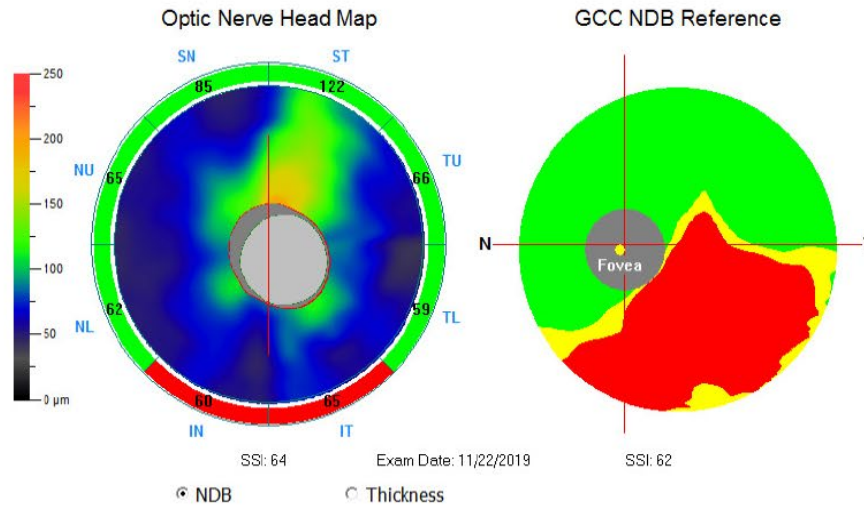
  

ONH Analysis	OD	OS	Inter Eye (OD-OS)
Cup/Disc Area Ratio	0.68	0.78	-0.08
Cup/Disc V. Ratio	0.77	0.90	-0.13
Cup/Disc H. Ratio	0.97	0.91	0.06
Rim Area (mm <sup>2</sup> )	0.60	0.48	0.12
Disc Area (mm <sup>2</sup> )	1.89	1.98	-0.09
Cup Volume (mm <sup>3</sup> )	0.180	0.271	-0.091

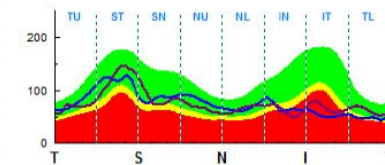
  

GCC Analysis	OD	OS	Inter Eye (OD-OS)
Average GCC (μm)	79	80	-1
Superior GCC (μm)	96	90	6
Inferior GCC (μm)	61	70	-9
Intra Eye (S-I) (μm)	35	20	N/A
FLV (%)	15.30	9.21	6.09
GLV (%)	17.61	16.58	1.03

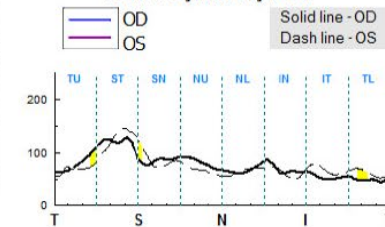
Left / OS



### TSNIT NDB Reference

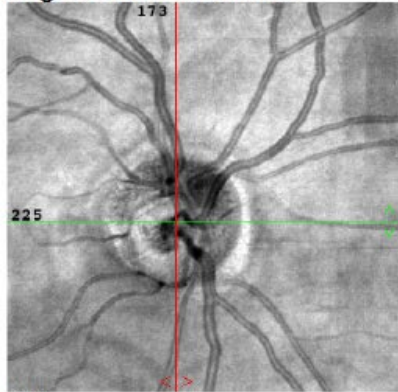


### TSNIT Symmetry Plot



# Case 6

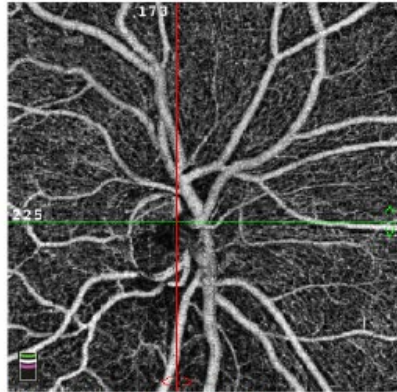
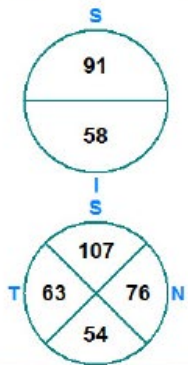
## Angio Disc QuickVue



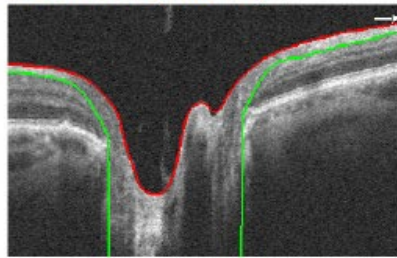
SLO

ONH Analysis	
Cup/Disc Area Ratio	0.34
Cup/Disc V. Ratio	0.73
Cup/Disc H. Ratio	0.47
Rim Area (mm <sup>2</sup> )	1.19
Disc Area (mm <sup>2</sup> )	1.81
Cup Volume (mm <sup>3</sup> )	0.121

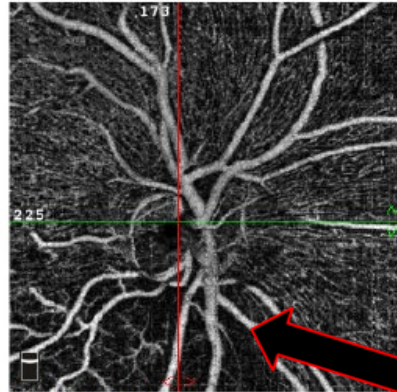
RNFL Thickness (μm)	
Peripapillary	75



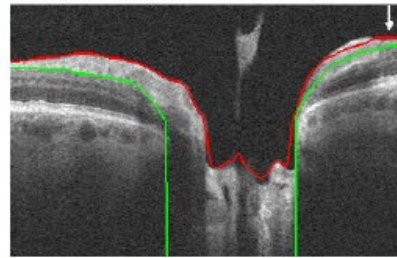
Vitreous/Retina (Above OPL)



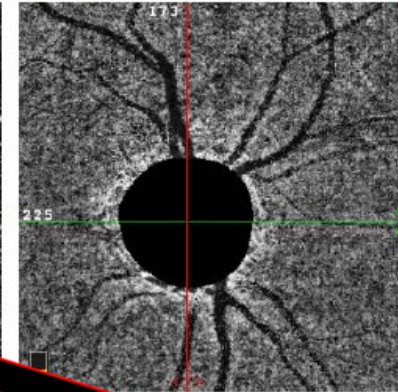
Scan Quality 8/10



RPC (ILM - NFL)



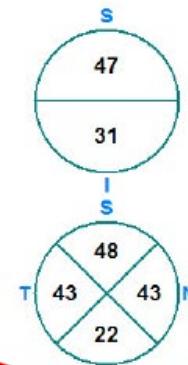
4.5 x 4.5 Scan Size (mm)



RPC (ILM - RPE)

RPC Density (%)	All Vessels	All
Whole Image	39.7	47.4
Inside Disc	41.2	55.5
Peripapillary	39.6	47.0
- Superior-Hemi	46.8	52.2
- Inferior-Hemi	31.5	41.3

RPC Vessel Density(%) - Small Vessels



Right / OD

Exit

Print

OverVue

Show Lines

Show Bnd

Angio Overlay

Auto Zoom



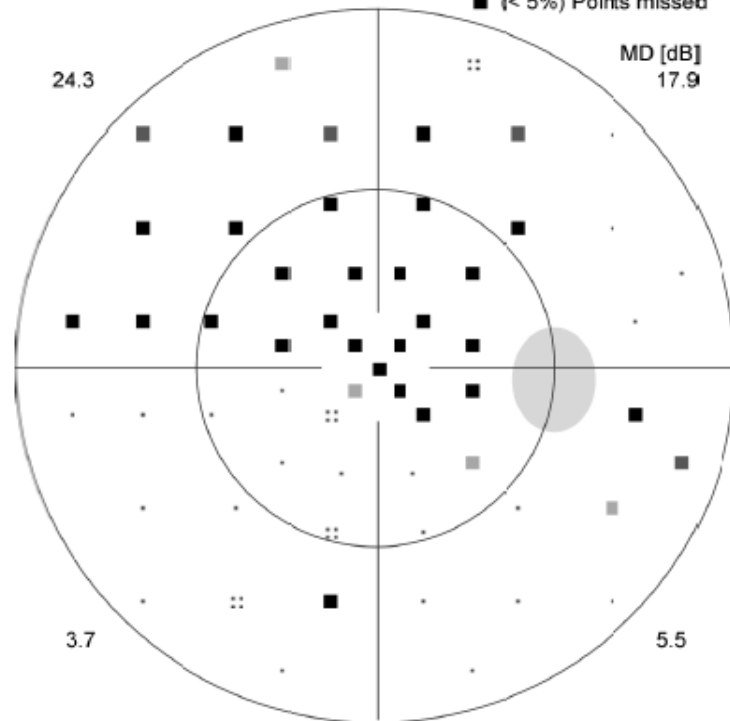
Overlay

# Case 6

Right eye (OD) / 11/22/2019 / 11:42:17

Probabilities

+ (> 5%) Points seen  
■ (< 5%) Points missed



30°	
MS [dB]:	13.1
MD [< 2.0 dB]:	13.0
sLV [< 2.5 dB]:	10.5

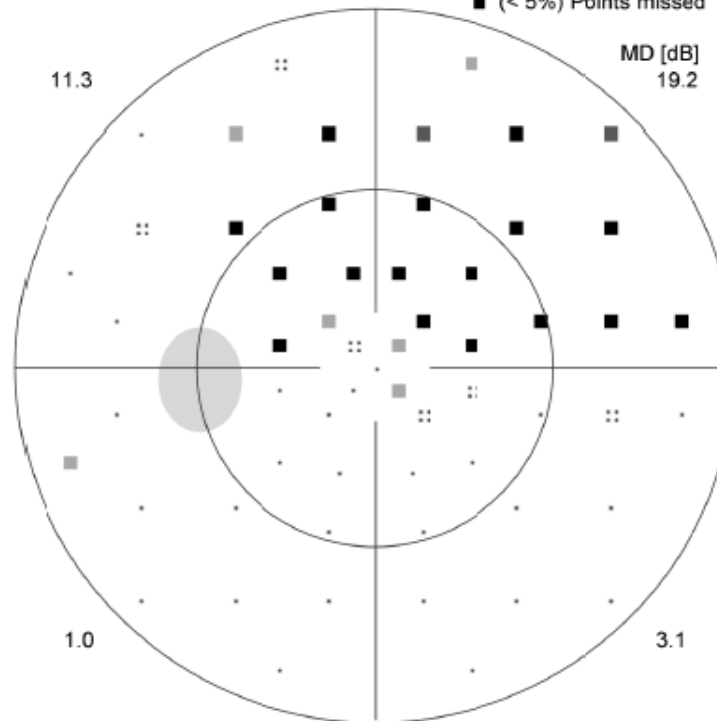
Programs: G Standard White/White / TOP Questions / repetitions: 69 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:47  
 Catch trials: 2/7 (29%) +, 0/7 (0%) - RF: 14.2  
 Trial lens : VA [m]:  
 Pupil [mm]: 5.2 IOP [mmHg]:  
 NV: T53 V2.1

Comment:

Left eye (OS) / 11/22/2019 / 11:45:56

Probabilities

+ (> 5%) Points seen  
■ (< 5%) Points missed



30°	
MS [dB]:	17.4
MD [< 2.0 dB]:	8.7
sLV [< 2.5 dB]:	9.0

Programs: G Standard White/White / TOP Questions / repetitions: 69 / 0  
 Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:14  
 Catch trials: 0/7 (0%) +, 3/7 (43%) - RF: 21.4  
 Trial lens : VA [m]:  
 Pupil [mm]: 5.7 IOP [mmHg]:  
 NV: T53 V2.1

Comment:

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



What's your plan?

Observe?

Treat?



Don't be afraid to ...

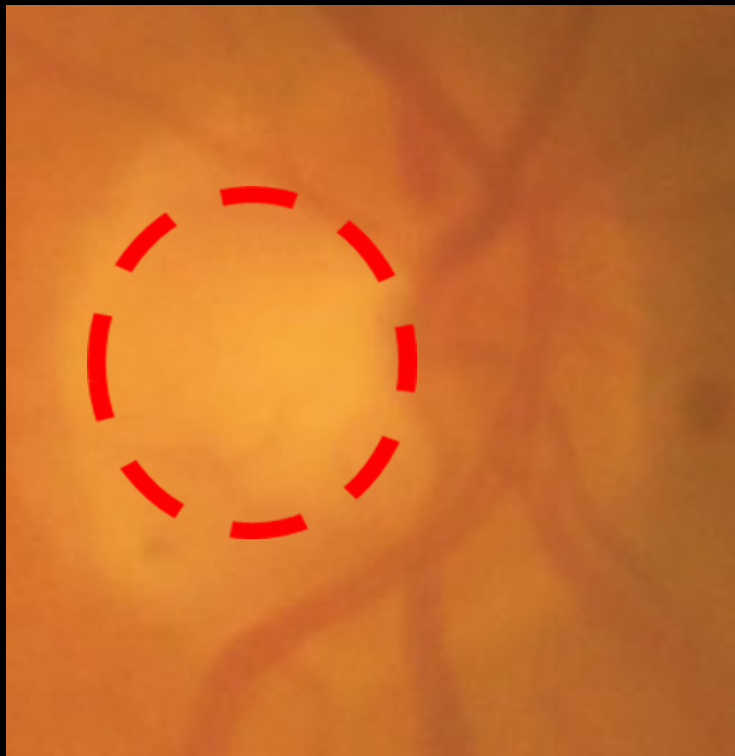
Make the eye **RED**.....



# Case 7

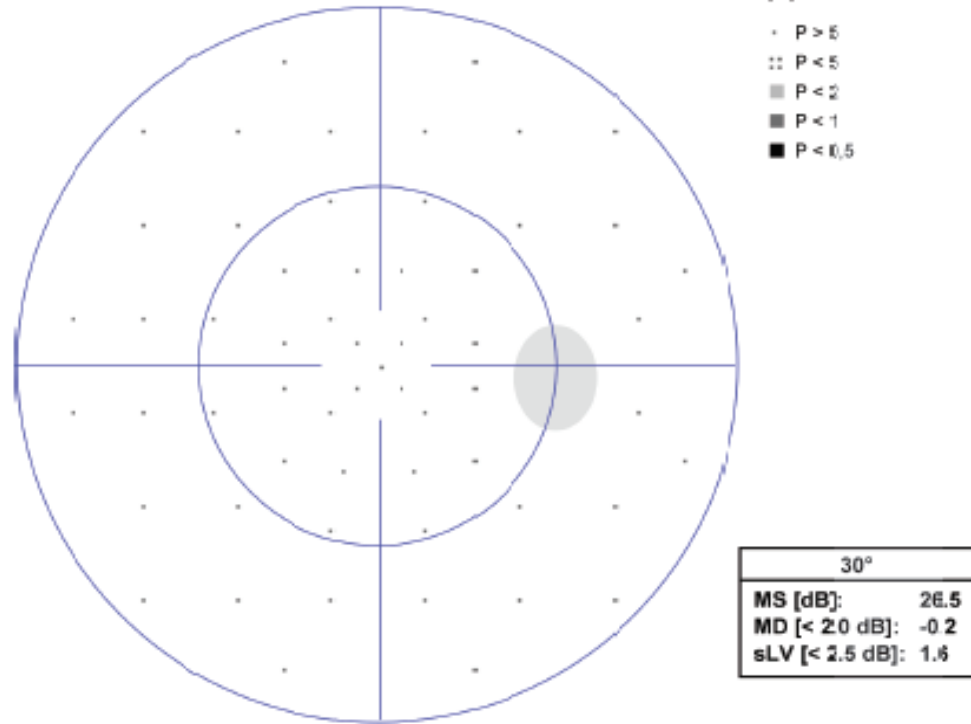
- 76-year-old Caucasian male
- Low hyperopia 20/25 best V/A
- 1+ cataract OU
- Brother and mother POAG
- Previous doctors noted high IOP – never treated
- IOP's 30, 29

# Case 7



# Case 7

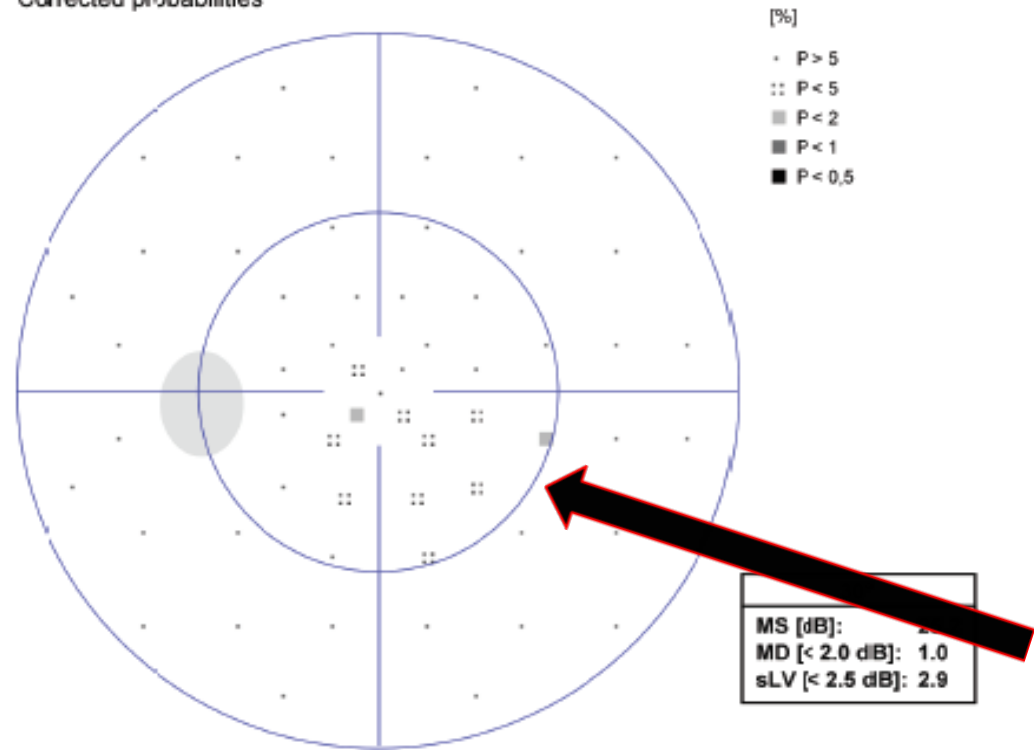
Right eye (OD) / 12/17/2019 / 10:19:29  
Corrected probabilities



Programs: G Standard White/White / TOP Questions / repetitions: 69 / 0  
Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:07  
Catch trials: 0/7 (0%) +, 0/7 (0%) - RF: 0.0  
Trial lens : Trial lens : VA [m]:  
Pupil [mm]: 3.7 IOP [mmHg]:  
NV: T53 V2.1

Comment:

Left eye (OS) / 12/17/2019 / 10:22:03  
Corrected probabilities



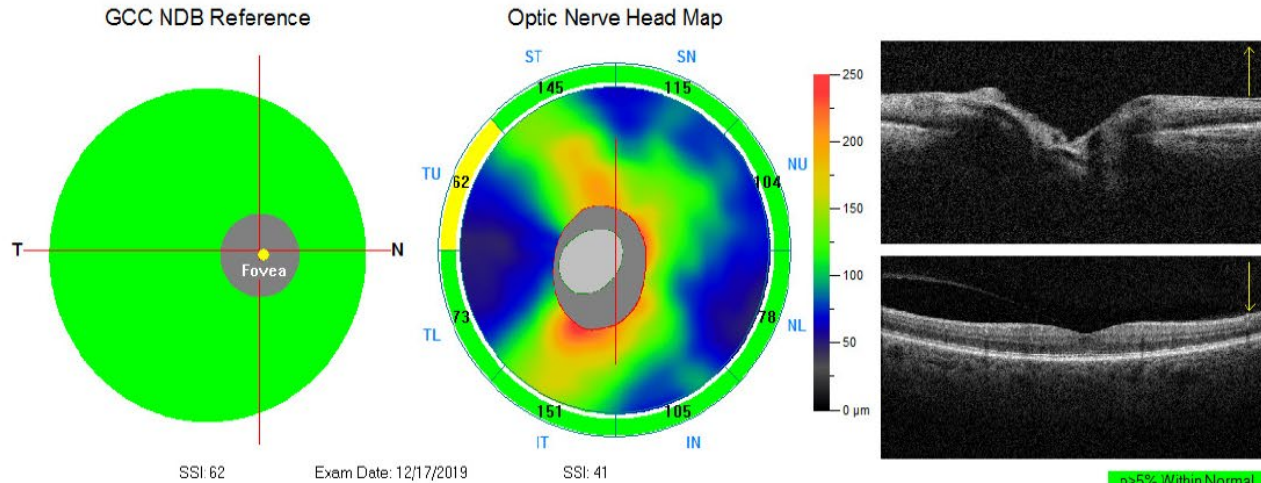
Programs: G Standard White/White / TOP Questions / repetitions: 71 / 1  
Parameters: 31.4 / 4000 asb III 100 ms Duration: 02:16  
Catch trials: 1/7 (14%) +, 0/7 (0%) - RF: 7.1  
Trial lens : Trial lens : VA [m]:  
Pupil [mm]: 3.9 IOP [mmHg]:  
NV: T53 V2.1

Comment:

# Case 7

## ONH/GCC OU Report

Right / OD



### Summary Parameters

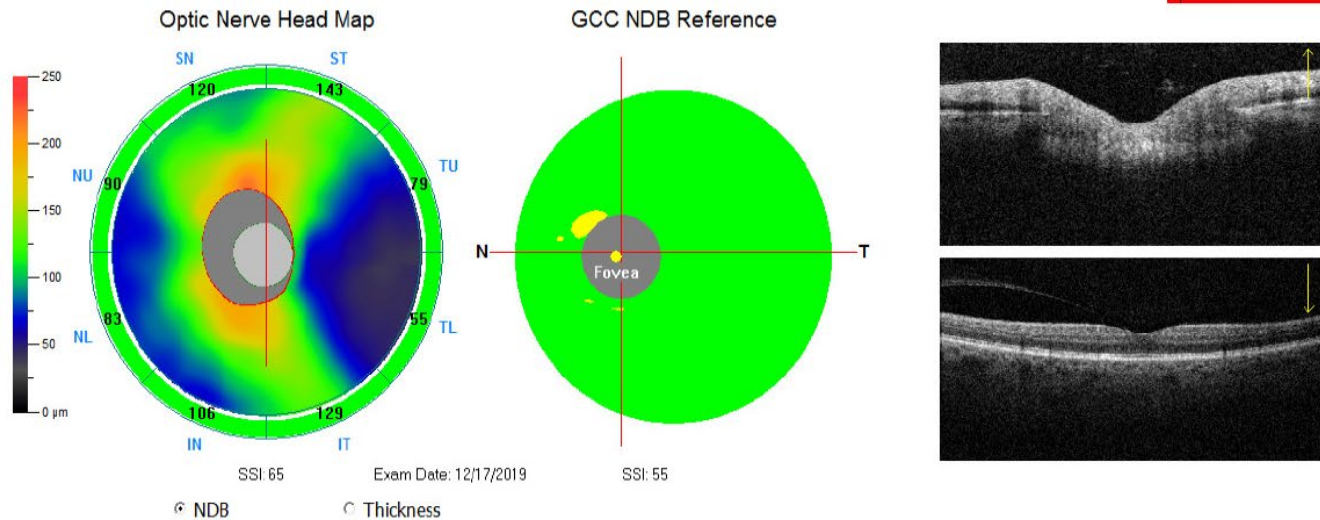
RNFL Analysis	OD	OS	Inter Eye (OD-OS)
Average RNFL (μm)	104	101	3
Superior RNFL (μm)	106	108	-2
Inferior RNFL (μm)	102	93	9
Intra Eye (S-I) (μm)	4	15	N/A

ONH Analysis	OD	OS	Inter Eye (OD-OS)
Cup/Disc Area Ratio	0.35	0.36	-0.01
Cup/Disc V. Ratio	0.52	0.57	-0.05
Cup/Disc H. Ratio	0.71	0.65	0.06
Rim Area (mm <sup>2</sup> )	1.40	1.28	0.12
Disc Area (mm <sup>2</sup> )	2.17	1.99	0.18
Cup Volume (mm <sup>3</sup> )	0.124	0.140	-0.016

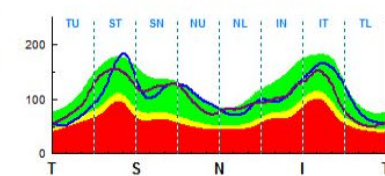
GCC Analysis	OD	OS	Inter Eye (OD-OS)
Average GCC (μm)	94	90	4
Superior GCC (μm)	93	91	2
Inferior GCC (μm)	94	90	4
Intra Eye (S-I) (μm)	-1	1	N/A
FLV (%)	0.00	0.94	-0.94
GLV (%)	2.03	4.57	-2.54

p > 5% Within Normal  
p < 5% Borderline  
p < 1% Outside Normal

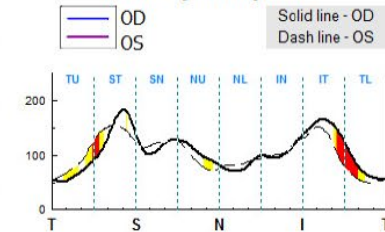
Left / OS



### TSNIT NDB Reference



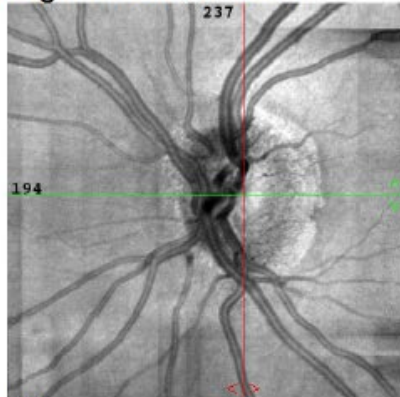
### TSNIT Symmetry Plot



NDB  
 Thickness

# Case 7

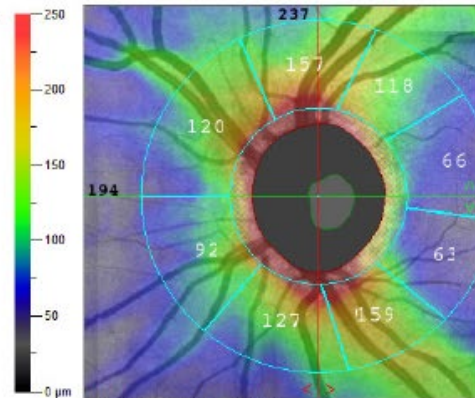
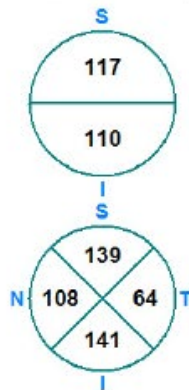
## Angio Disc QuickVue



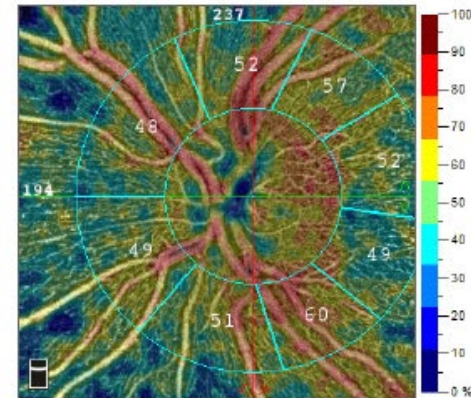
SLO

ONH Analysis	
Cup/Disc Area Ratio	0.13
Cup/Disc V. Ratio	0.38
Cup/Disc H. Ratio	0.34
Rim Area (mm <sup>2</sup> )	1.69
Disc Area (mm <sup>2</sup> )	1.94
Cup Volume (mm <sup>3</sup> )	0.026

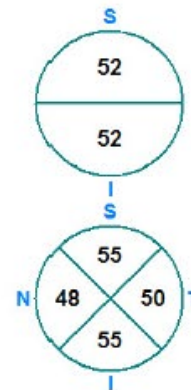
RNFL Thickness (μm)	
Peripapillary	114



Thickness(ILM - NFL)



Vessel Density (RPC)

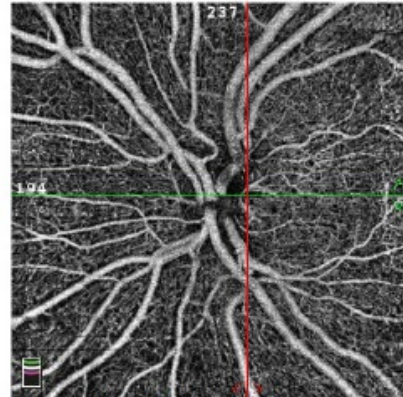


Overlay

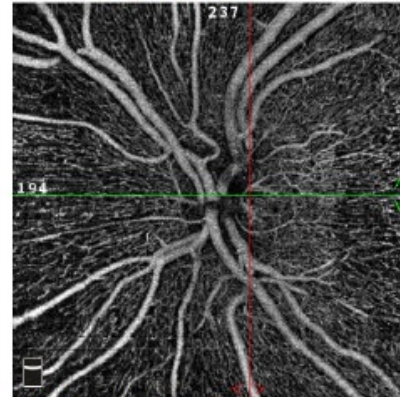
Scan Quality 8/10

4.5 x 4.5 Scan Size (mm)

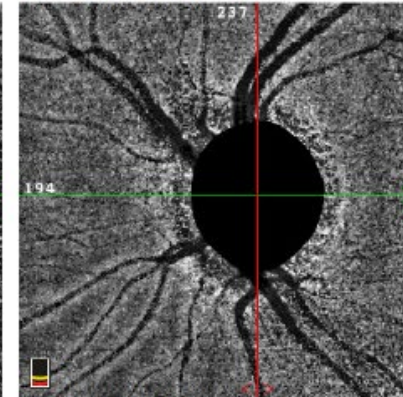
Left / OS



Vitreous/Retina (Above OPL)



RPC (ILM - NFL)



Choroid (Below RPE)

RPC Density (%)	Small Vessels	All
Whole Image	48.6	56.1
Inside Disc	51.3	61.0
Peripapillary	51.6	58.7
- Superior-Hemi	51.7	59.1
- Inferior-Hemi	51.5	58.2

Show Bnd

Angio Overlay

Auto Zoom



RPC Vessel Density(%) - Small Vessels

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



What's your plan?

Observe?

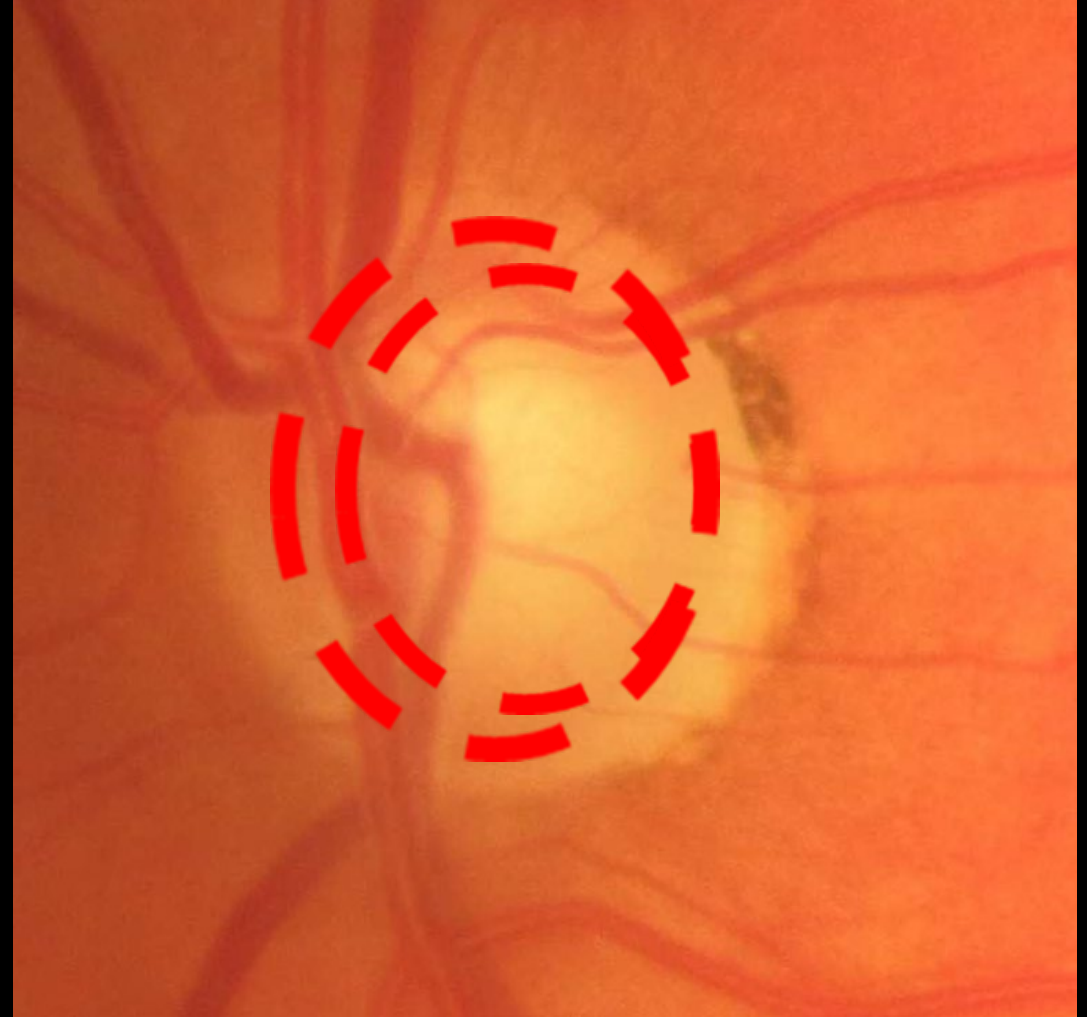
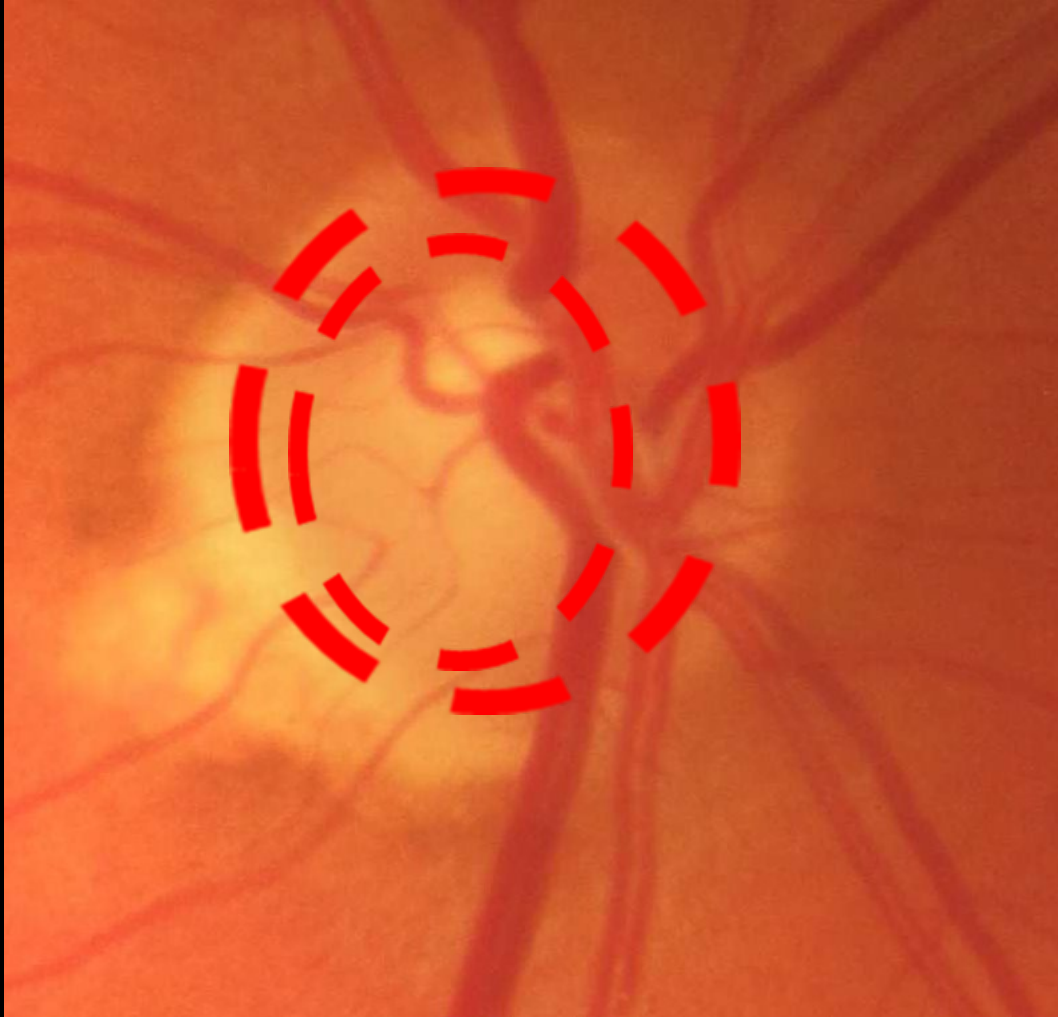
Treat?



# Case 8

- 64 y/o Caucasian male
- T-2 diabetes – well controlled
- Low myopia 20/20- OU
- Faint cataract OU
- No family history of POAG
- IOP's 20, 21

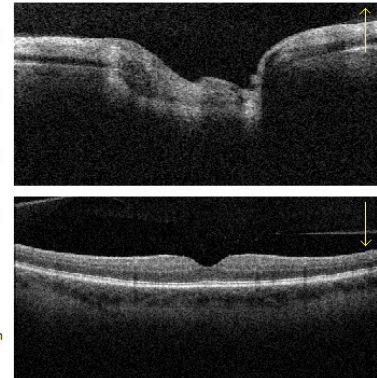
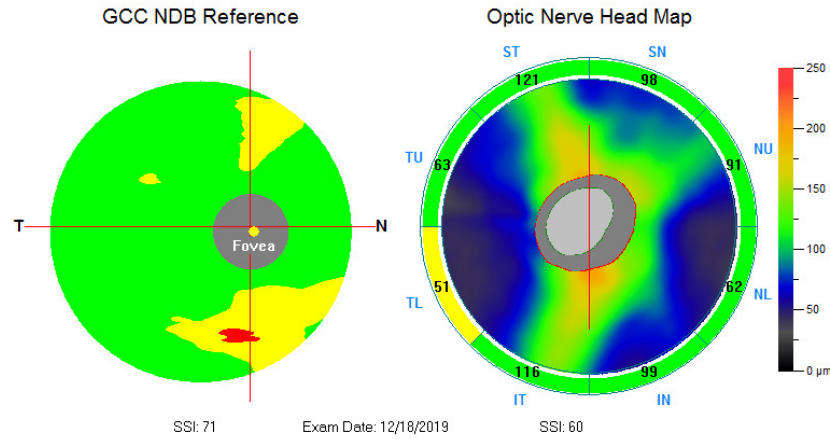
# Case 8



# Case 8

## ONH/GCC OU Report

Right / OD



p>5% Within Normal  
p<5% Borderline  
p<1% Outside Normal

### Summary Parameters

RNFL Analysis	OD	OS	Inter Eye (OD-OS)
Average RNFL (μm)	88	85	3
Superior RNFL (μm)	93	82	11
Inferior RNFL (μm)	82	89	-7
Intra Eye (S-I) (μm)	11	-7	N/A

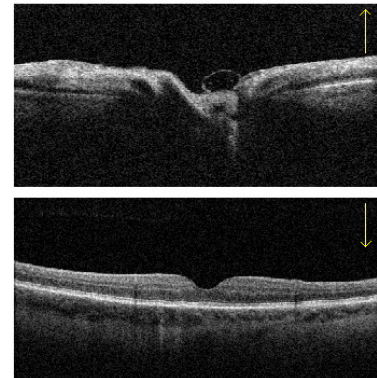
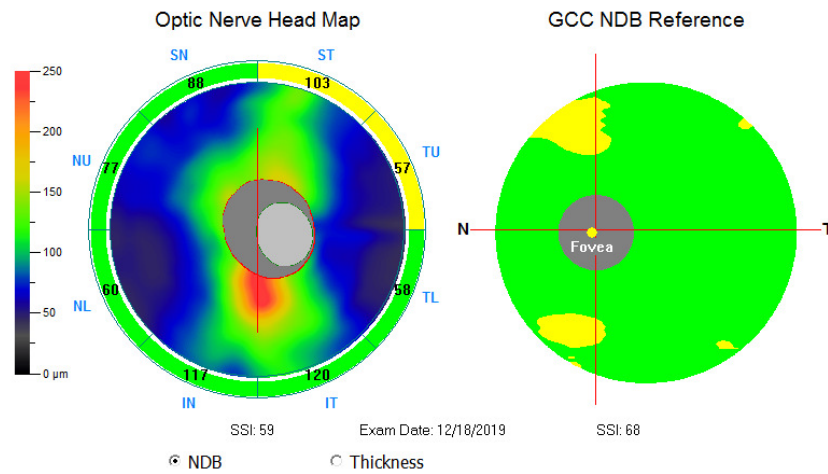
  

ONH Analysis	OD	OS	Inter Eye (OD-OS)
Cup/Disc Area Ratio	0.46	0.40	0.06
Cup/Disc V. Ratio	0.74	0.66	0.08
Cup/Disc H. Ratio	0.68	0.63	0.05
Rim Area (mm <sup>2</sup> )	1.13	1.17	-0.04
Disc Area (mm <sup>2</sup> )	2.09	1.96	0.13
Cup Volume (mm <sup>3</sup> )	0.228	0.109	0.119

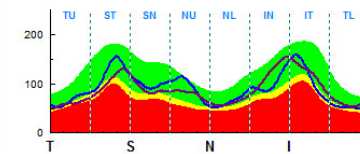
  

GCC Analysis	OD	OS	Inter Eye (OD-OS)
Average GCC (μm)	84	86	-2
Superior GCC (μm)	84	86	-2
Inferior GCC (μm)	84	86	-2
Intra Eye (S-I) (μm)	0	0	N/A
FLV (%)	0.66	1.64	-0.98
GLV (%)	10.97	8.99	1.98

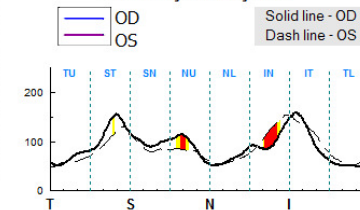
Left / OS



### TSNIT NDB Reference

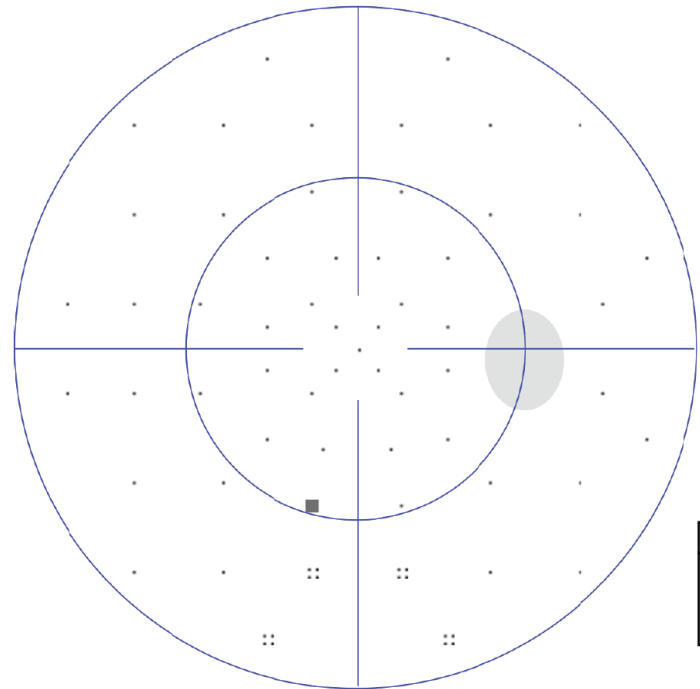


### TSNIT Symmetry Plot



# Case 8

Corrected probabilities

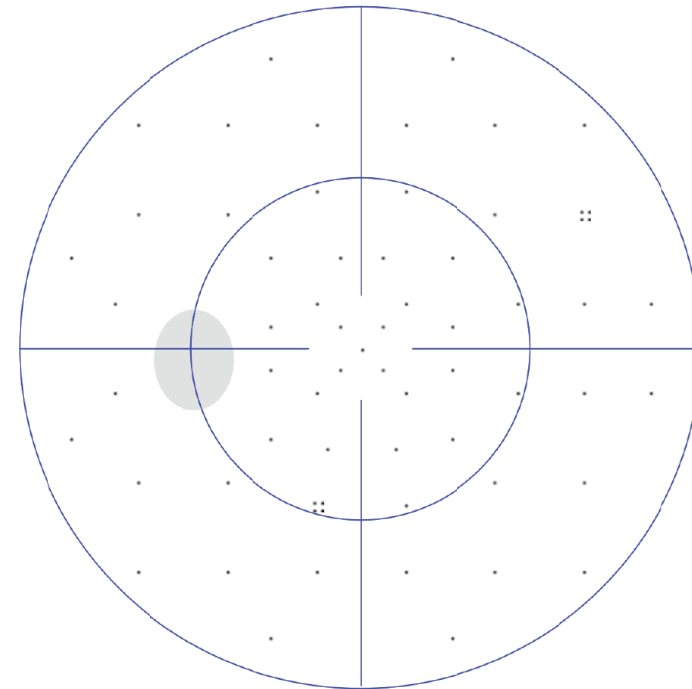


- [%]
- P > 5
  - :: P < 5
  - P < 2
  - P < 1
  - P < 0,5

30°	
MS [dB]:	26.6
MD [< 2.0 dB]:	0.3
sLV [< 2.5 dB]:	2.5

**Programs:** G Standard White/White / TOP **Questions / repetitions:** 74 / 0  
**Parameters:** 31.4 / 4000 asb III 100 ms **Duration:** 02:16  
**Catch trials:** 0/7 (0%) +, 0/8 (0%) - **RF:** 0.0  
**Trial lens :** -1.0 **VA [m]:**  
**Pupil [mm]:** 2.7 **IOP [mmHg]:**  
**NV:** T53 V2.1

Corrected probabilities



- [%]
- P > 5
  - :: P < 5
  - P < 2
  - P < 1
  - P < 0,5

30°	
MS [dB]:	25.2
MD [< 2.0 dB]:	1.7
sLV [< 2.5 dB]:	2.4

**Programs:** G Standard White/White / TOP **Questions / repetitions:** 71 / 0  
**Parameters:** 31.4 / 4000 asb III 100 ms **Duration:** 02:14  
**Catch trials:** 0/7 (0%) +, 0/7 (0%) - **RF:** 0.0  
**Trial lens :** **VA [m]:**  
**Pupil [mm]:** 3.4 **IOP [mmHg]:**  
**NV:** T53 V2.1

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



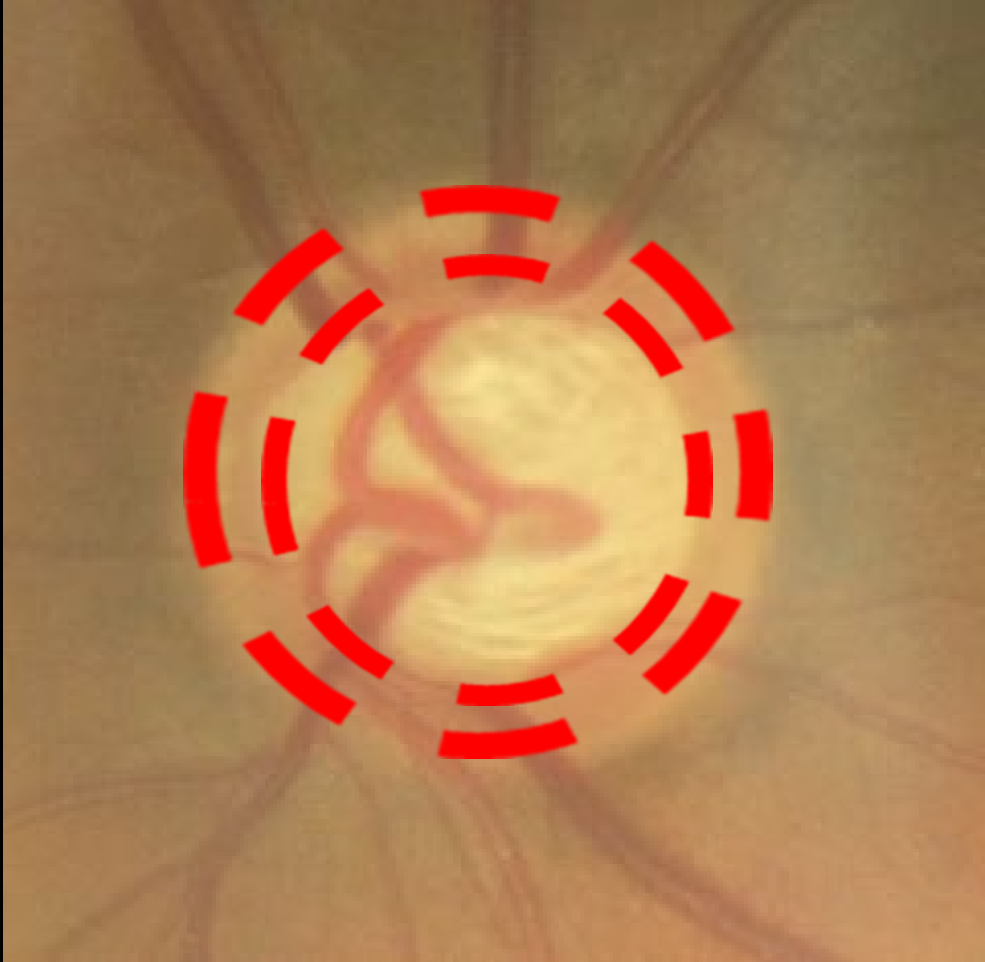
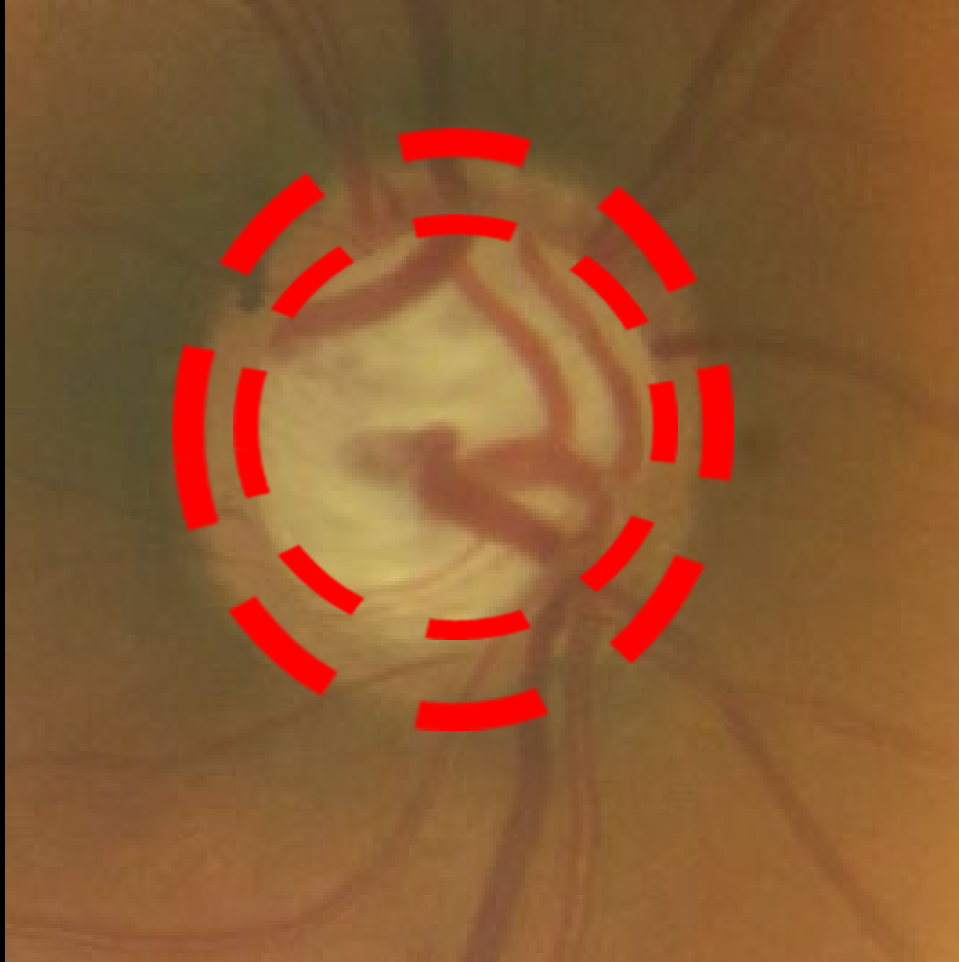
What's your plan?

Observe?

Treat?

## Case 9

- 64 y/o Guatemalan female
- Low hyperopia / presbyopia
- IOP's high teens
- Positive family history glaucoma
- Blood pressure about 90/60



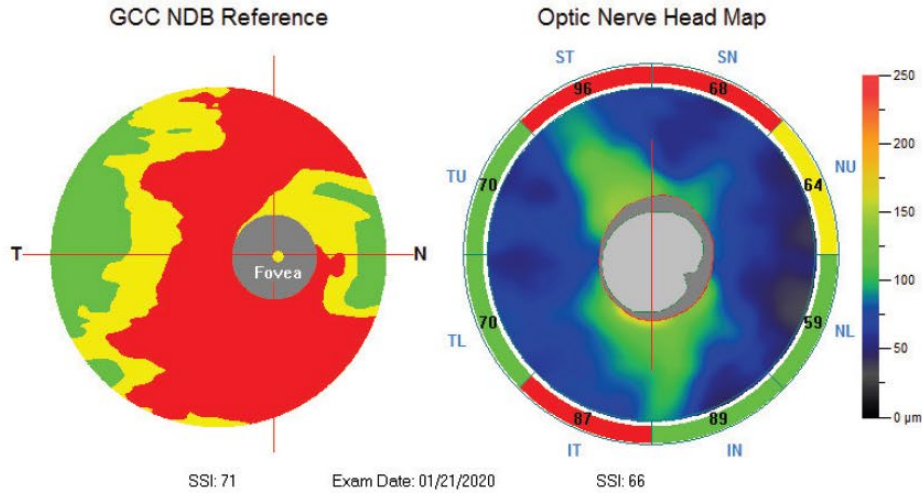
**Harper's Point Eye Associates**



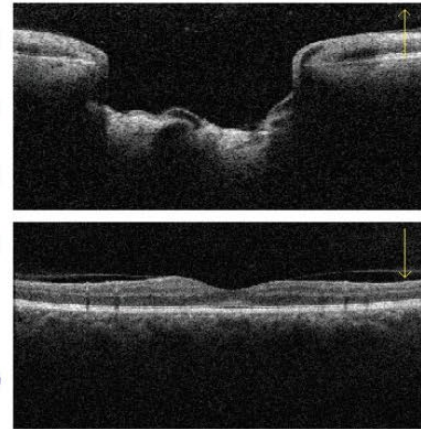
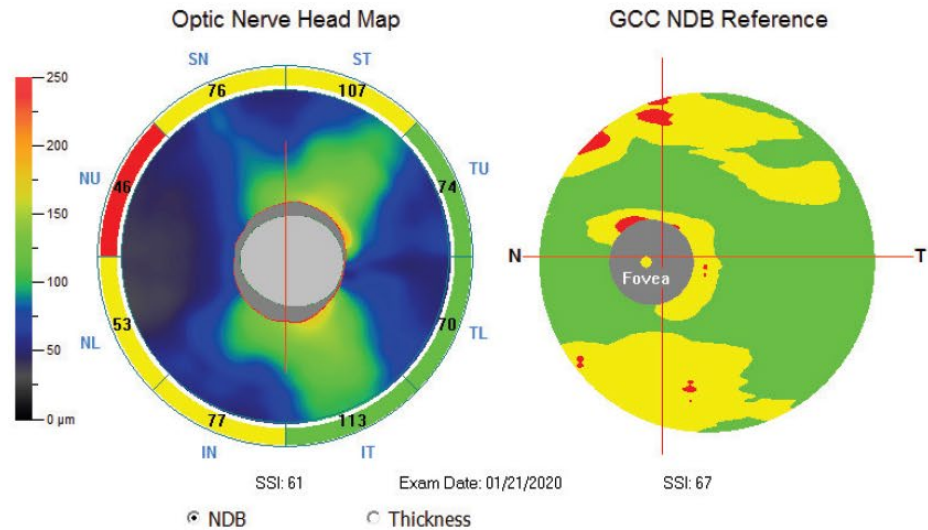
# Case 9

## ONH/GCC OU Report

Right / OD



Left / OS

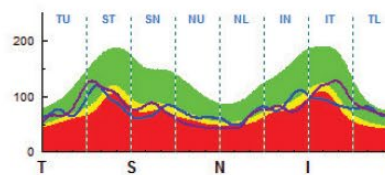


■ p>5% Within Normal  
■ p<5% Borderline  
■ p<1% Outside Normal

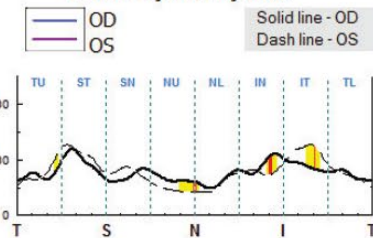
### Summary Parameters

Parameter	OD	OS	Inter Eye (OD-OS)
<b>RNFL Analysis</b>			
Average RNFL (μm)	75	77	-2
Superior RNFL (μm)	74	76	-2
Inferior RNFL (μm)	76	78	-2
Intra Eye (S-I) (μm)	-2	-2	N/A
<b>ONH Analysis</b>			
Cup/Disc Area Ratio	0.70	0.71	-0.01
Cup/Disc V. Ratio	0.85	0.78	0.07
Cup/Disc H. Ratio	0.94	0.95	-0.01
Rim Area (mm <sup>2</sup> )	0.73	0.68	0.05
Disc Area (mm <sup>2</sup> )	2.44	2.31	0.13
Cup Volume (mm <sup>3</sup> )	1.066	0.997	0.069
<b>GCC Analysis</b>			
Average GCC (μm)	70	82	-12
Superior GCC (μm)	73	81	-8
Inferior GCC (μm)	86	82	-16
Intra Eye (S-I) (μm)	7	-1	N/A
FLV (%)	7.07	2.77	4.30
GLV (%)	25.43	13.64	11.79

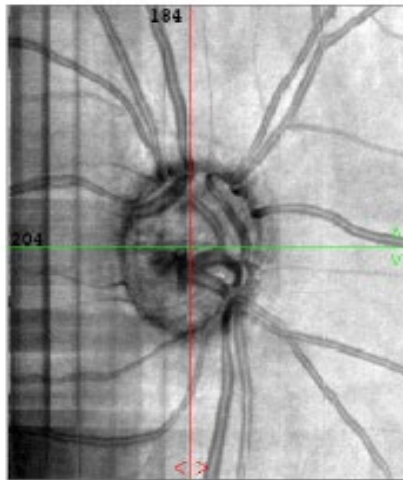
### TSNIT NDB Reference



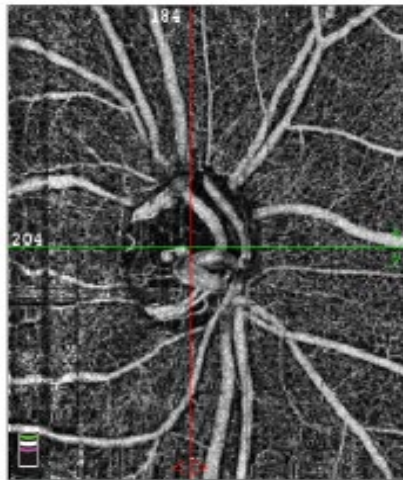
### TSNIT Symmetry Plot



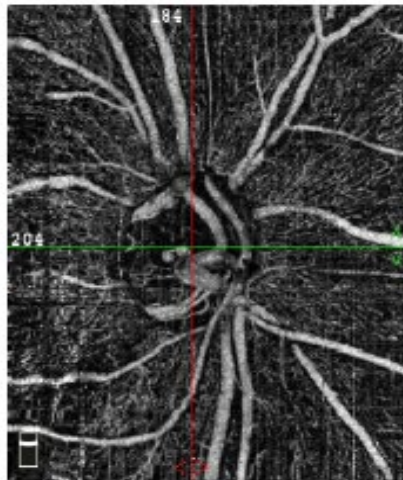
# Case 9



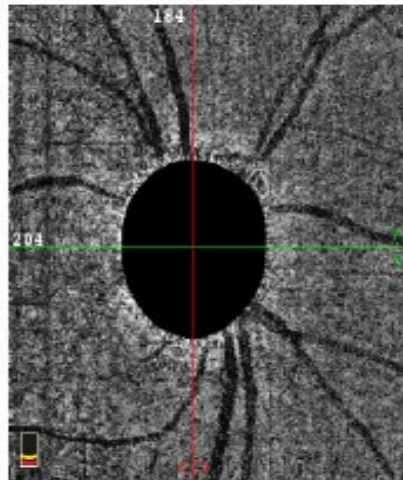
SLO



Vitreous/Retina (Above OPL)



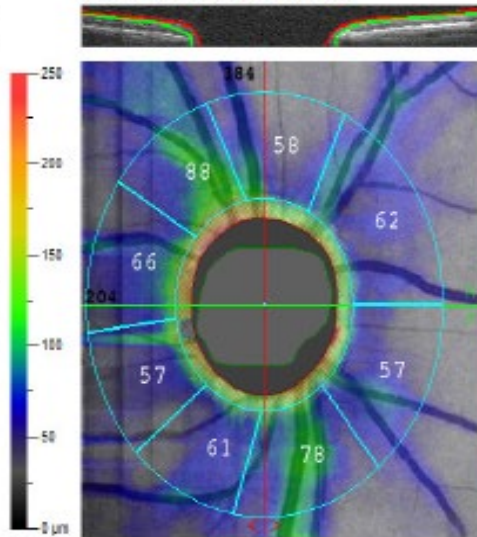
RPC (ILM - NFL)



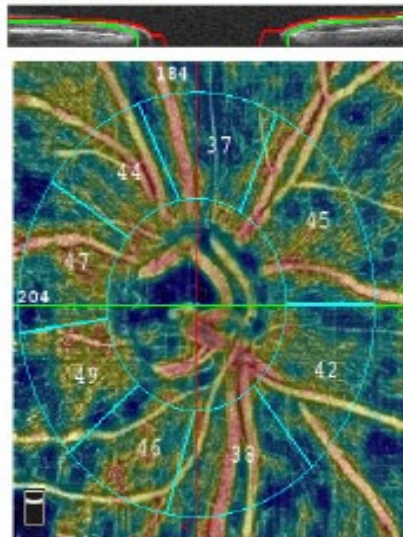
Choroid (Below RPE)

ONH Analysis	
Cup/Disc Area Ratio	0.65
Cup/Disc V. Ratio	0.93
Cup/Disc H. Ratio	0.70
Kim Area (mm <sup>2</sup> )	0.76
Disc Area (mm <sup>2</sup> )	2.15
Cup Volume (mm <sup>3</sup> )	0.660

RNFL Thickness (μm)	
Peripapillary	65



Thickness(ILM - NFL)



Vessel Density (RPC)

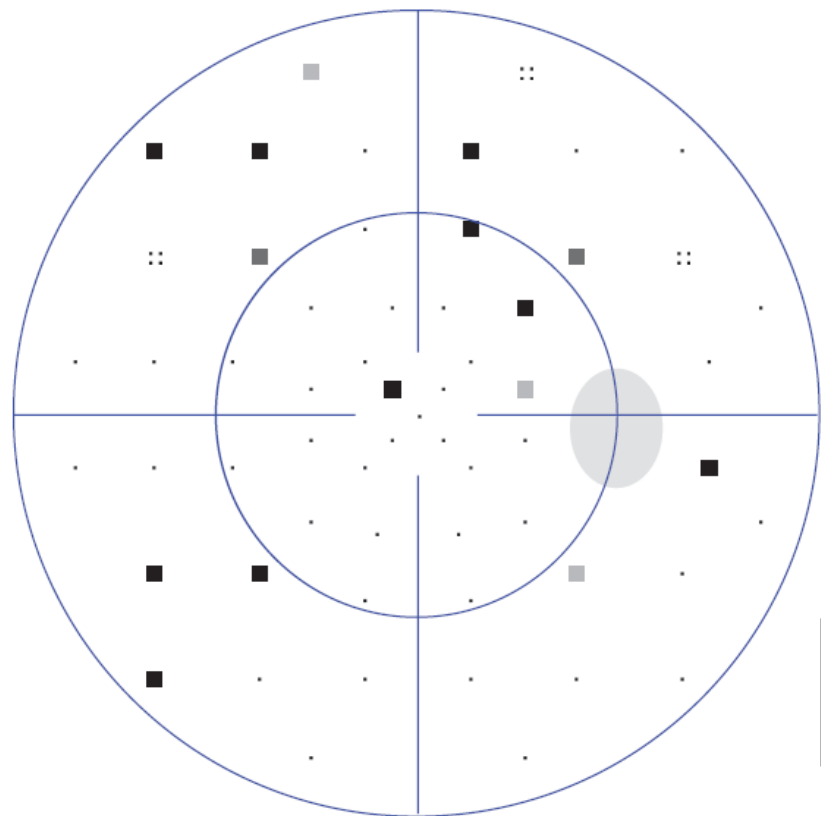
RPC Density (%)	Small Vessels	All
Whole Image	41.4	48.7
Optic Disc	37.7	48.5
Peripapillary	43.6	51.1
Superior-Hemi	43.5	51.5
Inferior-Hemi	43.7	50.6

RPC Vessel Density(%) - Small Vessels



**Right eye (OD) / 01/21/2020 / 15:56:42**

Corrected probabilities



- [%]
- P > 5
  - :: P < 5
  - P < 2
  - P < 1
  - P < 0,5

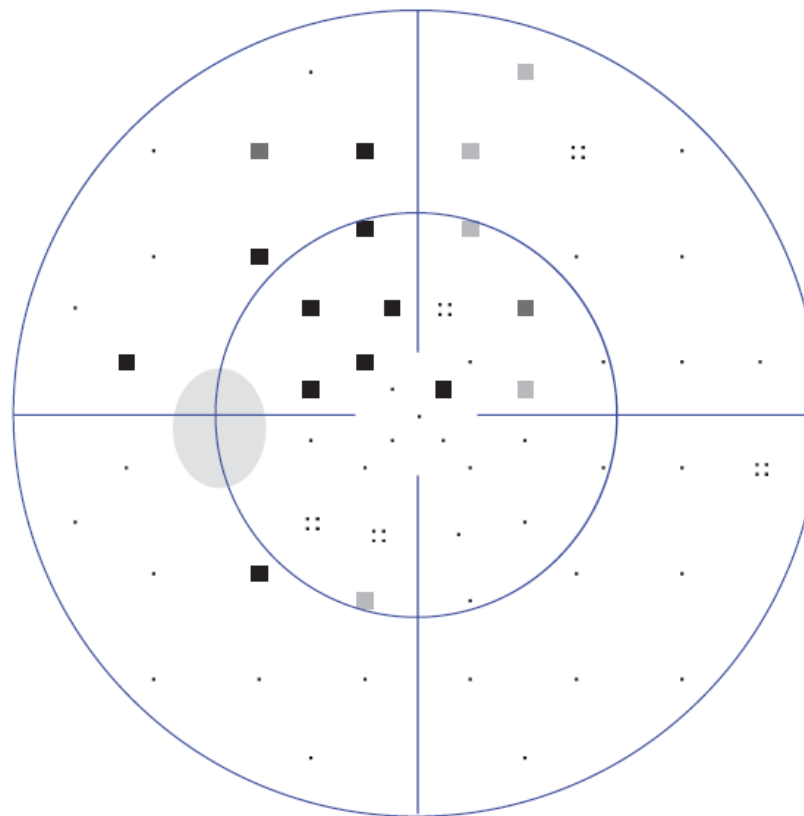
30°	
MS [dB]:	21.1
MD [< 2.0 dB]:	5.8
sLV [< 2.5 dB]:	5.5

**Programs:** G Standard White/White / TOP **Questions / repetitions:** 85 / 16  
**Parameters:** 31.4 / 4000 asb III 100 ms **Duration:** 02:46  
**Catch trials:** 0/4 (0%) +, 2/5 (40%) - **RF:** 22.2  
**Refraction S/C/A:** **VA [m]:**  
**Pupil [mm]:** 0.0 **IOP [mmHg]:**  
**NV:** T31 V1.0

Comment:

**Left eye (OS) / 01/21/2020 / 16:10:53**

Corrected probabilities



- [%]
- P > 5
  - :: P < 5
  - P < 2
  - P < 1
  - P < 0,5

30°	
MS [dB]:	18.4
MD [< 2.0 dB]:	8.5
sLV [< 2.5 dB]:	5.9

**Programs:** G Standard White/White / TOP **Questions / repetitions:** 71 / 2  
**Parameters:** 31.4 / 4000 asb III 100 ms **Duration:** 02:20  
**Catch trials:** 0/3 (0%) +, 1/4 (25%) - **RF:** 14.2  
**Refraction S/C/A:** **VA [m]:**  
**Pupil [mm]:** 0.0 **IOP [mmHg]:**  
**NV:** T31 V1.0

Comment:

What's your plan?

Observe?

Treat?

No glaucoma?

Glaucoma light?

**Diagnosis?**

Glaucoma medium?

Glaucoma dark?



A photograph of a modern reception desk in a clinic. The desk is white with a black countertop and is decorated with several floral arrangements. In the background, a light blue wall features the text "Barber's Point Eye Associates". The ceiling has recessed lighting.

Thank you!

Barber's Point  
Eye Associates

Elliot M. Kirstein, OD, FAAO