



**UNIVERSITY OF THE
INCARNATE WORD®**

ROSENBERG SCHOOL *of*
OPTOMETRY

Glaucoma or Neuro? Multimodality Testing Reveals the Answer

Alexander Martinez, O.D.

UIWRSO Primary Care Resident

Office Visit: #1

Patient demographics:	57-year-old Hispanic Male
Chief complaint:	Distance blur OD and OS that gradually worsened within the past 2 years
Ocular and medical history:	Unspecified glaucoma (1980) LPI OU (2002) Depression, anxiety, and OCD (2002) Hypertension (2017)
Family ocular and medical history:	Glaucoma – Mother Family medical history – unremarkable
Medications:	Unspecified hypertensive medication

Office Visit: #1

BCVA:	OD: 20/40 ⁻² PHNI OS: 20/200 PHNI
EOMs:	SFROM OU (-) pain (-) diplopia
Angles of Vision:	Right: 50, Left: 50
Pupils:	OD: PERRL (-) APD Size 5.5mm OS: PERRL (-) APD Size 5.5mm
CF:	OD: Slow responses to finger count, constriction inferior temporal OS: Field constriction: Superior temporal and inferior temporal

IOP:	OD: 24 mmHg OS: 26 mmHg
Slit Lamp:	LPI OD/OS, otherwise WNL
Fundus (Undilated):	OD: C/D: 0.80, deep cup OS: C/D: 0.70, deep cup

Assessment and Plan

- Moderate-Severe Primary Open Angle Glaucoma OU:
 - History of previous glaucoma treatment, high IOPs, and large optic nerve appearance.
- Pt was referred to the Bowden Clinic for a glaucoma work up and a DFE.

Office Visit #2: Glaucoma Work-Up

sc Visual Acuity	<ul style="list-style-type: none">• OD: 20/200⁻² (PH 20/150)• OS: 20/250⁺¹ (PH 20/150)
EOMs:	SFROM OU (-) pain (-) diplopia
Angles of Vision:	Right: 50, Left: 50
Pupils:	<ul style="list-style-type: none">• OD: PERRL (-) APD Size 5.5mm. Sluggish consensual response• OS: Equal, Round, Sluggish Reaction to light, Size 5.5mm, Fast escape with swinging flashlight test
Confrontation Fields:	OD/OS: Severe temporal constriction
Vitals:	BP: 143/80 mmHg

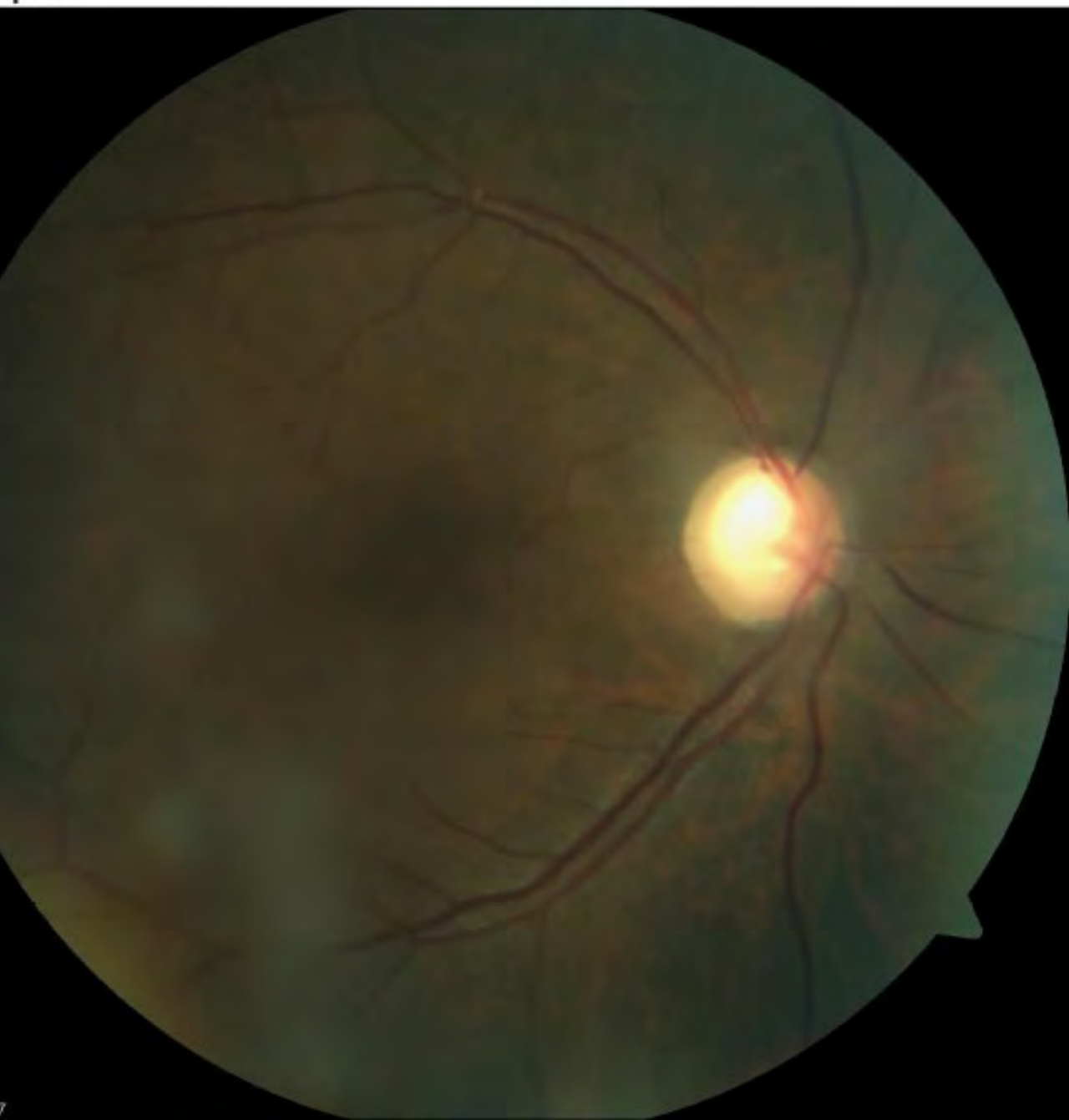
Office Visit #2: Glaucoma Work-Up

Color:	<ul style="list-style-type: none">• OD/OS: HRR 0/6• Red cap test: Temporal hemianopic vision loss. As the red cap was brought in from the temporal side, the patient noted the cap color changed from yellow to orange and then to red.
Gonioscopy:	D40r. Visible to CB, (-) PAS 360 degrees
IOPs:	28/27 mmHg
Anterior Segment:	Patent LPI OD 1 o'clock and non-patent LPI OS 11:30 o'clock. Otherwise WNL.
Fundus: OD/OS:	<ul style="list-style-type: none">• Optic nerve: Superior neuro-retinal rim thinning, OS: 1+ pallor• 0.80/0.80• Macula: Normal and contour• Vessels: Normal caliber without AV nicking• Periphery: Attached 360, (-) holes, tears

OS

Color

10/20/2017 9:57:26 PM



OD OS

Color

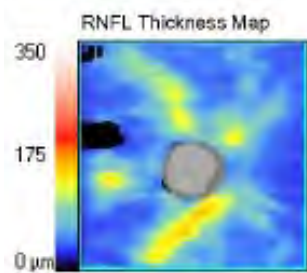
10/20/2017 9:56:51 PM



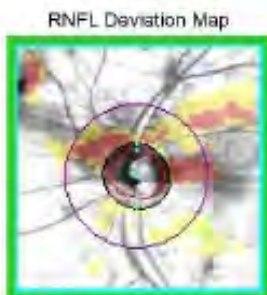
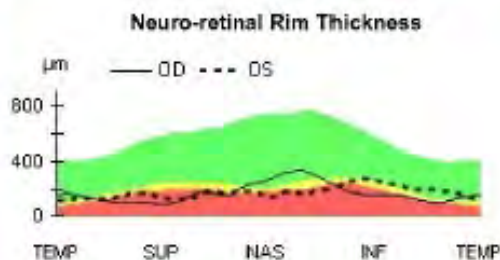
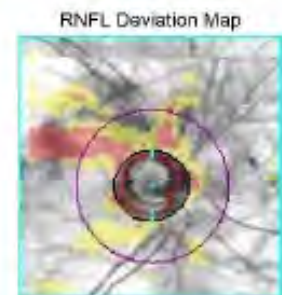
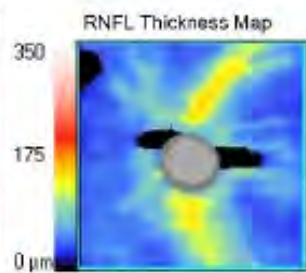
10/20/2017

ONH and RNFL OU Analysis: Optic Disc Cube 200x200

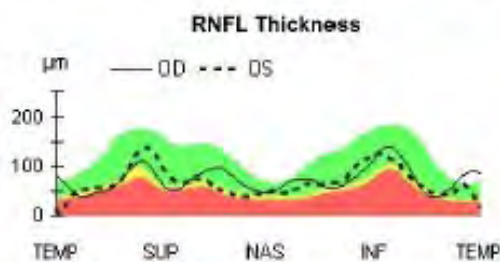
OD ● ● OS



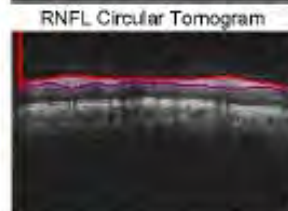
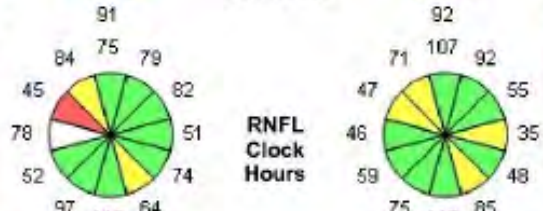
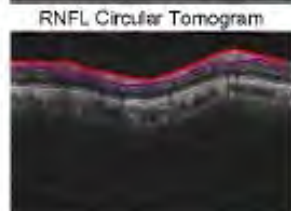
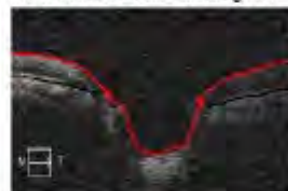
	OD	OS
Average RNFL Thickness	75 μm	70 μm
RNFL Symmetry	66%	
Rim Area	0.81 mm^2	0.79 mm^2
Disc Area	2.12 mm^2	2.02 mm^2
Average C/D Ratio	0.79	0.77
Vertical C/D Ratio	0.65	0.76
Cup Volume	0.774 mm^3	0.623 mm^3



Disc Center(0.00,-0.36)mm

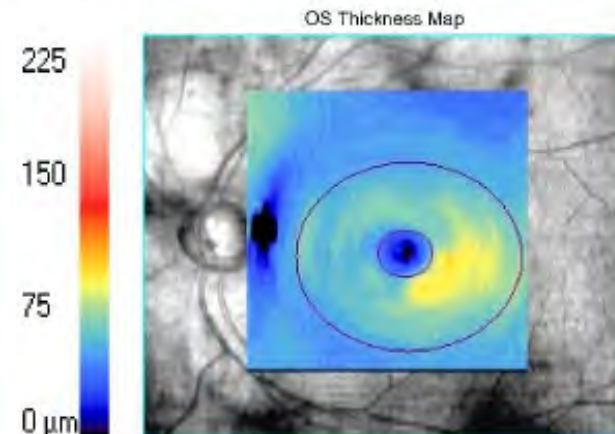
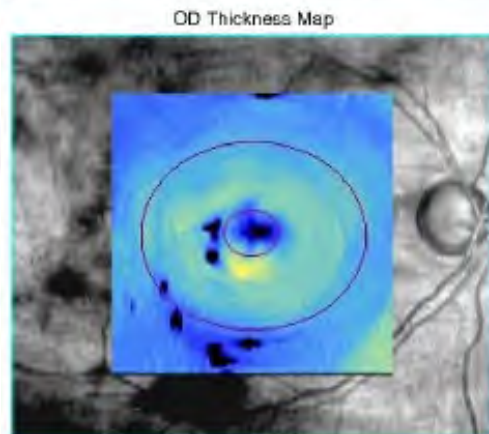


Disc Center(-0.09,-0.15)mm



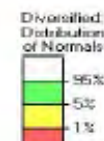
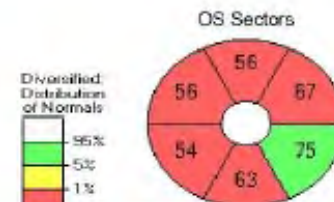
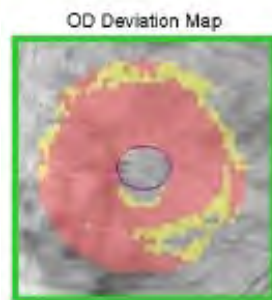
Ganglion Cell OU Analysis: Macular Cube 512x128

OD ● ● OS

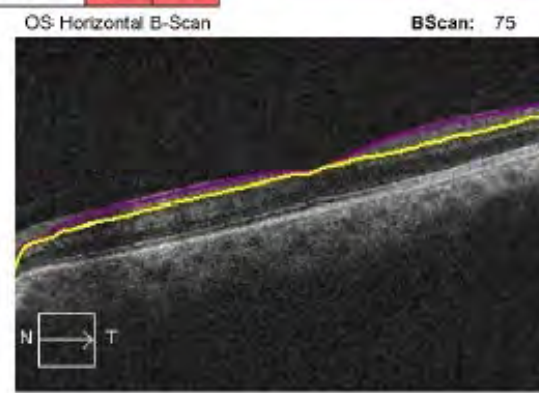
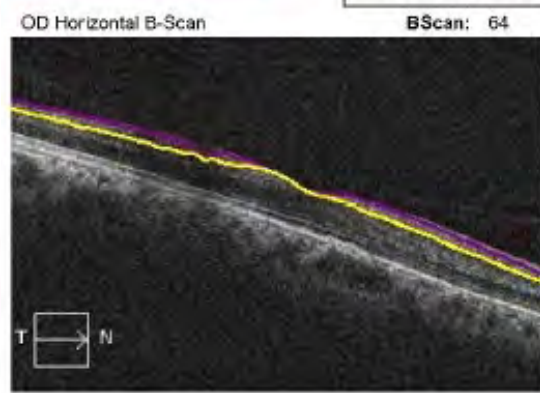


Fovea: Not found

Fovea: 291, 75

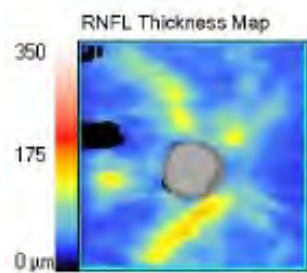


	OD μm	OS μm
Average GCL + PL Thickness	56	62
Minimum GCL + IPL Thickness	49	53

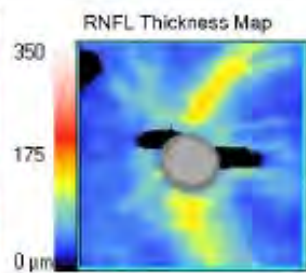


ONH and RNFL OU Analysis: Optic Disc Cube 200x200

OD ● ● OS

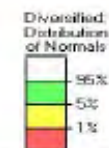
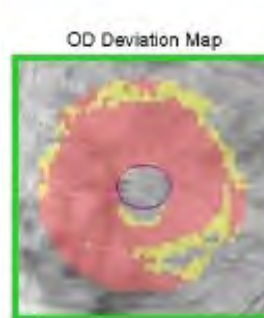
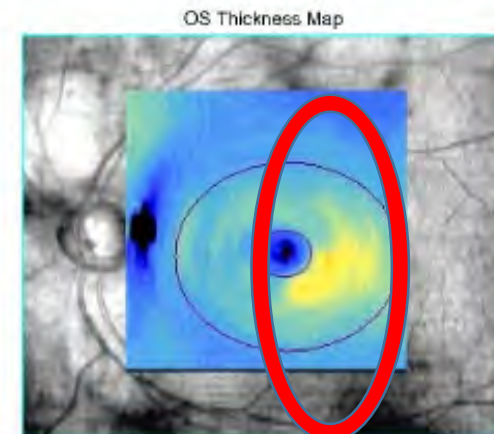
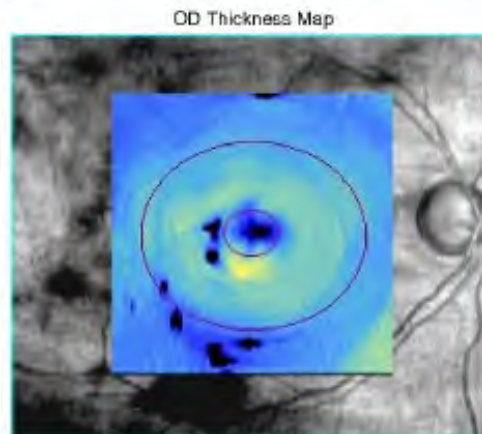


	OD	OS
Average RNFL Thickness	75 μm	70 μm
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Rim Area	0.81 mm ²	0.79 mm ²
Disc Area	2.12 mm ²	2.02 mm ²
Average C/D Ratio	0.79	0.77
Vertical C/D Ratio	0.65	0.76
Cup Volume	0.774 mm ³	0.623 mm ³

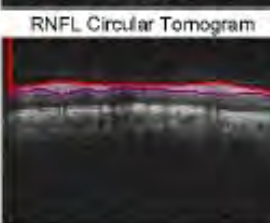
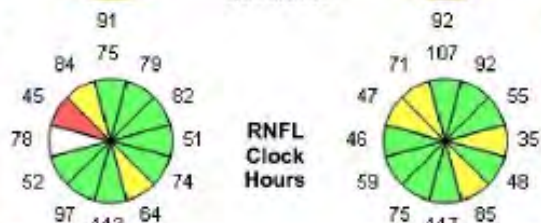
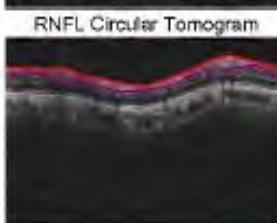
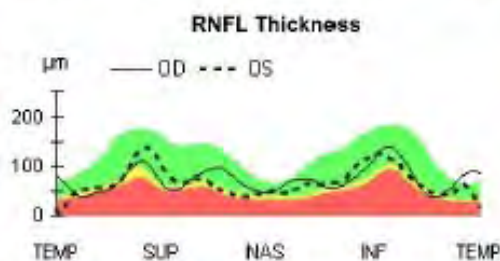
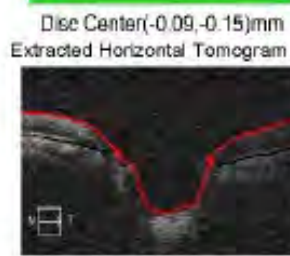
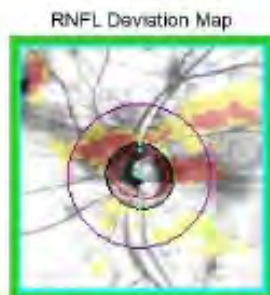
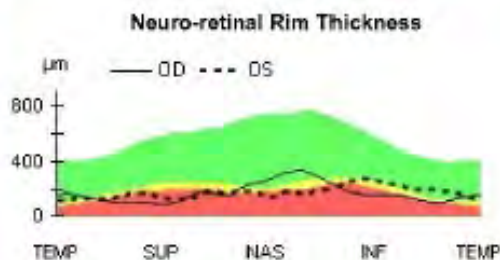
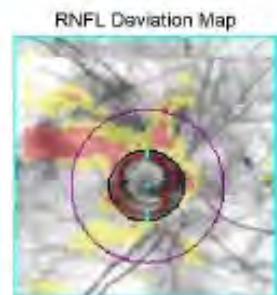
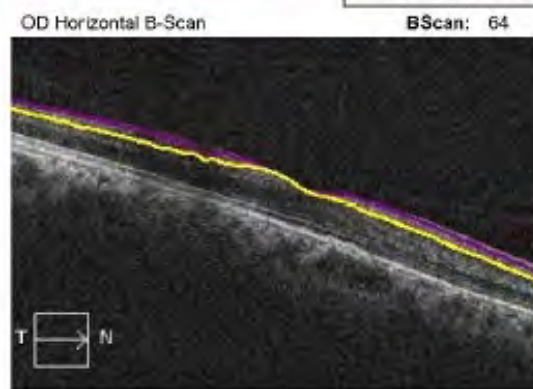
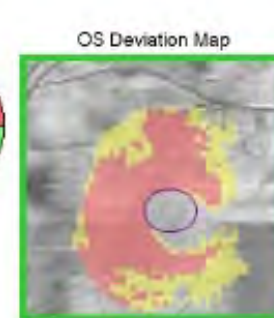


Ganglion Cell OU Analysis: Macular Cube 512x128

OD ● ● OS



	OD μm	OS μm
Average GCL + PL Thickness	56	62
Minimum GCL + IPL Thickness	49	53

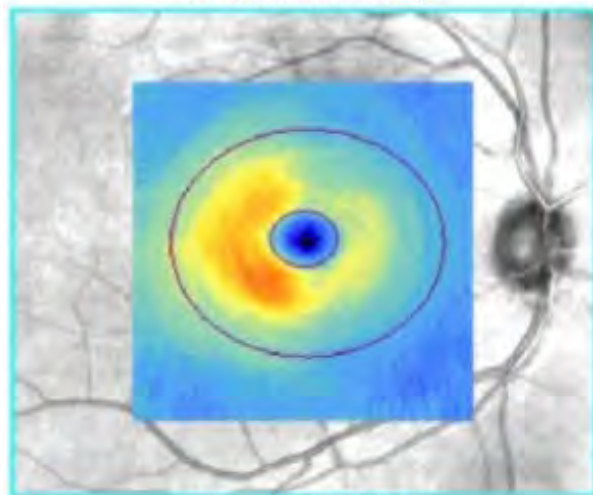


Example:

Ganglion cell ou analysis: macular cube 200x200

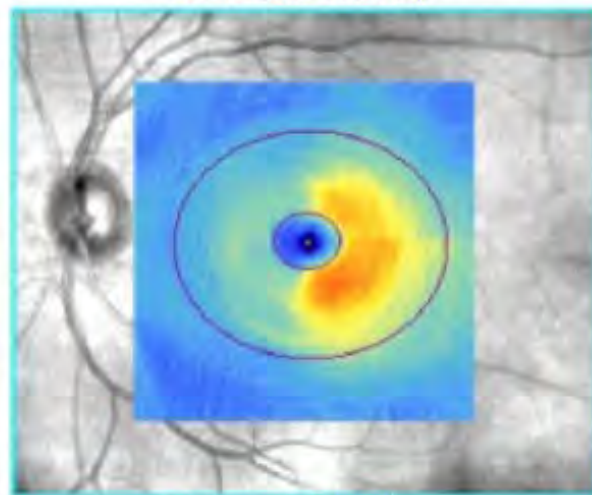
OD ● OS ●

OD thickness map

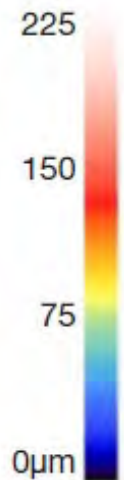


Fovea: 102, 94

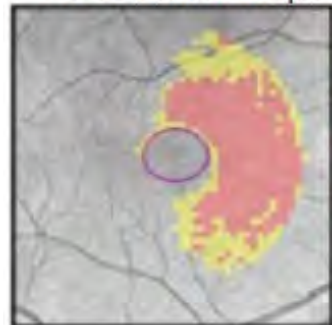
OS thickness map



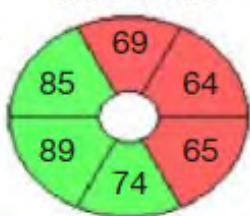
Fovea: 103, 95



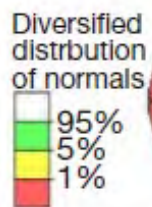
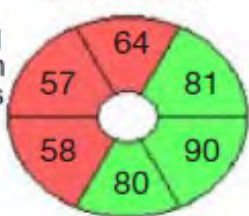
OD deviation map



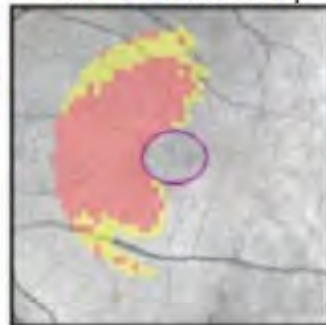
OD sectors



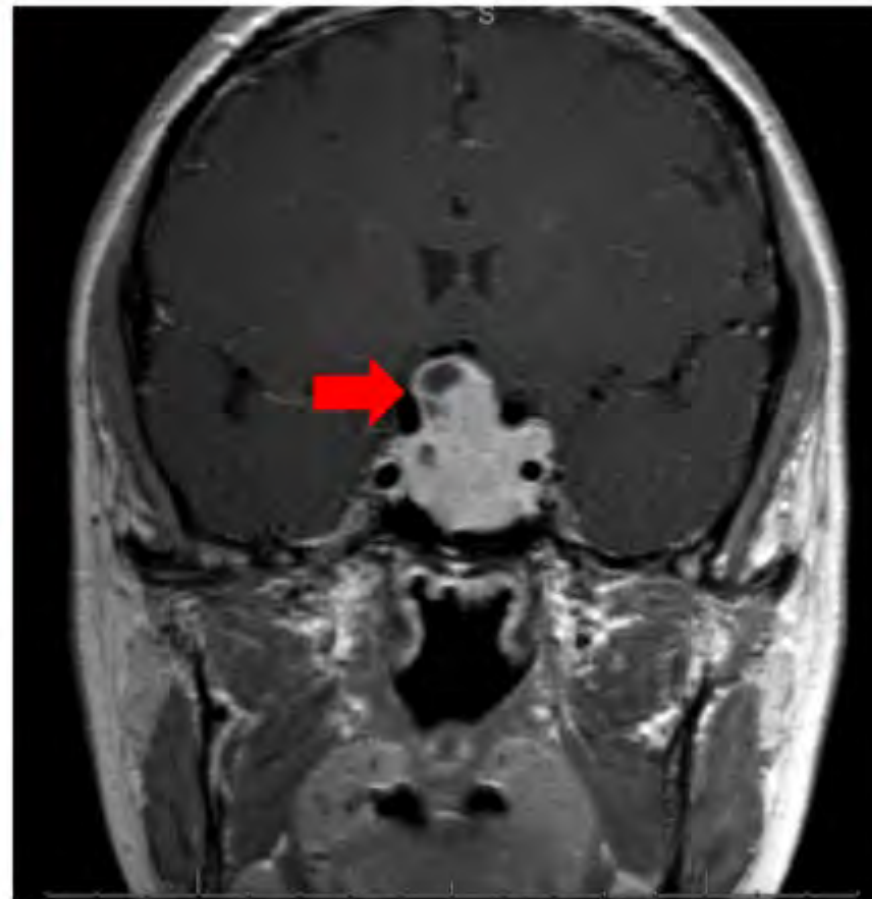
OS sectors

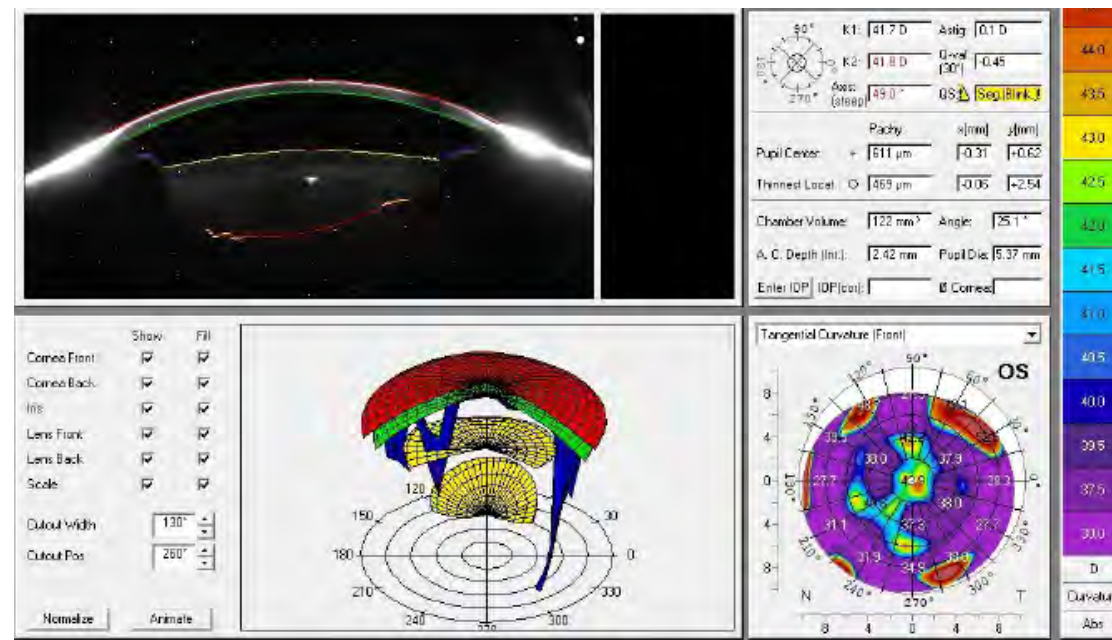
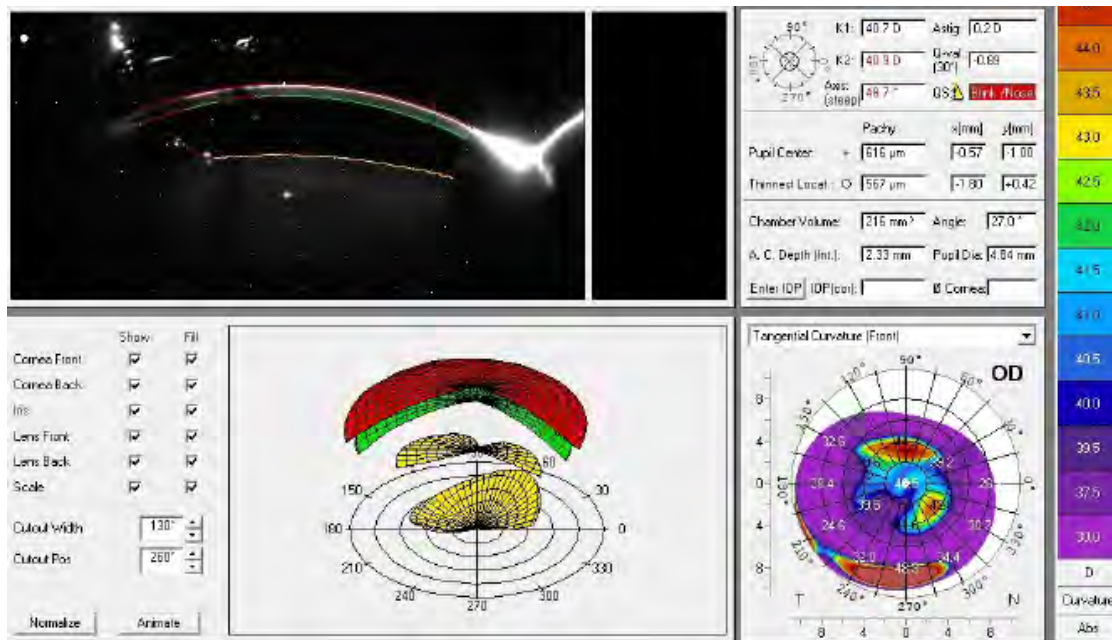


OS deviation map



	OD µm	OS µm
Average GCL + IPL thickness	74	72
Minimum GCL + IPL thickness	64	57





	OD	OS
Chamber Volume	216 mm^3	122 mm^3
A.C. Depth	2.33mm	2.42mm
CCT	616 μm	611 μm

Central 24-2 Threshold Test

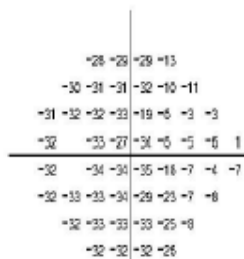
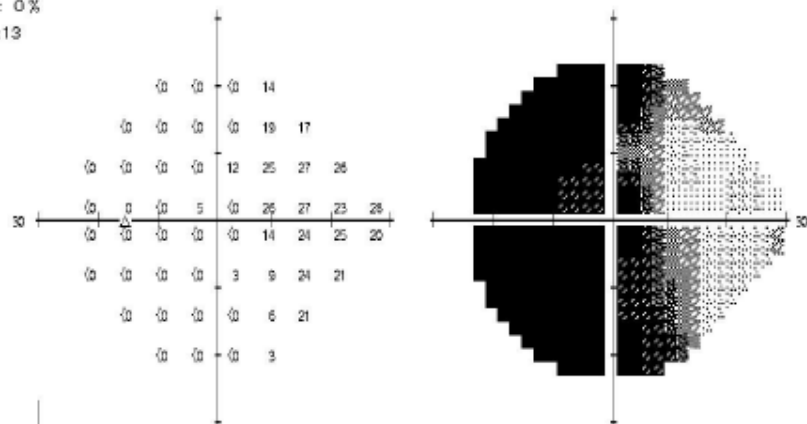
Fixation Monitor: Blind Spot
 Fixation Target: Central
 Fixation Losses: 1/14
 False POS Errors: 3 %
 False NEG Errors: 0 %
 Test Duration: 06:13

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

Pupil Diameter:
 Visual Acuity:
 RX: +1.75 DS DC X

Date: 10-20-2017
 Time: 1:04 PM
 Age: 57

Fovea: OFF

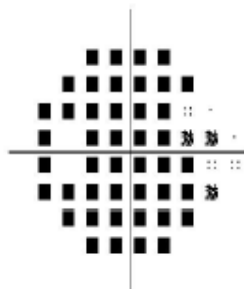


Total Deviation

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

Pattern Deviation

GHT
 Outside Normal Limits
 VFI 22%
 MD -23.27 dB P < 0.5%
 PSD 12.49 dB P < 0.5%



⋮ < 5%
 ⚬ < 2%
 ⚭ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

Central 24-2 Threshold Test

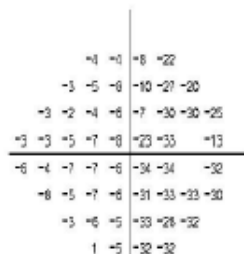
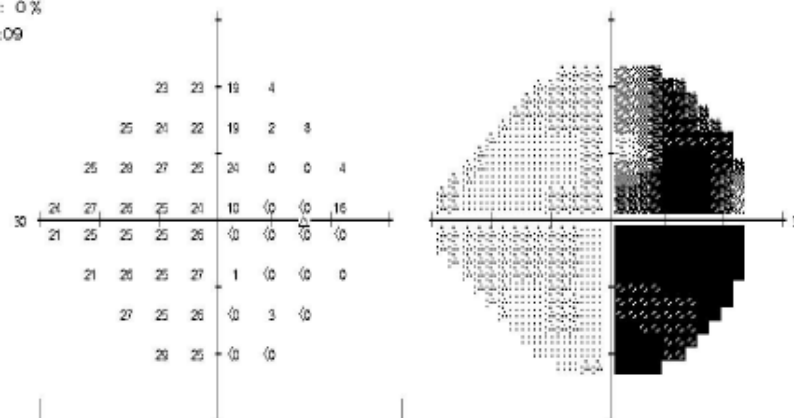
Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 2/15
 False POS Errors: 0 %
 False NEG Errors: 0 %
 Test Duration: 06:09

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

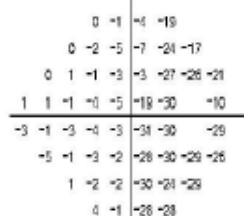
Pupil Diameter:
 Visual Acuity:
 RX: +1.00 DS -1.25 DC X 50

Date: 10-20-2017
 Time: 12:56 PM
 Age: 57

Fovea: OFF

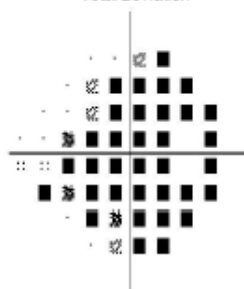


Total Deviation



Pattern Deviation

GHT
 Outside Normal Limits
 VFI 57%
 MD -14.63 dB P < 0.5%
 PSD 13.09 dB P < 0.5%



⋮ < 5%
 ⚬ < 2%
 ⚭ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

Assessment and Plan

Office visit #2

- Bitemporal hemianopia:
 - Decreased vision OS>>OD presumably secondary to chiasmal lesion
 - 24-2 HFV revealed a dense temporal hemianopsia OU with dense central defects OS. Pt was educated the need to perform an MRI. Pt's wife was informed that the most likely cause of the visual field defects is a pituitary adenoma. The condition and surgical treatment was discussed.
- Elevated IOPs:
 - (28/27 mmHg) Superior NRR thinning noted on DFE OU consistent with retinal nerve fiber layer thinning observed on OCT analysis. Pt's wife was informed the pt might need to take glaucoma drops in the future.
- RTC the next Monday to repeat HFV 24-2. Pending repeatability of the VF defects, will refer the patient for an MRI of the brain and orbits.

Differential Diagnosis

- Neoplastic lesions from breast, colon, kidney, prostate
- Pituitary hypophysitis (Inflammation)
- Craniopharyngioma
- Parasellar meningioma
- Chiasmatal glioma
- Parasellar internal carotid artery aneurysm

Office Visit: #3

Central 24-2 Threshold Test

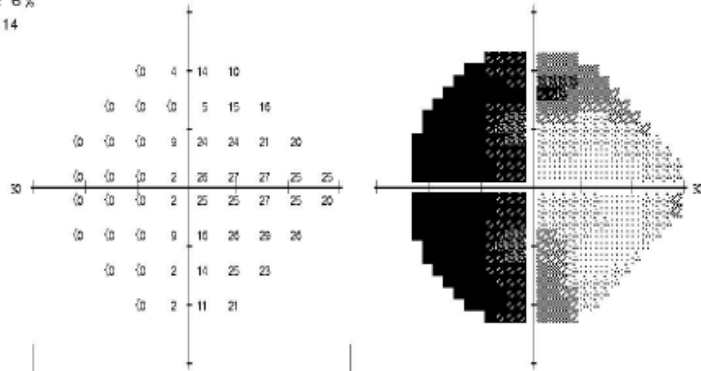
Fixation Monitor: OFF
 Fixation Target: Central
 Fixation Losses: 0/0
 False POS Errors: 13 %
 False NEG Errors: 6 %
 Test Duration: 07:14

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

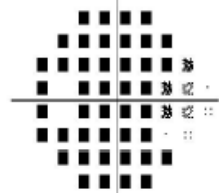
Pupil Diameter:
 Visual Acuity:
 RX: +0.75 DS DC X

Date: 10-24-2017
 Time: 1:45 PM
 Age: 47

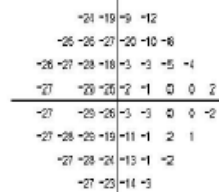
Fovea: OFF



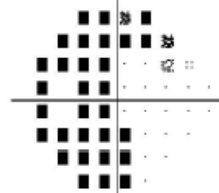
Total Deviation



□ $≤ 5$
 □ $≤ 2$
 □ $≤ 1$
 ■ $≤ 0.5$



Pattern Deviation



GHT
 Outside Normal Limits

VFI 47%

MD -18.46 dB P < 0.5%

PSD 12.49 dB P < 0.5%

BOWDEN EYE CARE

Central 24-2 Threshold Test

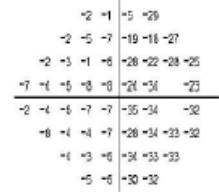
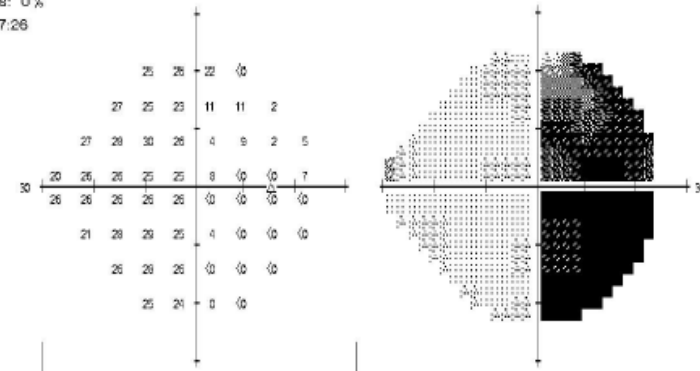
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 Fixation Target: Central
 Fixation Losses: 1/15
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 Test Duration: 07:26

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

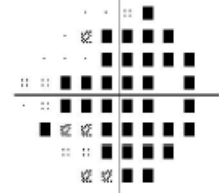
Pupil Diameter:
 Visual Acuity:
 RX: +0.00 DS -1.25 DC X 50

Date: 10-24-2017
 Time: 1:31 PM
 Age: 47

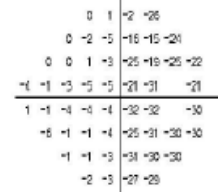
Fovea: OFF



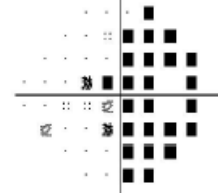
Total Deviation



□ $≤ 5$
 □ $≤ 2$
 □ $≤ 1$
 ■ $≤ 0.5$



Pattern Deviation



BOWDEN EYE CARE

GHT
 Outside Normal Limits

VFI 53%

MD -15.25 dB P < 0.5%

PSD 13.44 dB P < 0.5%

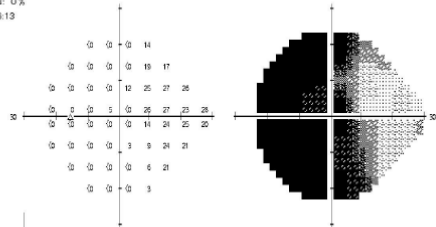
Central 24-2 Threshold Test

Fixation Monitor: Blind Spot
 Fixation Target: Central
 Fixation Losses: 1/14
 False POS Errors: 3%
 False NEG Errors: 0%
 Test Duration: 06:13
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +1.75 DS DC X

Date: 10-20-2017
 Time: 1:04 PM
 Age: 57



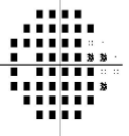
18 20 19 11
 10 10 10 19 17
 10 10 10 12 25 27 26
 10 10 10 5 10 27 23 28
 10 10 10 11 21 25 20
 10 10 10 3 9 24 21
 10 10 10 6 21
 10 10 10 3

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 22%
 MD -23.27 dB P < 0.5%
 PSD 12.49 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

BOWDEN EYE CARE

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

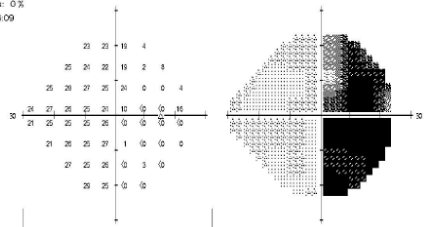
Central 24-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 2/15
 False POS Errors: 0%
 False NEG Errors: 0%
 Test Duration: 06:09
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +1.00 DS -1.25 DC X 50

Date: 10-20-2017
 Time: 12:58 PM
 Age: 57



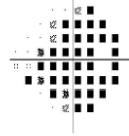
23 23 18 4
 25 21 22 19 2 8
 25 28 27 25 24 0 0 4
 21 27 25 25 21 13 10 16
 21 25 25 27 1 10 0 0
 27 25 25 3 10
 29 25 0 10

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 57%
 MD -14.63 dB P < 0.5%
 PSD 13.09 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

BOWDEN EYE CARE

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

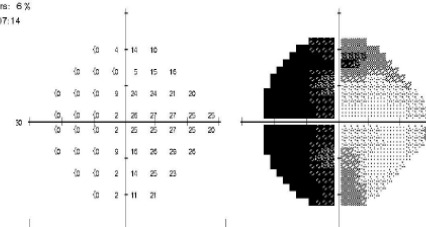
Central 24-2 Threshold Test

Fixation Monitor: OFF
 Fixation Target: Central
 Fixation Losses: 0/0
 False POS Errors: 13%
 False NEG Errors: 6%
 Test Duration: 07:14
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +0.75 DS DC X

Date: 10-24-2017
 Time: 1:45 PM
 Age: 47



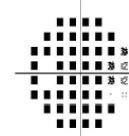
10 14 10
 10 10 5 15 16
 10 10 9 21 24 20 20
 10 10 2 26 27 27 25 27
 10 10 9 16 24 25 25
 10 10 2 11 25 23
 10 2 11 21

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 47%
 MD -18.46 dB P < 0.5%
 PSD 12.49 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

BOWDEN EYE CARE

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

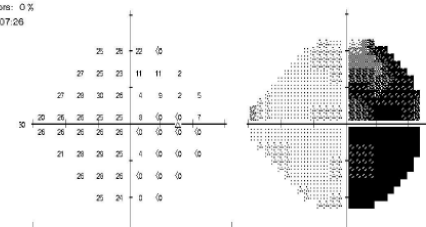
Central 24-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 1/15
 False POS Errors: 11%
 False NEG Errors: 0%
 Test Duration: 07:26
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +0.00 DS -1.25 DC X 50

Date: 10-24-2017
 Time: 1:31 PM
 Age: 47



25 25 22 10
 27 25 23 11 11 2
 27 28 30 26 0 0 2 5
 20 25 26 25 25 0 10 7
 20 25 25 25 25 0 10 10
 21 28 28 25 4 10 10
 25 26 26 7 10 10
 25 21 0 10

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 53%
 MD -15.25 dB P < 0.5%
 PSD 13.44 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

BOWDEN EYE CARE

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

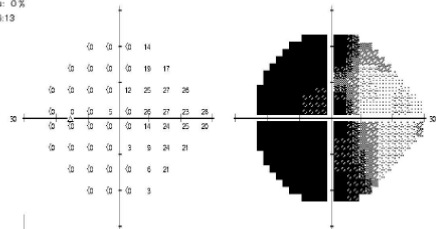
Central 24-2 Threshold Test

Fixation Monitor: Blind Spot
 Fixation Target: Central
 Fixation Losses: 1/14
 False POS Errors: 3 %
 False NEG Errors: 0 %
 Test Duration: 06:13
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +1.75 DS DC X

Date: 10-20-2017
 Time: 1:04 PM
 Age: 57



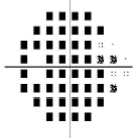
18 20 19 11
 10 10 10 19 17
 10 10 10 10 25 27 26
 10 10 10 10 11 21 25 20
 10 10 10 10 3 9 24 21
 10 10 10 10 6 21
 10 10 10 3

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 22%
 MD -23.27 dB P < 0.5%
 PSD 12.49 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

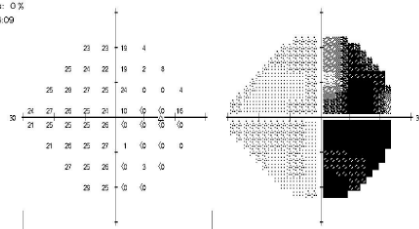
Central 24-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 2/15
 False POS Errors: 0 %
 False NEG Errors: 0 %
 Test Duration: 06:09
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +1.00 DS -1.25 DC X 50

Date: 10-20-2017
 Time: 12:58 PM
 Age: 57



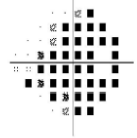
23 23 18 4
 25 21 22 19 2 8
 25 28 27 25 24 0 0 4
 21 27 25 25 26 0 0 16
 21 26 25 27 1 0 0 0
 27 26 26 0 3 0
 26 25 0 0

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 57%
 MD -14.63 dB P < 0.5%
 PSD 13.09 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

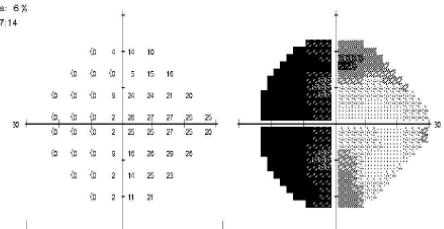
Central 24-2 Threshold Test

Fixation Monitor: OFF
 Fixation Target: Central
 Fixation Losses: 0/0
 False POS Errors: 13 %
 False NEG Errors: 6 %
 Test Duration: 07:14
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +0.75 DS DC X

Date: 10-24-2017
 Time: 1:45 PM
 Age: 47



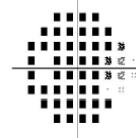
18 18 11 10
 10 10 10 5 15 16
 10 10 10 10 21 24 20 20
 10 10 10 10 2 26 27 27 25 27
 10 10 10 10 9 16 24 20 20
 10 10 10 10 2 11 25 23
 10 2 11 21

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 47%
 MD -18.46 dB P < 0.5%
 PSD 12.49 dB P < 0.5%

Total Deviation

Pattern Deviation



Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

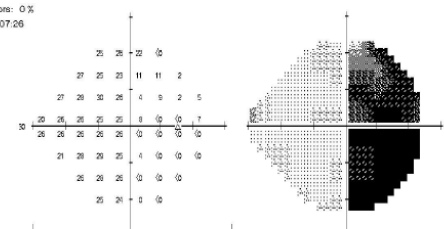
Central 24-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 1/15
 False POS Errors: 11 %
 False NEG Errors: 0 %
 Test Duration: 07:26
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +0.00 DS -1.25 DC X 50

Date: 10-24-2017
 Time: 1:31 PM
 Age: 47



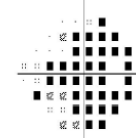
25 26 22 0
 27 25 23 11 11 2
 27 26 30 26 0 0 2 5
 20 26 26 25 25 0 0 7
 21 26 26 25 4 0 0 0
 26 26 26 0 0 0
 26 26 0 0

Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

GHT
 Outside Normal Limits
 VFI 53%
 MD -15.25 dB P < 0.5%
 PSD 13.44 dB P < 0.5%

Total Deviation

Pattern Deviation



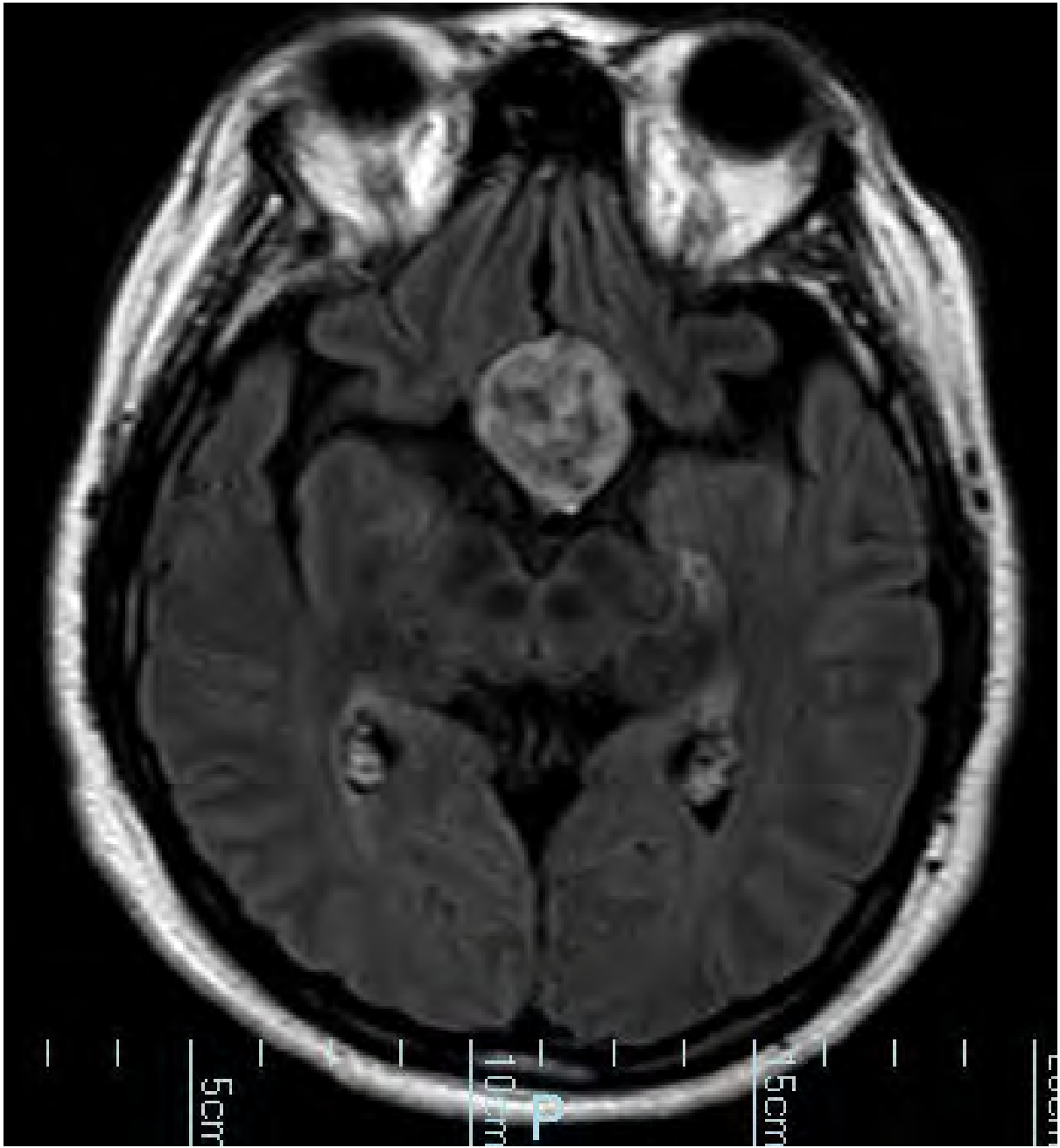
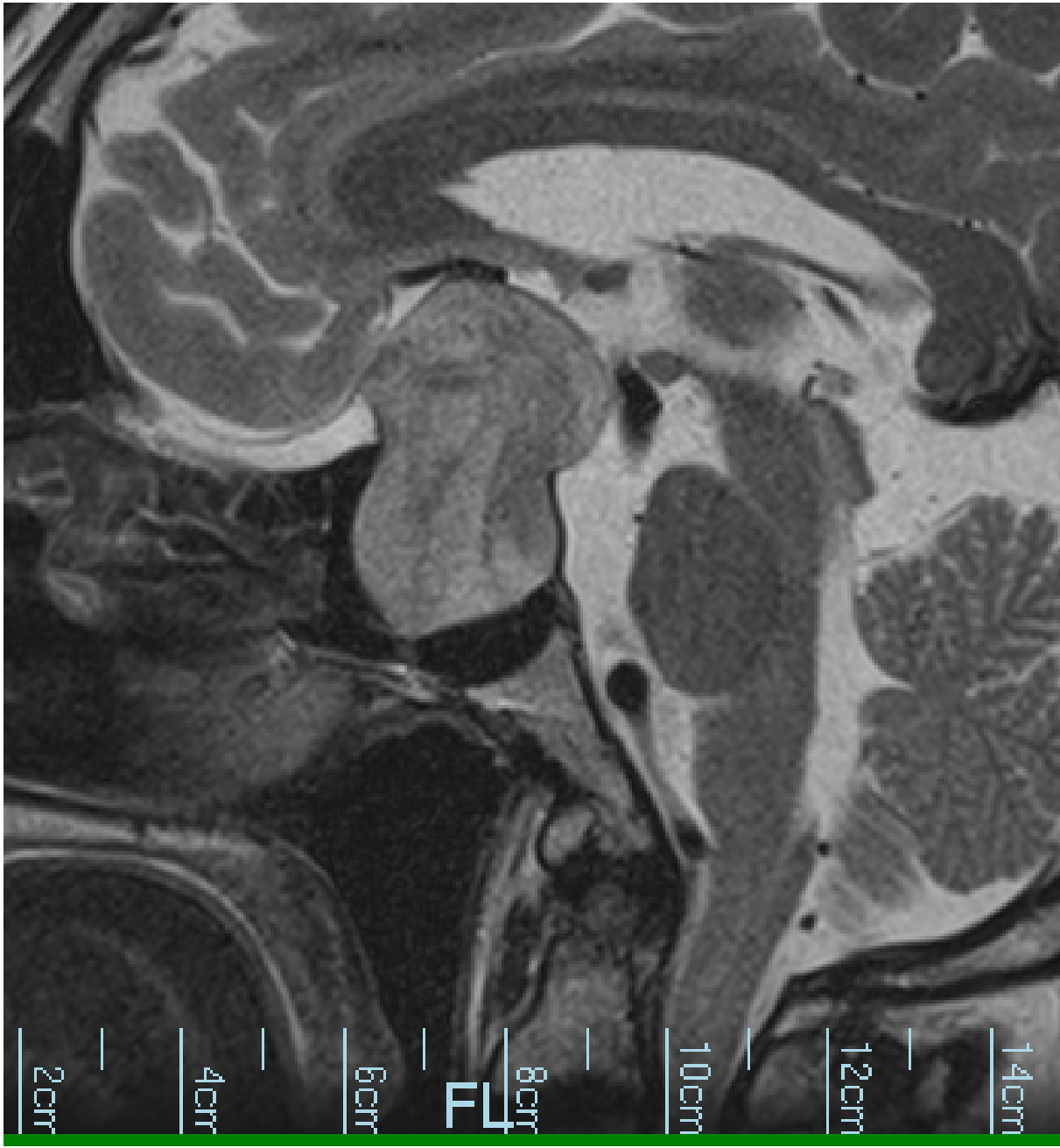
Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

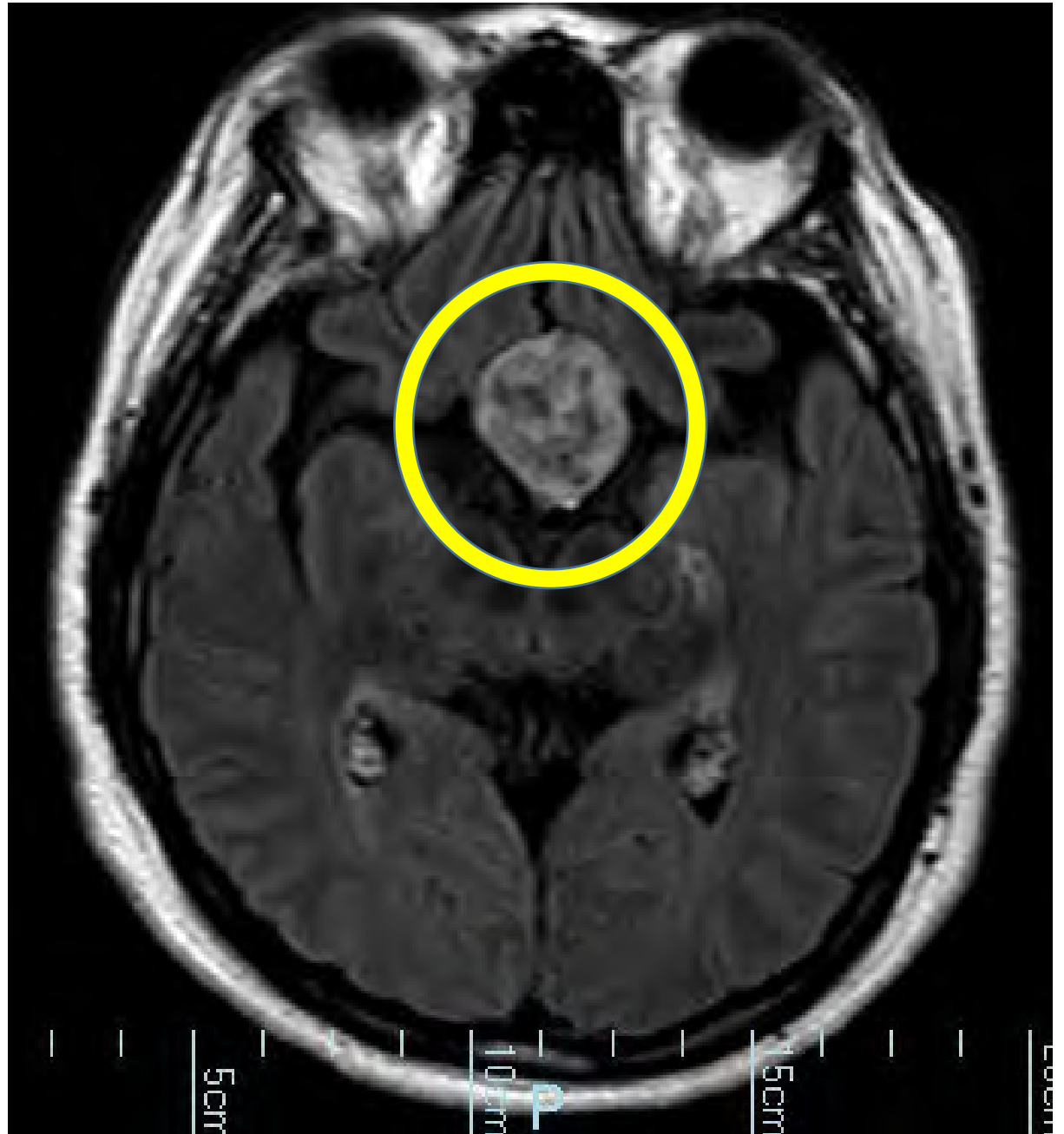
□ < 5%
 □ < 2%
 □ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

Normal Pituitary Gland:







University Health System's Results/Impression from MRI

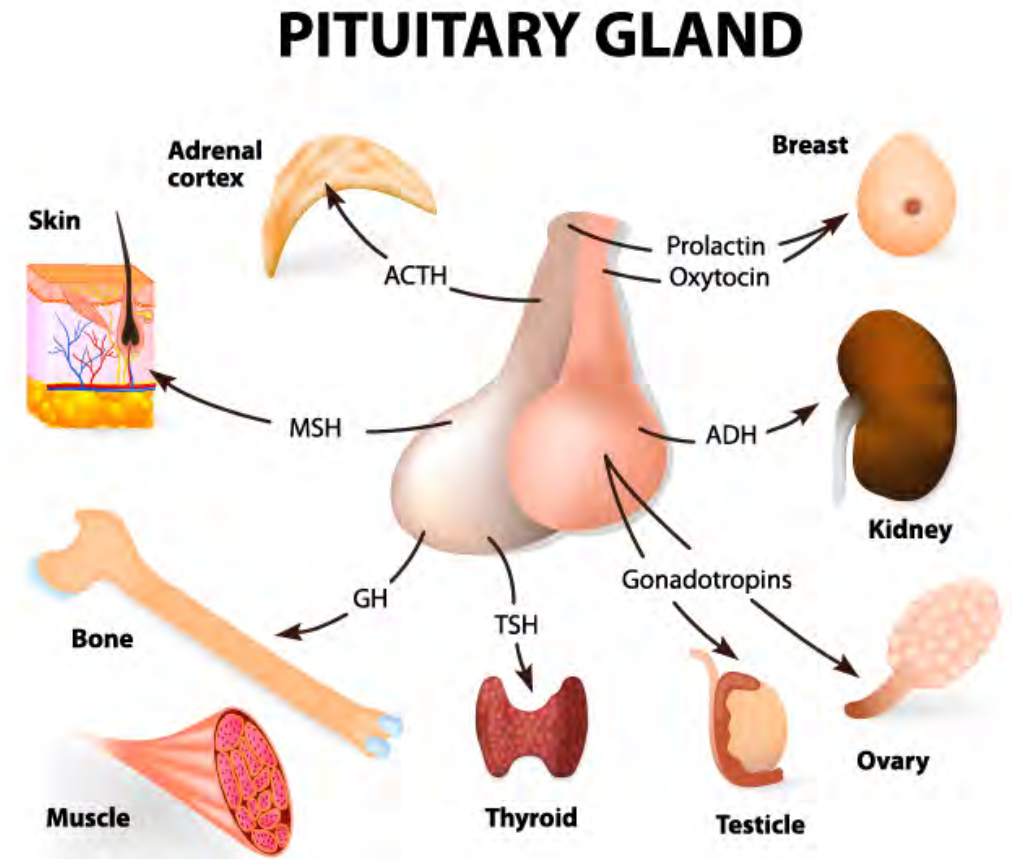
- "Pituitary and pineal glands. There is a 2.6 x 3 x 4.4 cm T1 isointense, T2 iso/hyperintense heterogeneously enhancing sellar lesion with suprasellar extension and mass effect on the optic chiasm. There is less than 50% encasement of bilateral cavernous ICAs, compatible with macroadenoma. There is also a mass effect on bilateral ACAs and third ventricle."

Outcome

- The wife called the clinic and reported the patient had a successful surgery
- Surgery lasted from 10:00am to 4:40pm
- An additional MRI was scheduled in 2 weeks
- Patient reported a significant improvement in vision and color vision after surgery
- Lost to follow up

Pituitary Gland Anatomy

- Anterior pituitary gland
 - Adenohypophysis
 - Somatotrophs – Growth hormone
 - Thyrotrophs – TSH
 - Corticotrophs – ACTH
 - Gonadotrophs – FSH and LH
 - Lactotrophs – Prolactin
- Posterior pituitary gland:
 - Neurohypophysis
 - Oxytocin
 - ADH



Pituitary Adenoma

- Functional:

- Hypersecretion of hormones
- Prolactinoma
- Acromegaly
- Cushing's disease
- Thyrotropin-secreting

- Nonfunctional

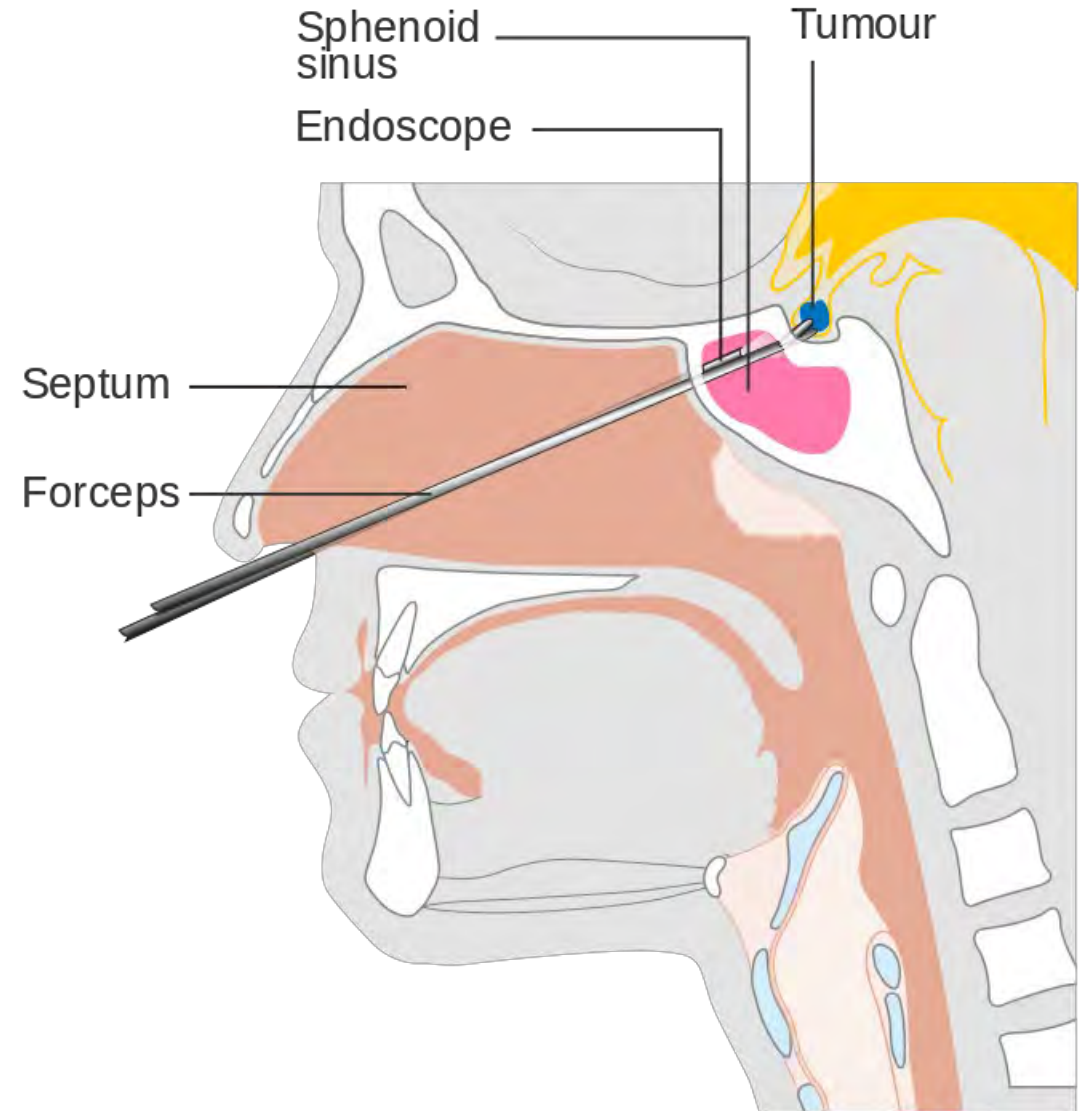
- Macroadenomas (>1cm)
- No active secretion of hormones
- Mass effects

Pituitary Macroadenoma Symptoms

- **General:**
 - Visual field loss
 - Decreased visual acuity
 - Headache
 - Depression
- **Corticotrophin Insufficiency:**
 - Weakness
 - Dizziness
 - Vomiting
 - Shock
- **Thyrotropin Insufficiency:**
 - Weight gain
 - Depression
 - Emotional instability
 - Decreased mental function
- **Gonadotrophin Insufficiency:**
 - Depression
 - Sleep disturbances
- **Somatotropin Insufficiency:**
 - Stunt growth in children
 - Delayed puberty

Treatment

- Transsphenoidal surgery
 - Most common surgery
 - Endoscope travels from nasal cavity → sphenoid sinus → sellar floor
 - Serious complications are rare
- Radiation therapy
- Medical therapy



Post Operative

- Headache relief
- Rapid visual field improvement
 - May take 6-12 months for the full extent of visual field recovery
- Pituitary function assessed
- Steroid coverage
- MRI in 3 months

Post Operative

- Visual outcome is difficult to predict because of different factors:
 - Age
 - Size of adenoma
 - Pre-operative visual field defect and visual acuity
 - Optic atrophy
 - Duration of symptoms
 - Amount of retrograde axonal degeneration using OCT Ganglion Cell Analysis
- 3 stages of recovery of visual function:
 - Rapid, delayed and late recovery

Prognosis If Left Untreated

- Optic atrophy → permanent vision loss
- CN palsies (3, 4, 6)
- Temporal lobe epilepsy
- Facial pain
- Hypothalamic dysfunction
- Pituitary gland apoplexy



Normal Tension Glaucoma vs Space Occupying Lesion

- Unexplainable decreased VAs
- >50 years of age
- Optic nerve pallor
- Vertical respect on visual fields
- Neurological symptoms

References

1. Melmed, S. (2017). *The Pituitary* (4th ed.). London, United Kingdom: Elsevier/Academic Press. Retrieved June 13, 2018, from <https://www-clinicalkeycom.uiwtx.idm.oclc.org/#!/content/book/3-s2.0B9780128041697000192?scrollTo=#hl0000750>.
2. Perez-Castro, C., Renner, U., Haedo, M., Stalla, G., & Arzt, E. (2012). Cellular and Molecular Specificity of Pituitary Gland Physiology. *Physiological Reviews*, 92(1), 1-38. doi:<https://doi.org/10.1152/physrev.00003.2011>
3. Pituitary Adenomas. (2017). (n.d.). Retrieved from <http://pituitary.ucla.edu/pituitary-adenomas>
4. Hamrahian, A., Johnston, P. C., Kennedy, L., & Weil, R. J. (2015). Pituitary Tumor Apoplexy. *Journal of Clinical Neuroscience*, 22(6), 939-944. Retrieved June 13, 2018, from <https://www-clinicalkey-com.uiwtx.idm.oclc.org/#!/content/playContent/1-s2.0-S0967586815000132?returnurl=null&referrer=null&scrollTo=#top>.
5. Longhair, R., Weed, M., & Thurtell, M. (n.d.). (2013). Pituitary Adenoma Causing Compression of the Optic Chiasm. Retrieved June 13, 2018, from <https://webeye.ophth.uiowa.edu/eyeforum/cases/177-pituitary-adenoma.htm>
6. Hajiabadi, M., Alimohamadi, M., & Fahlbusch, R. (2015). Decision Making for Patients With Concomitant Pituitary Macroadenoma and Ophthalmologic Comorbidity: A Clinical Controversy. *World Neurosurgery*, 84(1), 147-153. Retrieved June 13, 2018, from <https://doi.org/10.1016/j.wneu.2015.02.043>
7. Cappabianca, P., Cavallo, L., Esposito, F., Stagno, V., & E Notaris, M. (n.d.). (2010). *Transsphenoidal Surgery* (12th ed.). Retrieved June 13, 2018, from <https://www-clinicalkey-com.uiwtx.idm.oclc.org/#!/content/book/3-s2.0-B9781416002925000127?scrollTo=#references>.
8. Barzaghi, L., Medone, M., Losa, M., Bianchi, S., Giovanelli, M., & Morton, P. (2012). Prognostic factors of visual field improvement after trans-sphenoidal approach for pituitary macroadenomas: Review of the literature and analysis by quantitative method. *Neurosurgical Review*, 35(3), 369-379. Retrieved June 13, 2018, from <https://link-springer-com.uiwtx.idm.oclc.org/article/10.1007/s10143-011-0365-y>.
9. Lee, J., Kim, S. W., Kim, D. W., Shin, J. Y., Choi, M., Oh, M. C., . . . Byeon, S. H. (2016). Predictive model for recovery of visual field after surgery of pituitary adenoma. *Journal of Neo-Oncology*, 130(1), 155-164. Retrieved June 13, 2018, from <https://link-springer-com.uiwtx.idm.oclc.org/article/10.1007/s11060-016-2227-5>.
10. Gnanalingham, K., Bhattacharjee, S., Pennington, R., Ng, J., & Mendoza, N. (2005). The time course of visual field recovery following transsphenoidal surgery for pituitary adenomas: Predictive factors for a good outcome. *BMJ Journals*, 76(3), 415-419. Retrieved June 13, 2018, from <http://jnnp.bmj.com/content/76/3/415>
11. Osaguona, V., & Okiebemen, V. (2016). Pituitary adenoma misdiagnosed as glaucoma in an adult Nigerian male. *Nigerian Journal of Ophthalmology*, 24(2), 92. Retrieved June 13, 2018, from <http://link.galegroup.com/apps/doc/A474009695/HRCA?u=txshracd2623 &sid=HRCA&xid=cc04fe90>

PUSH IT TO THE LIMIT

A Glaucoma Quandary

Saoul Mancha, OD



UIWRSO Primary Care Resident

New Patient Initial Visit

10/14/19

- CC: 48 year old Hispanic female referred for glaucoma work up from outside clinic due to failed VF testing.
- HPI: GLC suspect, OU, since last exam, no pattern, no reported decrease in vision. Denied any ocular symptoms.

Initial Visit

Hx

- Ocular Hx
 - Unremarkable other than (+) FOHx of glaucoma (mother)
- Medical Hx
 - Unremarkable
- ROS
 - Unremarkable
- NKDA
- Medications
 - Pt denies use of ocular or systemic medication
- Mood normal alert and oriented x3

Initial Visit

Entrance
Testing

- DVAcc
 - OD: 20/20-1
 - OS: 20/20-1
- Rx
 - OD: -0.75 sph
 - OS: -1.00 sph
 - Add +1.00
- EOMS:
 - SFRM, (-)
pain/dpl OD and OS
- Pupils
 - PERRLA (-) APD
5mm OU
- Confrontation fields
 - OD: normal
 - OS: normal
- IOP
 - OD: 19 mmHg GAT
 - OS: 17 mmHg GAT

Initial Visit

Ant. Seg.

OD

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - WNL
- Lens
 - 1+NS, central congenital opacity (not within visual axis)
- Angles
 - 4T&N
- Gonio
 - S: Pig TM, flat iris insertion, 2+ pig, iris strands 360, (-) PAS
 - I/N/T: CB, flat iris insertion, 2+ pig, iris strands 360, (-) PAS

OS

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - Flat iris nevus 5 o'clock
- Lens
 - 1+NS, trace cortical change
- Angles
 - 4T&N
- Gonio
 - S/I/N/T: CB, flat iris insertion, 2+ pig, iris strands 360, (-) PAS

Initial Visit

Post. Seg.

Dilated

OD

- Optic Disc:
 - Inferior NFL thinning at 7 o'clock, Drance heme 7 o'clock, temporal choroidal crescent, slight tilt
- C/D:
 - V: 0.80
 - H: 0.70
- Macula:
 - Normal color and contour for age
- Vessels:
 - Mild A-V nicking
- Periphery:
 - WWOP nasal and superior
- Vitreous:
 - WNL

• Inferior NFL thinning
• Drance heme

OS

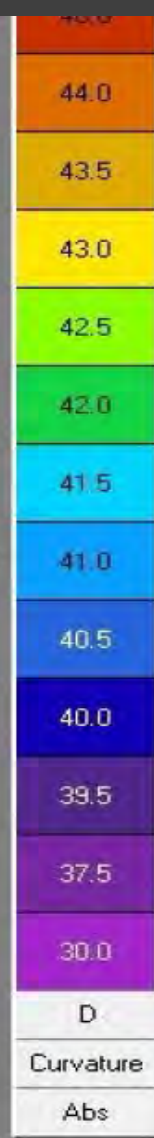
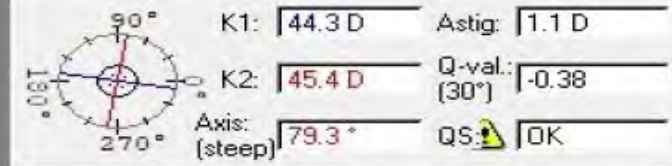
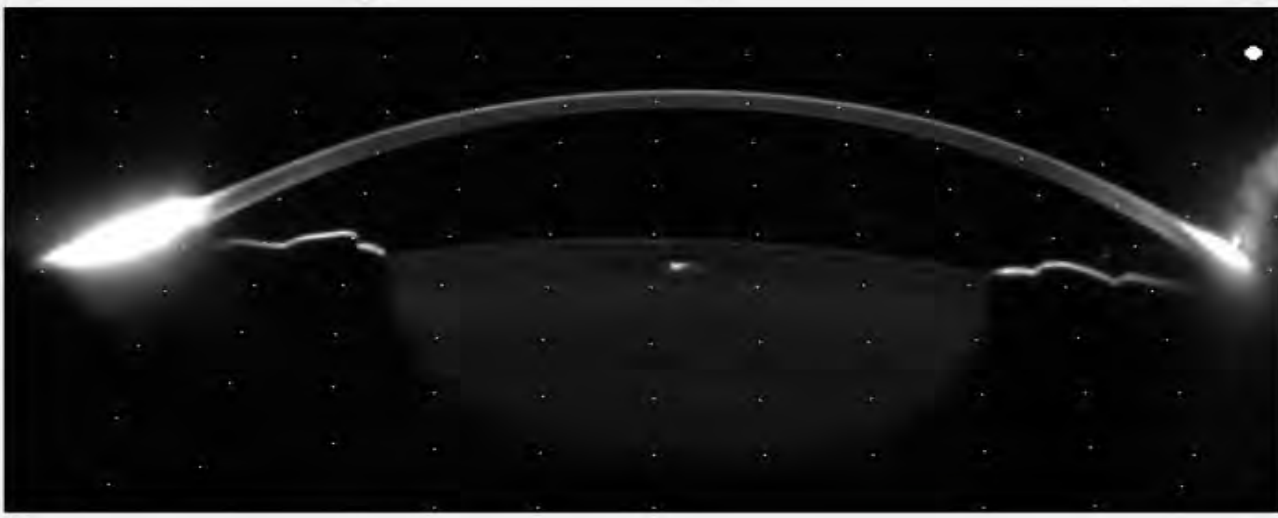
- Optic Disc:
 - Inferior NFL thinning at 6 o'clock, (+) lamellar dots, temporal PPA
- C/D:
 - V: 0.70
 - H: 0.65
- Macula:
 - Normal color and contour for age
- Vessels:
 - Mild A-V nicking
- Periphery:
 - WWOP inferior-nasal and nasal
- Vitreous:
 - WNL

• Inferior NFL thinning

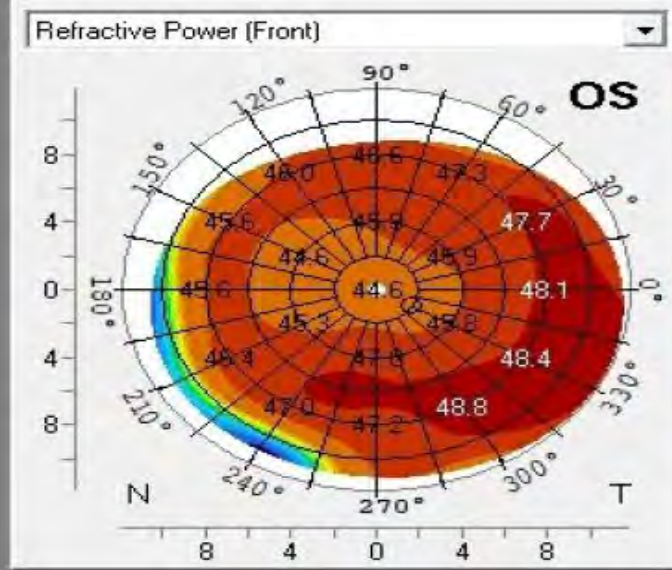
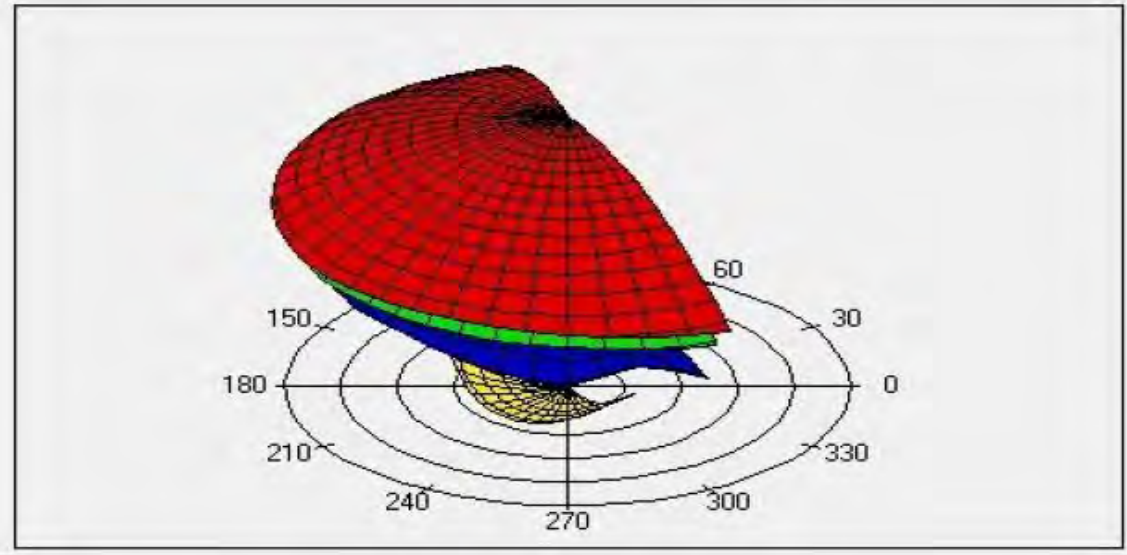
Initial Visit

Diagnostic
Tests

- Pentacam:
- Humphrey Visual Field 24-2
- Optical Coherence Tomography ONH/ RNFL
- Optical Coherence Tomography Ganglion Cell Analysis



Show Fill
 Cornea Front
 Cornea Back
 Iris
 Lens Front
 Lens Back
 Scale
 Cutout Width: 170°
 Cutout Pos: 20°



OD

OS

- CCT: 527um
- ACV:168 mm³
- ACD:2.90 mm

- CCT: 514 um
- ACV:166 mm³
- ACD: 2.93mm

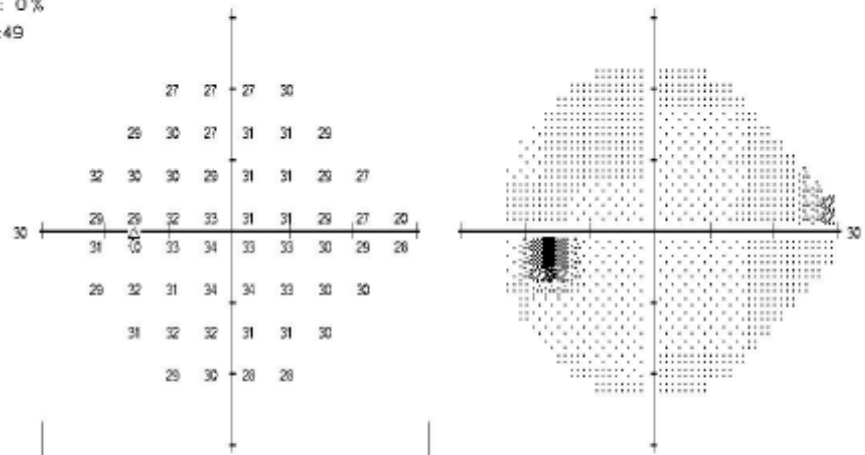
HVF

Central 24-2 Threshold Test
 Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 1/13
 False POS Errors: 10 %
 False NEG Errors: 0 %
 Test Duration: 04:49
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +0.50 DS DC X

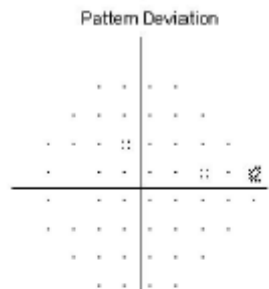
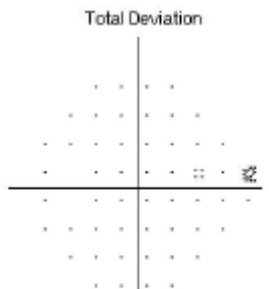
Date: 10-14-2019
 Time: 1:05 PM
 Age: 48



0	-1	-1	2
0	1	-3	1
2	0	-1	-3
-1	0	0	0
1	1	1	0
-1	0	-1	1
1	1	0	-1
-1	0	-2	-2

-1	-2	-1	1
0	0	-1	0
2	-1	-2	-1
-2	-1	-1	-3
0	0	0	0
-2	0	-2	0
0	0	-1	-2
0	0	-1	-1
-2	-1	-2	-3

GHT
 Within Normal Limits
 VFI 99%
 MD -0.47 dB
 PSD 1.48 dB



⋯ < 5%
 ⋯ < 2%
 ⋯ < 1%
 ■ < 0.5%

BOWDEN EYE CARE

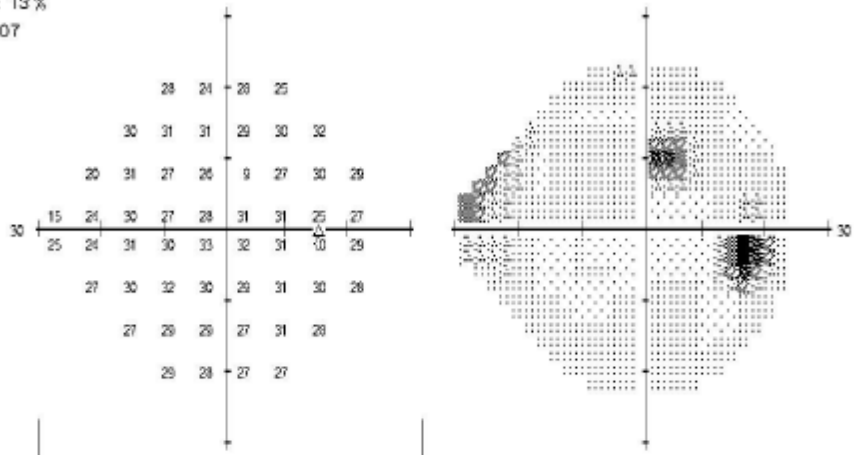


Central 24-2 Threshold Test
 Fixation Monitor: Gaze/Blind Spot
 Fixation Target: Central
 Fixation Losses: 3/16
 False POS Errors: 13 %
 False NEG Errors: 13 %
 Test Duration: 06:07
 Fovea: OFF

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

Pupil Diameter:
 Visual Acuity:
 RX: +0.75 DS DC X

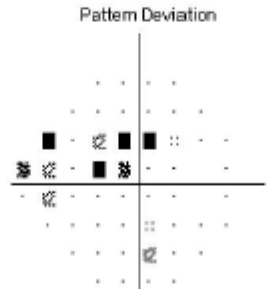
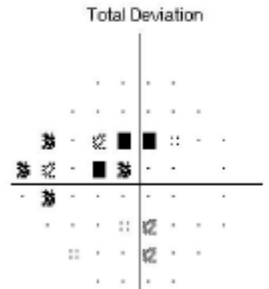
Date: 10-14-2019
 Time: 12:56 PM
 Age: 48



0	-1	1	-2
1	1	1	-1
-9	0	-1	-6
-12	-5	-2	-6
-3	-6	0	-2
-3	-1	-1	-3
-3	-2	-2	-1
0	-2	-3	-3

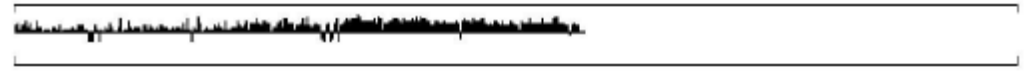
0	-1	1	-2
1	0	0	-1
-9	0	-5	-6
-12	-6	-2	-6
-3	-6	-1	-3
-3	-1	-1	-3
-4	-2	-3	-5
-1	-2	-3	-3

GHT
 Outside Normal Limits
 VFI 94%
 MD -2.63 dB P < 2%
 PSD 3.99 dB P < 0.5%

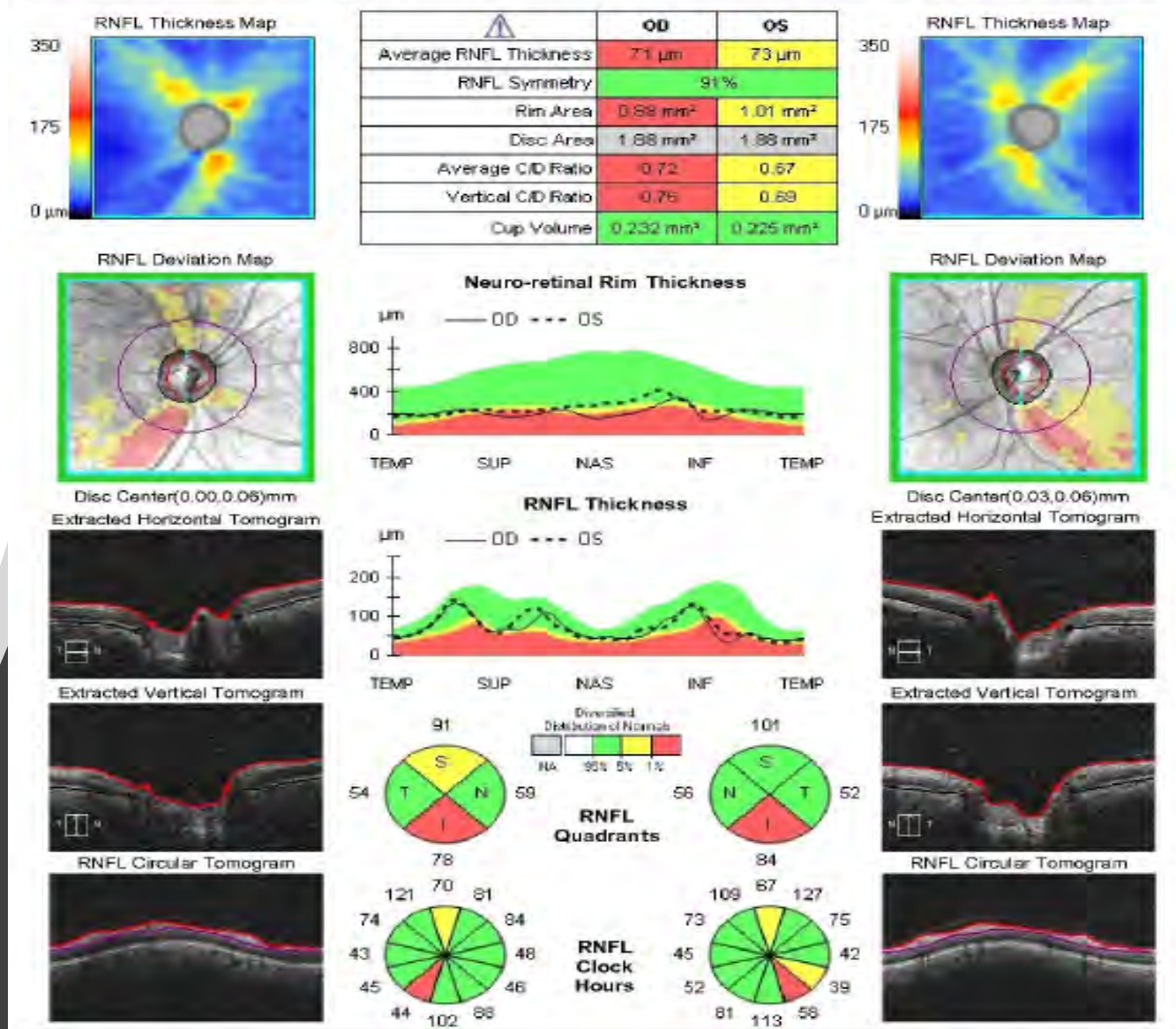


⋯ < 5%
 ⋯ < 2%
 ⋯ < 1%
 ■ < 0.5%

BOWDEN EYE CARE



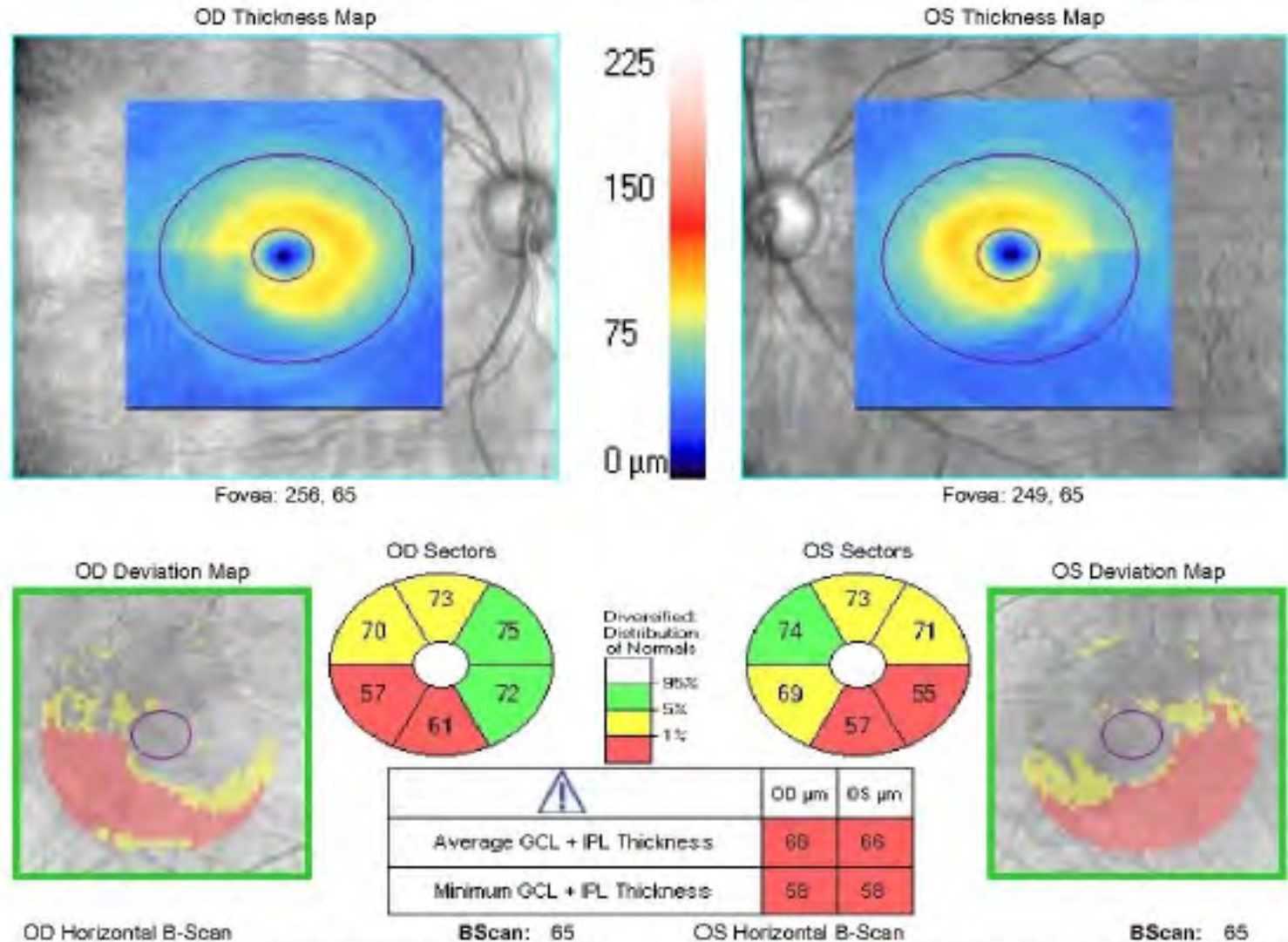
OCT ONH & RNFL



- Avg size nerve, thinning of sup and inf neuroretinal rim and RNFL, Inf notch OD>OS

- Avg size nerve, thinning of sup and inf neuroretinal rim and RNFL, Inf notch OD>OS

OCT GCC



- Inferior step defect, diffuse thinning of superior and inferior macular thickness.

- Inferior step defect, diffuse thinning of superior and inferior macular thickness.

Assessment & Plan

- Normal-tension glaucoma (NTG) suspect. Secondary to enlarged C/D ratios, (+) family Hx and NRR thinning.
- Patient currently undergoing intense bodybuilding regimen. Drance heme likely 2' Valsalva maneuver associated increase on intraocular pressure.
- Patient educated on findings and recommended scaling down weight and intensity.
- RTC 4 weeks for repeat HVF 24-2, IOP check and monitor Drance heme.

Follow Up Visit

11/11/19

- CC: 48 year old Hispanic female return for continuation of glaucoma work up.
- HPI: GLC suspect, OU, since last exam, no pattern, no reported decrease in vision. Denied any ocular symptoms. Denied sleep apnea.

Follow Up Visit

Entrance testing

- DVA sc
 - OD 20/25
 - OS 20/30
- EOMS:
 - SFROM, (-)
pain/dpl OD and OS
- Pupils
 - PERRLA (-) APD
5mm OU
- Confrontation fields
 - OD: normal
 - OS: normal
- IOP
 - OD: 14 mmHg GAT
 - OS: 15 mmHg GAT

Follow Up Visit

Ant. Seg.

OD

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - WNL
- Lens
 - 1+NS, central congenital opacity (not within visual axis)
- Angles
 - 4T&N

OS

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - Flat iris nevus 5 o'clock
- Lens
 - 1+NS, trace cortical change
- Angles
 - 4T&N

No changes OD/OS since last visit

Follow Up Visit

Diagnostic tests

- Humphrey Visual Field 24-2
- Provocative Water Drinking Test
- Fundus Photos

HVF

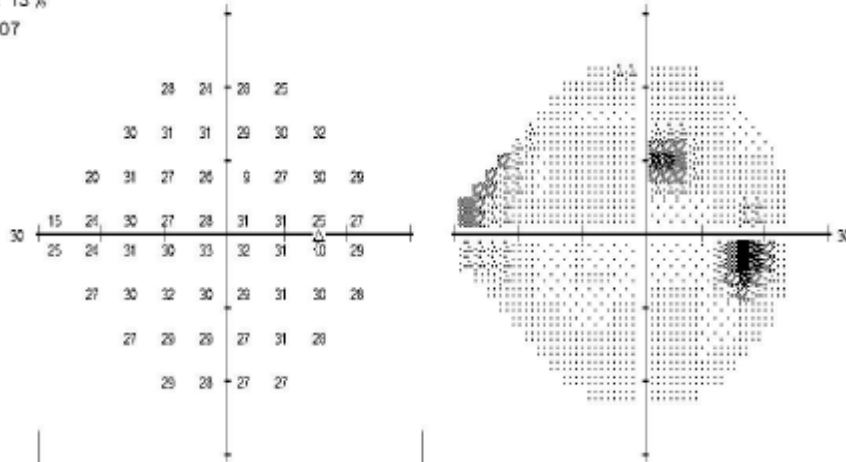
Central 24-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 3/16
False POS Errors: 13 %
False NEG Errors: 13 %
Test Duration: 06:07

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

Pupil Diameter:
Visual Acuity:
RX: +0.75 DS DC X

Date: 10-14-2019
Time: 12:56 PM
Age: 48



Fovea: OFF

Repeat

0	-4	1	-2
1	1	1	-1
-9	0	-4	-6
-12	-5	-2	-6
-3	-6	0	-2
-3	-1	-1	-3
-3	-2	-2	-1
0	-2	-3	-3

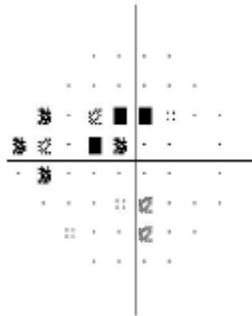
Total Deviation

0	-1	1	-2
1	0	0	-1
-9	0	-5	-6
-12	-6	-2	-5
-3	-6	-1	-3
-3	-1	-1	-3
-4	-2	-3	-5
-1	-2	-3	-3

Pattern Deviation

GHT
Outside Normal Limits

VFI 94%
MD -2.63 dB P < 2%
PSD 3.99 dB P < 0.5%



:: < 5%
☼ < 2%
☹ < 1%
■ < 0.5%

BOWDEN EYE CARE

10-14-19

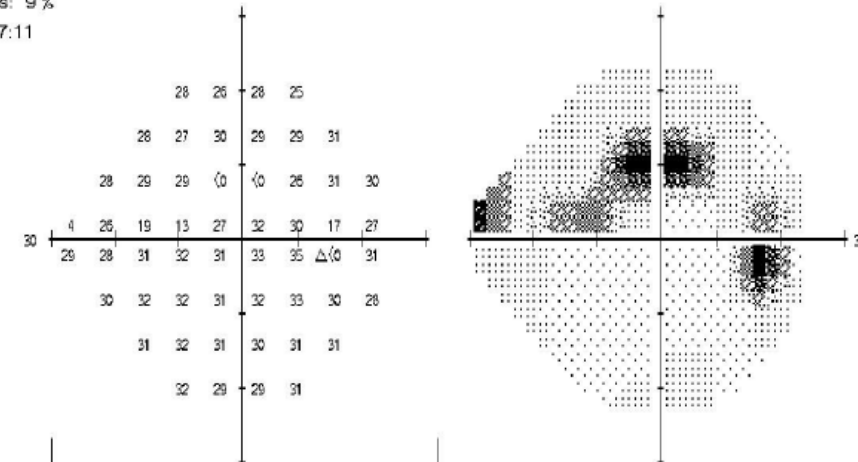
Central 24-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 4/15 xx
False POS Errors: 9 %
False NEG Errors: 9 %
Test Duration: 07:11

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

Pupil Diameter:
Visual Acuity:
RX: +0.75 DS DC X

Date: 11-11-2019
Time: 1:40 PM
Age: 48



Fovea: OFF

0	-1	1	-2
-1	-3	-1	-1
-1	-1	-3	-3
-23	-4	-13	-20
1	-2	-1	-2
0	0	0	-1
1	1	-1	-2
2	-1	-1	1

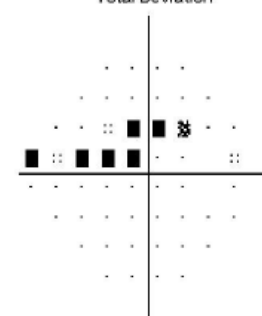
Total Deviation

-1	-2	0	-3
-2	-4	-2	-2
-2	-2	-4	-3
-24	-5	-14	-21
0	-3	-2	-3
-1	-1	-1	-2
0	0	-2	-3
1	-2	-2	0

Pattern Deviation

*** Low Test Reliability ***
GHT
Outside Normal Limits

VFI 90%
MD -3.34 dB P < 2%
PSD 8.61 dB P < 0.5%



:: < 5%
☼ < 2%
☹ < 1%
■ < 0.5%

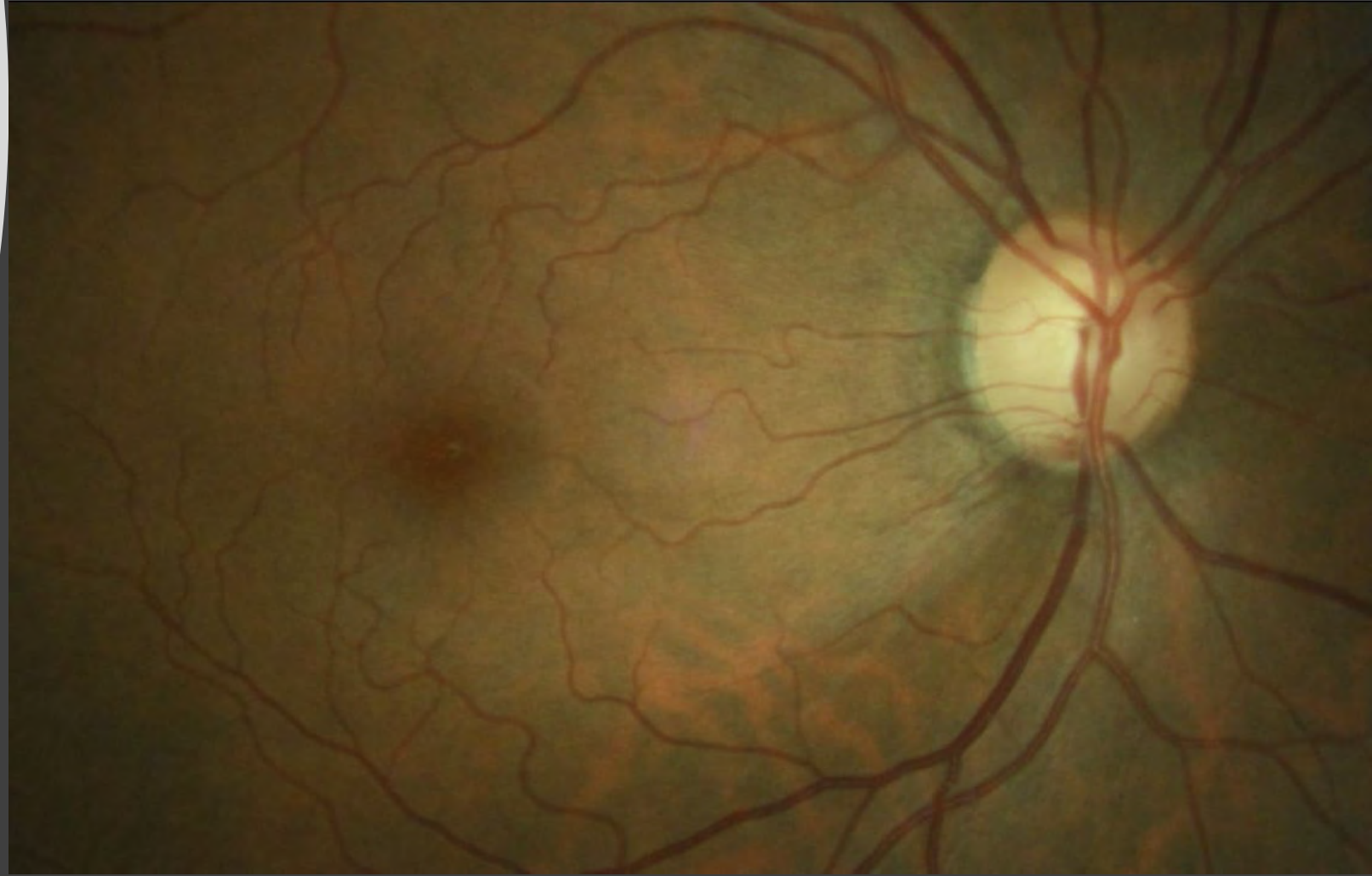
BOWDEN EYE CARE

11-11-19

Provocative Water Drinking Test

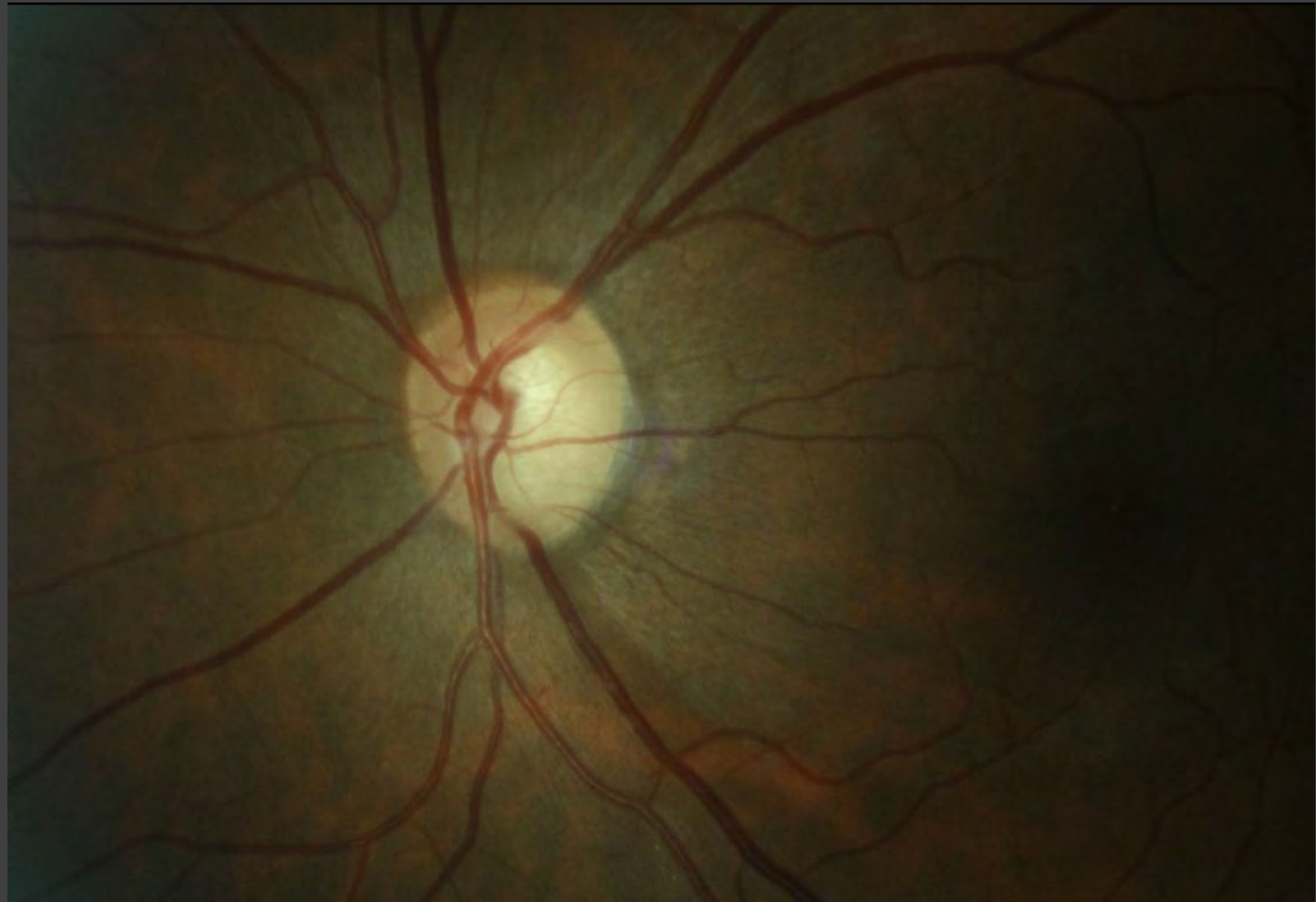
- Baseline IOP
 - OD: 14 mmHg GAT
 - OS: 15 mmHg GAT
- 15 minute IOP check post WDT
 - OD: 20 mmHg GAT
 - OS: 20mmHg GAT
- 30 minute IOP check post WDT
 - OD: 19 mmHg GAT
 - OS: 19 mmHg GAT
- 45 minute IOP check post WDT
 - OD: 17 mmHg GAT
 - OS: 15 mmHg GAT

Fundus Photos



- Inferior NFL thinning
- Resolving Drance heme
- Wedge defect

Fundus Photos



- Inferior NFL thinning
- Wedge defect

Assessment & Plan

- Normal-tension glaucoma (NTG) suspect. Secondary to enlarged C/D ratios, (+) family Hx and NRR thinning.
- Patient currently/still undergoing intense bodybuilding regimen.
- Patient educated on findings and recommended scaling down weight and intensity. Patient reported understanding and concurred
- RTC 1 week for HVF 24-2 (patient educated on importance of obtaining reliable baseline test for BOTH EYES), Pattern ERG, VEP.
- Patient did not return to 1 week follow up.

GYM

Baseline	Cardio	Leg Press	Bench Press	Squat
17/17	15/15	11/12	15/16	21/22
17/15	11/13	13/13	15/15	17/15
16/16	13/12	14/13	20/15	19/22
			16/15	26/26

- IOP was checked (with iCare) at beginning of lift, bottom of lift and during lift.

Follow Up Visit #2

1/6/2020

- CC: 48 year old Hispanic female return for glaucoma work up (HVF OU).
- HPI: GLC suspect, OU, since last exam, no pattern, no reported decrease in vision. Denied any ocular symptoms.

Follow Up Visit

Entrance testing

- DVA sc
 - OD 20/25
 - OS 20/40_{ph 20/20}
- EOMS:
 - SFROM, (-)
pain/dpl OD and OS
- Pupils
 - PERRLA (-) APD
5mm OU
- Confrontation fields
 - OD: normal
 - OS: normal
- IOP
 - OD: 18 mmHg GAT
 - OS: 16 mmHg GAT

Follow Up Visit

Ant. Seg.

OD

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - WNL
- Lens
 - 1+NS, central congenital opacity (not within visual axis)
- Angles
 - 4T&N

OS

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - Flat iris nevus 5 o'clock
- Lens
 - 1+NS, trace cortical change
- Angles
 - 4T&N

No changes OD/OS since last visit

Follow Up Visit

Post. Seg.

Undilated

OD

- Optic Disc:
 - Resolved Drance heme, wedge defect 6 o'clock, temporal choroidal crescent, slight tilt
 - Inferior NFL thinning
- C/D:
 - V: 0.80
 - H: 0.70
- Macula:
 - Normal color and contour for age
- Vessels:
 - Mild A-V nicking
- Periphery:
 - Not examined
- Vitreous:
 - WNL

OS

- Optic Disc:
 - Thinning of inferior rim, (+) lamellar dots, temporal PFA, wedge defect 6 o'clock
 - Inferior NFL thinning
- C/D:
 - V: 0.70
 - H: 0.65
- Macula:
 - Normal color and contour for age
- Vessels:
 - Mild A-V nicking
- Periphery:
 - Not examined
- Vitreous:
 - WNL

HVF

1-6-2020

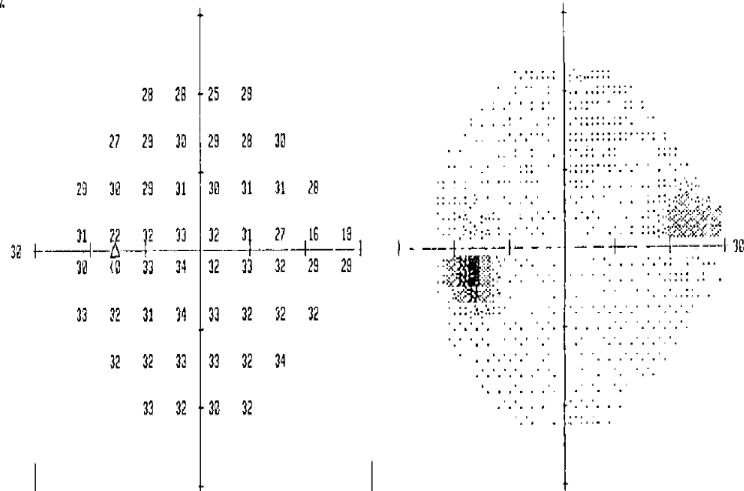
CENTRAL 24-2 THRESHOLD TEST
 FIXATION MONITOR: GAZE/BLIND SPOT
 FIXATION TARGET: CENTRAL
 FIXATION LOSSES: 2/10
 FALSE POS ERRORS: 7 %
 FALSE NEG ERRORS: 1 %
 TEST DURATION: 03:14

STIMULUS: III, WHITE
 BACKGROUND: 31.5 ASB
 STRATEGY: SITA-FAST

PUPIL DIAMETER:
 VISUAL ACUITY:
 RX: +0.50 DS DC X

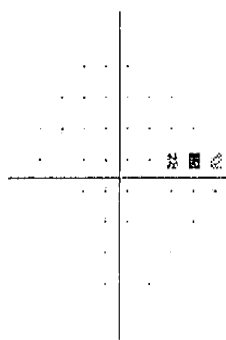
DATE: 01-06-2020
 TIME: 1:54 PM
 AGE: 49

FOVER: OFF



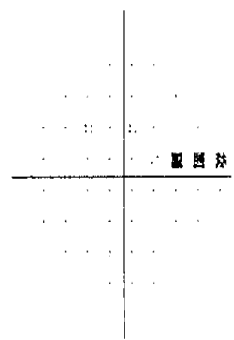
1	1	-3	0				
-2	0	0	-1	-2	0		
-1	-1	-2	0	-2	-1	0	-2
0	0	1	-1	-2	-5	-14	-9
0	1	1	-1	0	0	-1	1
0	0	-1	1	1	0	1	2
1	1	1	1	1	4		
2	2	0	3				

TOTAL DEVIATION



0	0	-4	-1				
-3	-1	-1	-2	-3	-1		
-2	-2	-4	-1	-3	-2	-2	-3
-1	-1	0	-2	-3	-6	-15	-10
-2	0	0	-2	-1	-1	-2	0
1	-1	-2	0	-1	-1	-1	1
0	-1	0	0	-1	3		
1	1	-2	2				

PATTERN DEVIATION



GHT
 OUTSIDE NORMAL LIMITS
 VF1 96%
 MD -0.51 DB
 PSD 2.81 DB P < 2%

BOWDEN EYE CARE

○ < 5%
 ○ < 2%
 ○ < 1%
 ■ < 0.5%

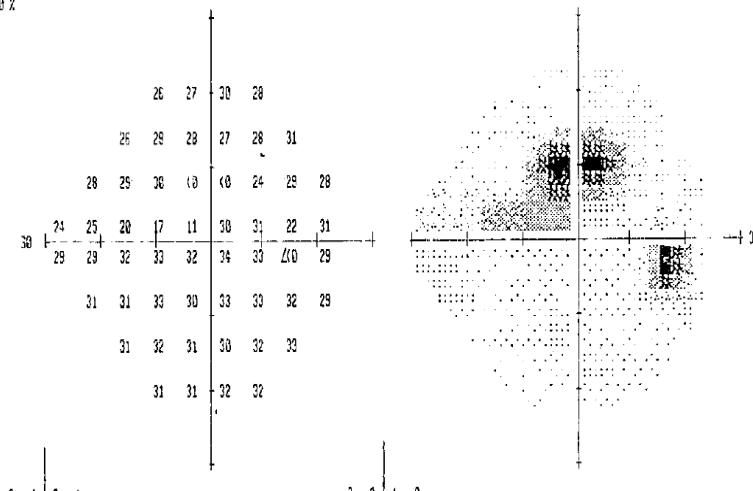
CENTRAL 24-2 THRESHOLD TEST
 FIXATION MONITOR: GAZE/BLIND SPOT
 FIXATION TARGET: CENTRAL
 FIXATION LOSSES: 1/12
 FALSE POS ERRORS: 6 %
 FALSE NEG ERRORS: 0 %
 TEST DURATION: 04:50

STIMULUS: III, WHITE
 BACKGROUND: 31.5 ASB
 STRATEGY: SITA-FAST

PUPIL DIAMETER:
 VISUAL ACUITY:
 RX: +0.75 DS DC X

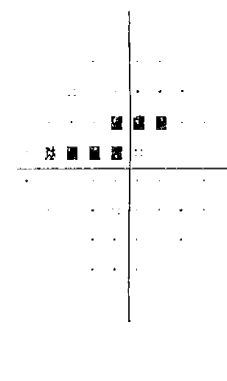
DATE: 01-06-2020
 TIME: 1:47 PM
 AGE: 49

FOVER: OFF



-2	-1	2	1				
-4	-1	-2	-3	-1	2		
-2	-2	-2	-34	-34	-7	-1	-1
-4	-6	-12	-15	-22	-3	-1	0
0	-2	0	0	-1	1	1	-2
1	-1	0	-3	0	1	0	-1
1	0	-1	-1	1	2		
1	1	1	2				

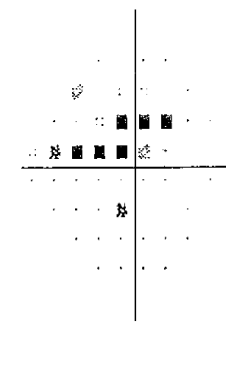
TOTAL DEVIATION



○ < 5%
 ○ < 2%
 ○ < 1%
 ■ < 0.5%

-3	-2	1	0				
-5	-3	-4	-4	-2	0		
-3	-3	-3	-35	-8	-2	-3	
-5	-7	-10	-17	-23	-4	-2	-1
-1	-3	-1	-1	-2	-1	0	-3
-1	-2	-1	-4	-1	-1	-1	-3
-1	-1	-2	-2	0	1		
0	0	0	0				

PATTERN DEVIATION



GHT
 OUTSIDE NORMAL LIMITS
 VFI 87%
 MD -3.60 DB P < 1%
 PSD 8.43 DB P < 0.5%

BOWDEN EYE CARE

Assessment & Plan

- Patient was stressed on the controversy of beginning topical treatment.
 - Normal-tension glaucoma (NTG) vs Valsalva maneuver induced optic neuropathy. Secondary to enlarged C/D ratios, + family hx and NRR thinning.
 - Patient currently still undergoing intense bodybuilding regimen.
 - Patient educated on option of topical vs surgical treatment. Patient reported understanding and wished to begin topical treatment.
 - RTC 4-6 weeks for pressure check.
- understanding and
wished to begin
Latanoprost OU.

Follow Up Visit #3

- CC: 48 year old Hispanic female return for glaucoma work up (HVF OU).
- HPI: GLC suspect, OU, since last exam, no pattern, no reported decrease in vision. Denied any ocular symptoms.

Follow Up Visit

Entrance testing

- DVA cc
 - OD 20/20
 - OS 20/20
- EOMS:
 - SFROM, (-)
pain/dpl OD and OS
- Pupils
 - PERRLA (-) APD
5mm OU
- Confrontation fields
 - OD: normal
 - OS: normal
- IOP (+) use of Latanoprost drops
 - OD: 12 mmHg GAT
 - OS: 11 mmHg GAT
- Color HRR plates
 - OD: WNL
 - OS: WNL

Follow Up Visit

Ant. Seg.

OD

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - WNL
- Lens
 - 1+NS, central congenital opacity (not within visual axis)
- Angles
 - 4T&N

OS

- Lids:
 - Clean and clear
- Tear film:
 - TBUT 4 seconds
- Conj:
 - Pinguecula N&T
- Ant Chamber:
 - Deep and quiet
- Iris
 - Flat iris nevus 5 o'clock
- Lens
 - 1+NS, trace cortical change
- Angles
 - 4T&N

No changes OD/OS since last visit

Follow Up Visit

Post. Seg.

Undilated

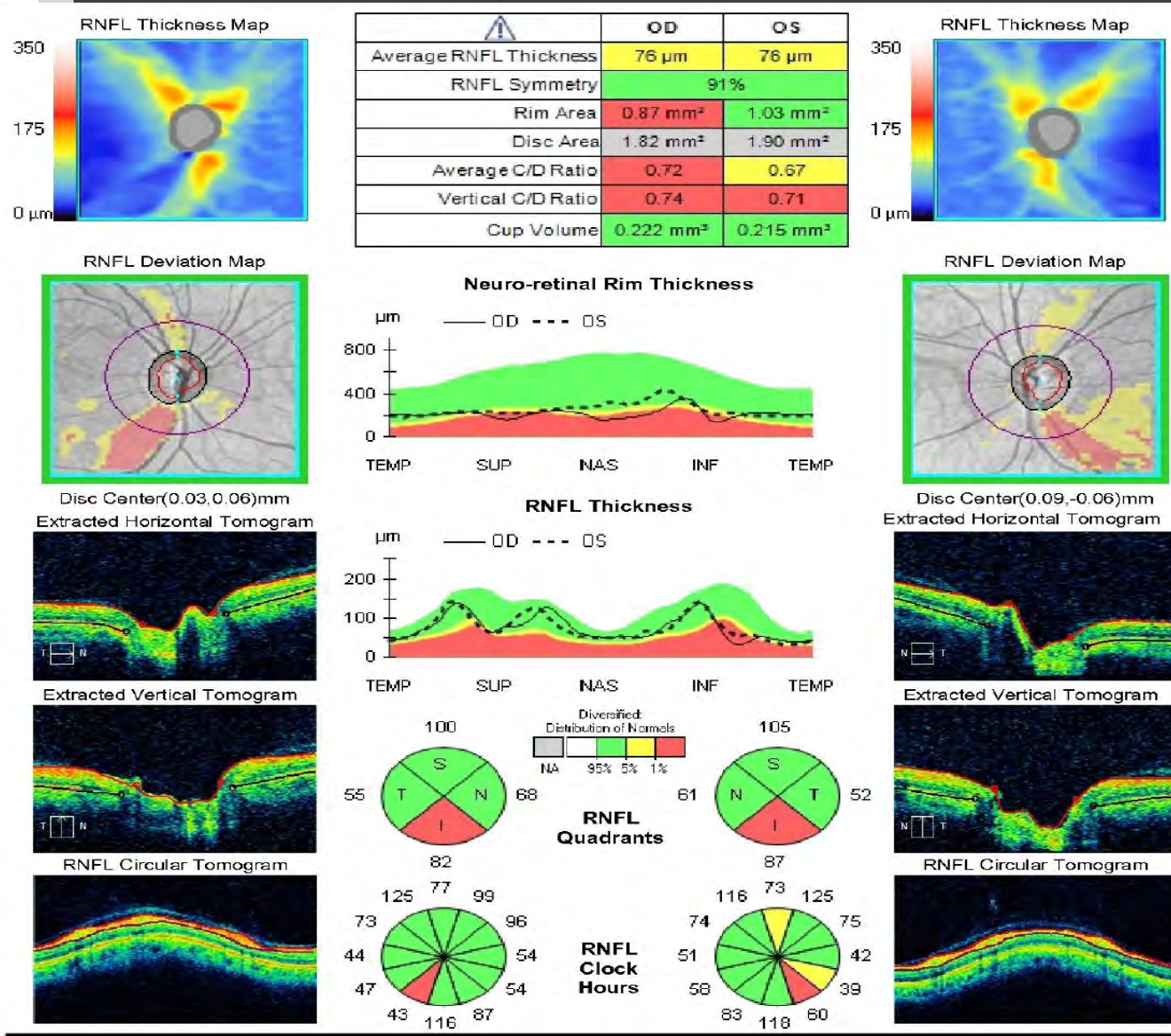
OD

- Optic Disc:
 - Resolved Drance heme, wedge defect 6 o'clock, temporal choroidal crescent, slight tilt
 - Inferior NFL thinning
- C/D:
 - V: 0.80
 - H: 0.70
- Macula:
 - Normal color and contour for age
- Vessels:
 - Mild A-V nicking
- Periphery:
 - Not examined
- Vitreous:
 - WNL

OS

- Optic Disc:
 - Thinning of inferior rim, (+) lamellar dots, temporal PFA, wedge defect 6 o'clock
 - Inferior NFL thinning
- C/D:
 - V: 0.70
 - H: 0.65
- Macula:
 - Normal color and contour for age
- Vessels:
 - Mild A-V nicking
- Periphery:
 - Not examined
- Vitreous:
 - WNL

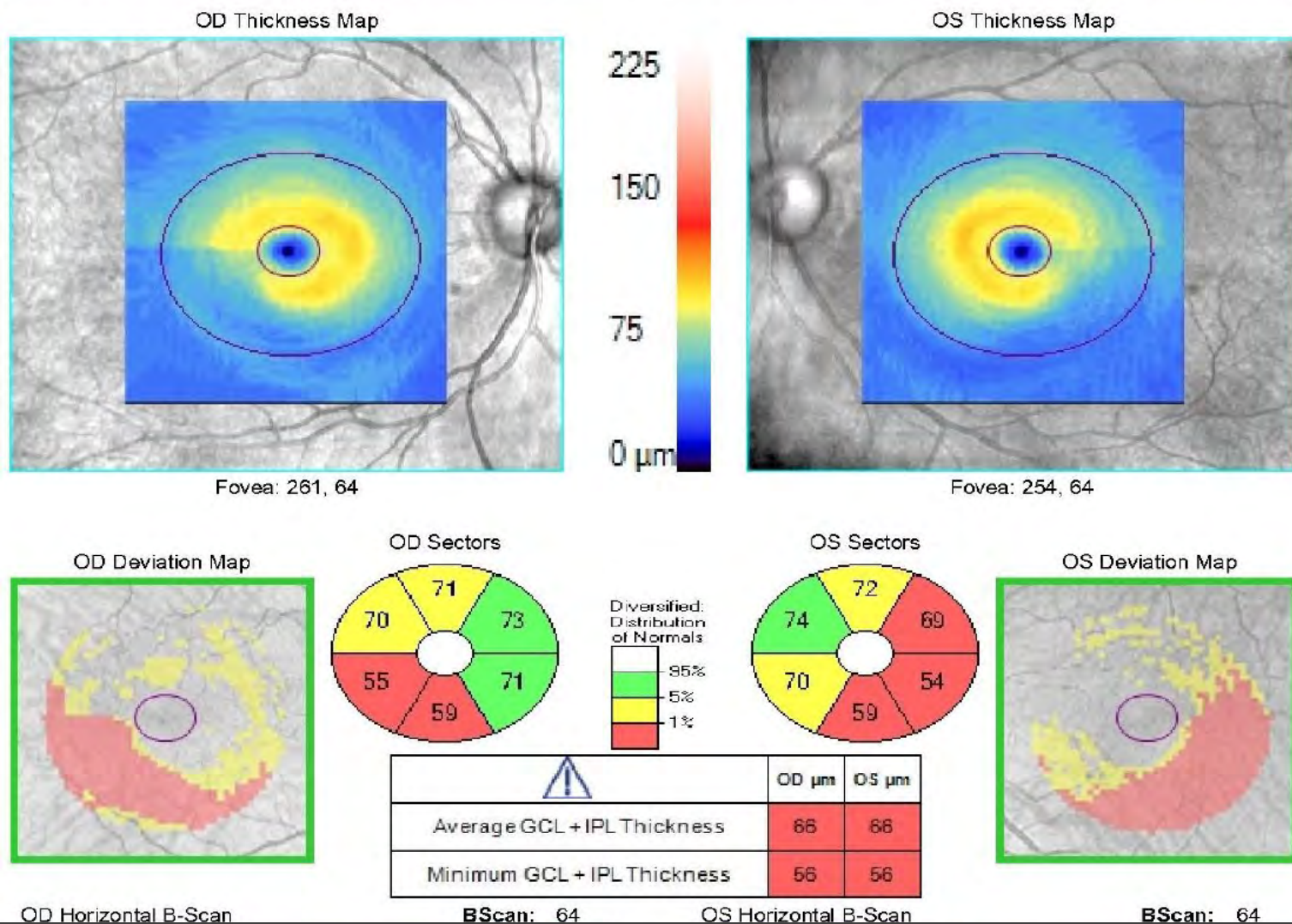
OCT ONH & RNFL



- Avg size nerve, thinning of sup and inf neuroretinal rim and RNFL, Inf notch OD>OS

- Avg size nerve, thinning of sup and inf neuroretinal rim and RNFL, Inf notch OD>OS

OCT GCC



- Inferior step defect, diffuse thinning of superior and inferior macular thickness.

- Inferior step defect, diffuse thinning of superior and inferior macular thickness.

HVF

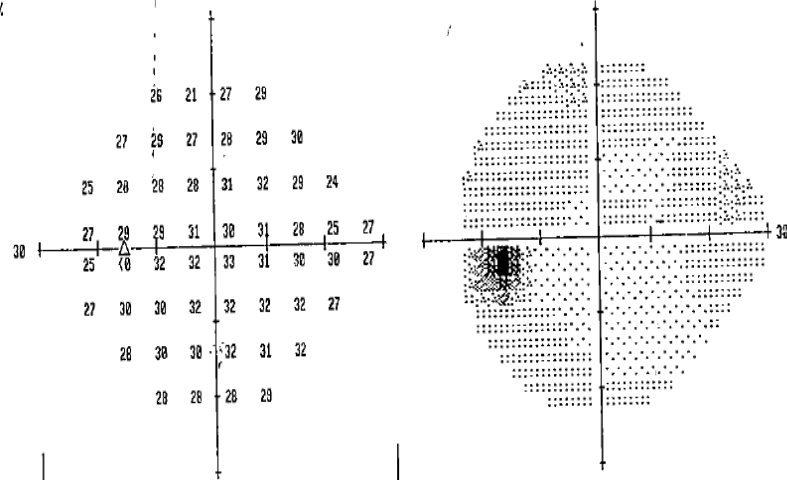
CENTRAL 24-2 THRESHOLD TEST

FIXATION MONITOR: GAZE/BLIND SPOT
 FIXATION TARGET: CENTRAL
 FIXATION LOSSES: 1/14
 FALSE POS ERRORS: 0 %
 FALSE NEG ERRORS: 0 %
 TEST DURATION: 05:13
 FOVEA: OFF

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

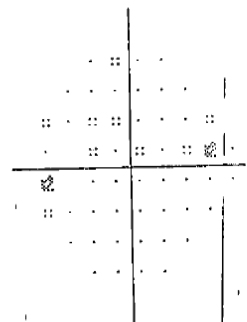
PUPIL DIAMETER: 6.9 MM
 VISUAL ACUITY:
 RX: +1.00 DS DC X

DATE: 02-10-2020
 TIME: 1:19 PM
 AGE: 49



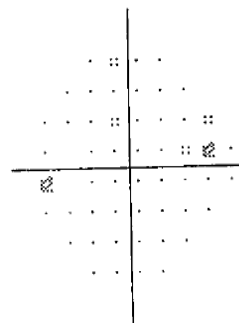
-1	-6	-1	1				
-1	-1	-3	-2	-1	1		
-4	-2	-3	-4	0	1	-2	-5
-3	-3	-2	-3	-2	-3	-5	0
-5	-1	-1	0	-2	-1	0	0
-4	-1	-2	0	-1	0	1	-2
-3	-1	-2	0	0	2		
-2	-2	-2	0				

TOTAL DEVIATION



-1	-7	-1	1				
-2	-1	-3	-2	-1	0		
-4	-2	-4	-4	-1	0	-2	-5
-3	-4	-2	-3	-2	-3	-5	-1
-5	-1	-1	-1	-2	-2	0	-1
-4	-2	-2	-1	-1	-1	0	-3
-3	-1	-2	0	0	1		
-2	-2	-2	-1				

PATTERN DEVIATION



⋯ (5%
 ⊗ (2%
 ⊠ (1%
 ■ (0.5%

CMT
 WITHIN NORMAL LIMITS
 VFI 93%
 MD -1.51 DB
 PSD 1.89 DB

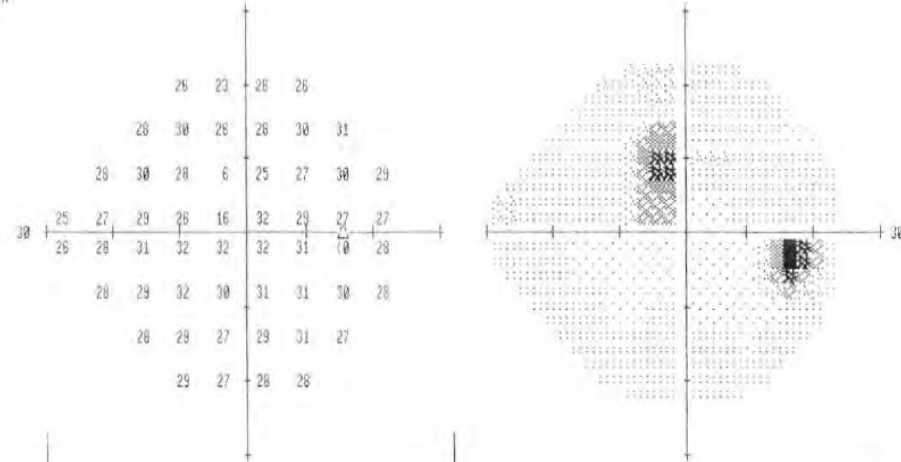
THRESHOLD TEST

FIXATION MONITOR: GAZE/BLIND SPOT
 FIXATION TARGET: CENTRAL
 FIXATION LOSSES: 0/16
 FALSE POS ERRORS: 0 %
 FALSE NEG ERRORS: 0 %
 TEST DURATION: 05:52

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

PUPIL DIAMETER: 6.8 MM
 VISUAL ACUITY:
 RX: +1.25 DS DC X

DATE: 02-10-2020
 TIME: 1:11 PM
 AGE: 49



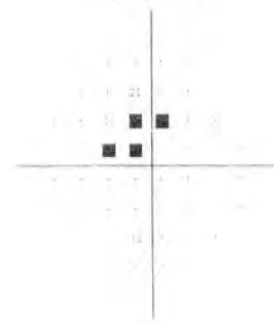
-1	-4	-2	-1			
-1	0	-4	-1	1	2	
-1	-4	-2	-6	-4	0	0
-3	-6	-1	-1	-2	-3	
-1	-1	-1	-1	-1	-3	
-2	0	-3	-2	-1	-1	-3
-2	-2	-4	-2	0	-3	
0	-3	-2	-2			

TOTAL DEVIATION



-1	-4	-2	0				
-1	0	-4	-1	1	3		
-1	-1	-4	-2	-6	-3	0	0
-2	-3	-2	-6	-1	0	-2	-3
-1	-1	-1	-1	-1	-1	-2	
-1	-2	0	-2	-1	0	-1	-2
-2	-2	-4	-2	1	-3		
0	-2	-2	-2				

PATTERN DEVIATION



⋯ (5%
 ⊗ (2%
 ⊠ (1%
 ■ (0.5%

CMT
 OUTSIDE NORMAL LIMITS
 VFI 93%
 MD -2.89 DB P (2%
 PSD 4.98 DB P (0.5%

Assessment & Plan

- Normal-tension glaucoma (NTG) vs Valsalva maneuver induced optic neuropathy. Secondary to enlarged C/D ratios, (+) family Hx and NRR thinning.
- Patient re-educated on importance of compliance with Latanoprost gtt.
- BP checked at end of exam was recorded as 115/76 RAS.
- Recommended to follow up with PCP, recommended an ambulatory blood pressure monitoring cuff to check for nocturnal hypotension.
- RTC 4-6 weeks for pressure check and consult with OMD.

Glaucoma

Epidemiology

- Glaucoma is one of the worlds leading causes of irreversible blindness.
- Affecting ~60-70 million people world wide.
 - Expected to reach >110 million by 2040

NTG

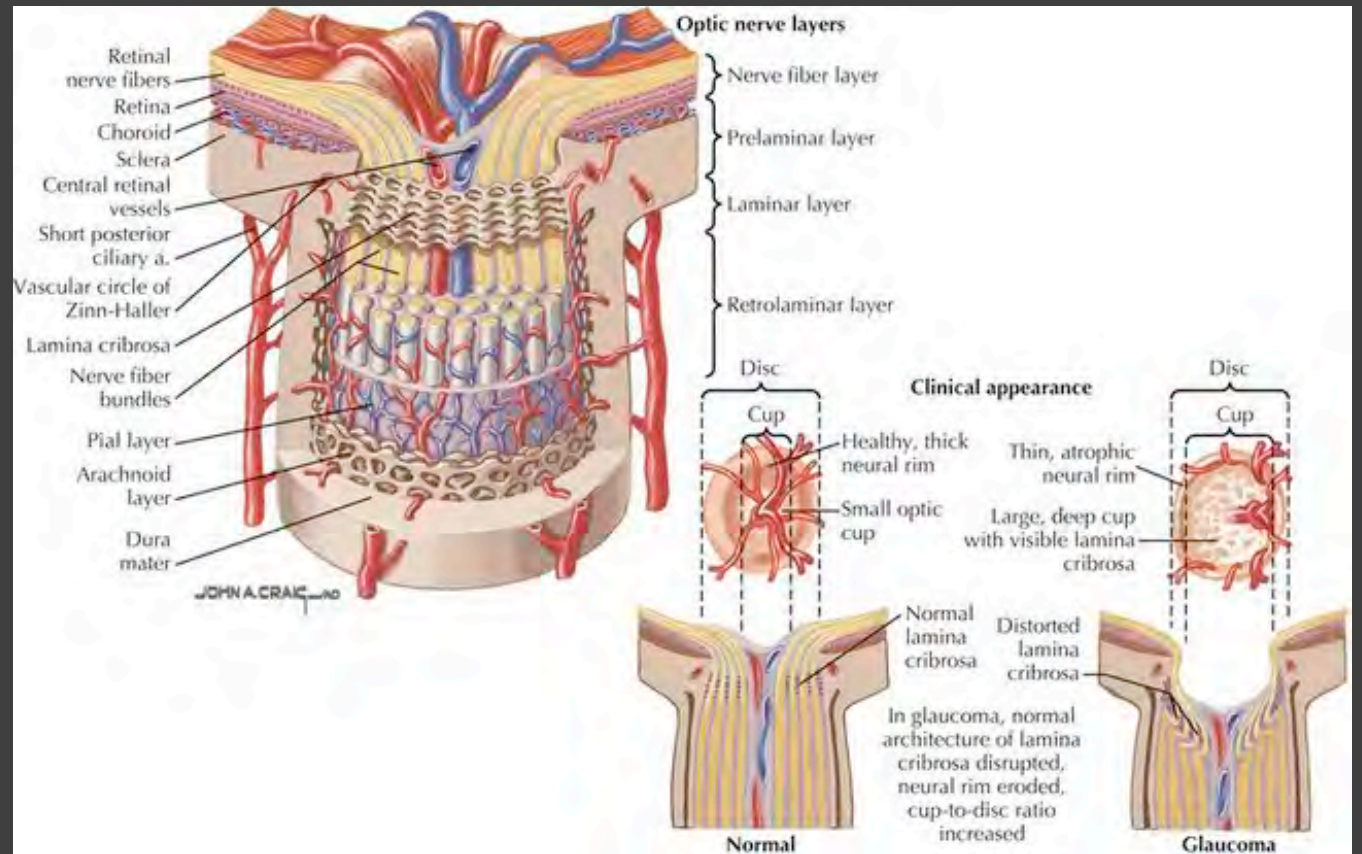


NTG

Pathophysiology-
“y-tho”

•Vascular

•Mechanical



NTG

Risk Factors

- Systemic vascular disease
- Increased diastolic blood pressure
- Vasospastic conditions
- Disc hemorrhages
- Genetics (MYOC, GLC1A, OPTN)*

NTG

Diagnosis

- Progressive cupping of optic disc.
- IOP <22mmHg.
- VF defects that correlate with optic nerve damage.
- Normal open angles with no previous episode of closure or damage.

NTG

Treatment

The Effectiveness of Intraocular Pressure Reduction in the Treatment of Normal-Tension Glaucoma

CNTGS

Purpose:

- **We report an intent-to-treat analysis of the study data to determine the effectiveness of pressure reduction.**
- **Determined that intraocular pressure is part of the pathogenesis of normal-tension glaucoma by analyzing the effect of a 30% intraocular pressure reduction on the subsequent course of the disease.**

The Effectiveness of Intraocular Pressure Reduction in the Treatment of Normal-Tension Glaucoma

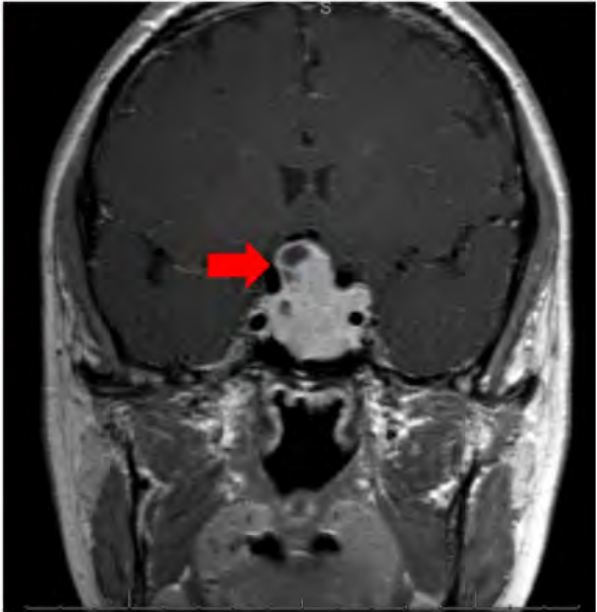
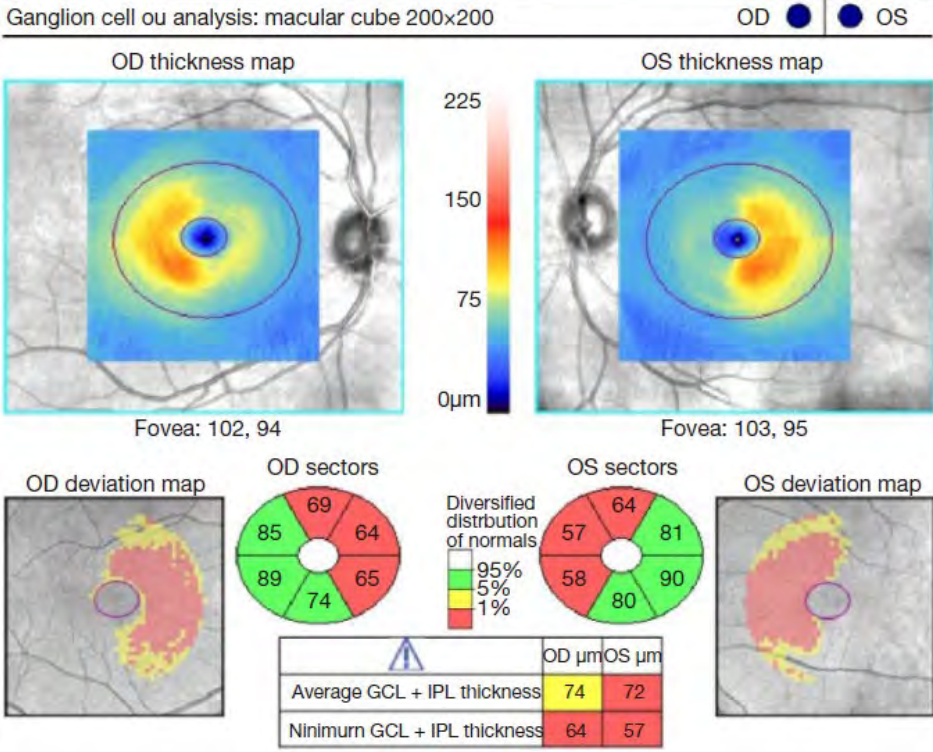
NTG

CNTGS

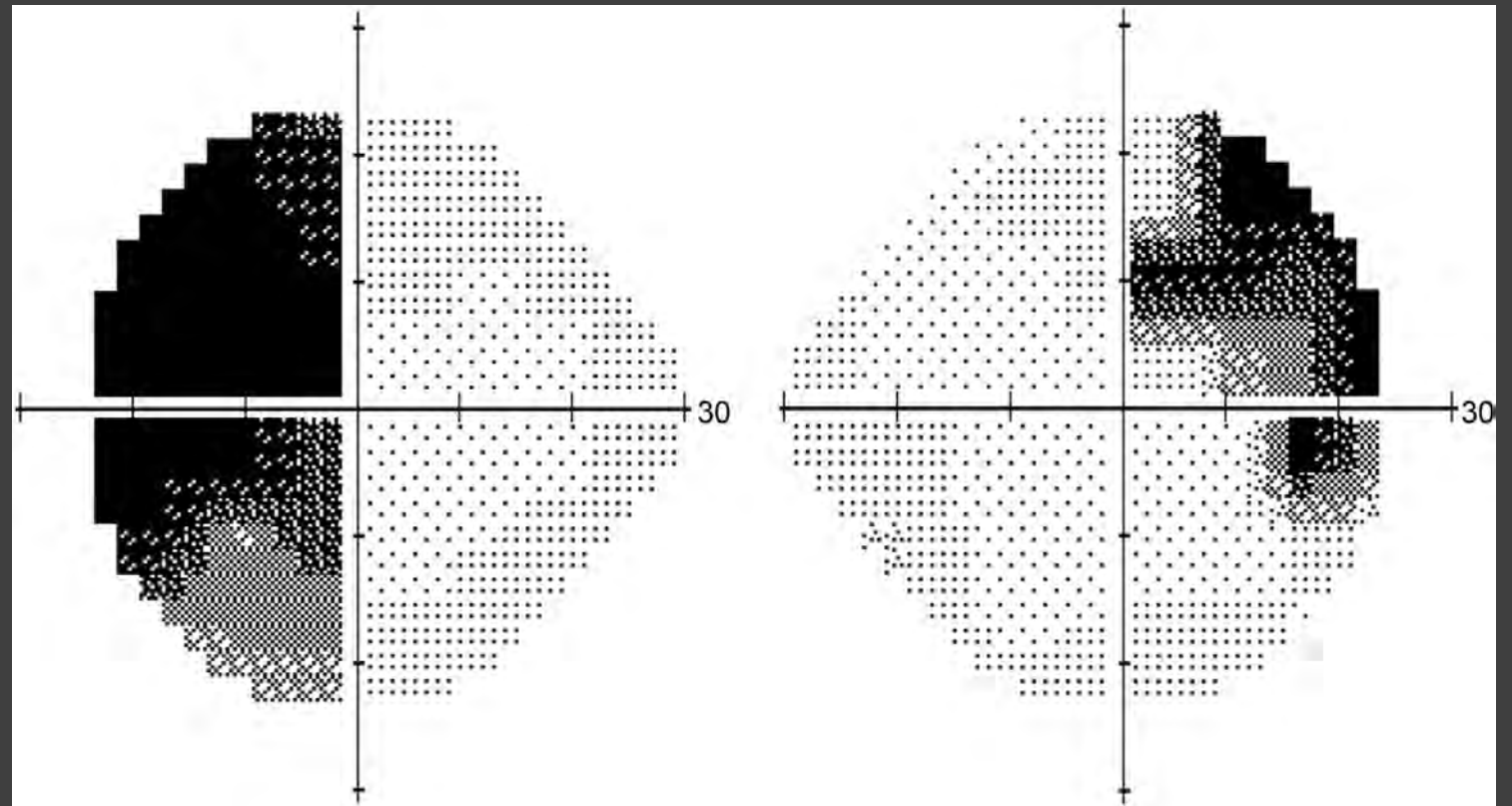
Treatment

- RESULTS:
- Visual field progression occurred at indistinguishable rates in the pressure-lowered (22/66) and the untreated control (31/79) arms of the study (P = .21). In an analysis with data censored when cataract affected visual acuity, visual field progression was significantly more common in the untreated group (21/79) compared with the treated group (8/66).
- An overall survival analysis showed a survival of 80% in the treated arm and of 60% in the control arm at 3 years, and 80% in the treated arm and 40% in the controls at 5 years.

Differential Diagnosis



Differential Diagnosis



- Compressive lesion
- Optic neuritis
- Optic disc pits
- Angle closure
- PION
- NAION

NTG

Take away

- Diagnosis of exclusion

NTG

1 Million dollar
question....

- Will the latanoprost decrease this patients glaucomatous damage if we are able to reach a 30% reduction of IOP?

NTG

2 Million dollar
question....

- Is this patient too healthy?
- Will we find a decrease in nocturnal blood pressure causing a optic nerve perfusion problem?

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So You've Diagnosed Optic Disc Drusen, Now What?

CPT FIONA YUAN, OD

A solid orange horizontal bar at the bottom of the slide.



What is disc drusen?

- Calcified, hyaline deposits located in optic nerve anterior to lamina
- 1-2% of general population
- Varied appearance:
 - Buried vs exposed
- Associated visual field defects
- Differential: papilledema

Natural course

- Observational case series
- 8 patients
- Purpose: to investigate anatomical and visual field changes in patients with optic disc drusen
- Median follow-up time: 56 years

Long-term evolution of superficial optic disc drusen

Lasse Malmqvist, Henrik Lund-Andersen and Steffen Hamann

Department of Ophthalmology, Rigshospitalet, University of Copenhagen, Glostrup, Denmark

Natural course

- Conclusions:
 - Most changes in anatomy and visual field during “transition phase”
 - Occurs primarily in teenage years

- Malmqvist et al 2017

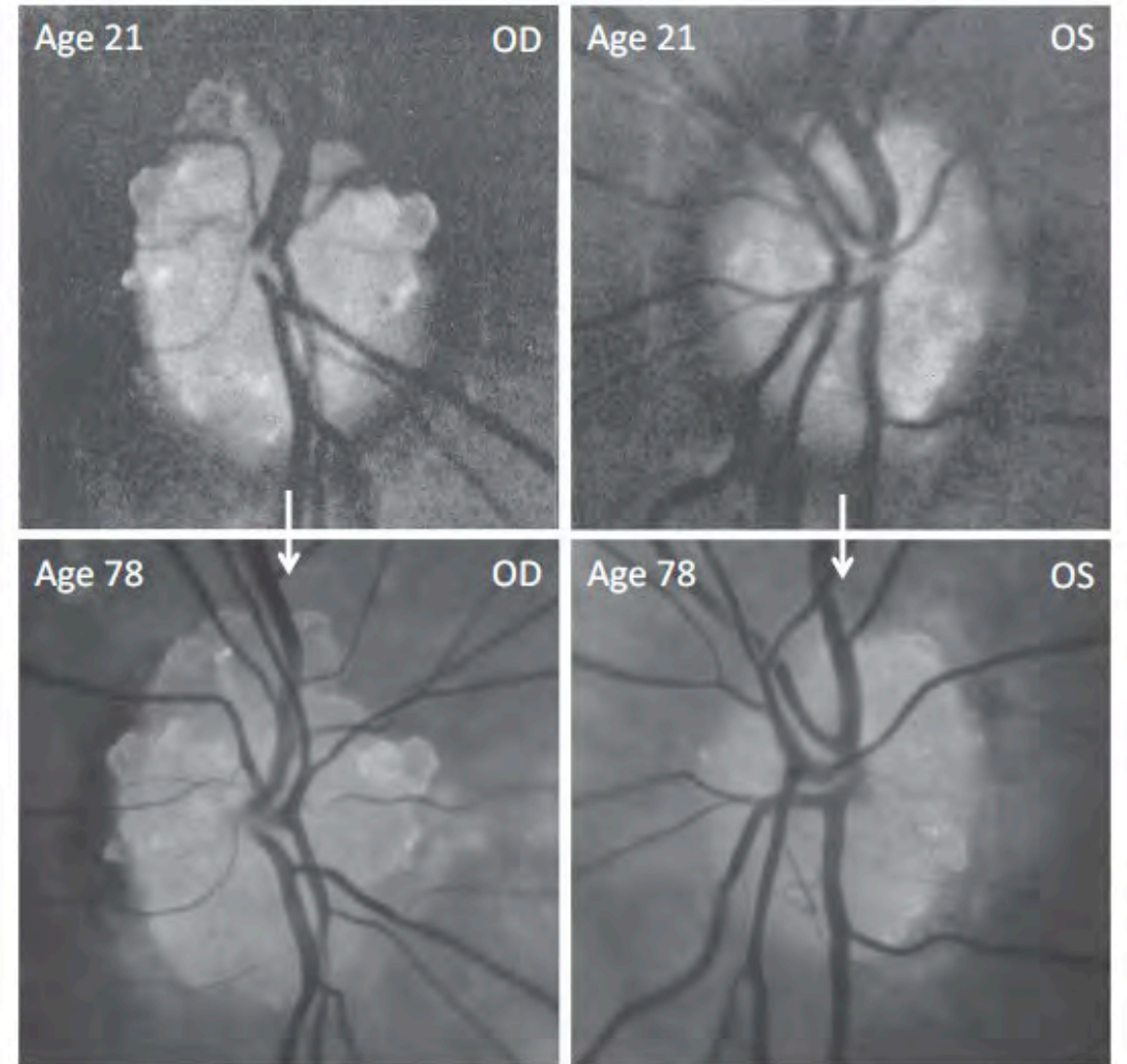


Fig. 1. Comparison of fundusoscopic pictures with 57-year follow-up time. Initial pictures from the patient were obtained in 1958. As seen, the optic nerve head structure had not changed a lot over the 57 years. OD = right eye, OS = left eye.

Pathophysiology

- Unknown mechanism
- Theory:
 - Dysfunctional axoplasmic flow and metabolism?
 - Small scleral canal?
 - Byproduct of papilledema?

Complications

- Anterior ischemic optic neuropathy
- Vascular occlusions
- Choroidal neovascular membranes
- Retinal hemorrhages

Diagnosis

- Optical coherence tomography (OCT)
 - Enhanced Depth Imaging
- Fundus Autofluorescence (FAF)
- B-scan ultrasound
- Fluorescein Angiography (FA)
- Visual field?

Diagnosis

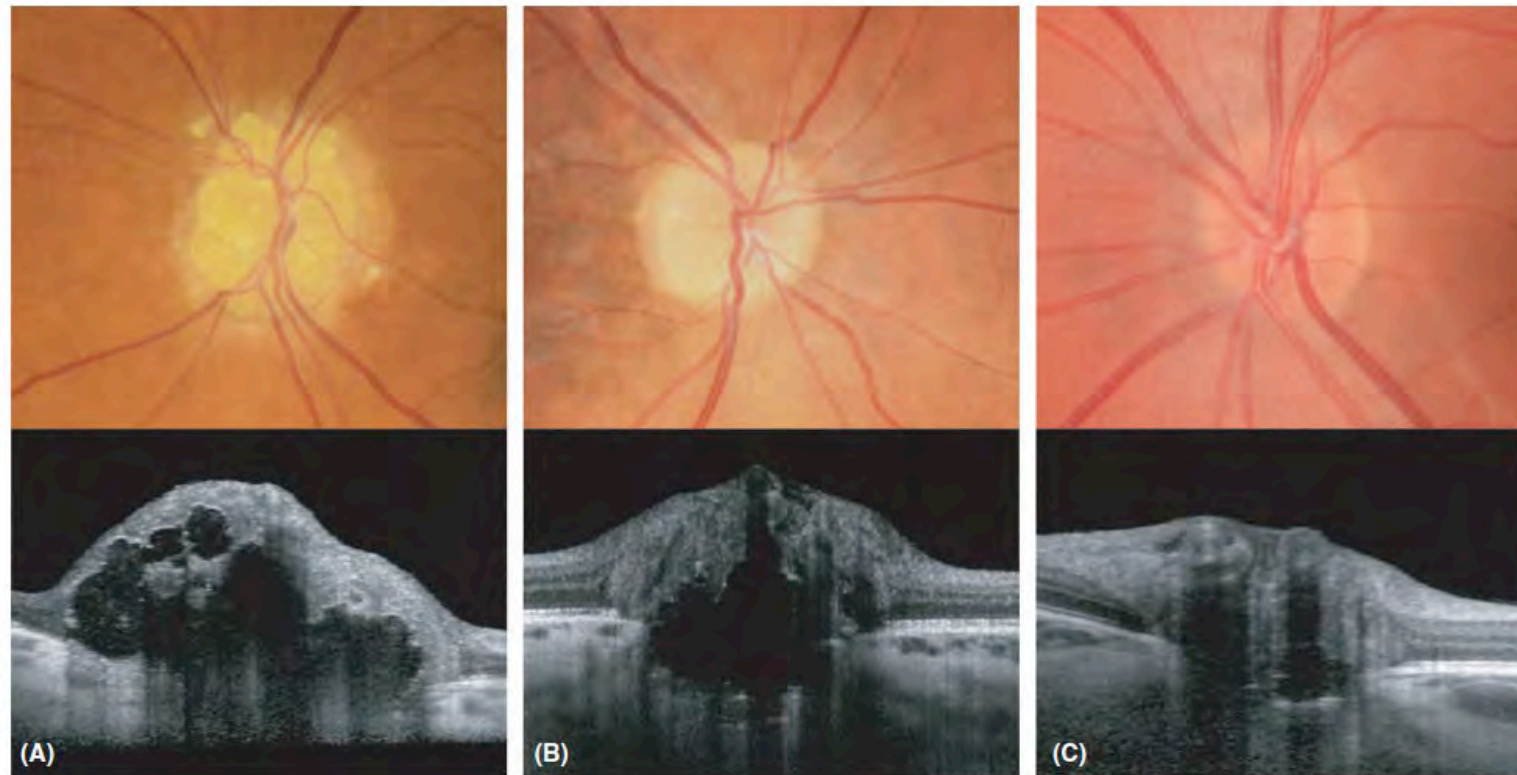


Fig. 2. Fundus photographs and correlating optical coherence tomography (OCT) scans of a 63-year-old woman with multiple and clearly visible optic disc drusen (ODD) (A), a 25-year-old woman with a few visible ODD (B) and a 23-year-old woman with buried ODD (C).

Diagnosis

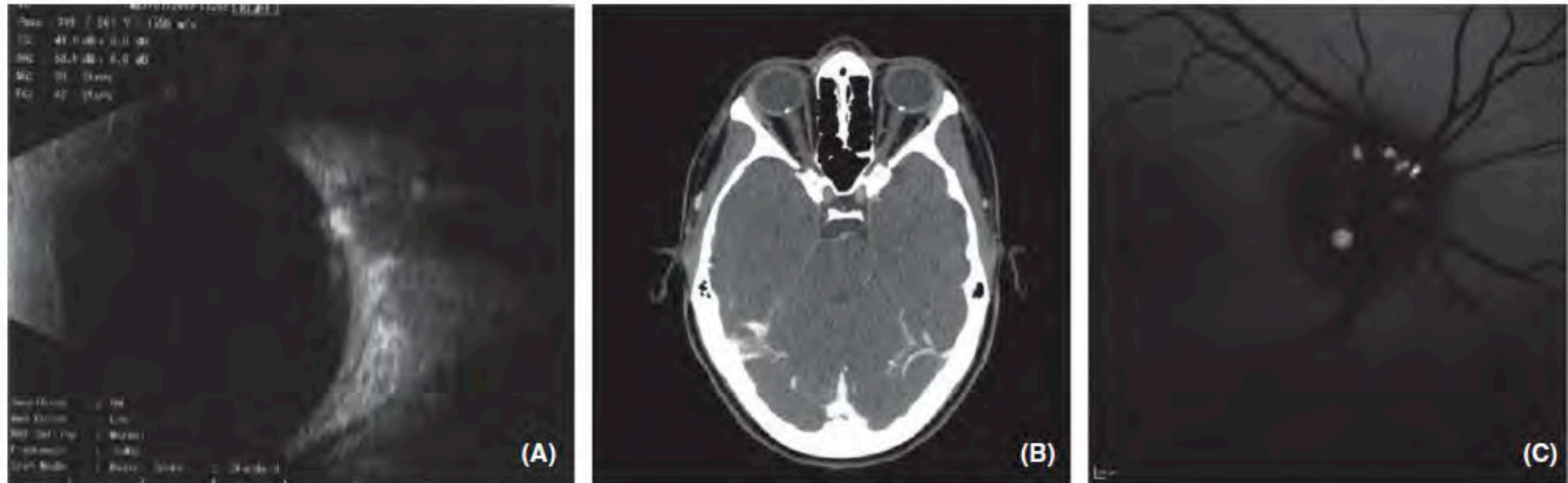


Fig. 5. (A) B-scan ultrasound of the right eye of a 12-year-old boy showing increased reflectivity from the optic nerve head consistent with calcified optic disc drusen (ODD). (B) Computed tomography scan of a 25-year-old woman showing hyperdense signals from the optic nerve head consistent with calcified ODD. (C) Hyperautofluorescence seen in the right eye of a 27-year-old woman with visible ODD seen by ophthalmoscopy.

Pseudopapilledema vs papilledema

- Difficult diagnosis in pediatrics
- Papilledema:
 - Optic nerve swelling secondary to elevated intracranial pressure (ICP)
- Symptoms:
 - Headaches
 - Nausea
 - Pulsatile tinnitus
 - Binocular diplopia
 - Transient visual obscurations
 - Visual field defects

Pseudopapilledema vs papilledema

-OCT

- Inward deflection of RPE

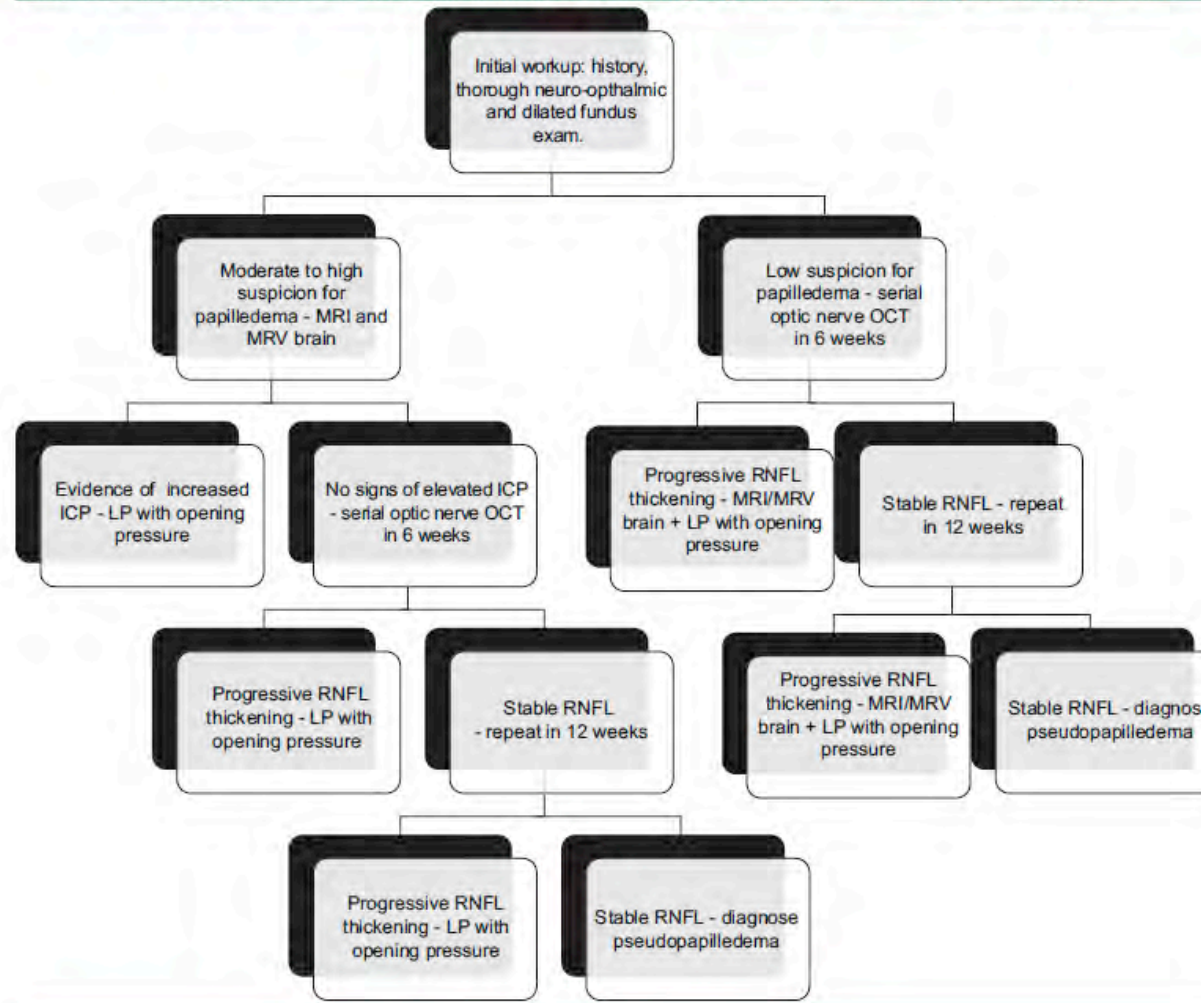
-MRI

- Posterior scleral flattening

-Exam findings

- Loss of spontaneous venous pulsation (SVP)
- Choroidal folds
- Disc hyperemia
- Retinal hemorrhages
- Cotton wool spots

Table 1: General algorithm used at our institution for evaluating a pediatric patient with possible papilledema



Which came first, papilloedema or drusen?

Increased Prevalence of Optic Disc Drusen after Papilloedema from Idiopathic Intracranial Hypertension: On the Possible Formation of Optic Disc Drusen

Faith A. Birnbaum^a, Gabriella M. Johnson^b, Lenworth N. Johnson^a, Bokkwan Jun^b, and Jason T. Machan^c

^aNeuro-Ophthalmology Unit, Department of Ophthalmology, Alpert Medical School of Brown University/Lifespan/Rhode Island Hospital, Providence, Rhode Island, USA; ^bNeuro-Ophthalmology Unit, Mason Eye Institute, University of Missouri, Columbia, Missouri, USA; ^cLifespan Biostatistics Core, Departments of Orthopaedics and Surgery, Alpert Medical School of Brown University/Lifespan/Rhode Island Hospital, Providence, Rhode Island, USA

ABSTRACT

This is a 25-year observational retrospective review of 372 consecutive participants with optic disc drusen or resolved papilloedema from idiopathic intracranial hypertension. The prevalence of optic disc drusen at 19% among eyes with resolved papilloedema was approximately 10 times higher and significantly increased ($p < 0.001$) as compared with the occurrence in the general population. Eyes with both resolved papilloedema and optic disc drusen had similar visual acuity and visual field outcome as compared with resolved papilloedema alone. Eyes with exposed drusen had significantly worse visual acuity and visual field outcome ($p < 0.001$) than buried drusen. The high prevalence of optic disc drusen after papilloedema has resolved suggests a non-coincidental relationship. Optic disc drusen formation can be a sequela of papilloedema.

ARTICLE HISTORY

Received 7 April 2016
Revised 26 May 2016
Accepted 27 May 2016

KEYWORDS

Idiopathic intracranial hypertension; optic disc drusen; papilloedema; pseudopapilloedema; pseudotumor cerebri

Which came first, papilledema or drusen?

- Increased incidence of disc drusen in patients with resolved papilledema
 - 19% of patients vs 2% of general population
- Mechanism?
 - Decrease axonal transport -> altered calcium metabolism
 - Drusen reduce available space in optic nerve -> increased risk for elevated ICP
 - Misdiagnosis of pseudodrusen for optic disc drusen

Disease progression

- Fundus examination
- Fundus photography
- OCT
 - Negative correlation between drusen volume and RNFL thickness
 - RNFL loss develops before VF loss
- Visual field
 - Slowly progressive
 - Defects more severe with exposed vs buried

- Hamann et al 2018

- Skaat et al 2017

The Effect of a Decrease in Intraocular Pressure on Optic Nerve Function in Patients with Optic Nerve Drusen

Dorota Pojda-Wilczek^{a, b} Patrycja Wycisło-Gawron^b

^aDepartment of Ophthalmology, School of Medicine in Katowice, Medical University of Silesia, and

^bOphthalmology Division, Kornel Gibiński University Clinic Centre of Medical University of Silesia in Katowice, Katowice, Poland

Treatment and management

- No established effective treatment
- Possible treatment:
 - IOP lowering medications
 - Brinzolamide: neuroprotective?
- Authors' conclusion: decreasing IOP resulted in improved RGC function and delay in optic neuropathy

Concluding points

- Optic disc drusen remain fairly stable throughout life with most changes occurring during puberty/teenage years
- Various diagnostic methods
 - Pseudopapilledema vs papilledema
- High incidence of disc drusen in patients with resolved papilledema
- Fundus photography, OCT, and visual fields can be used to follow progression
- No treatment at the moment
 - In patients with elevated IOPs, Brinzolamide may be used to improve retinal function and delay disease

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MGD, CVD, or HIV

PRIMARY CARE OPTOMETRY RESIDENCY

FT. SAM HOUSTON, SAN ANTONIO, TX

CPT CHRISTMAN OD FAAO



Disclosures

No Financial disclosures

The view(s) expressed herein are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army, the Department of the Air Force, the Department of the Navy, or the Department of Defense or the U.S. Government.

Acute Exam - Thursday morning (Not Friday)

A 29 female, newly diagnosed with Human Immune Deficiency Virus (HIV) presents with symptoms of eye pain 7/10 especially when working on the computer (8 hours or more a day)

Ocular history: Simple Myopia, not a contact lens wear.

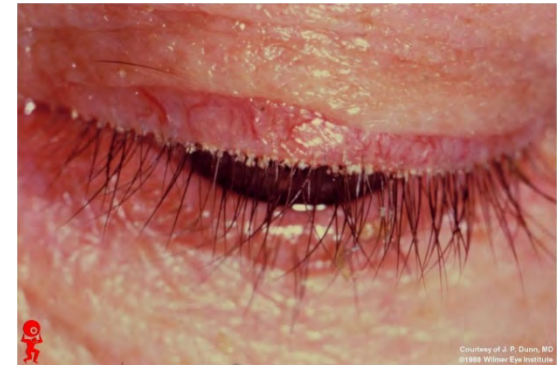
Medical history: Recently diagnosed (8 months) with HIV with a viral count of 7000 (3^d trimester pregnant) and T-Cell count (CD4) of 93. Started on Retroviral therapy (HAART), Truvada and Septra

Family history: Family history of: Diabetes (MGM and MGF), Hypertension (Father and MGM), Glaucoma (Mother and MGM)

Medications: Symtuza, ranitidine, sertraline, eszopiclone, clobetasol (topical), loperamide, valacyclovir, atovaquone, dolutegravir, emtricitabine/tenofovir

Examination

- Entrance testing: Visual fields normal, Extraocular movements normal, Pupils equal round and reactive, notable red rim upper and lower lid both eyes (OU)
- Change in Manifest glasses prescription in 8 months
 - Previous: Right eye (OD) -1.50-0.50x165 Left eye (OS) -1.75-0.25x150
 - Current: OD -2.50-0.25x015 OS -2.75-0.25x154
 - Improved 20/60 OU to 20/20 OU
- Lids 3+ inflamed and capped, no oil leaving glands on expression, 4-5 telangiectatic vessels along lower lid OD/OS, rubbery/swollen appearance.
- Cornea shows inferior 2+ punctate epithelial staining OU
- C/D OD: 0.3R, OS 0.35R
- Dilated Fundus Exam shows retina normal, no retinal viral disease noted



Summary

Signs

- i. Meibomian gland expression very low and poor quality
- ii. Telangiectasia along lid margins
- iii. Eyelid rim redness
- iv. Instant Tear Breakup
- v. Diffuse corneal staining

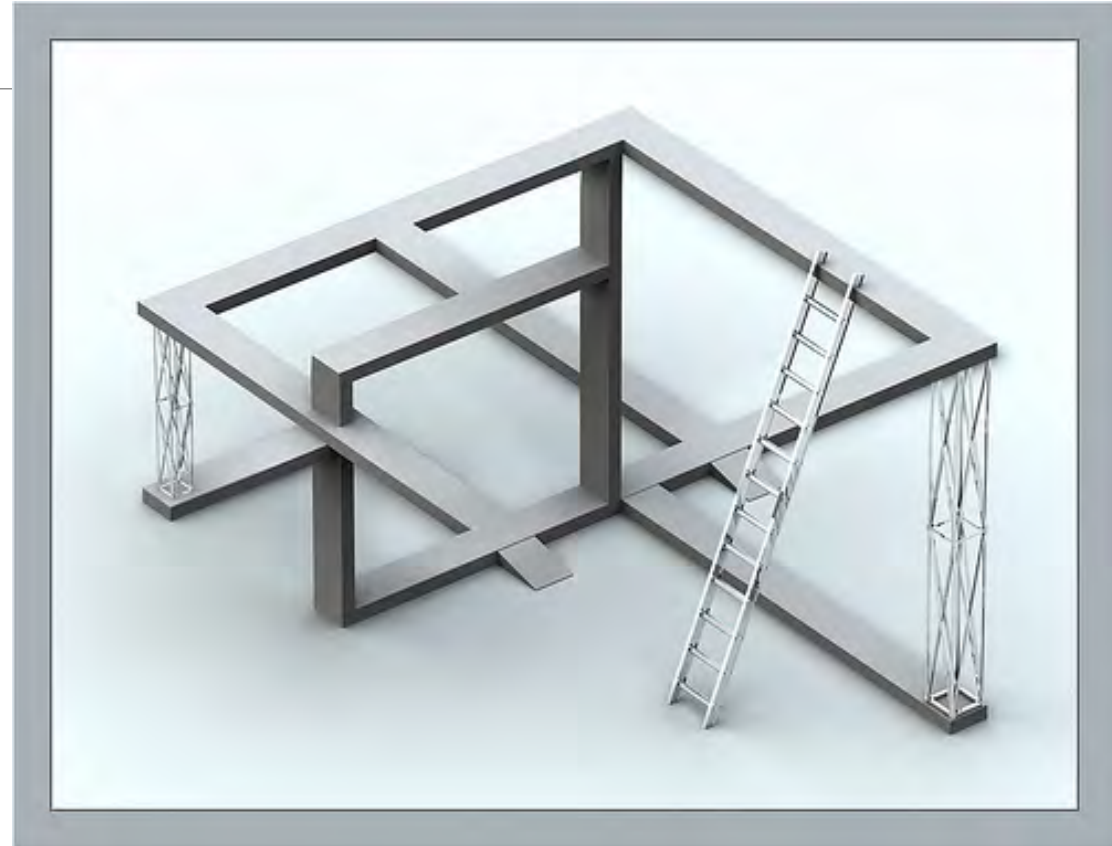
Symptoms

- i. Reduced fixation time
- ii. Watery eyes
- iii. Eye pain and irritation with near tasks
- iv. Eyestrain and headache

What is causing the patient's symptoms?

Treatment

- 1st visit:
 - Updated glasses Rx
 - Educated on visual hygiene
 - Bruder Mask warm compresses 2x daily
 - Oil based artificial tears
- 2nd visit :
 - Celluvisc
 - Fluorometholone
 - Doxycycline 100mg 2x daily (Ophthalmology ordered)
 - Doxycycline 20mg 2x daily after complications
- 3rd visit
 - 1000 mg Omega 3 supplementation (Patient felt better)
 - Lid debridement (Patient felt worse)
- 4th visit
 - Referred for Lipiflow treatment



Computer Vision Syndrome (CVS)

Trouble with near work, usually screens

- Occupational productivity: 64 -90% have eyestrain, headaches, dry eye, diplopia and blurred vision either at near or distance after prolonged computer use
- Appropriate refractive correction alone could produce at least a 2.5% increase in productivity
 - presence of relatively small amounts of uncorrected astigmatism (<1.0 D) may produce a significant increase in symptoms of CVS

Combination of several eye problems

- Dry eye
 - higher gaze angle
- Infrequent blink
 - Mean blink rates were 22 per min while relaxed, but only 10 and 7 per min When reading a book or electronic display
 - Incomplete blink coverage
- Binocular vision issues
 - a subgroup of patients may exist whose symptoms of CVS can be alleviated by creating exo AP.
- Accommodative issues
 - accommodative infacility was the most common oculomotor anomaly found

Computer Vision Syndrome (CVS)

Low to moderate oculomotor anomalies may cause significant symptoms if combined with prolonged computer use.

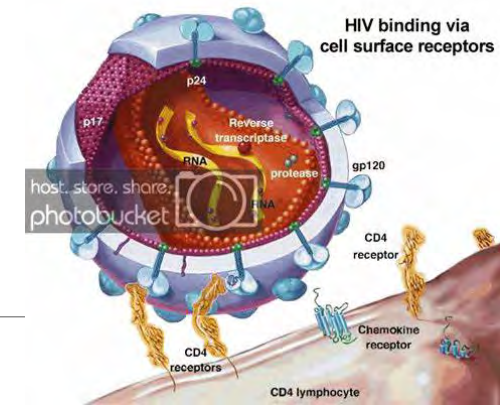
Bottom Line Up Front: Fix small problems

4-20 Rule

- Every 20 minutes
- Look 20 feet away
- For 20 seconds
- And blink 20 times



CD4 Cells – T Helper cells



To enter a host cell, HIV binds to a **CD4 receptor**

HIV mainly targets lymphoid CD4⁺ T cells, but can infect other cells that express CD4 such as macrophages

More than 95% of the CD4⁺ T cells that die are resting

- Cell death is triggered when the host cell detects HIV and initiates a suicidal death pathway, thus causing pyroptosis (a highly inflammatory form of programmed cell death).

A normal CD4⁺ count is from 500 to 1,400 cells per cubic millimeter of blood

CD4⁺ T lymphocytes stimulate macrophages, B lymphocytes (B cells), and CD8 T lymphocytes (CD8 cells),

Two components particularly affected in AIDS:

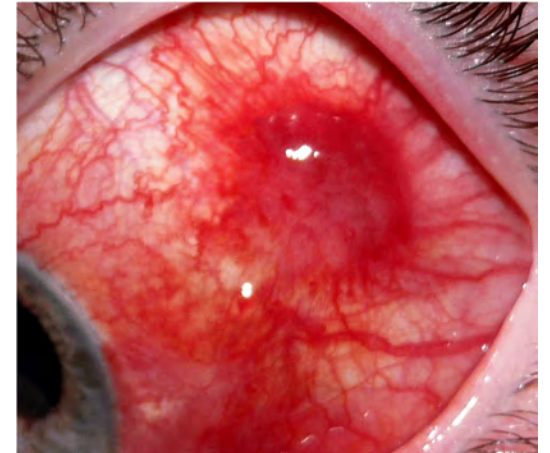
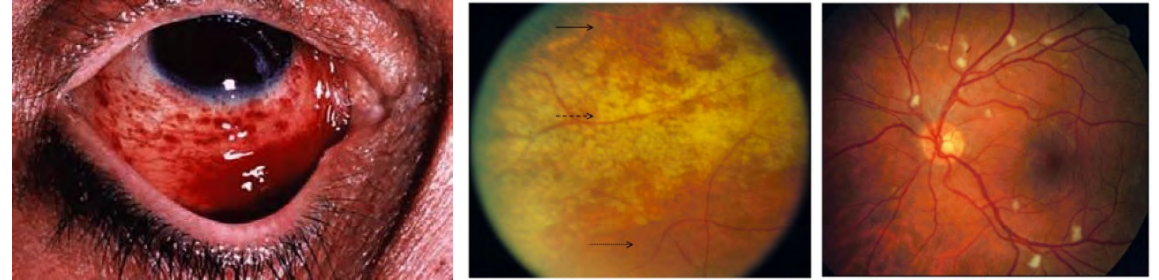
- CD8⁺ T cells are not stimulated making AIDS patients very susceptible to most viruses, including HIV itself
- Antibody class switching declines significantly once helper T cell function fails. The immune system loses its ability to improve the affinity of their antibodies, and are unable to generate B cells that can produce antibody groups such as IgG and IgA.

AIDS is diagnosed when the CD4⁺ T cell count falls below 200 or you have an AIDS-defining complication

Human Immunodeficiency Virus (HIV)

Ocular Complications of HIV/AIDS

- Mechanism of action
 - Opportunistic infection
 - Inflammatory State of system
- Kaposi Sarcoma (AIDS defining illness)
 - cancer that develops from the cells that line lymph or blood vessels
- Cytomegalovirus
 - Over 50% are infected by age 40
 - Retinal detachment, uveitis
- Immune reconstitution inflammatory Syndrome (IRIS)
 - Median of 48 days (29 to 99 days) after ART initiation
 - "immune recovery uveitis" (IRU) or "immune recovery vitritis" by various investigators
 - IRIS has been reported in 16 to 63 percent of CMV retinitis following the initiation of ART



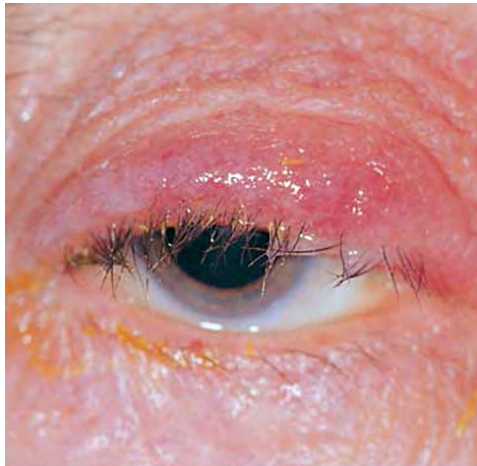
Human Immunodeficiency Virus (HIV)

Other Complications to consider

- Oral/esophagus candidiasis
- Exacerbations of existing skin ailments
- Bacterial super infections post antibiotic therapy

Dry eye, blepharitis and uveitis were the top three complications.

- Up to 33.9% of HAART study side effects



Meibomian Gland dysfunction (MGD)

Inflammatory disease

- ocular rosacea, mucous membrane pemphigoid, Sjögren's syndrome, and chronic graft-versus-host
- Polymorphous neutrophil recruitment shown in MGD

Meibomitis = Inflammation

Meibomian gland dysfunction = blockage of meibum outflow

- Inspissation
- Blepharitis
- Structural change
- Gland death

Co-morbidity

- Ocular Rosacea
- Auto-Immune Conditions
- Sicca Syndrome



(FIGURE 1) **TOP** Truncated meibomian glands alter the tear film and can ultimately cause damage to the ocular surface if left untreated. **BOTTOM** Normally functioning meibomian glands secrete oil which prevents the tear film from evaporating. (Photos courtesy of TearScience)

MGD Treatment – Global treatment

Environmental factors, blink rate, CVS

Sicca Syndrome

- punctal plugs

Artificial tears

- Oil based AT

Exposure treatment

- Scleral lenses
- Lagophthalmos
 - Night masks
 - Gels

Co-management

- Dermatology
- Rheumatology



MGD Treatment – Lipid flow

Warm compress

- Proper procedure
 - patients should heat lids to approximately 45°C
 - maintain contact for at least four minutes
- Lipiflow/iLux
- Pulsed Light

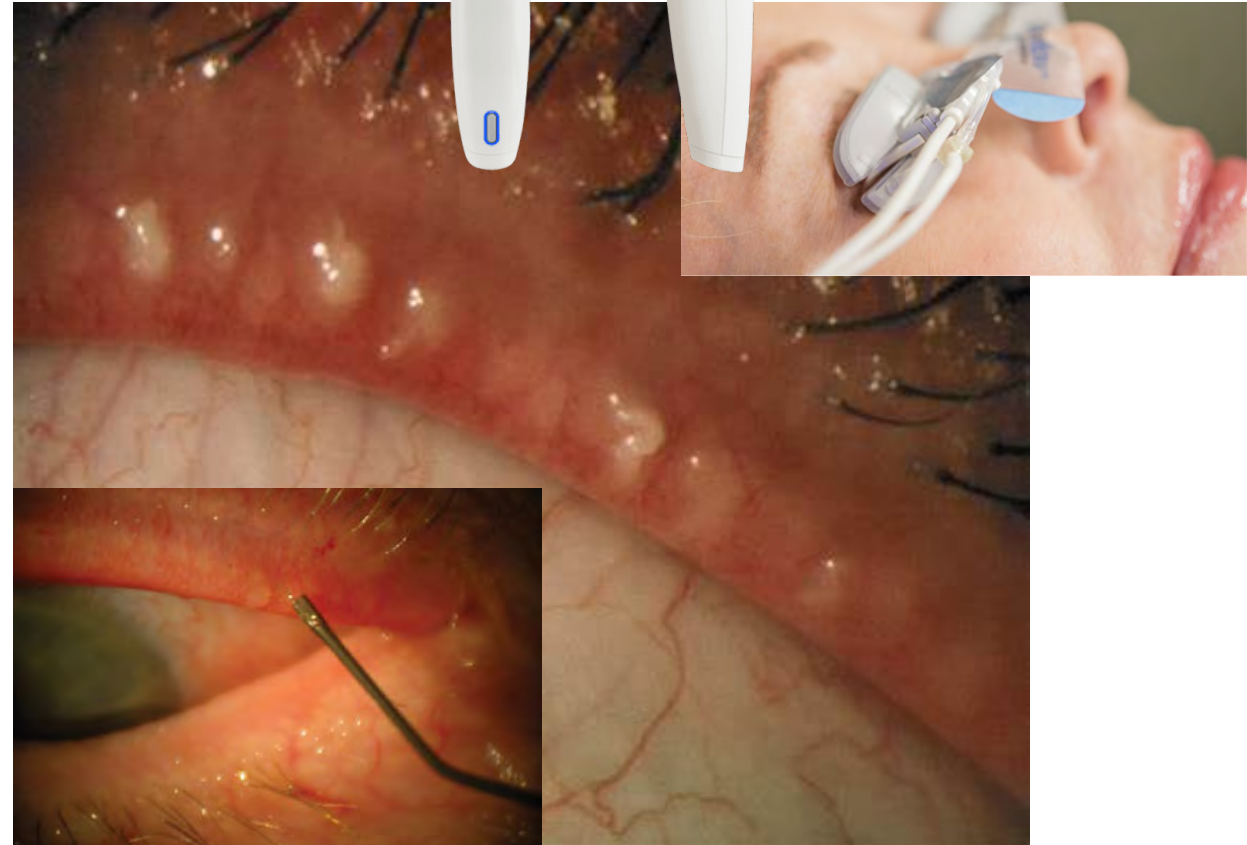
Scraping or expression

- Increase in inflammation
- 5psi to 40psi
- Probing

Omega 3

- 1000 mg DHA/EPA
 - For higher potency, the total milligrams on the front of the label should closely match the milligrams of EPA and DHA listed on the back.

Liposome spray



MGD Treatment – Anti Inflammation

Topical treatment

- FML- inhibits neutrophils
- Iodine!!
 - low-dose formulation of 1% PVP-I (w/w) in a gel containing DMSO
- Androgen therapy
- N-acetyl-cysteine
- Azithromycin
- cyclosporine A

Oral treatment

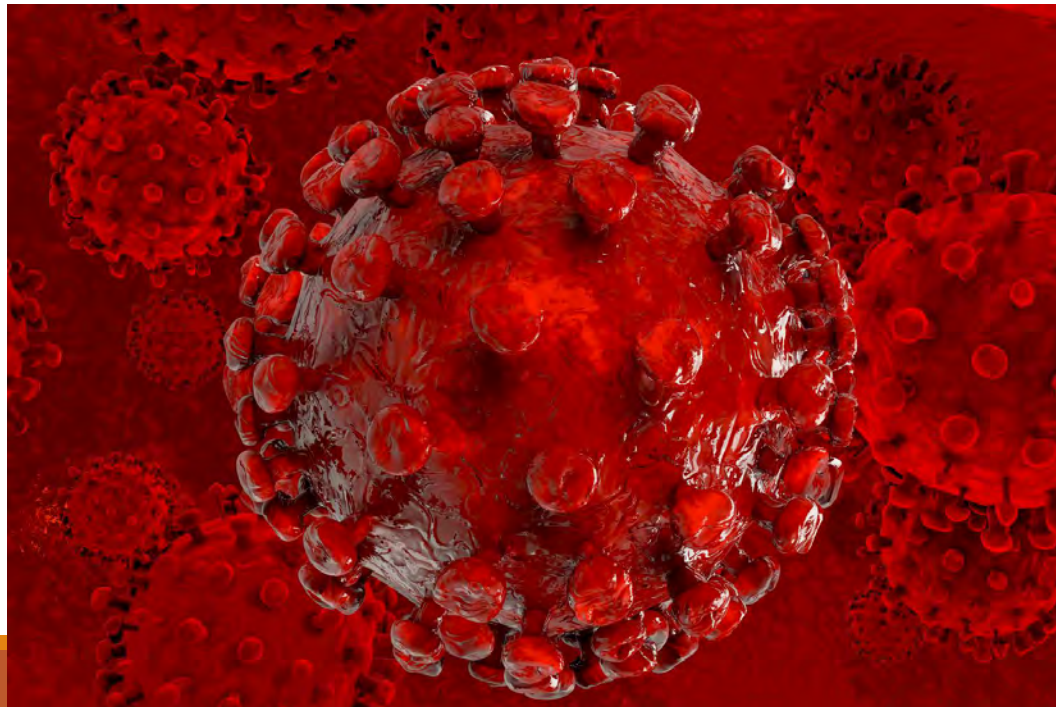
- Doxycycline
 - Anti-inflammatory, anti-metalloproteinase
- Azithromycin
 - Inhibits cytokines, antibiotic Gram (-)



MGD Treatment

Considerations for patients with HIV

- Fungal superinfections w/antibiotic treatments
- Immune reconstitution inflammatory Syndrome (IRIS)
- If their cell count is low “They have the right to present with whichever complication they want”



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