

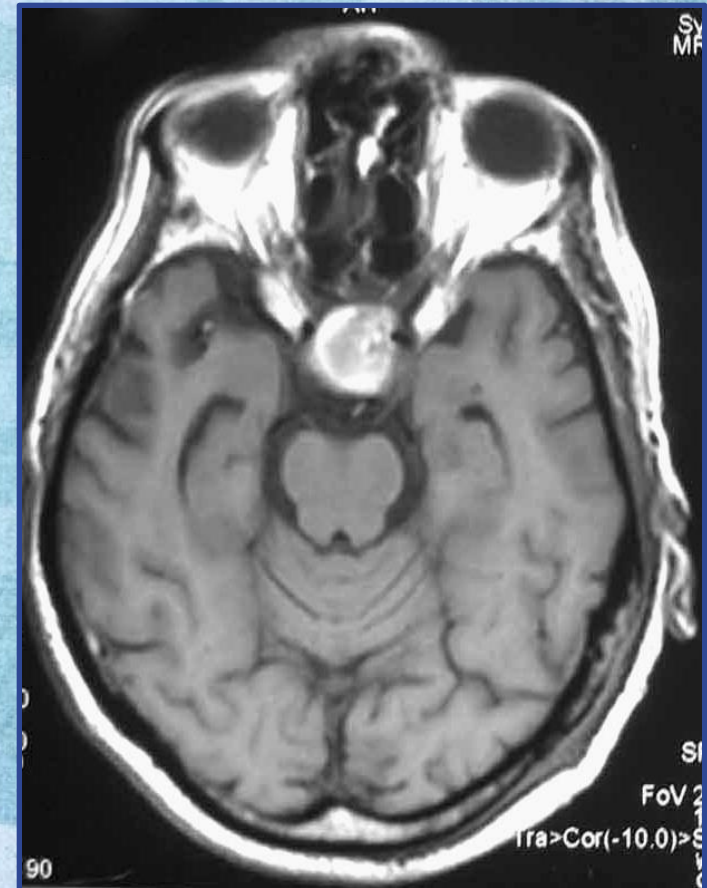
Everything You Always Wanted to Know About **PITUITARY ADENOMA**

But Were Afraid to Ask!

Rick Trevino, OD, FAAO
Indiana University School of Optometry

Chiasmal Syndrome

- Online notes
 - richardtrevino.net
- Email me
 - rctrevin@iu.edu
- Disclosures
 - None



Case 1

Case 1

61yo BM presents for annual exam

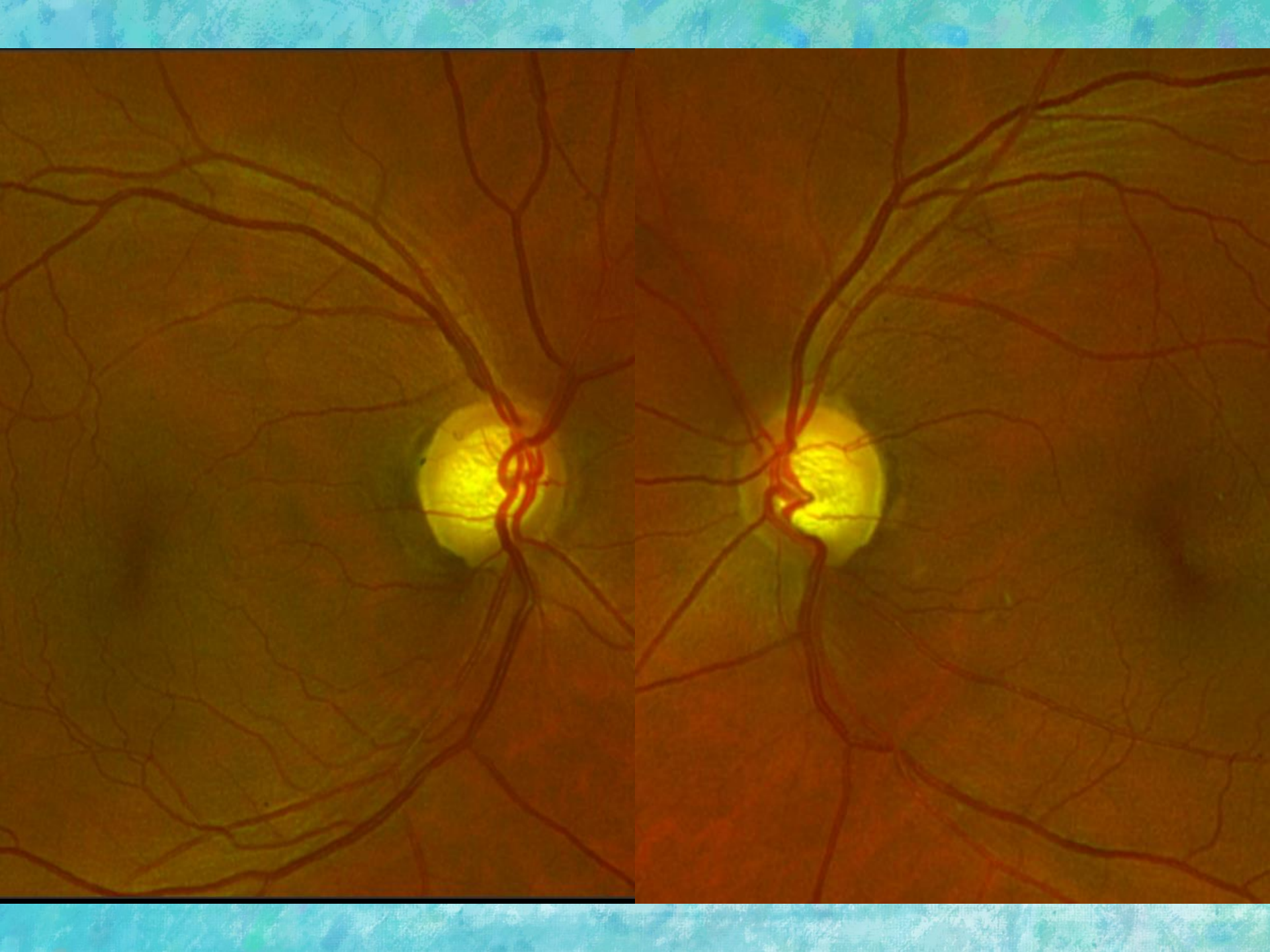
- POH: **NTG glaucoma**. Takes Alphagan
S/P LASIK OU (18yrs ago)
- MH: Good health

VA: 20/20 OU

PERRL, (-)APD / FROM

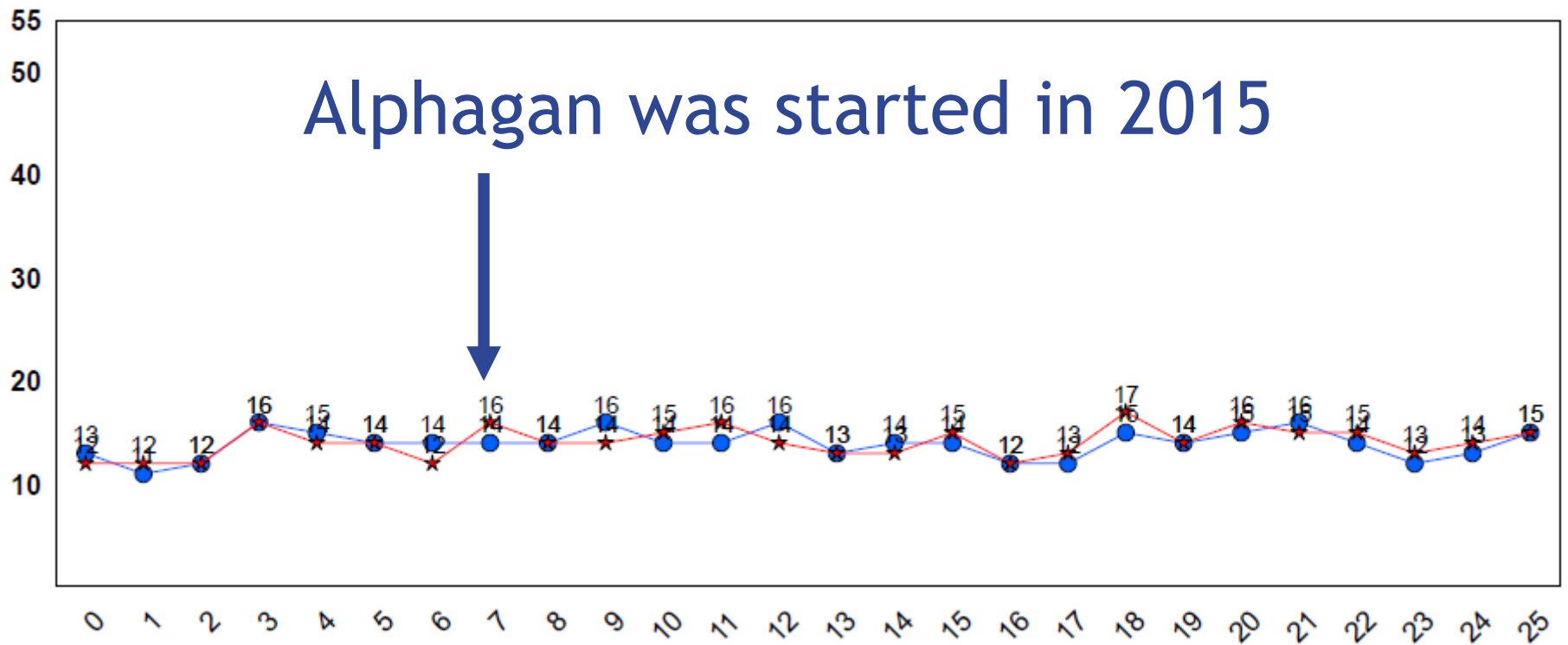
Ta 14/15

SLE: WNL OU



Intraocular Pressure

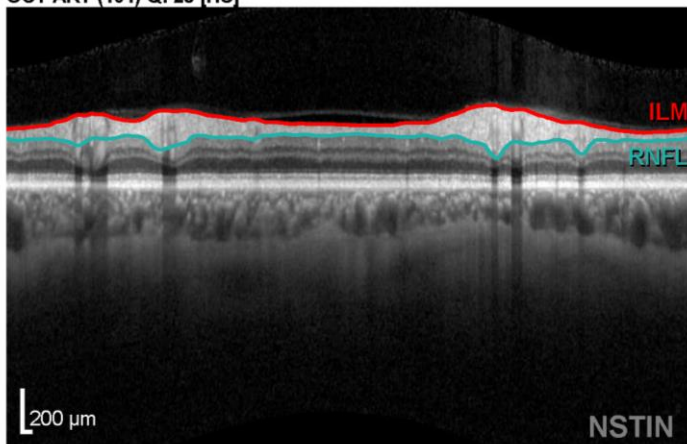
Alphagan was started in 2015



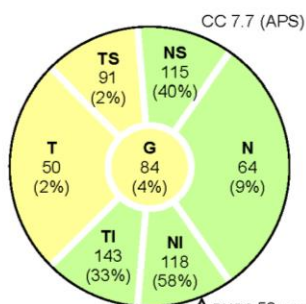
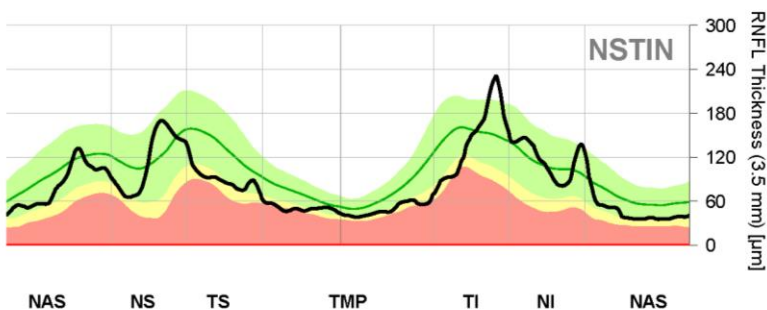
2013

2022

OCT ART (101) Q: 28 [HS]

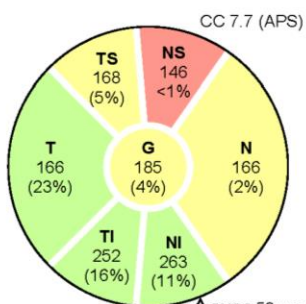


OD



Classification RNFLT

Borderline

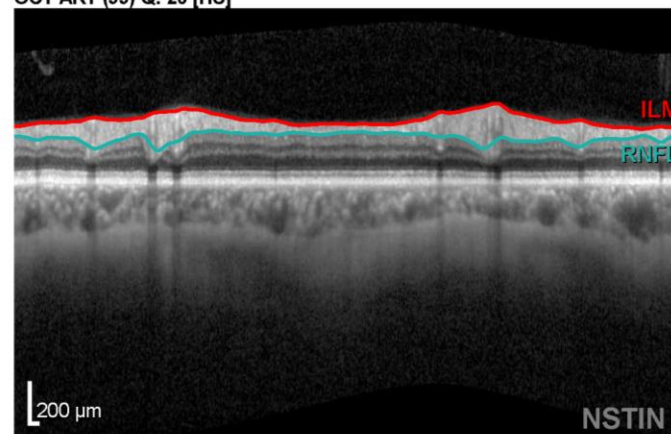


Classification MRW

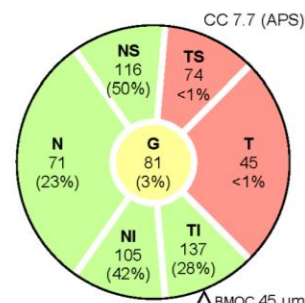
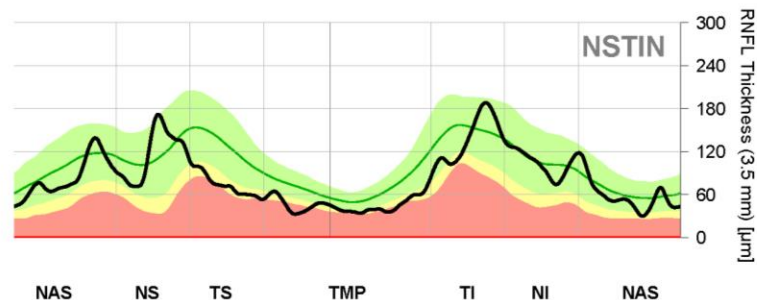
Outside Normal Limits



OCT ART (99) Q: 26 [HS]

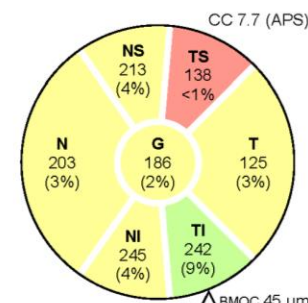


OS



Classification RNFLT

Outside Normal Limits

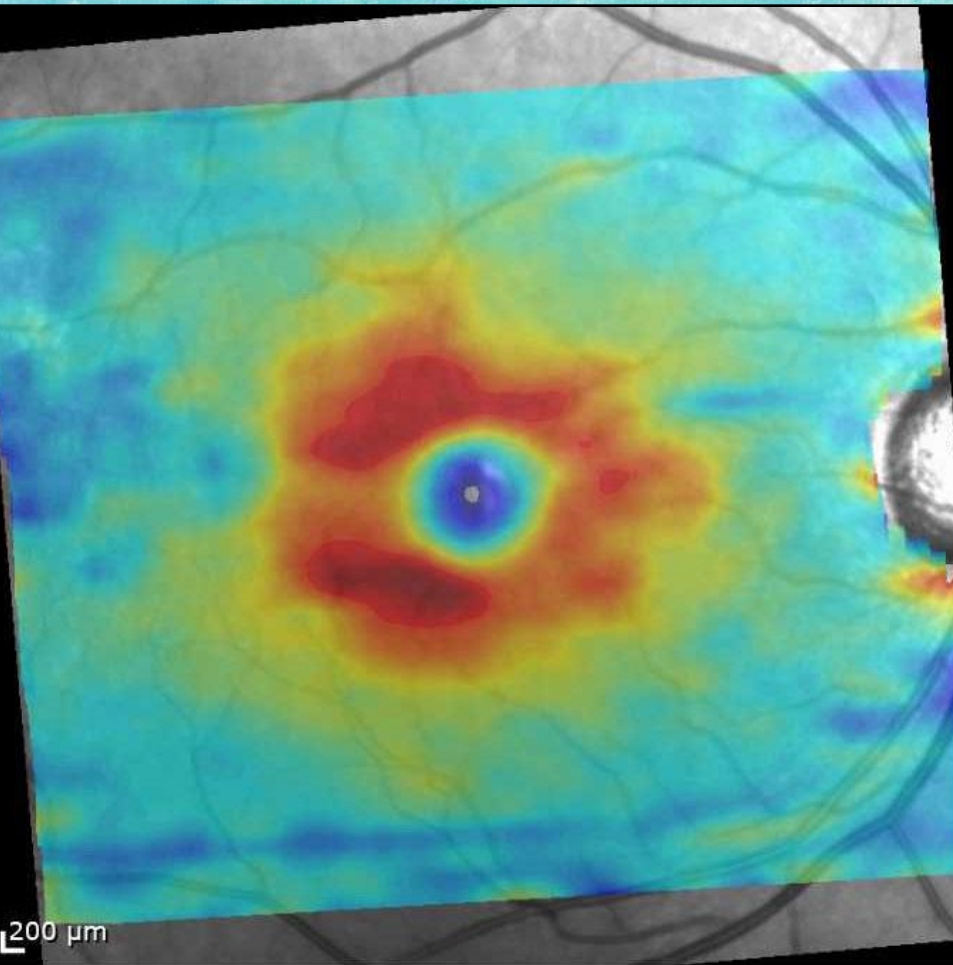


Classification MRW

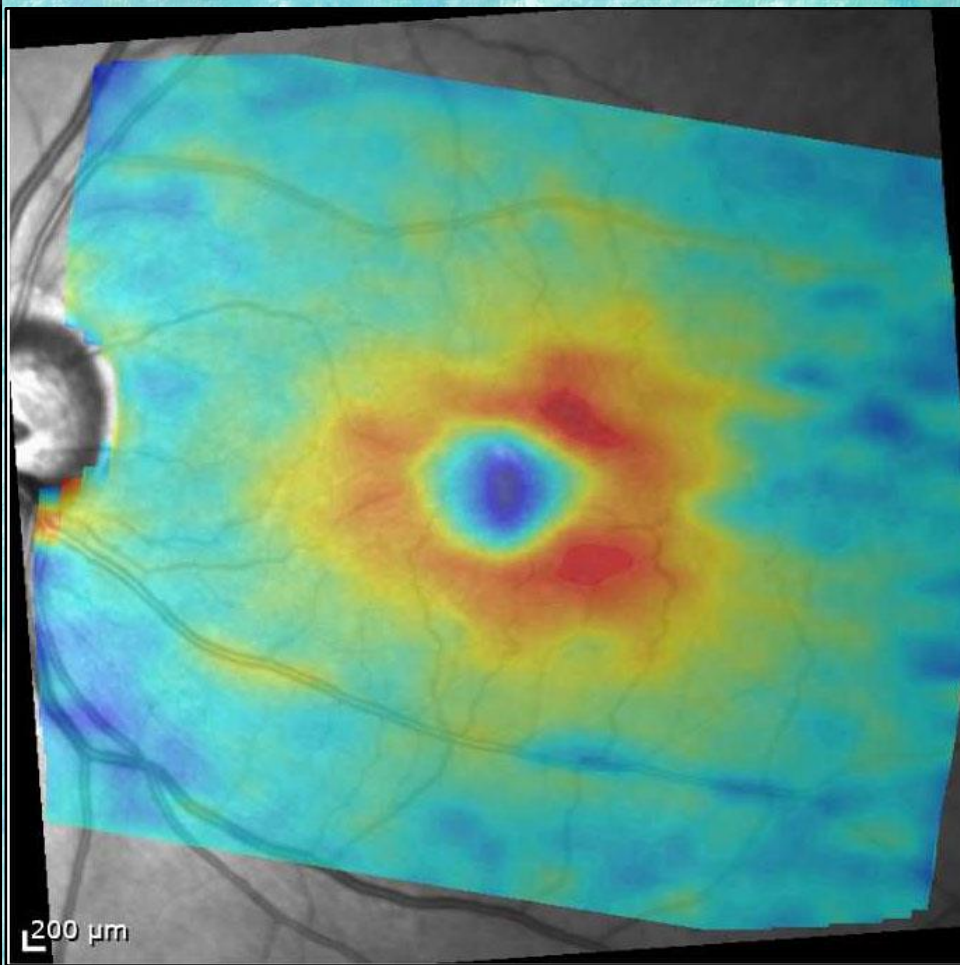
Outside Normal Limits



OD

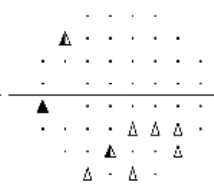
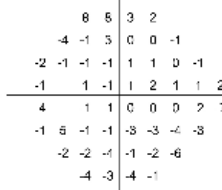
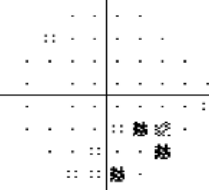
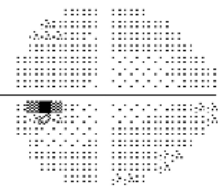


OS



Dec 11, 2014

SITA Standard

GHT: **Borderline**Pupil Diameter: 4.4 mm *
Visual Acuity:VFI: 98%
Fovea: 36 dBMD24-2: -1.10 dB
PSD24-2: 1.99 dB P < 10%

FL: 1/15

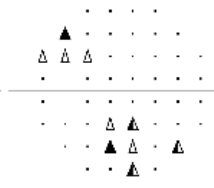
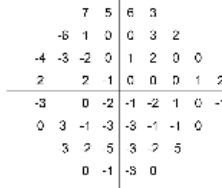
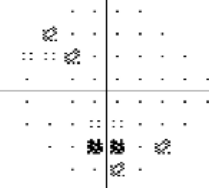
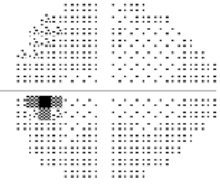
FN: 1%

FP: 4%

Possible Progression

Jun 01, 2015

SITA Standard

GHT: **Outside Normal Limits**Pupil Diameter: 5.4 mm *
Visual Acuity:VFI: 98%
Fovea: 35 dBMD24-2: -0.60 dB
PSD24-2: 1.89 dB P < 10%

FL: 0/12

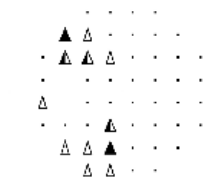
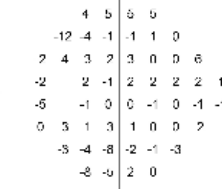
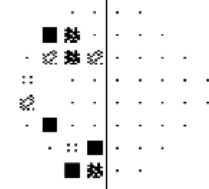
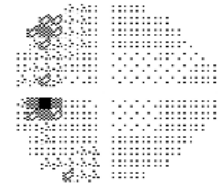
FN: 0%

FP: 4%

Possible Progression

May 24, 2018

SITA Standard

GHT: **Borderline**Pupil Diameter: 4.9 mm *
Visual Acuity:VFI: 96%
Fovea: 33 dBMD24-2: -1.66 dB
PSD24-2: 2.93 dB P < 2%

FL: 0/15

FN: 3%

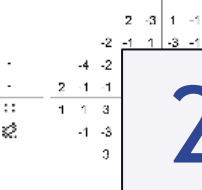
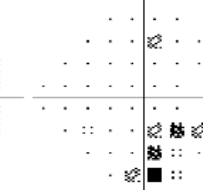
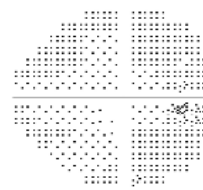
FP: 1%

Possible Progression

Baseline Exams:

Dec 11, 2014

SITA Standard

GLIT: **Borderline**Pupil Diameter: 5.3 mm *
Visual Acuity:VFI: 99%
Fovea: 33 dBMD24-2: 0.58 dB
PSD24-2: 2.83 dB P < 2%

FL: 3/14 XX

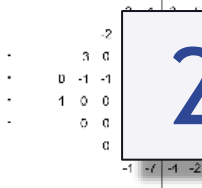
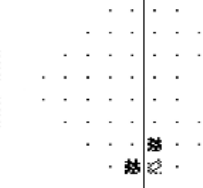
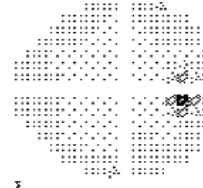
FN: 1%

FP: 1%

Possible Progression

Jun 01, 2015

SITA Standard

GHT: **Borderline**Pupil Diameter: 4.9 mm *
Visual Acuity:VFI: 99%
Fovea: 33 dBMD24-2: 0.23 dB
PSD24-2: 1.67 dB

FL: 0/14

FN: 0%

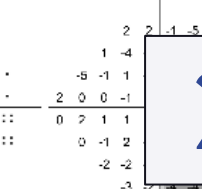
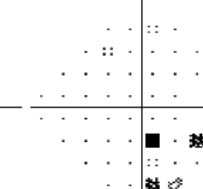
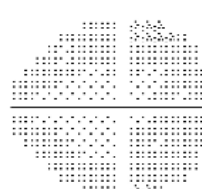
FP: 0%

Possible Progression

Baseline Exams:

May 24, 2018

SITA Standard

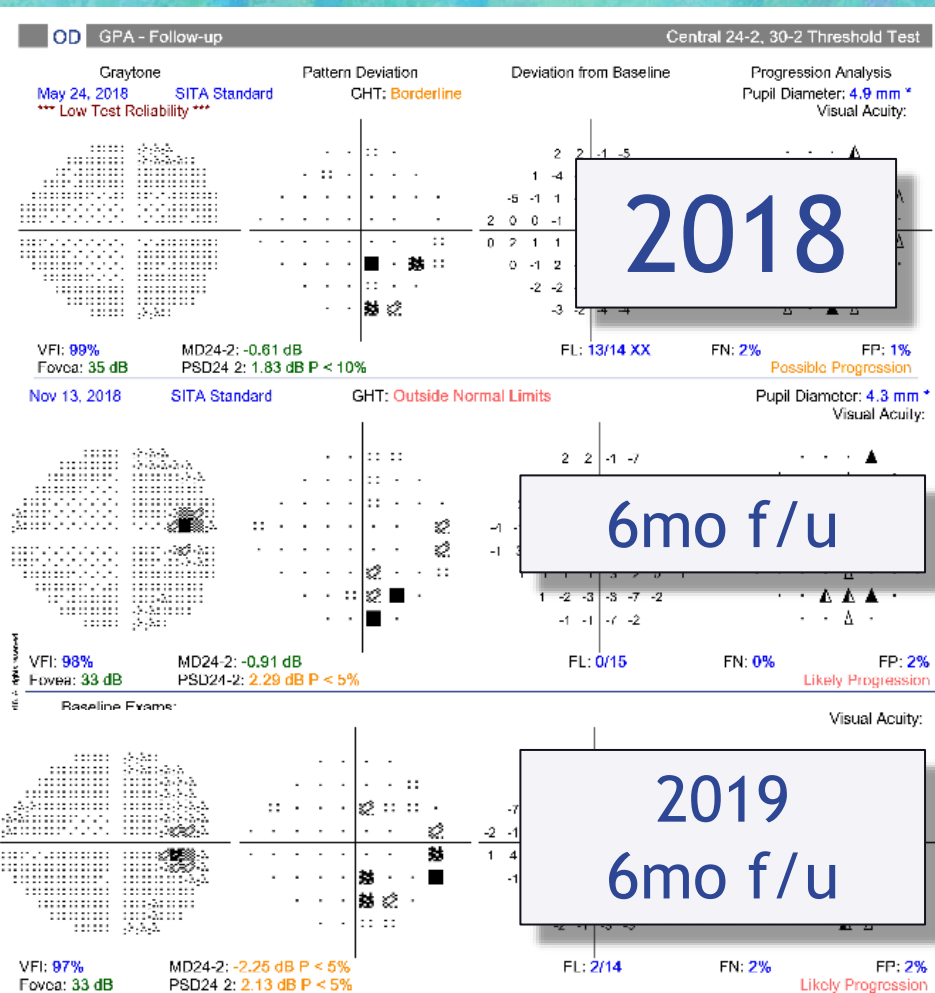
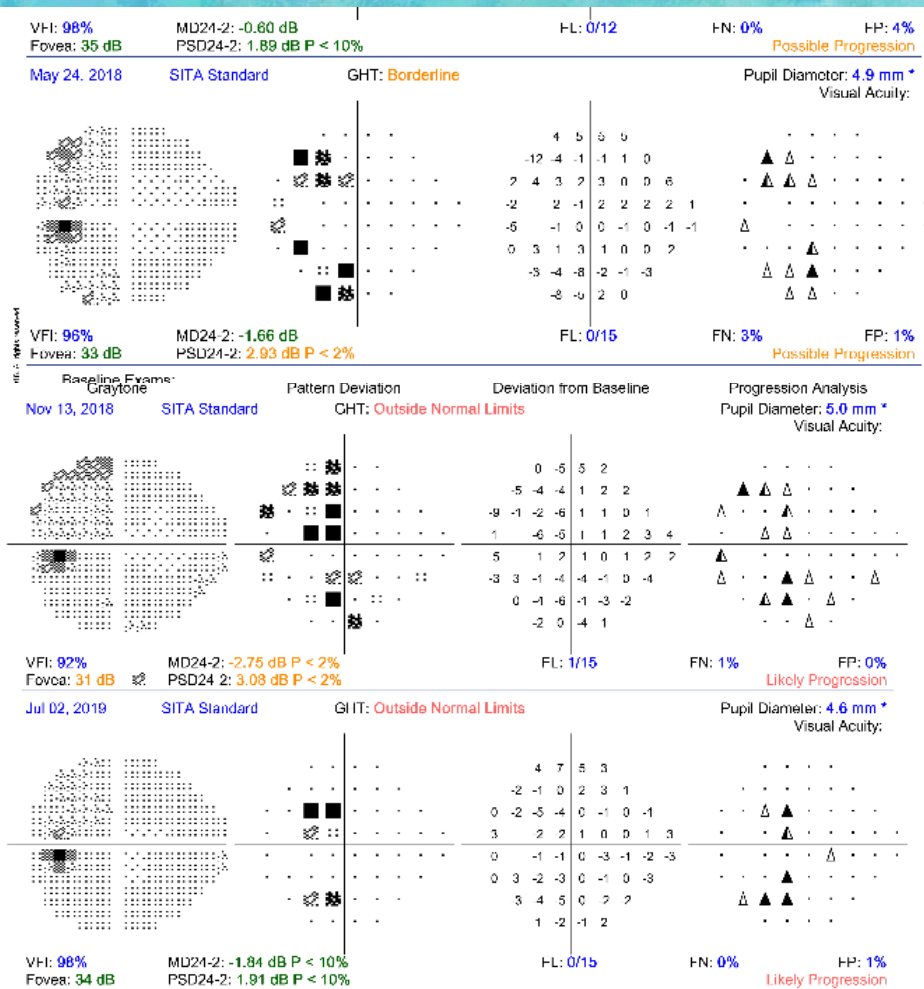
GHT: **Borderline**Pupil Diameter: 4.9 mm *
Visual Acuity:VFI: 99%
Fovea: 35 dBMD24-2: -0.61 dB
PSD24-2: 1.83 dB P < 10%

FL: 13/14 XX

FN: 2%

FP: 1%

Possible Progression



Patient was referred at 2019 exam for MRI which revealed a pituitary adenoma

MISSED IT

BY THAT MUCH



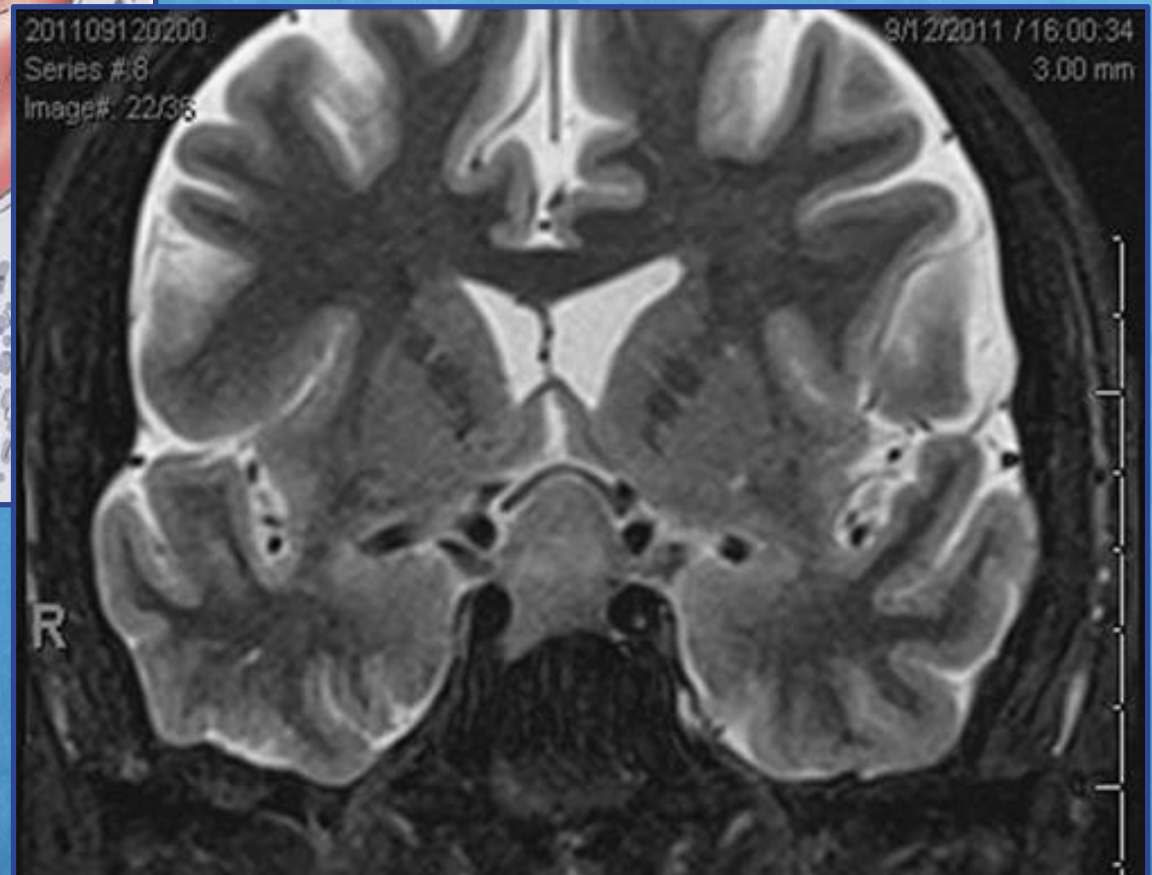
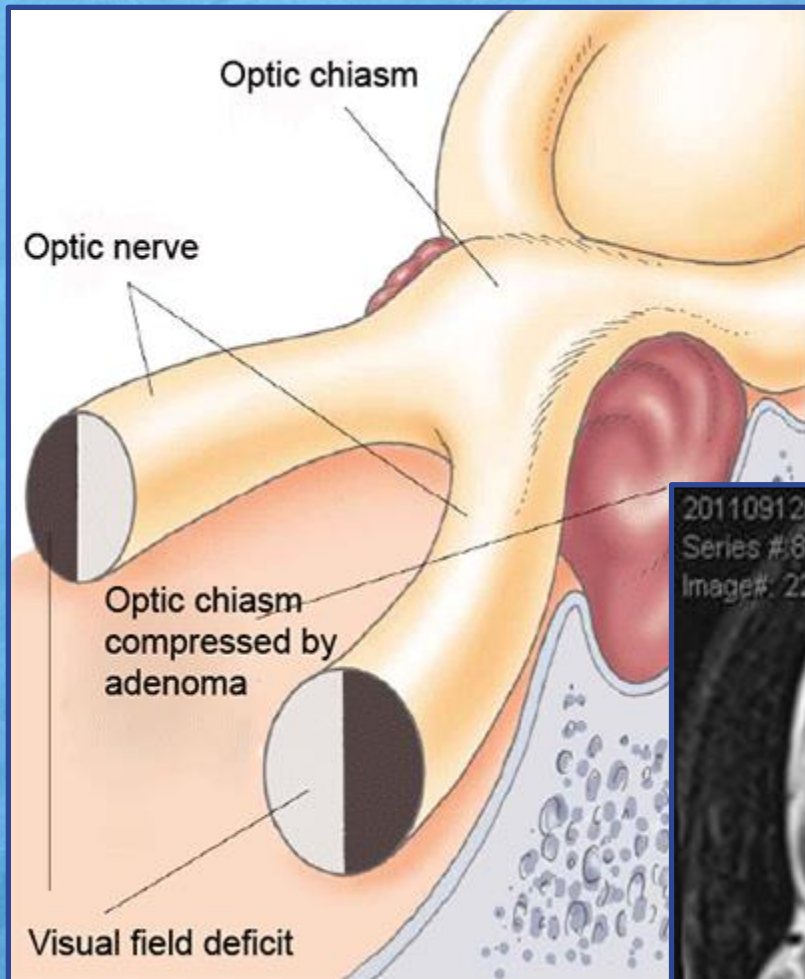
Chiasmal Syndrome

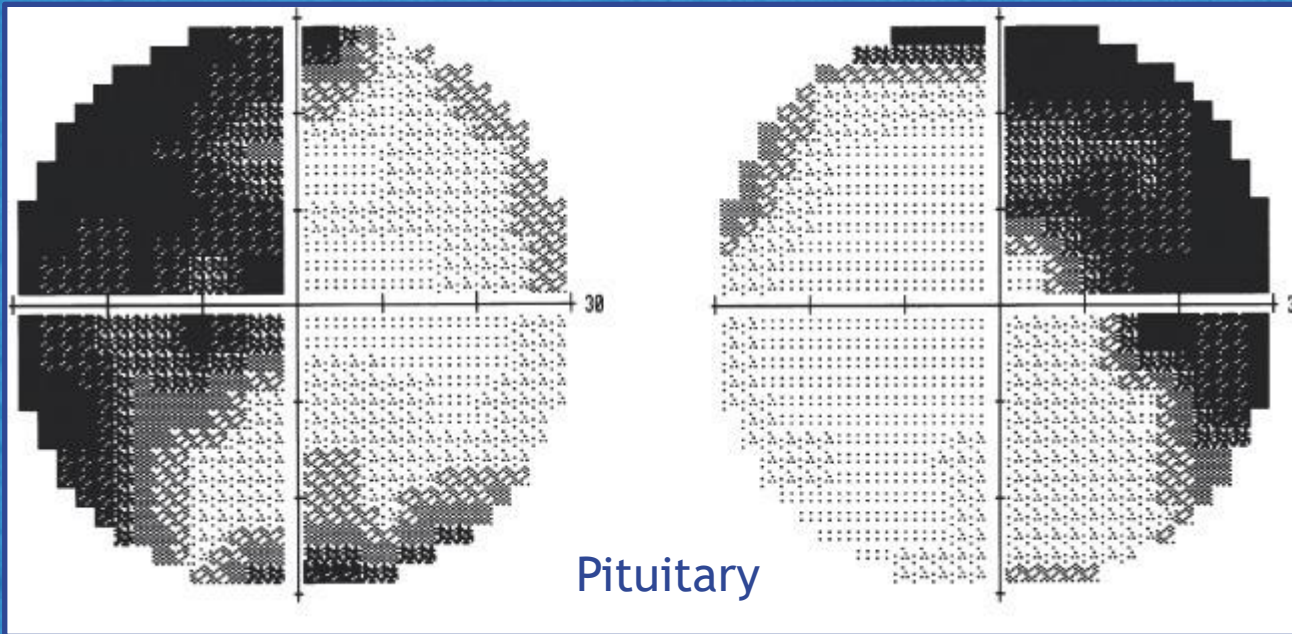
- Chiasmal syndrome is the constellation of signs and symptoms associated with lesions of the optic chiasm
 - Pituitary adenoma is the most common cause
- **25% of all brain tumors occur in this region**
 - 50% are pituitary adenomas
 - *Visual disturbance is common*
- Patients with chiasmal lesions may present c/o headache and/or visual disturbances

Chiasmal Syndrome

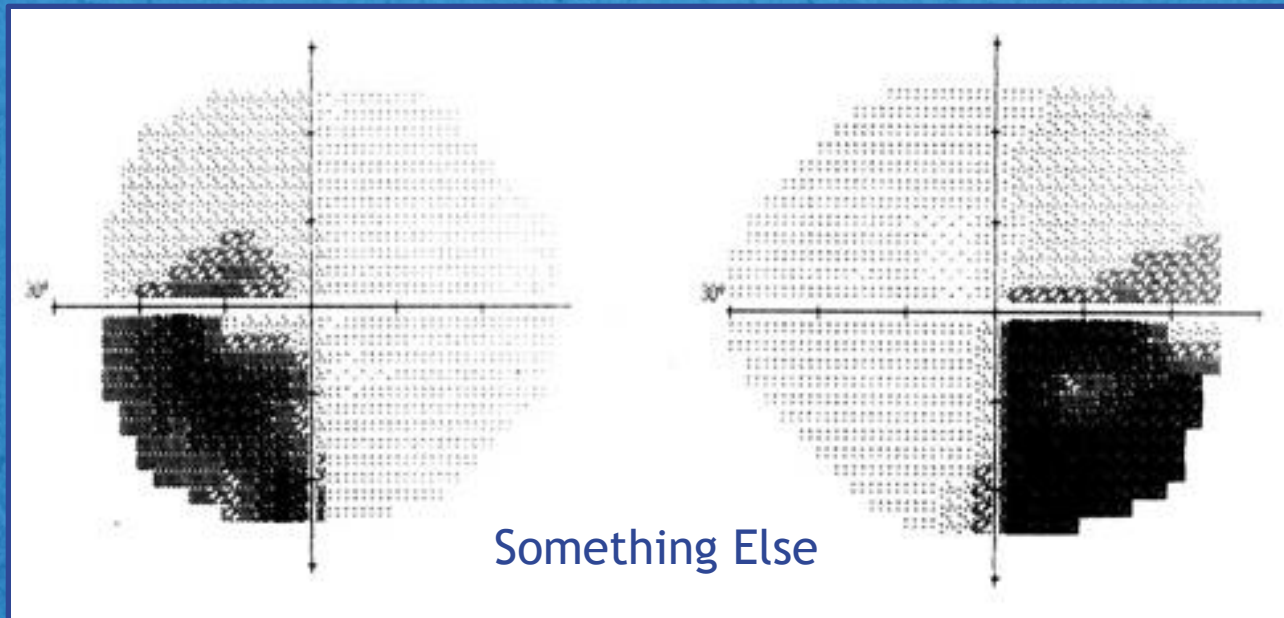
- Causes of chiasmal syndrome include tumor, inflammation, and ischemia
- Findings suggestive of an etiology other than pituitary adenoma:
 - **Visual sx**s (blur or difficulties with side vision)
 - **VF defect greater inferiorly than superiorly**
 - Younger age
 - Unilateral optic disk pallor
 - RAPD
 - A complete hemianopic VF defect

Pituitary adenoma compresses the optic chiasm from below





Incomplete
bitemporal
hemianopic defect
greater above
than below - highly
suggestive of
pituitary adenoma



Incomplete
bitemporal
hemianopia
greater below
than above - highly
suggestive of
something other
than pituitary
adenoma

Chiasmal Syndrome

- Anatomy Review
- All About Pituitary Adenomas
- Clinical Features of Chiasmal Syndrome
- Clinical Pearls
 - Red Flag Warning Signs
 - Case Presentations

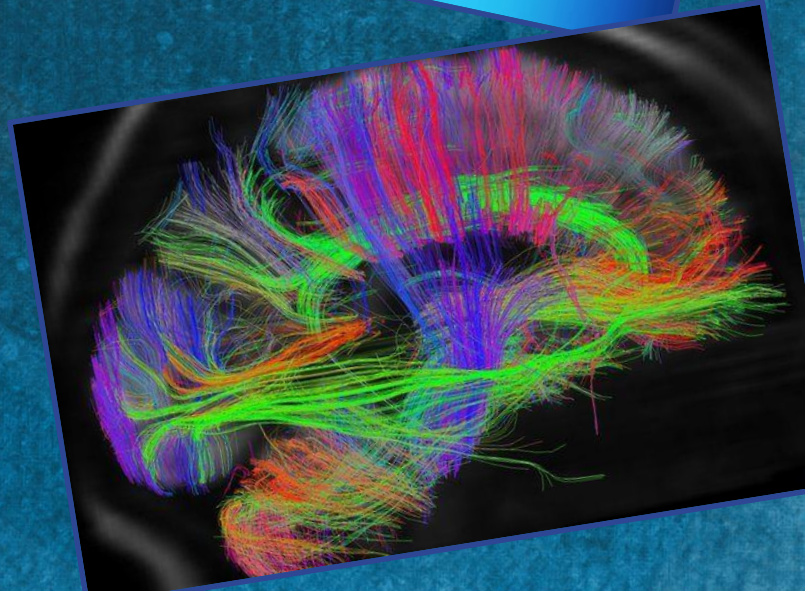
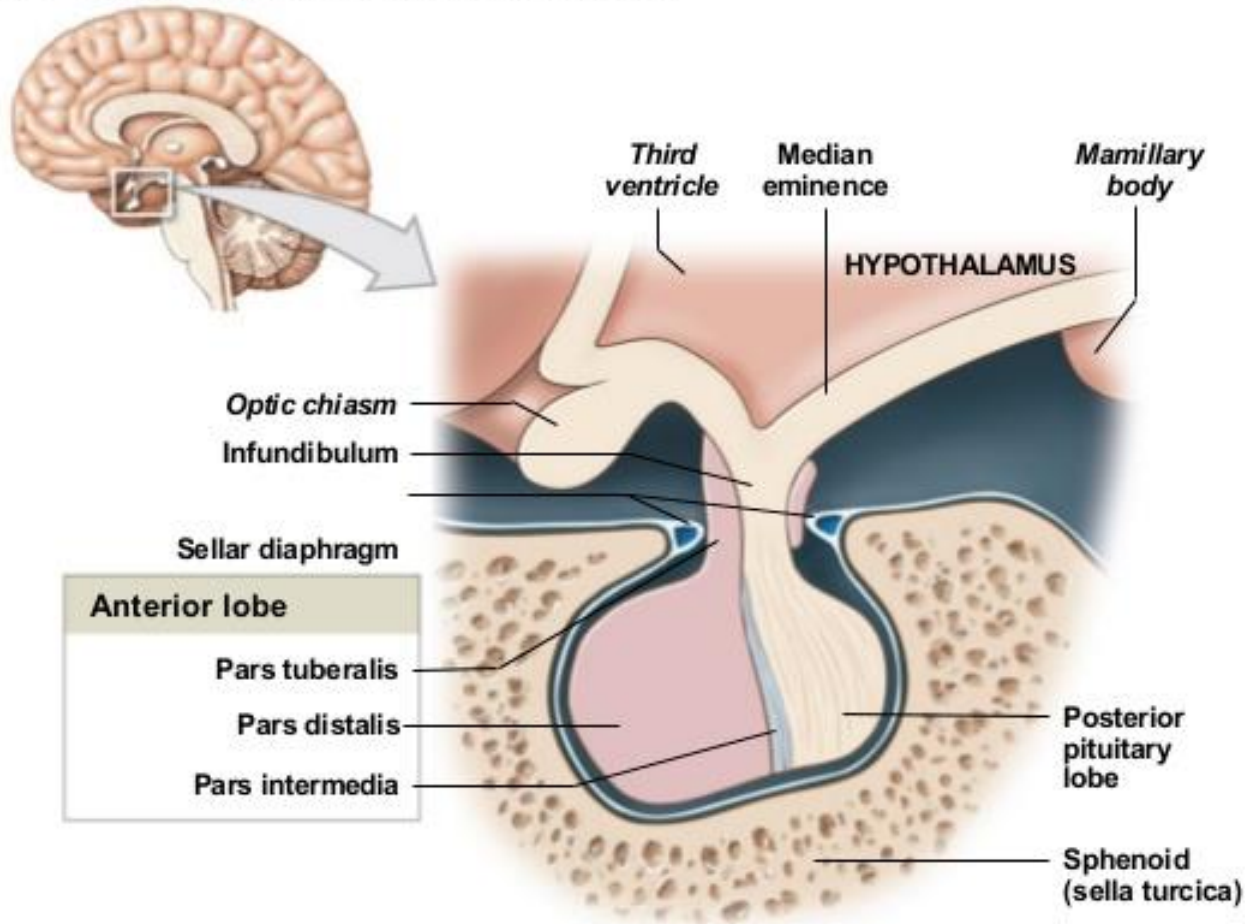
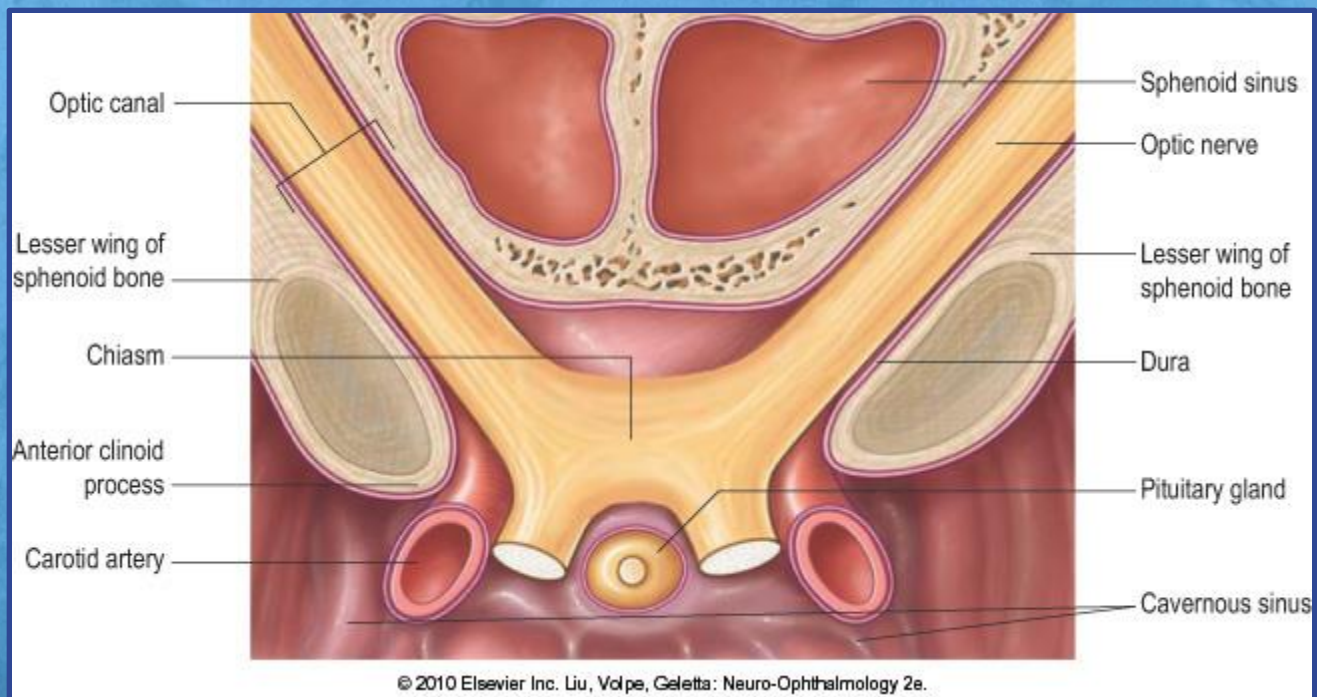
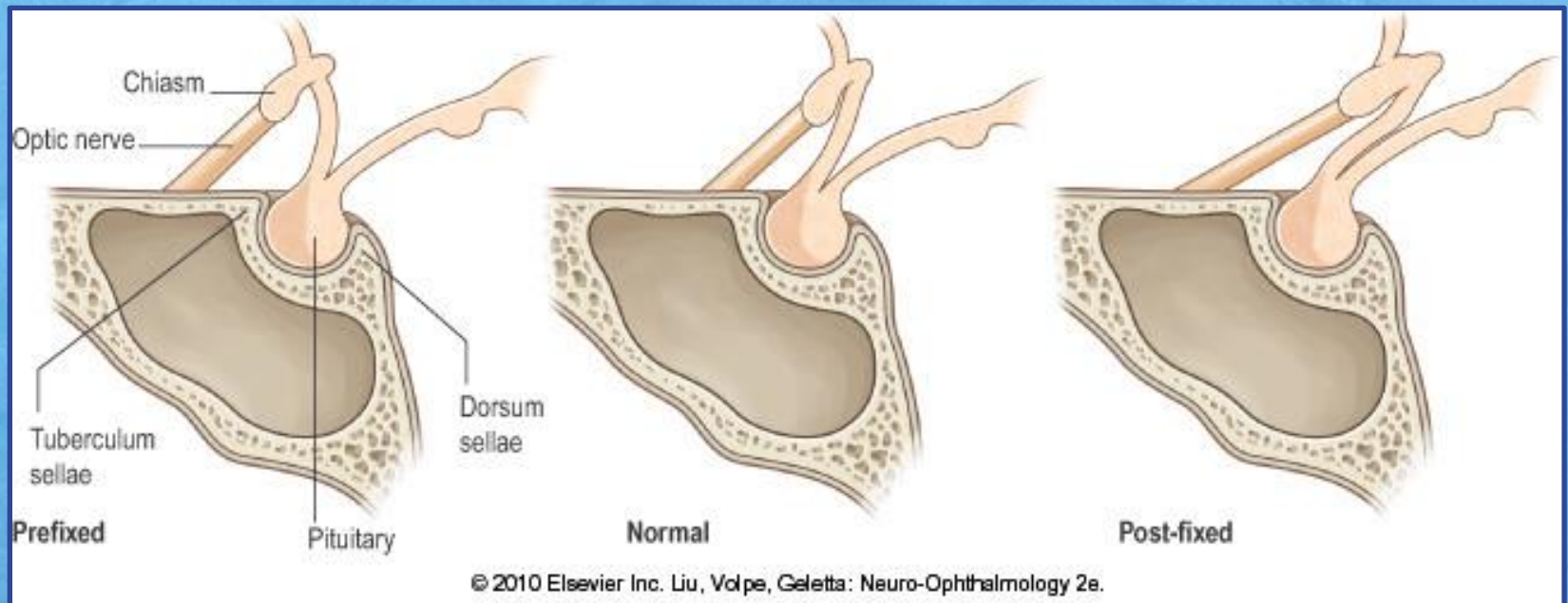


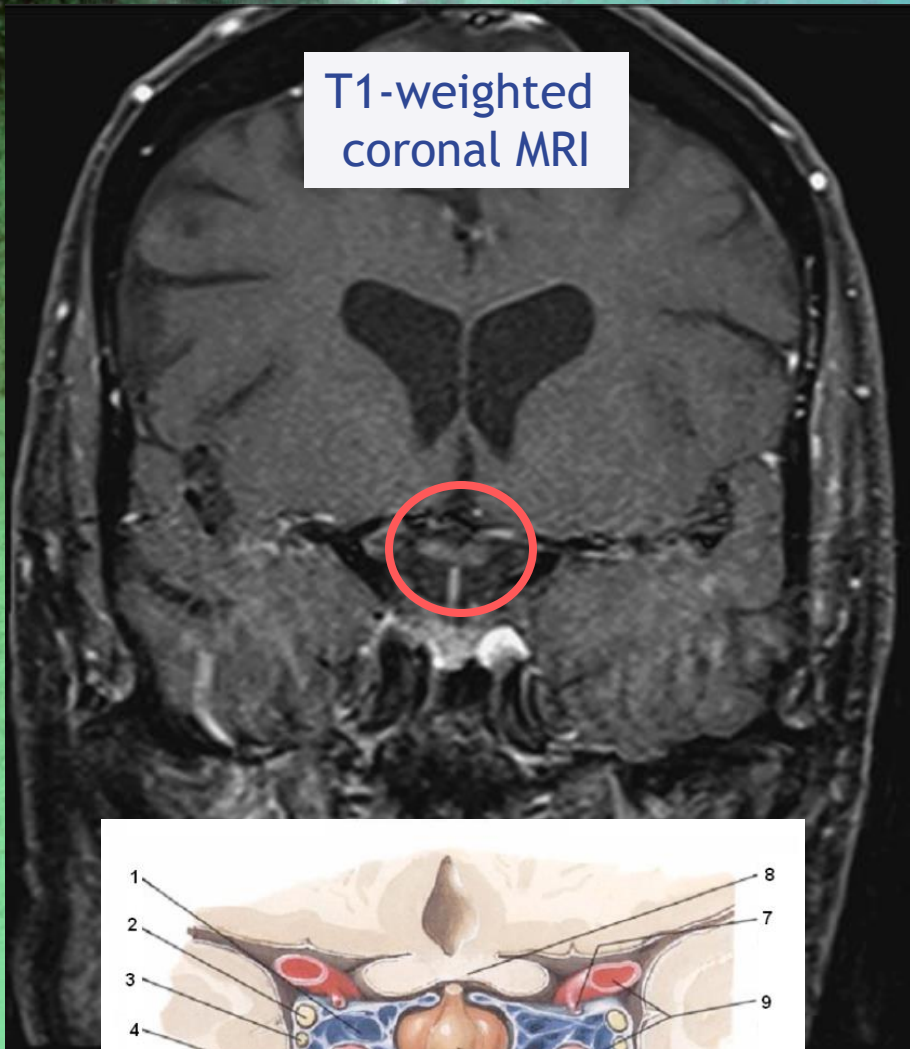
Figure 18-6a The Anatomy and Orientation of the Pituitary Gland



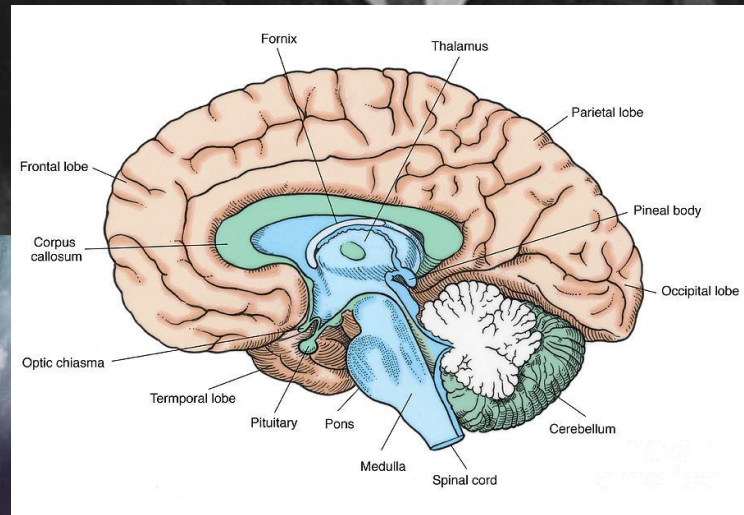
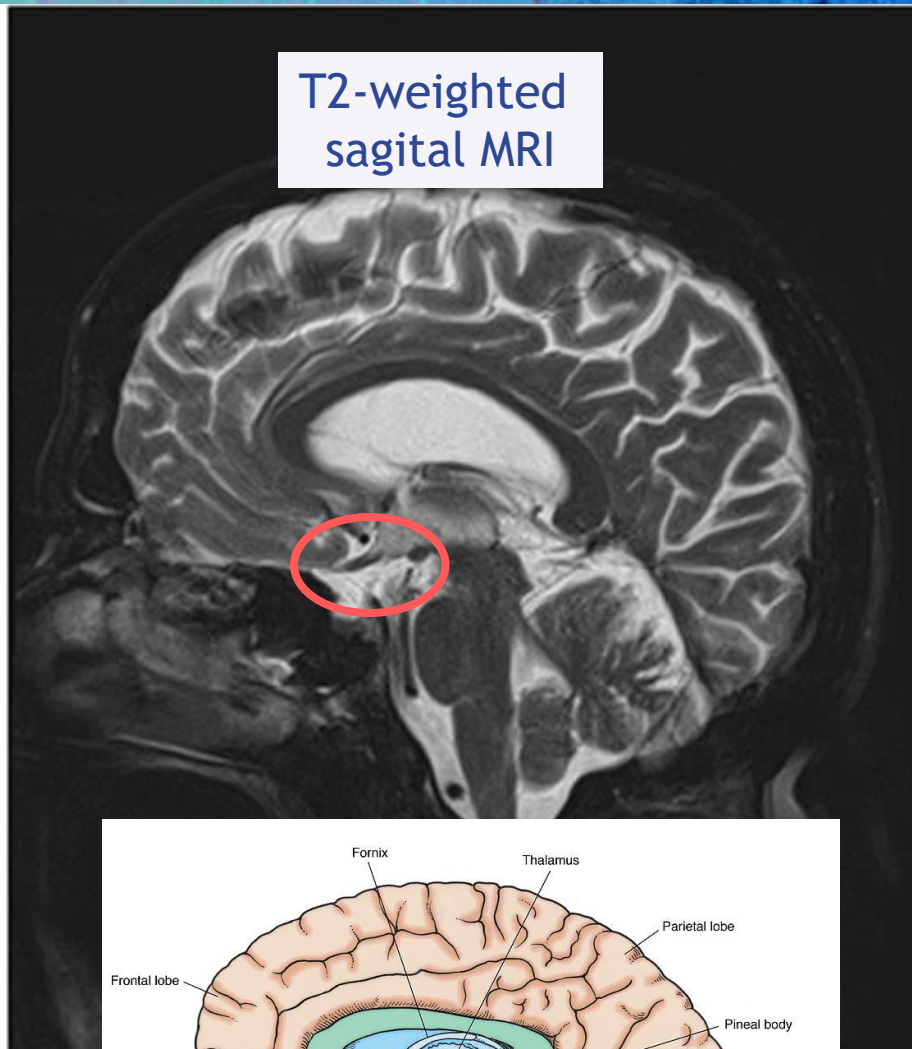
The pituitary gland is located 10mm immediately below the optic chiasm

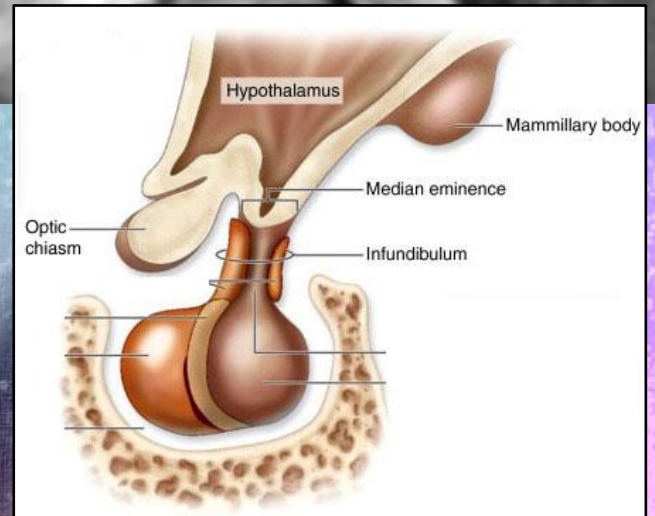
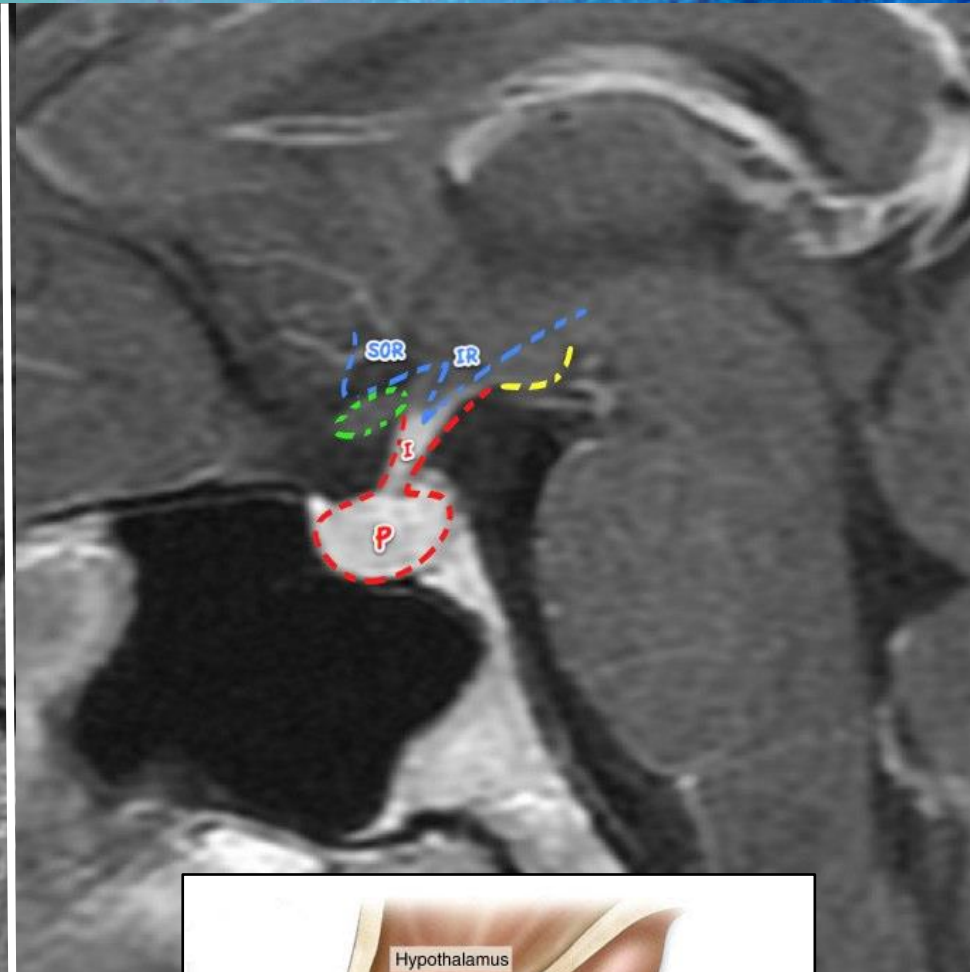
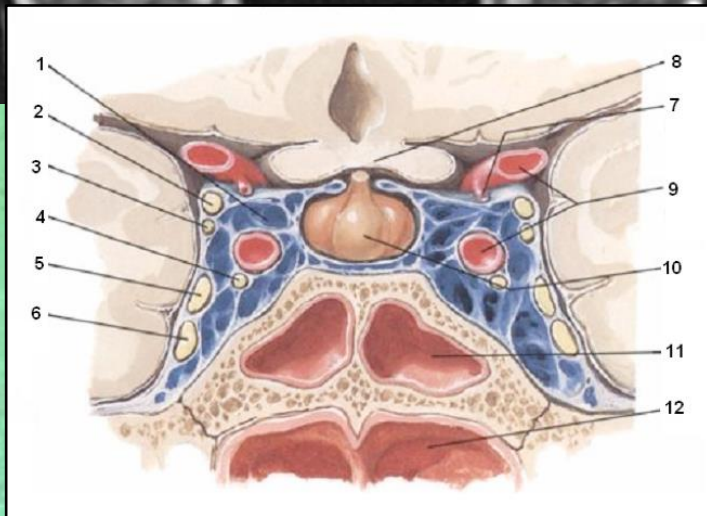
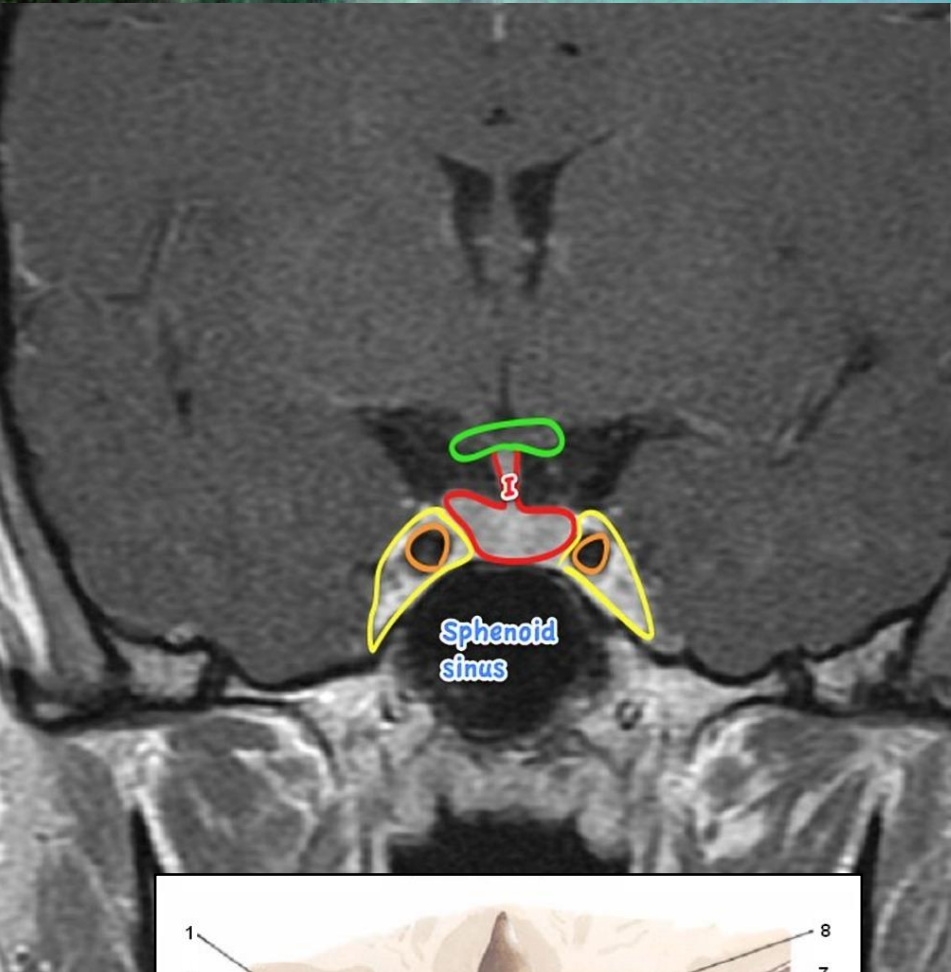


T1-weighted
coronal MRI



T2-weighted
sagittal MRI



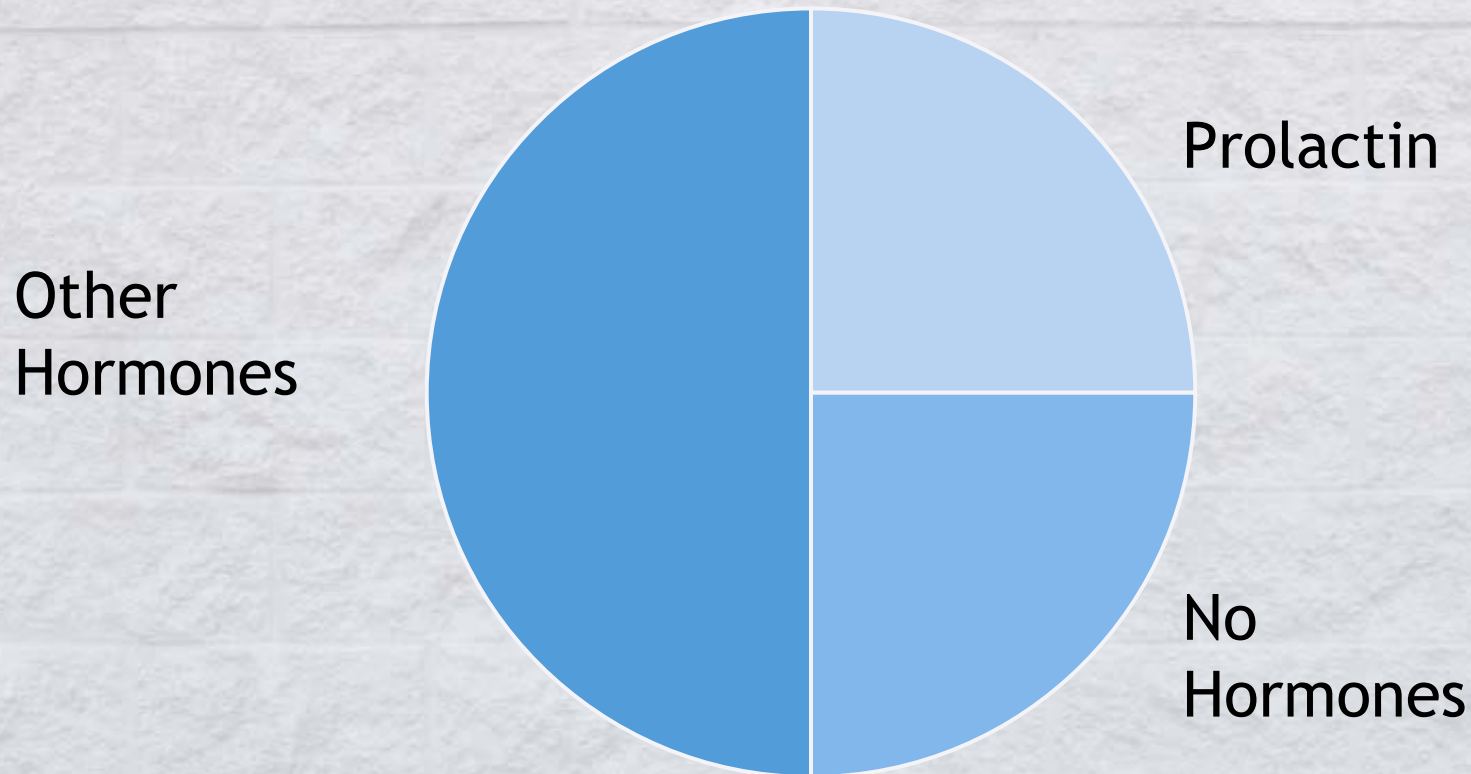


Pituitary Adenoma

- **Benign slow-growing tumor**
- Epidemiology
 - 10-25% of all brain tumors
 - Incidence highest 30-45yo age group
 - No racial or sex difference
- Classification
 - **Hormone producing (75%) or non-functioning**
 - Most common (25%) produce prolactin
 - Signs & symptoms determined by hormone secreted, if any

Pituitary Adenoma

Hormone Production

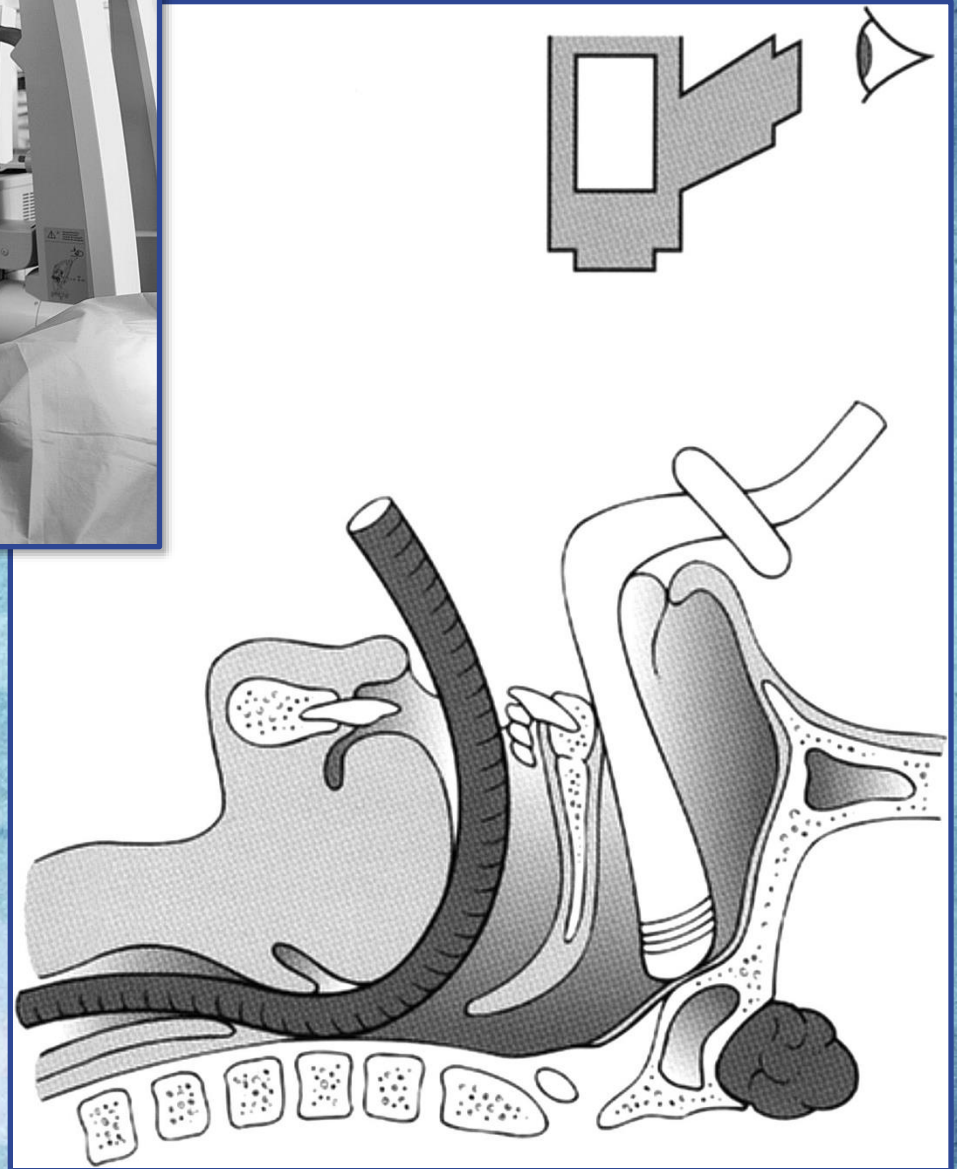
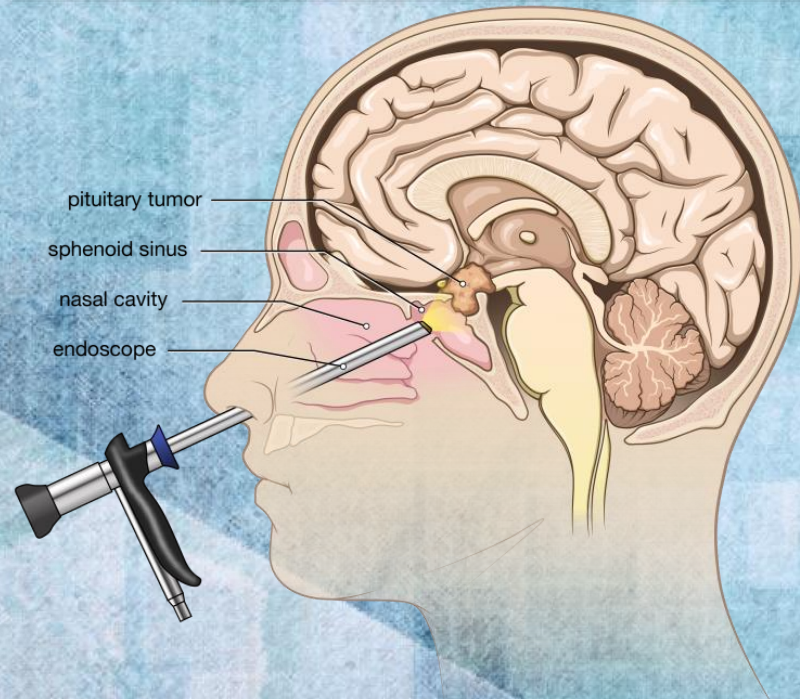


Pituitary Adenoma

- Nonfunctioning adenomas
 - 25% of cases
 - Most common cause of chiasmal syndrome
 - Only non-specific manifestations, such as **headache**, prior to onset of vision loss
 - May lead to hypopituitarism by compression of adjacent normal gland
 - Findings include diabetes insipidus, fatigue, weight loss, hypothyroidism, sexual dysfunction

Pituitary Adenoma

- Treatment
 - Medical
 - Treatment-of-choice for smaller hormone-secreting tumors
 - Surgery
 - Treatment for **larger non-secreting tumors** and smaller tumors resistant to medical therapy
 - Endonasal transsphenoidal endoscopic approach used in >90% of cases



UPMC

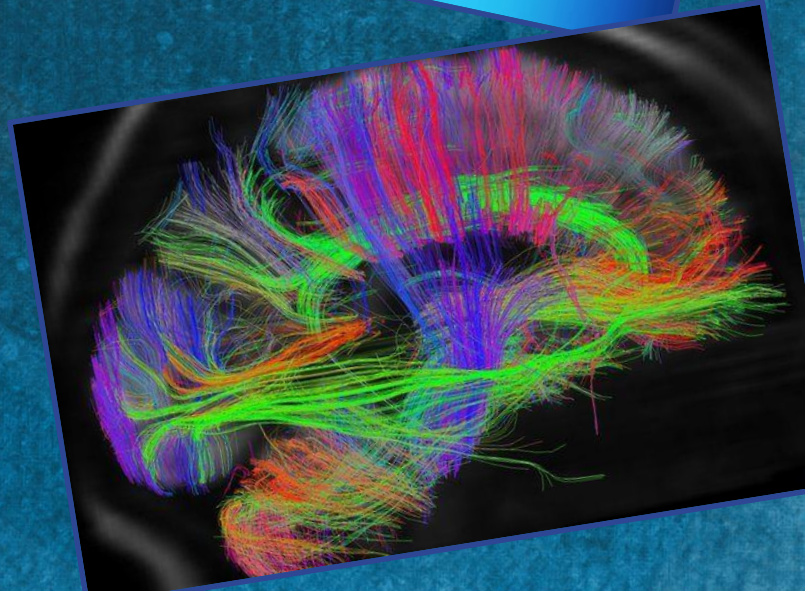
Endoscopic Endonasal Approach (EEA)

*A Pioneering Surgical Approach for
Skull Base Tumors and Lesions*

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Chiasmal Syndrome

- Anatomy Review
- All About Pituitary Adenomas
- Clinical Features of Chiasmal Syndrome
- Clinical Pearls
 - Red Flag Warning Signs
 - Case examples



Chiasmal Syndrome

SYMPTOMS

- Headache
- Visual loss
- Diplopia
- Loss of depth perception
- Endocrine dysfunction

SIGNS

- Visual field defects
- Optic disc pallor and cupping
- OCT abnormalities
- Oculomotor paresis
- Nystagmus
- Cerebrospinal fluid rhinorrhea

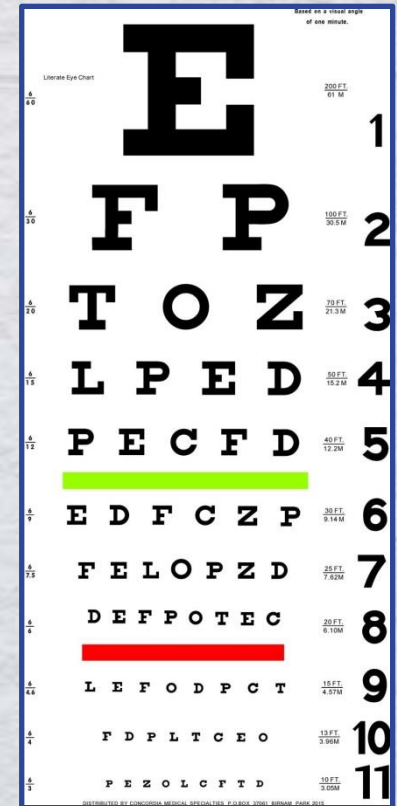
Headache

- 50%-70% of patients with pituitary adenoma
- Often the presenting symptom
- May be mild or severe
- HA severity not related to tumor size
 - May be related to hormonal imbalance caused by tumor



Visual Loss

- **VA is typically normal** in patients with chiasmal lesions
- Depression of central acuity is rare with bitemporal VF defects
- Anterior chiasmal lesions (“junctional scotoma”) are the exception



Visual Field Defects

- VF defects and ganglion cell loss may be the *only* clinical signs of a chiasmal lesion

RED FLAGS

- VF defects that are **greater temporally than nasally**
- VF defects that **respect the vertical meridian**

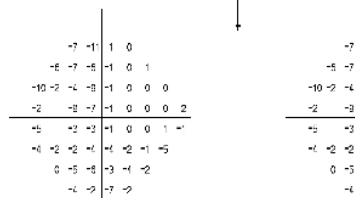
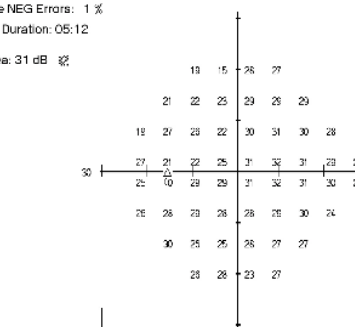
VF defects greater temporally than nasally are NOT typical for glaucoma

Central 24-2 Threshold Test

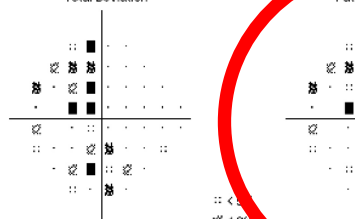
Fixation Monitor: Gaze/Blind Spot
Stimulus: III, White
Background: 31.5 ASB
Fixation Target: Central
Fixation Losses: 1/15
Strategy: SITA-Standard

False POS Errors: 0 %
False NEG Errors: 1 %
Test Duration: 05:12

Fovea: 31 dB



Total Deviation



Legend:
● < 2%
■ < 1%
■ < 0.5%

Single Field Analysis

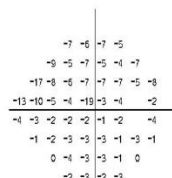
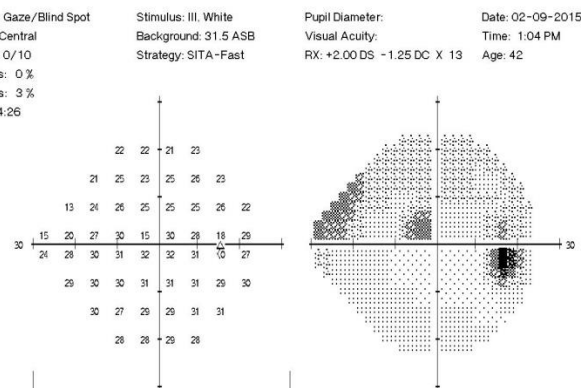
Name: ID:
Eye: Right
DOB: 11-23-1972

Central 24-2 Threshold Test

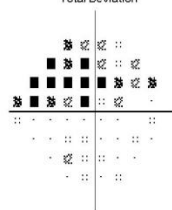
Fixation Monitor: Gaze/Blind Spot
Stimulus: III, White
Background: 31.5 ASB
Fixation Target: Central
Fixation Losses: 0/10
Strategy: SITA-Fast

False POS Errors: 0 %
False NEG Errors: 3 %
Test Duration: 04:26

Fovea: OFF

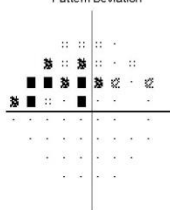


Total Deviation



Legend:
● < 5%
● < 2%
■ < 1%
■ < 0.5%

Pattern Deviation

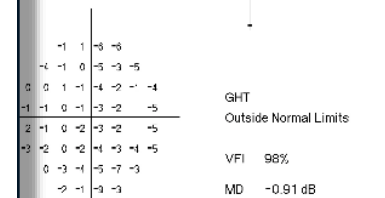
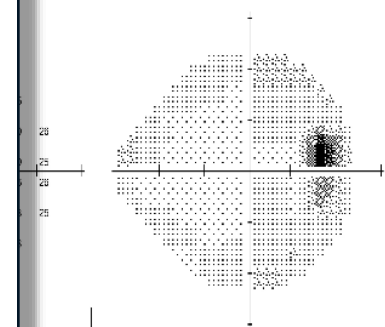


BOWDEN EYE CARE

GHT
Outside Normal Limits

VFI 90%
MD -4.62 dB P < 1%
PSD 3.96 dB P < 0.5%

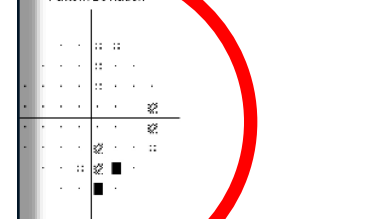
Pupil Diameter: 4.3 mm
Visual Acuity: 20/20
RX: +2.50 DS DC X
Date: 10:53 AM
Time: 10:53 AM
Age: 61



GHT
Outside Normal Limits

VFI 98%
MD -0.91 dB
PSD 2.29 dB P < 5%

Pattern Deviation



Visual Defects in Patients With Pituitary Adenomas: The Myth of Bitemporal Hemianopsia

OBJECT

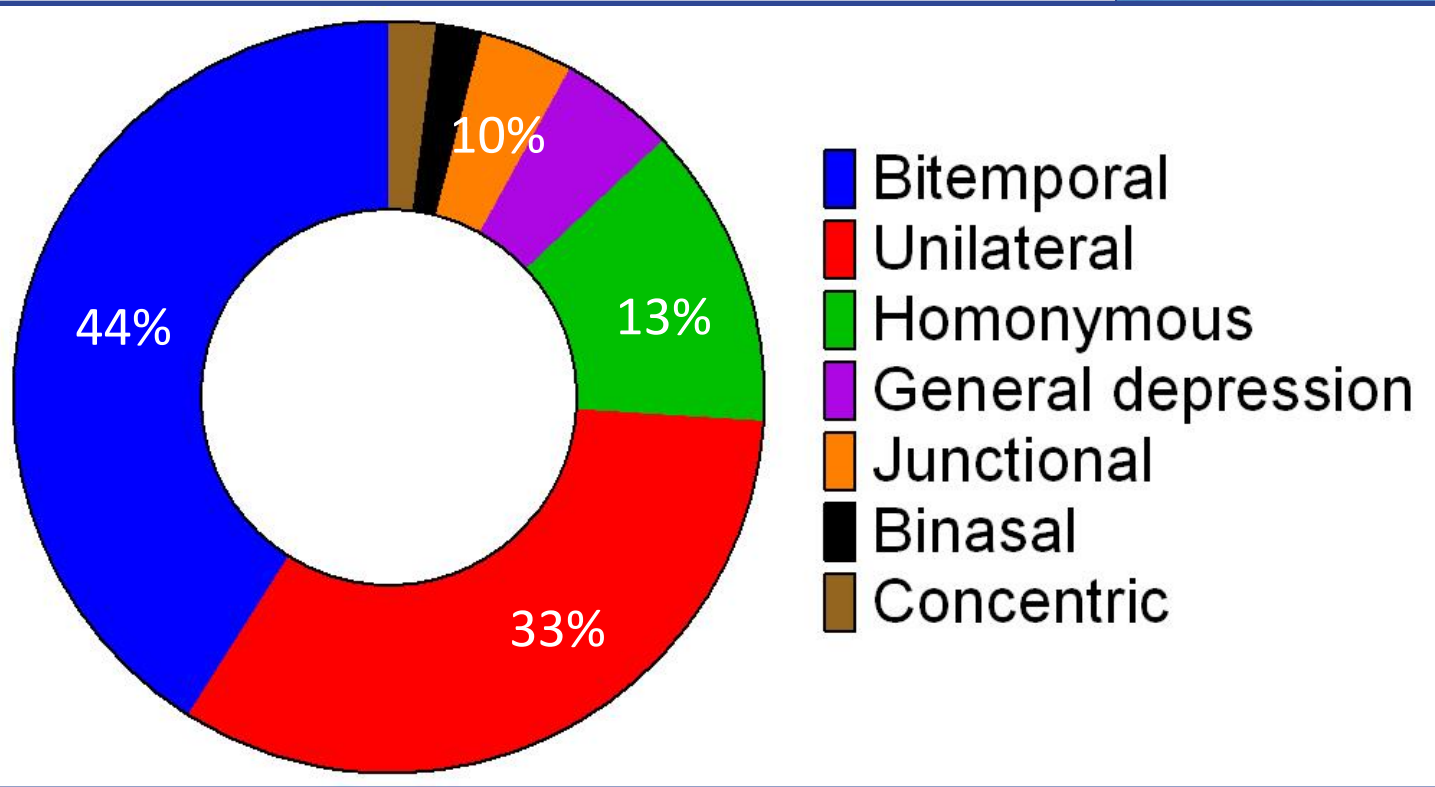
anopsia (B
roadenoma
sual defects

MATER

of 119 patie
We then ev
roadenoma,
included no
ate displace
that were m
or nonspeci

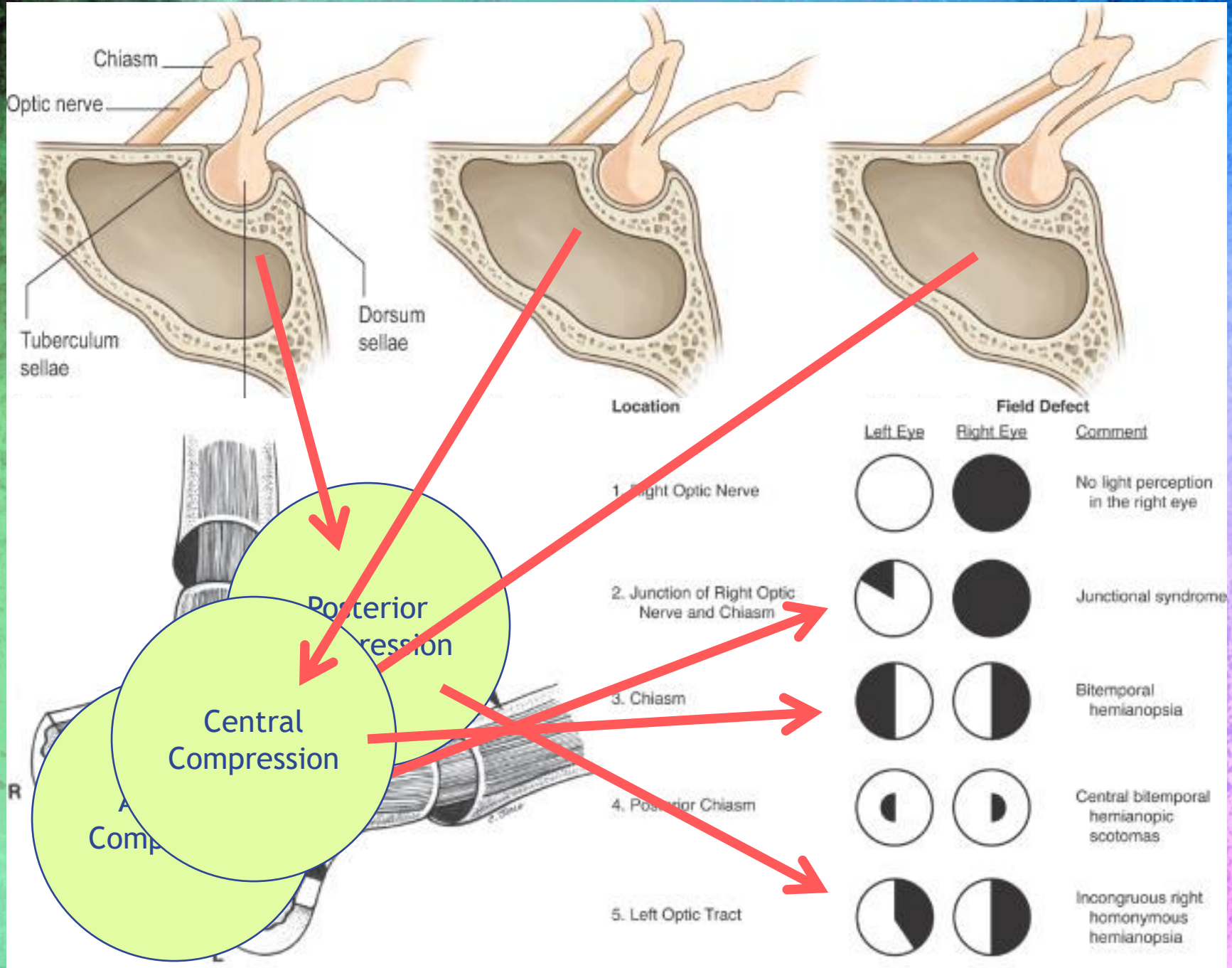
RESULT

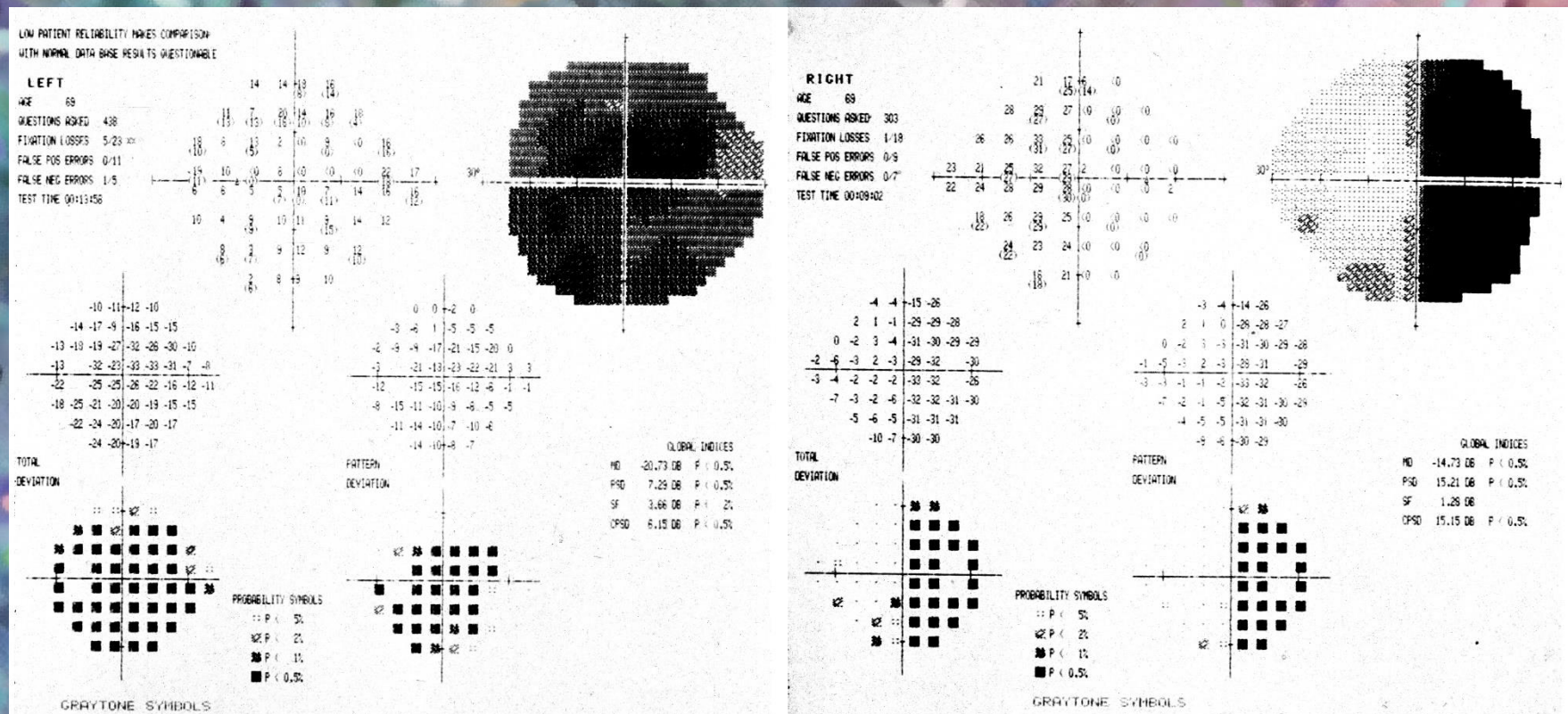
BHA. The



Bitemporal hemianopia accounts for $\approx 40\%$ of VF defects caused by chiasmal compression

Source: PIDM 26496573; 23563861





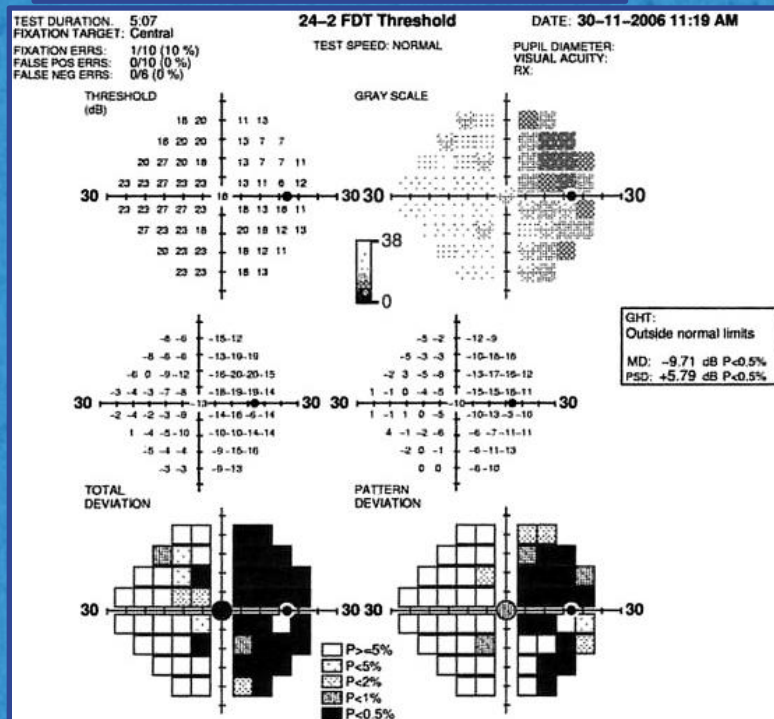
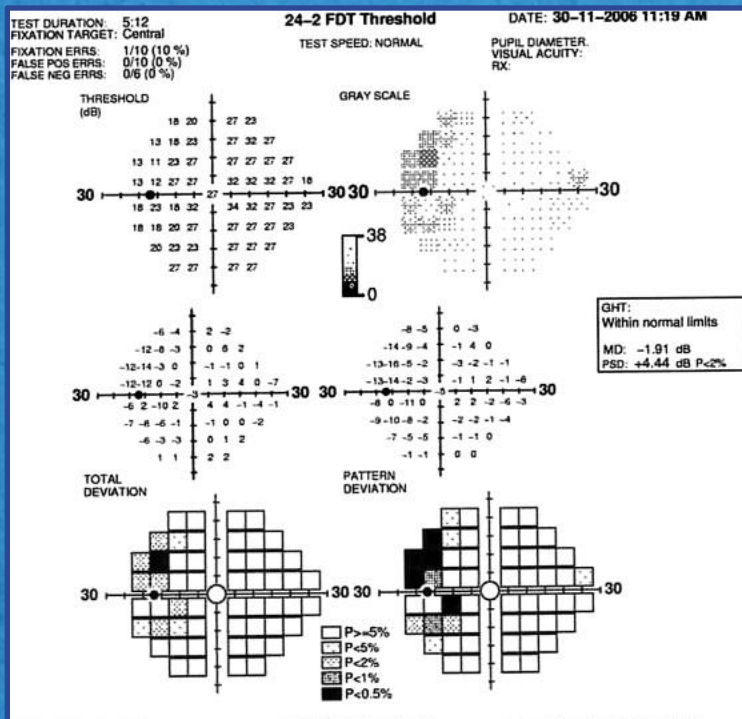
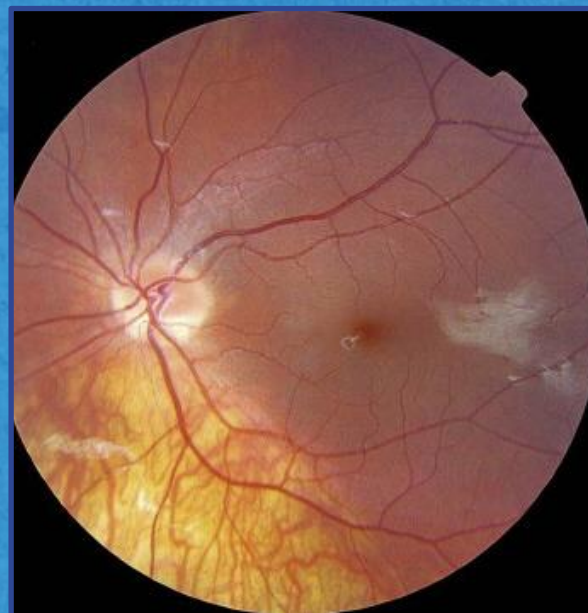
Junctional scotoma of the left eye. This 69yo man presented with c/o vision loss OS x 4 weeks. BVA was 20/25 OD and FC OS. +APD OS. CT scan revealed a pituitary adenoma.

Visual Field Defects

- Bitemporal hemianopia is NOT pathognomonic for chiasmal syndrome
- Other conditions that can give rise to bitemporal vision loss
 - Tilted disc syndrome
 - Overhanging redundant upper lid tissue
 - Enlarged blind spots
 - Bilateral medullation of nasal nerve fibers

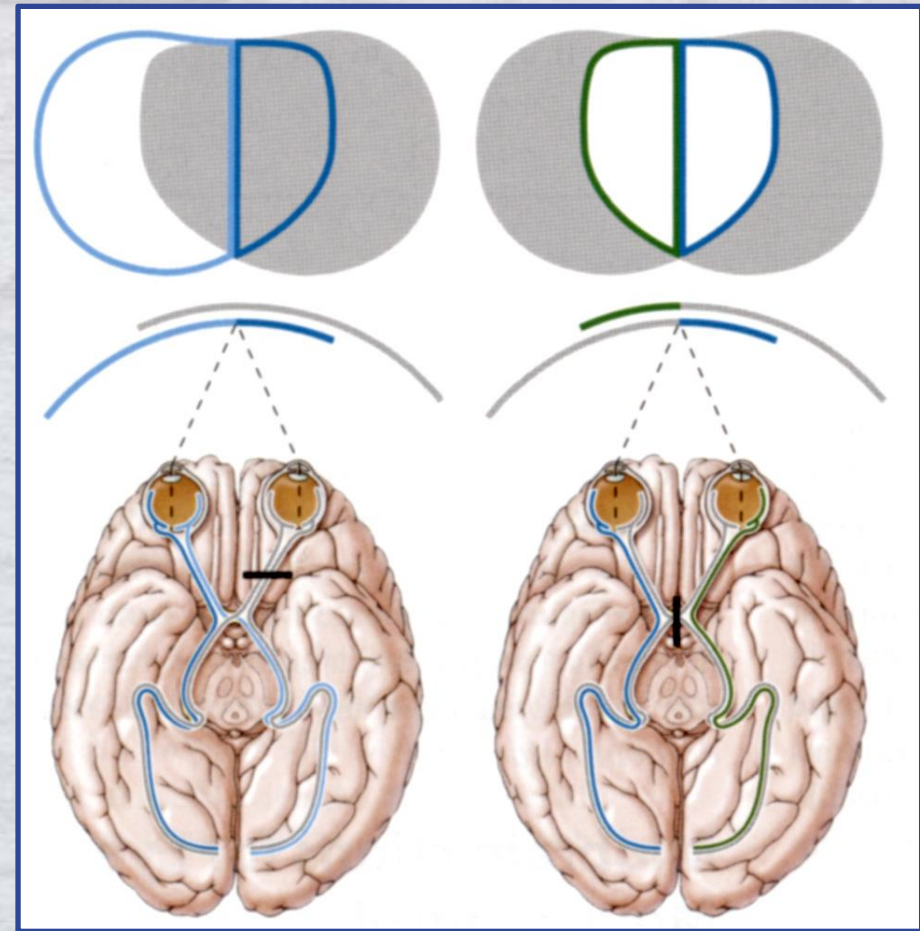
Tilted disc syndrome simulating bitemporal hemianopia

Sowka JW, Luong V
V. Optometry
2009;80:232-42.



Bitemporal Hemianopia

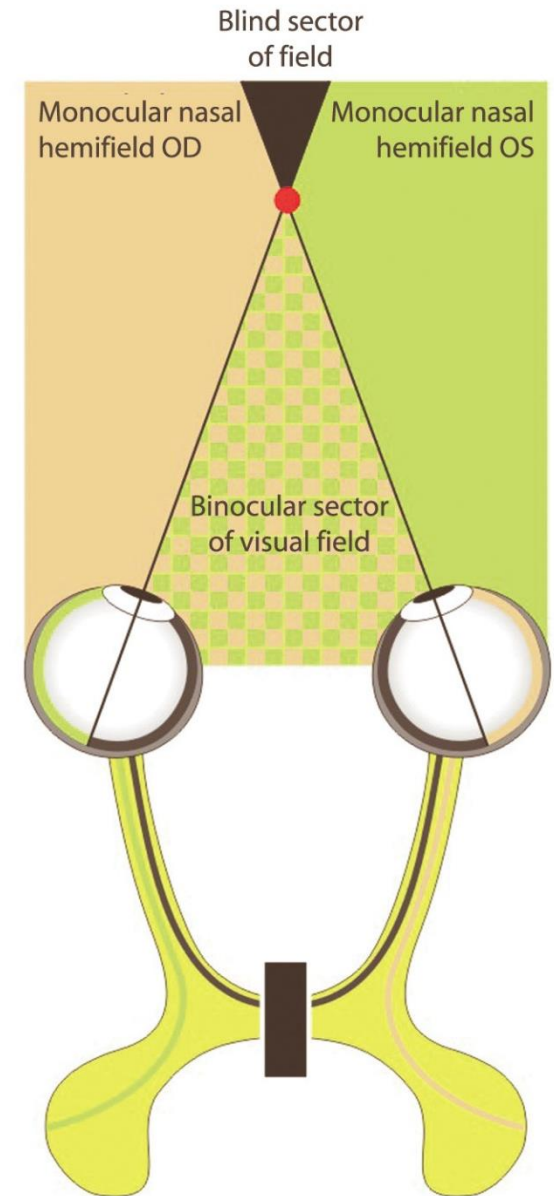
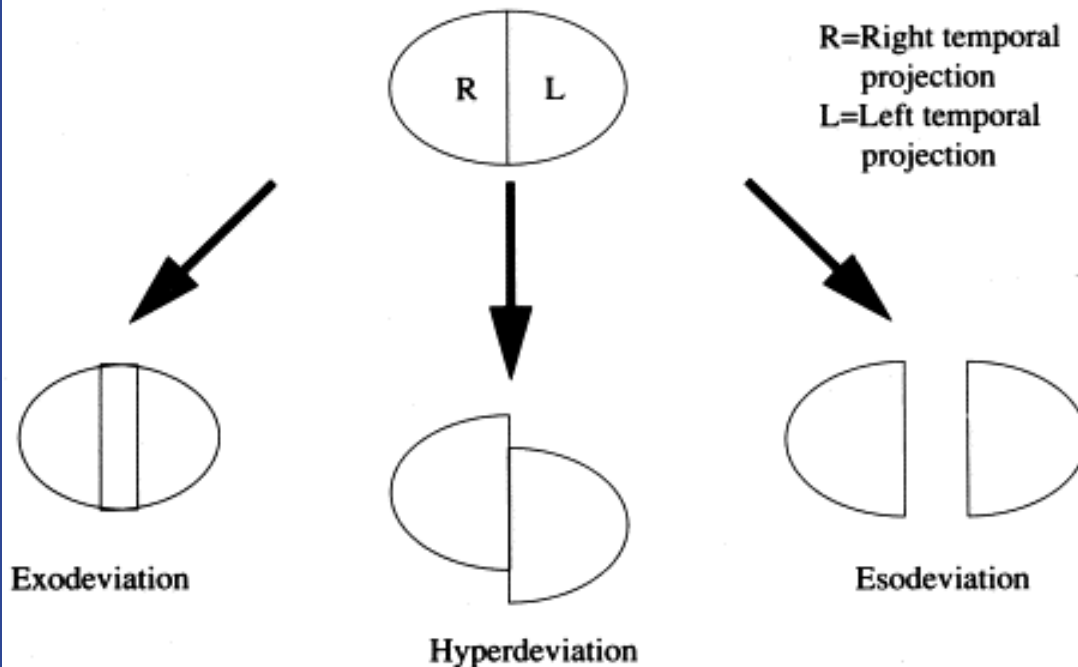
- The temporal crescents are the only part of the binocular VF that is lost
- A central 110-120° remains but there are **no overlapping VF elements**
- Lack of fusion lock decompensates any pre-existing phoria into a tropia



Absence of fusion lock allows hemifields to slide.

When converged at near, there is overlap before the target and blindness behind it.

KIRKHAM'S "HEMIFIELDS SLIDE PHENOMENON"



Diplopia & Stereopsis

- Intermittent diplopia occurs due to decompensating exophoria and vertical imbalance
- *Poor depth perception is an important symptom of chiasmal syndrome*
- Loss of overlapping VF at fixation results in severe loss of stereopsis, even when VF loss is minimal and VA is preserved.
- **Stereo tests are a simple, easy, and quick screening test for chiasmal disease**

Chiasmal Syndrome

SYMPTOMS

- Headache
- Visual loss
- Diplopia
- Loss of depth perception
- Endocrine dysfunction

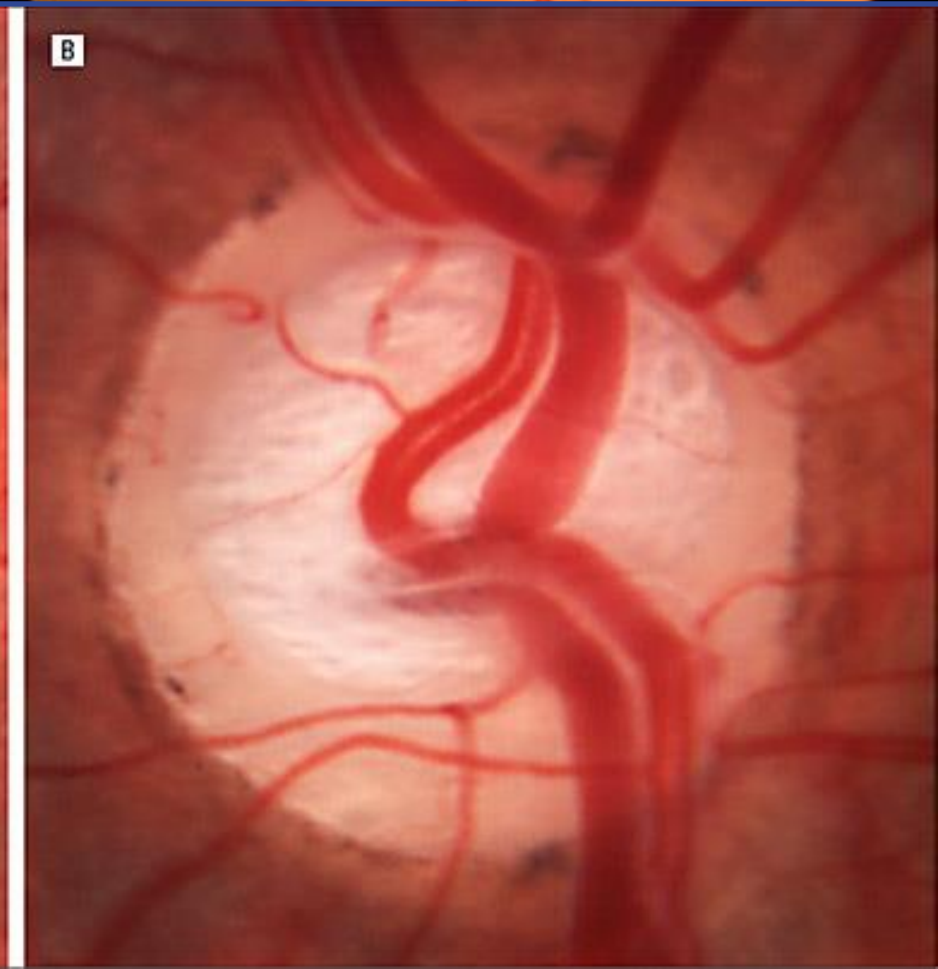
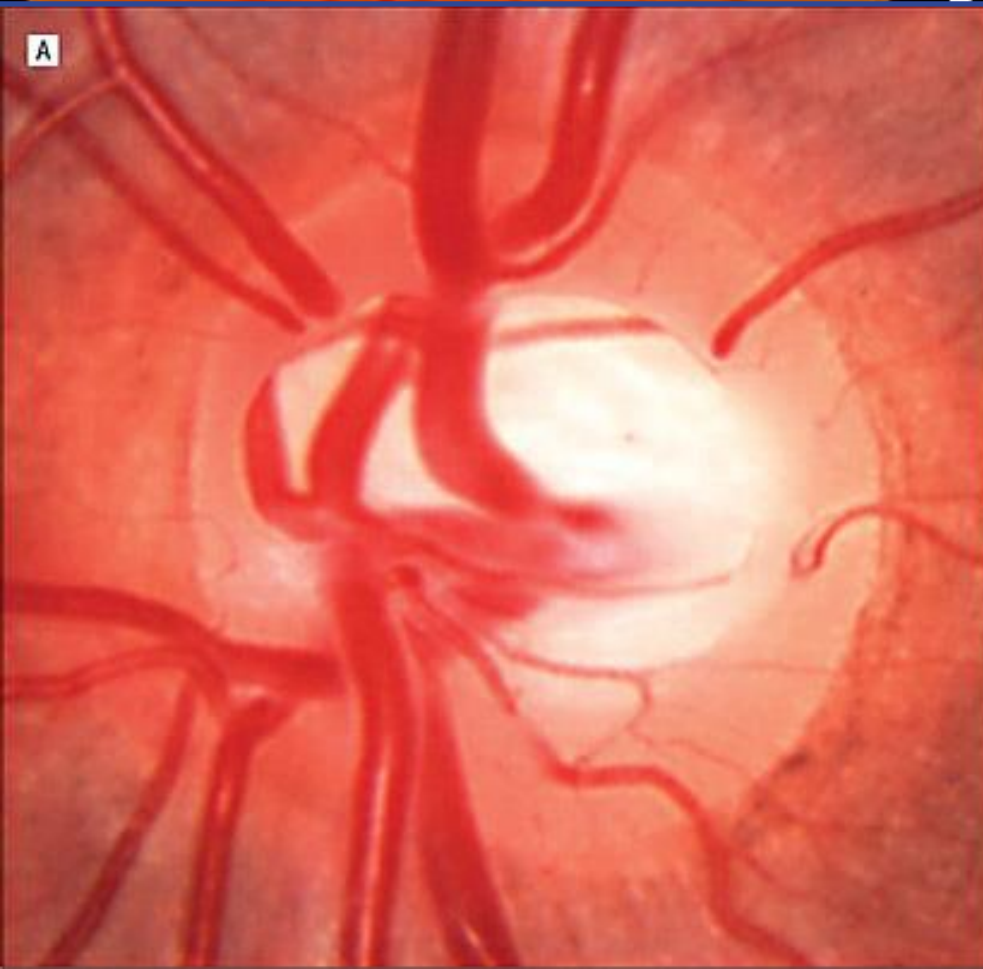
SIGNS

- Visual field defects
- Optic disc pallor and cupping
- OCT abnormalities
- Oculomotor paresis
- Nystagmus
- Cerebrospinal fluid rhinorrhea

Optic Disc

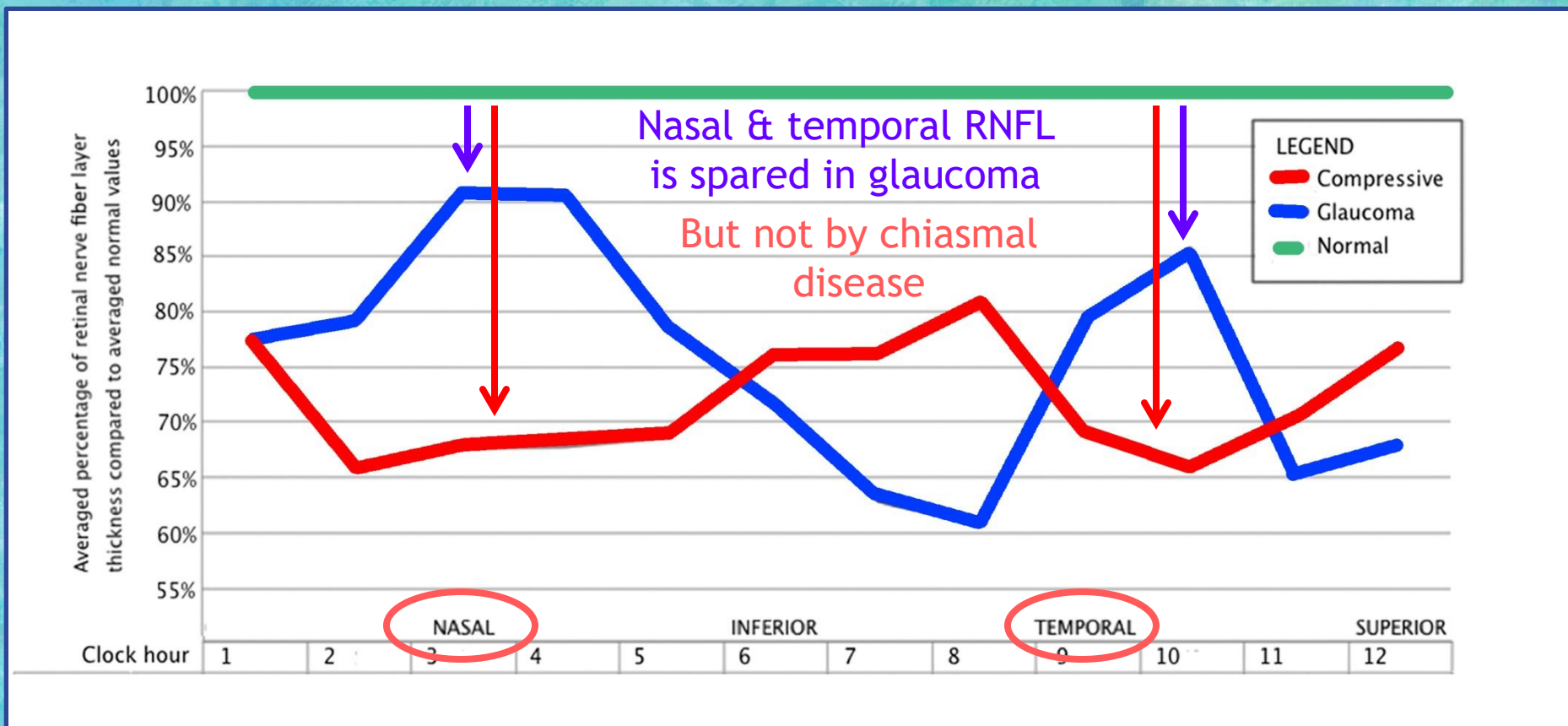
- Pituitary adenoma is an important cause of non-glaucomatous optic disc cupping
 - Compression of the chiasm can produce shallow enlargement of the cup (no lamellar back-bowing)
- End stage chiasmal compression may produce a horizontal **band of pallor** (“bow-tie”)
- Pituitary adenoma does not cause papilledema



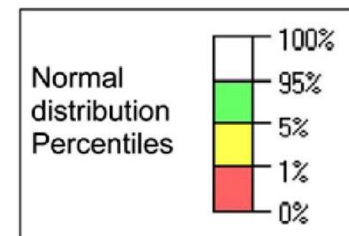
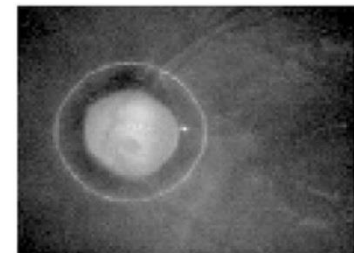
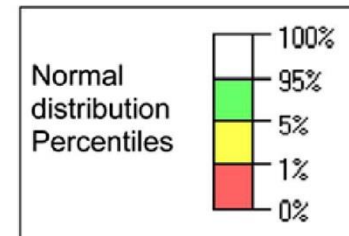
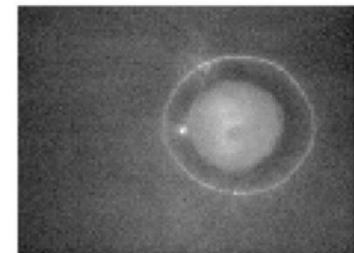
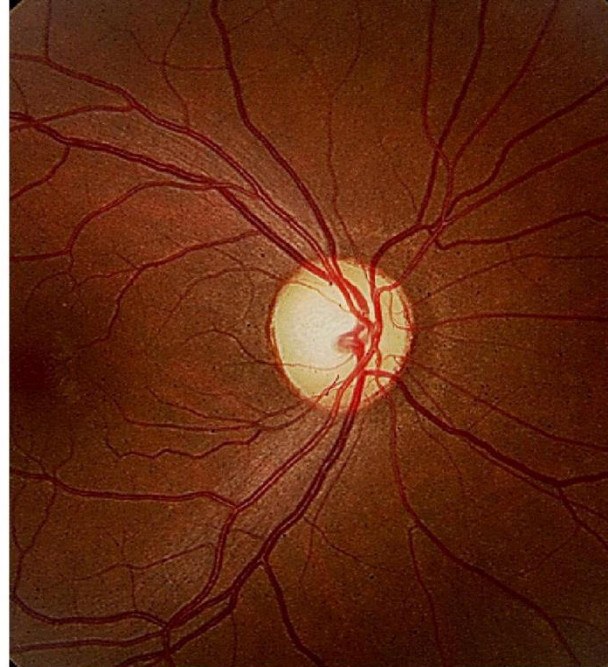


OCT Findings

- Chiasmal compression results in RNFL and GCC thinning
 - Unlike glaucoma, RNFL thinning is fairly uniform in all meridians
 - Binasal thinning of the GCC may be detected before RNFL loss (also before VF loss)
 - *More severe RNFL/GCC loss is associated with less VF recovery following tumor excision (Prognostic indicator?)*



There is relative sparing of the nasal and temporal RNFL with glaucomatous optic neuropathy but not with chiasmal compression.



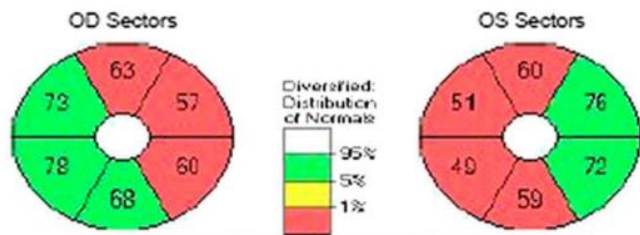
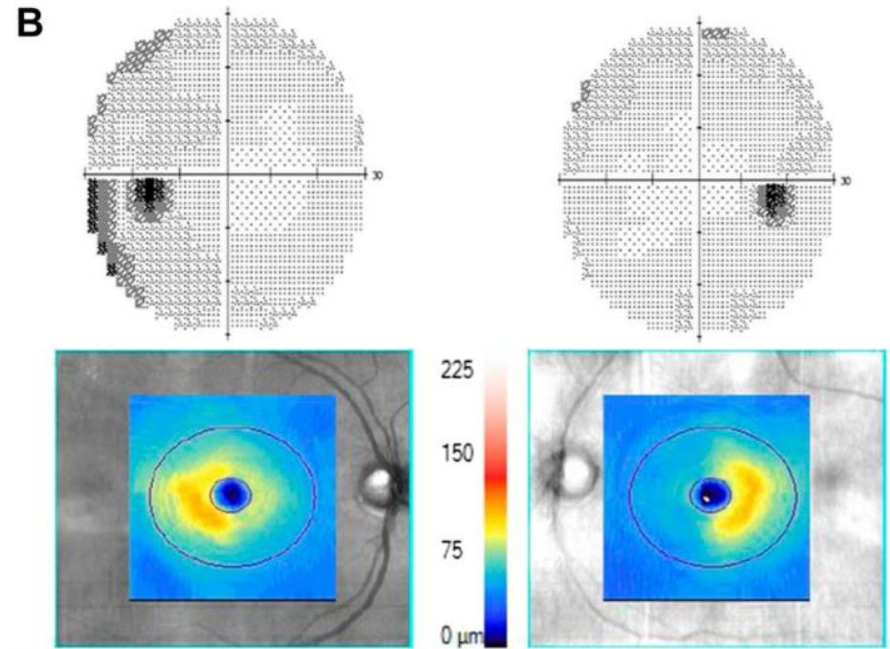
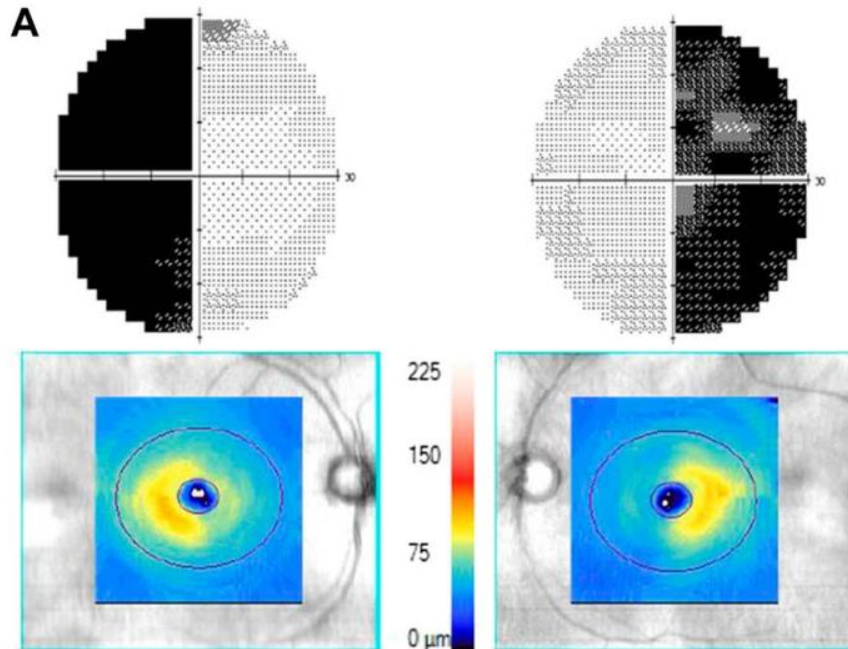
OCT Findings

- GCC thinning is more sensitive than perimetry in detecting chiasmal compression
- **Ganglion cell complex (GCC) thinning occurs before visual field loss**

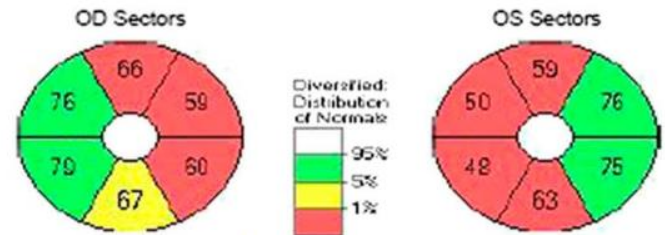
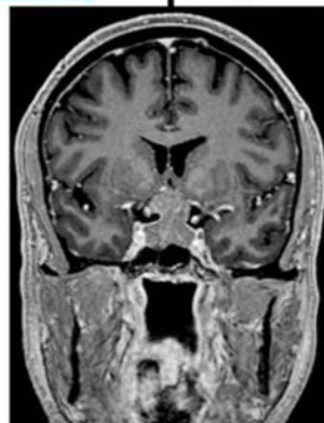


Pre-Op

Post-Op



	OD μm	OS μm
Average GCL + IPL Thickness	66	61
Minimum GCL + IPL Thickness	59	47

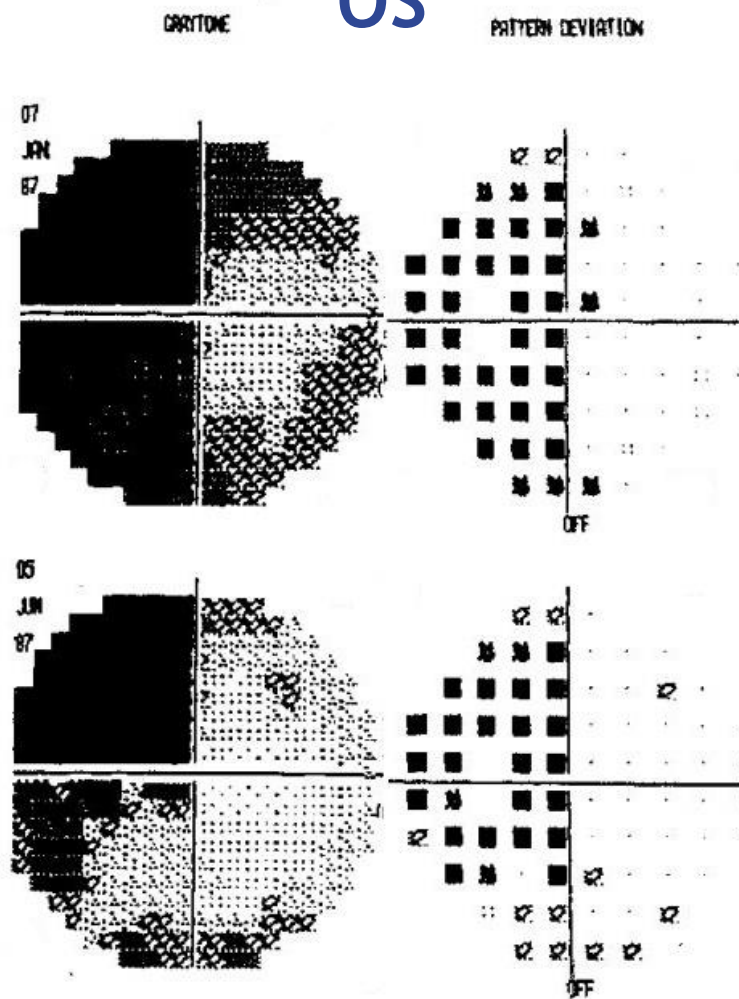


	OD μm	OS μm
Average GCL + IPL Thickness	68	62
Minimum GCL + IPL Thickness	61	48

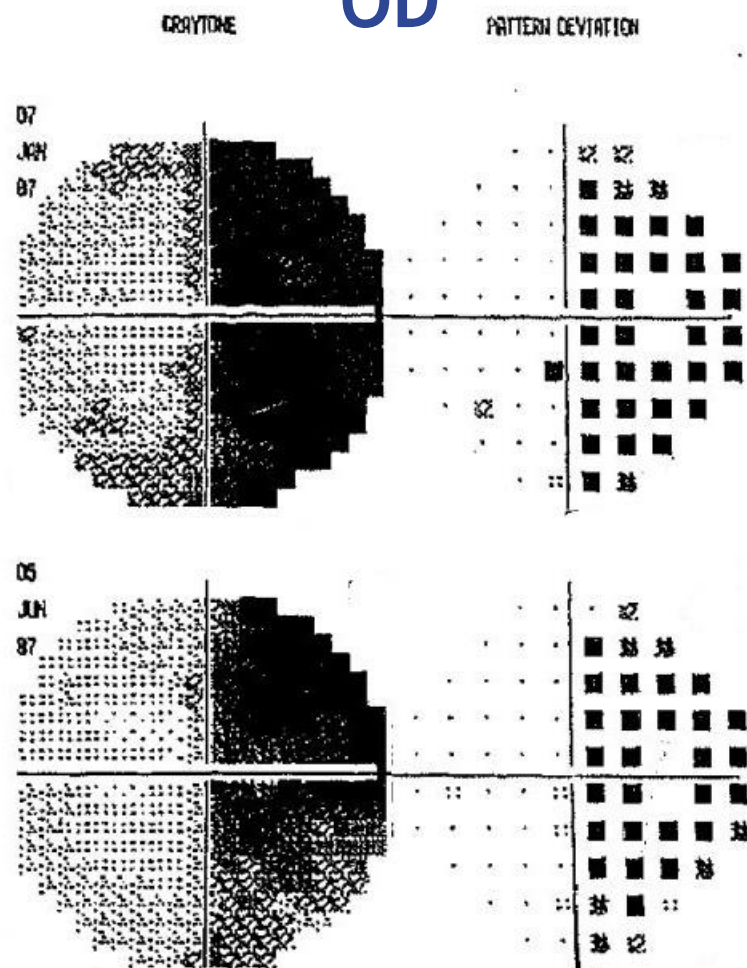
Prognosis

- Visual outcome following pituitary adenoma surgery is highly variable
 - RNFL/GCC thickness, duration of symptoms, disc pallor, and age influence recovery
 - **Most patients will experience some recovery**, and many will experience complete resolution of VF defects
 - Most of the recovery occurs within the first 3 months following surgery

OS

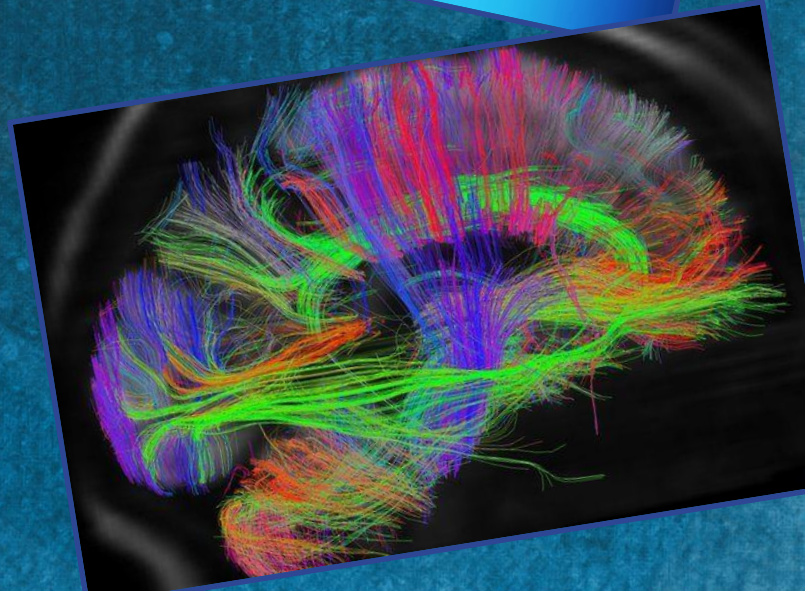


OD



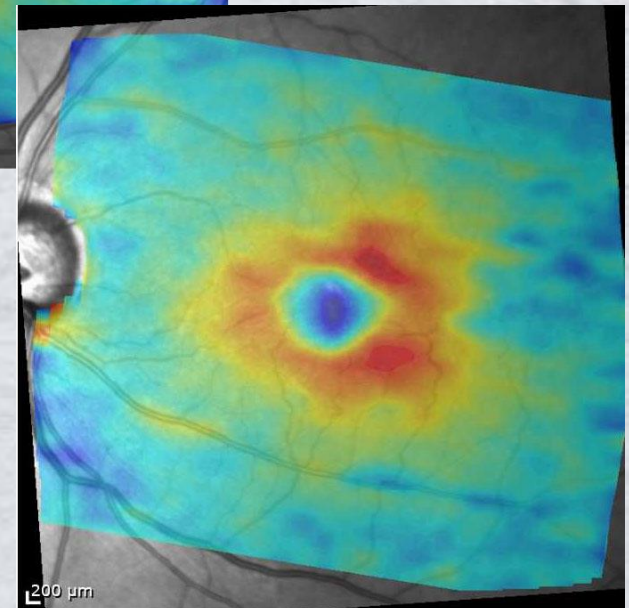
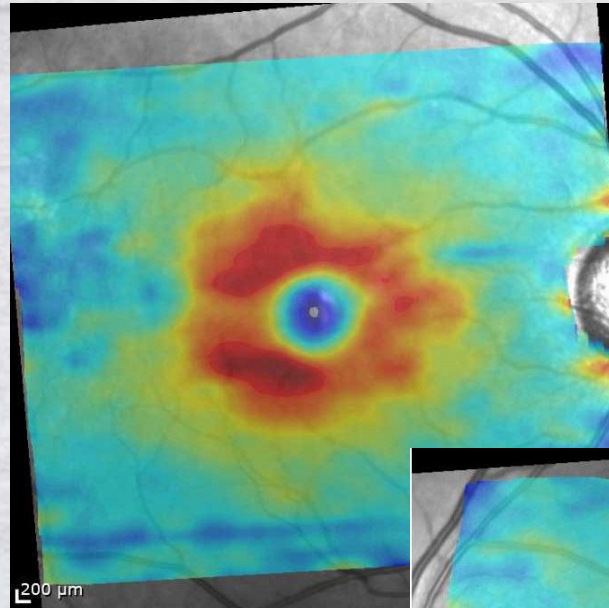
Chiasmal Syndrome

- Anatomy Review
- All About Pituitary Adenomas
- Clinical Features of Chiasmal Syndrome
- Clinical Pearls
 - Red Flag Warning Signs
 - Case examples



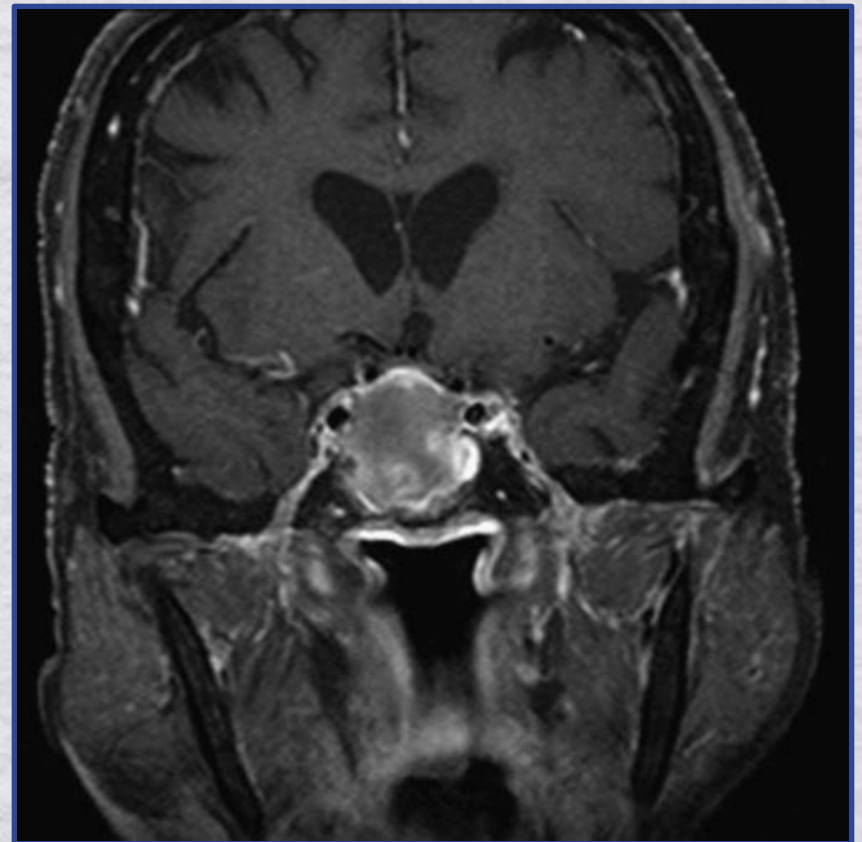
Red Flags

- Headaches
- NTG suspects
- Binodal GCC thinning
- VF loss greater temporally than nasally



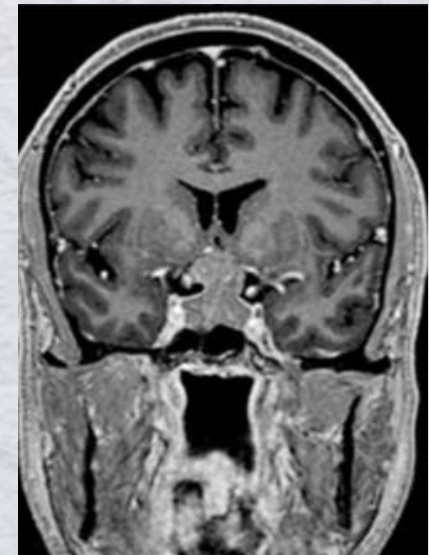
Red Flags

- When should I order an MRI on my NTG suspects?
 - Age younger than 50 years
 - VA less than 20/40
 - Optic nerve pallor
 - **Vertically aligned visual field defects**
 - Focal neurologic signs (eg. **headache**)



MRI

- **Required to confirm diagnosis** and plan treatment
- Order MRI of optic chiasm with and without contrast
- The exploration protocol is with T1-weighted sagittal sections, then T1- and T2-weighted coronal sections with and without contrast



Case 2

Case 2

44yo WM presents for routine exam

- POH: LEE 7-8yrs ago
- MH: Migraines, smoker. No meds

BCVA: 20/25 OD, 20/20 OS

PERRL, (-)APD / FROM

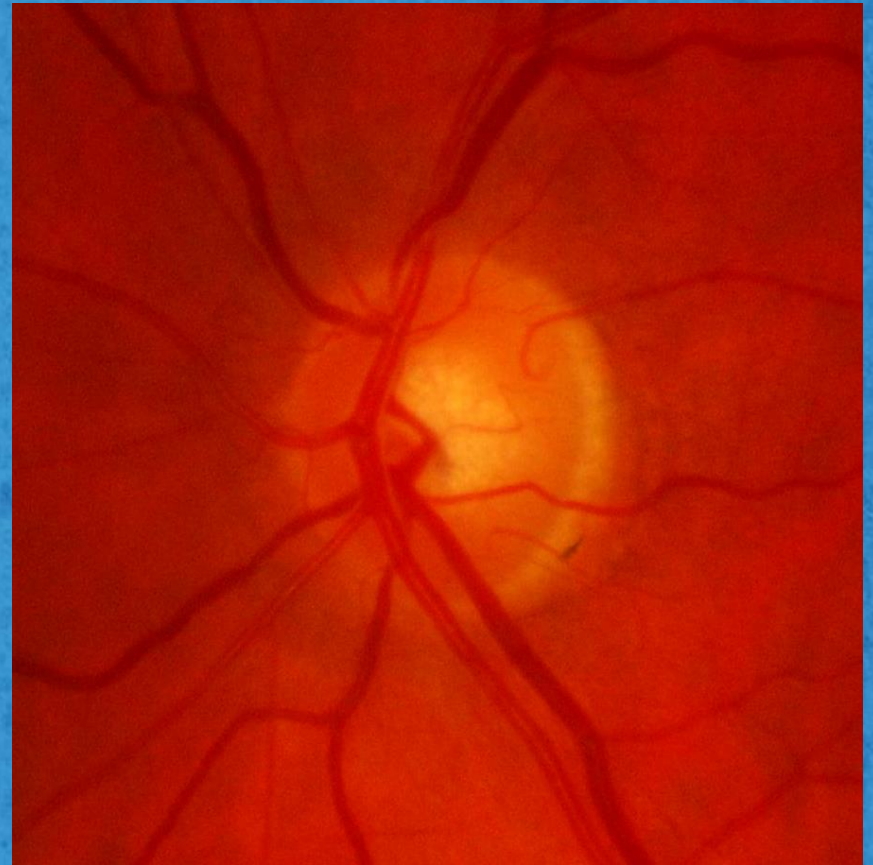
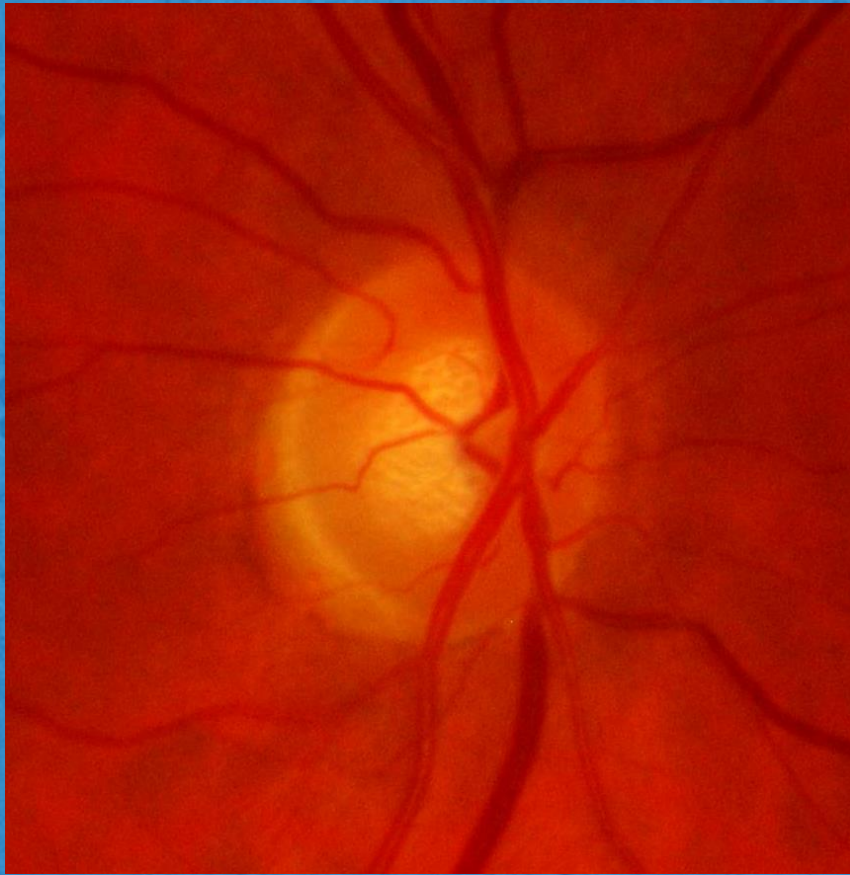
Ta 20/20 @ 3PM

SLE: WNL OU

CDR: 0.6 OD, 0.5 OS

IMP: Borderline IOP
with asym cupping

Plan: Schedule VF



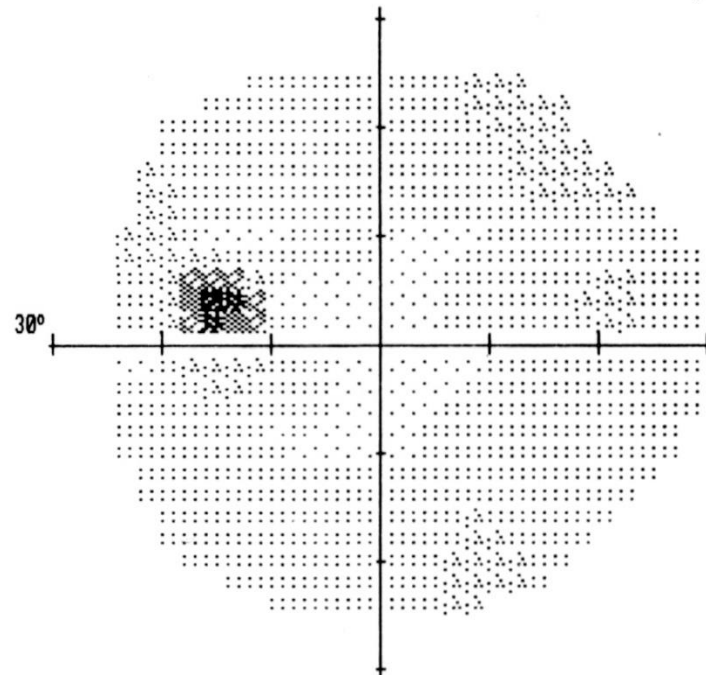
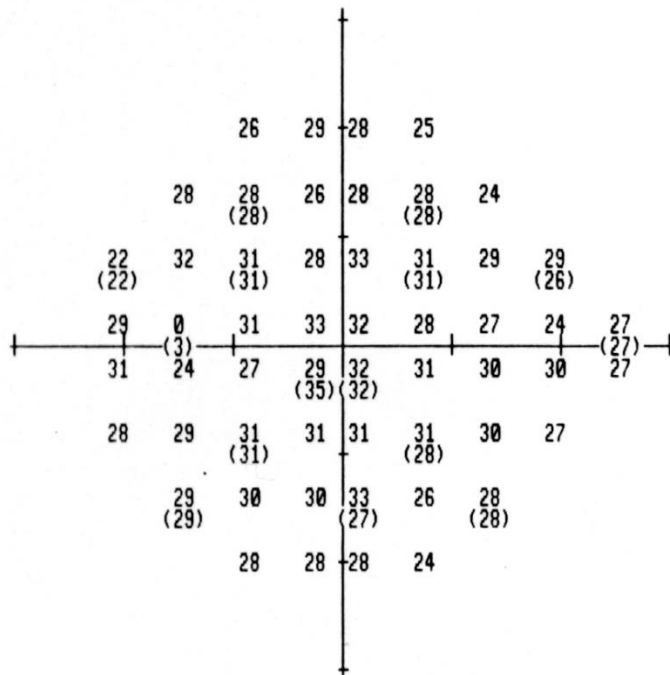
Slight asymmetry of optic cupping

LEFT EYE

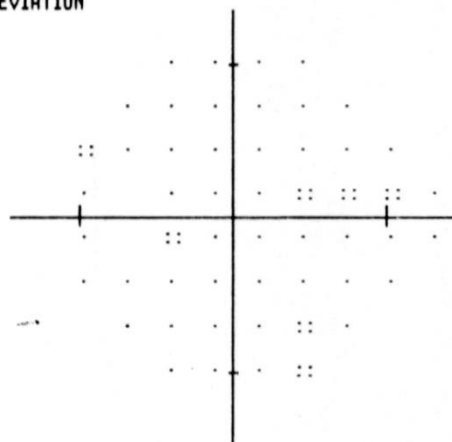
AGE 44
 FIXATION LOSSES 0/12
 FALSE POS ERRORS 0/9
 FALSE NEG ERRORS 0/6
 QUESTIONS ASKED 210
 F0VERA: 37 DB
 TEST TIME 05:55

HFA S/N 607-1382

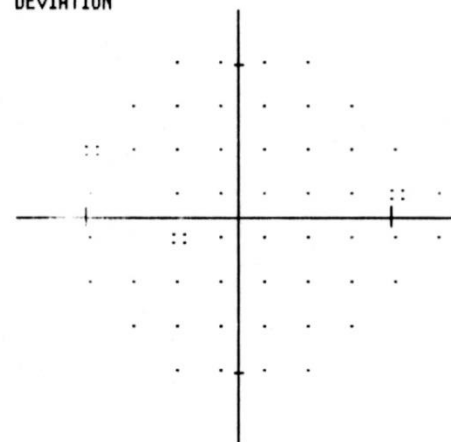
MD - 1.56 DB
 PSD 1.96 DB
 SF 1.60 DB
 CPSD 0.96 DB



TOTAL
DEVIATION



PATTERN
DEVIATION



PROBABILITY SYMBOLS

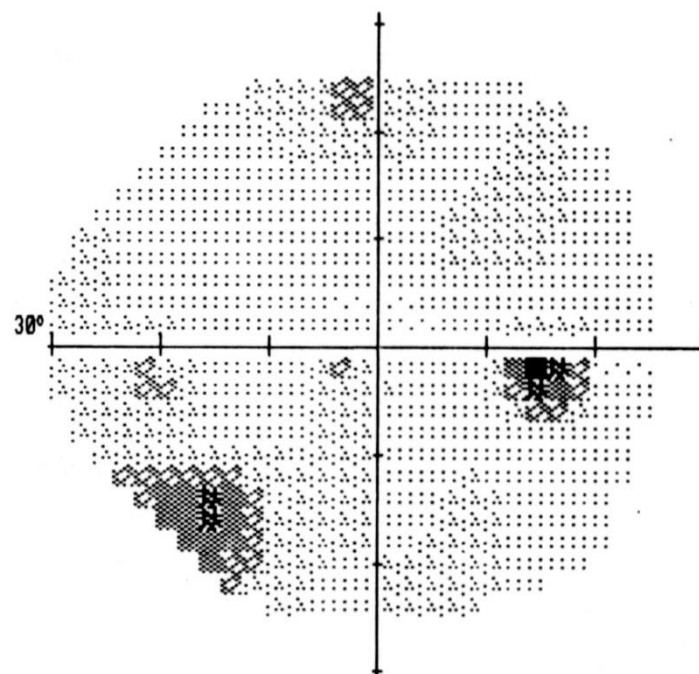
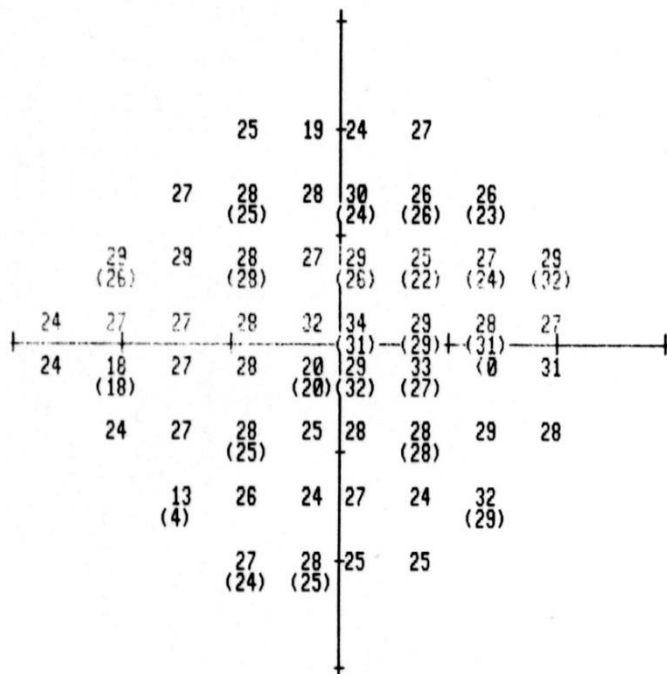
- ∴ P < 5%
- ⊠ P < 2%
- ⊛ P < 1%
- P < 0.5%

RIGHT EYE

AGE 44
 FIXATION LOSSES 0/13
 FALSE POS ERRORS 0/11
 FALSE NEG ERRORS 0/7
 QUESTIONS ASKED 248
 FOVEA: 36 DB
 TEST TIME 07:17

HFA S/N 607-1382

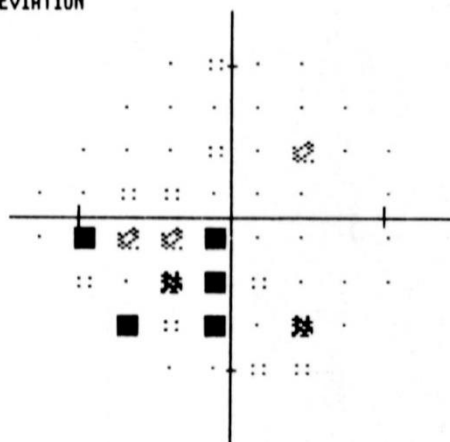
MD - 4.26 DB P < 2%
 PSD 4.05 DB P < 2%
 SF 2.51 DB
 CPSD 3.03 DB P < 0.5%



TOTAL
DEVIATION

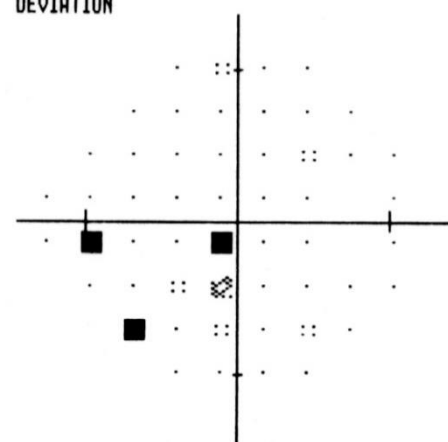
PATTERN
DEVIATION

GAT: 18/15 (6:30pm)



PROBABILITY SYMBOLS

⋯ P < 5%
 ▨ P < 2%
 ▩ P < 1%
 ■ P < 0.5%

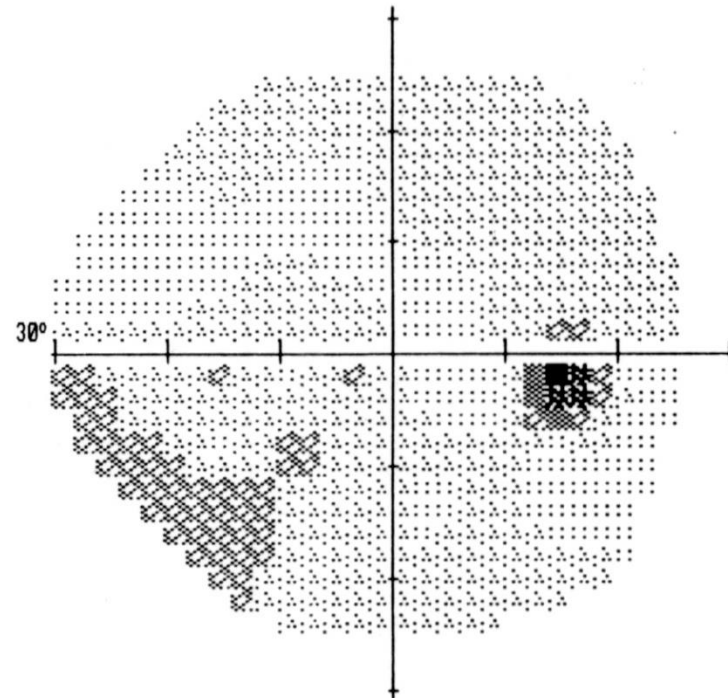
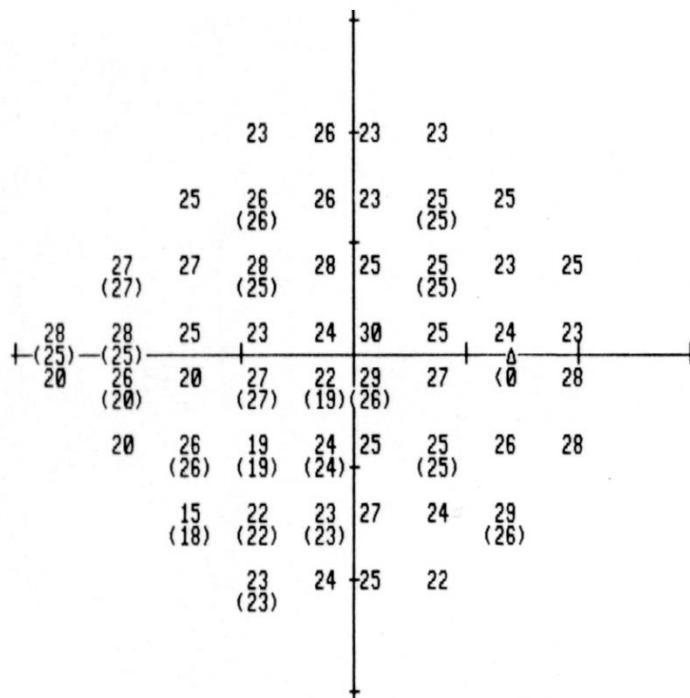


RIGHT EYE

AGE 44
 FIXATION LOSSES 0/12
 FALSE POS ERRORS 0/8
 FALSE NEG ERRORS 0/6
 QUESTIONS ASKED 212
 FOVEA: 28 DB ■
 TEST TIME 06:08

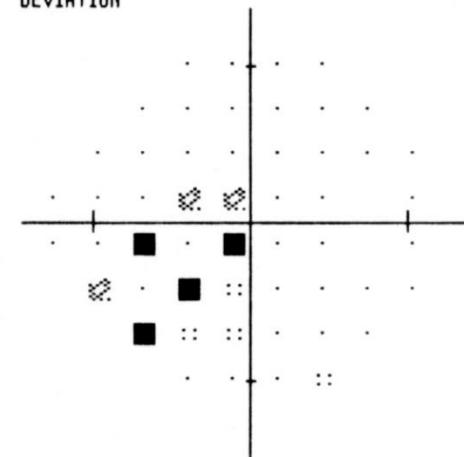
HFA S/N 607-1382

MD - 6.18 DB P < 0.5%
 PSD 3.23 DB P < 10%
 SF 1.56 DB
 CPSD 2.76 DB P < 1%



TOTAL
DEVIATION

PATTERN
DEVIATION



PROBABILITY SYMBOLS

- ∴ P < 5%
- ⊠ P < 2%
- ⊞ P < 1%
- P < 0.5%

GAT: 19/19 (5pm)

Confirmation of inferior
nasal defect OD

What is going on here?

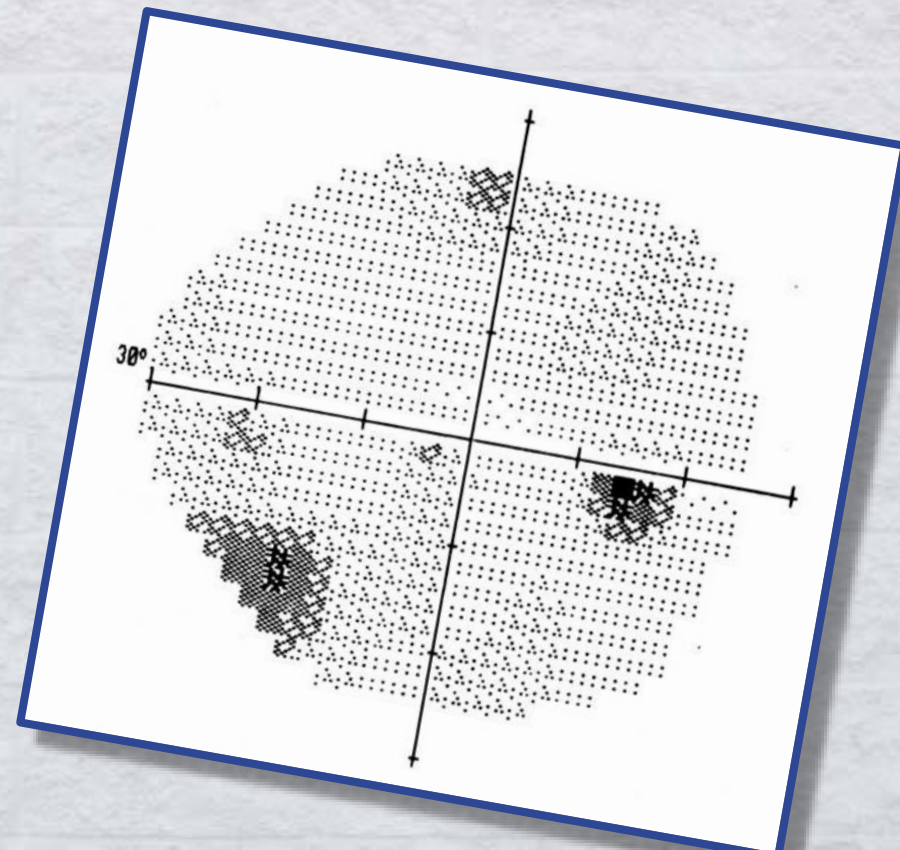
44yo WM

Inferior nasal VF defect OD

15-20 mmHg

C/D: 0.6/0.5

- A. Normal tension glaucoma
- B. Ischemic optic neuropathy
- C. Brain tumor
- D. Something else?



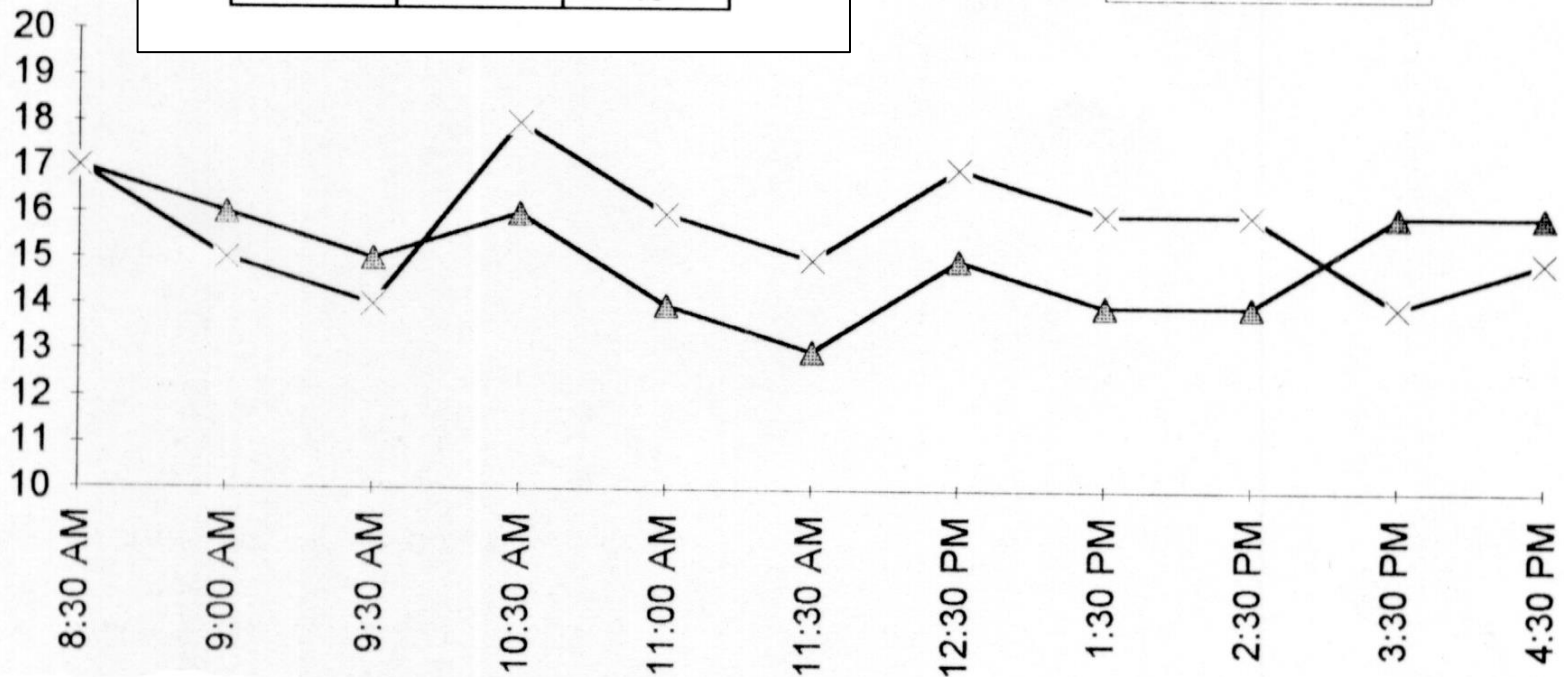
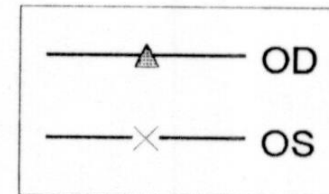
Case 2

- Ophthalmology consult
 - Hx: No head/eye trauma, (+) migraine HA
 - GAT: 19/19 (3:30pm)
 - Gonio: normal OU
 - Pupils normal, Color: normal
 - DFE: normal OU, no pallor
 - **IMP:** Abnormal VF with normal IOP and ONH
 - **PLAN:** Get diurnal curve

APPLANATION TONOMOMETRY READINGS

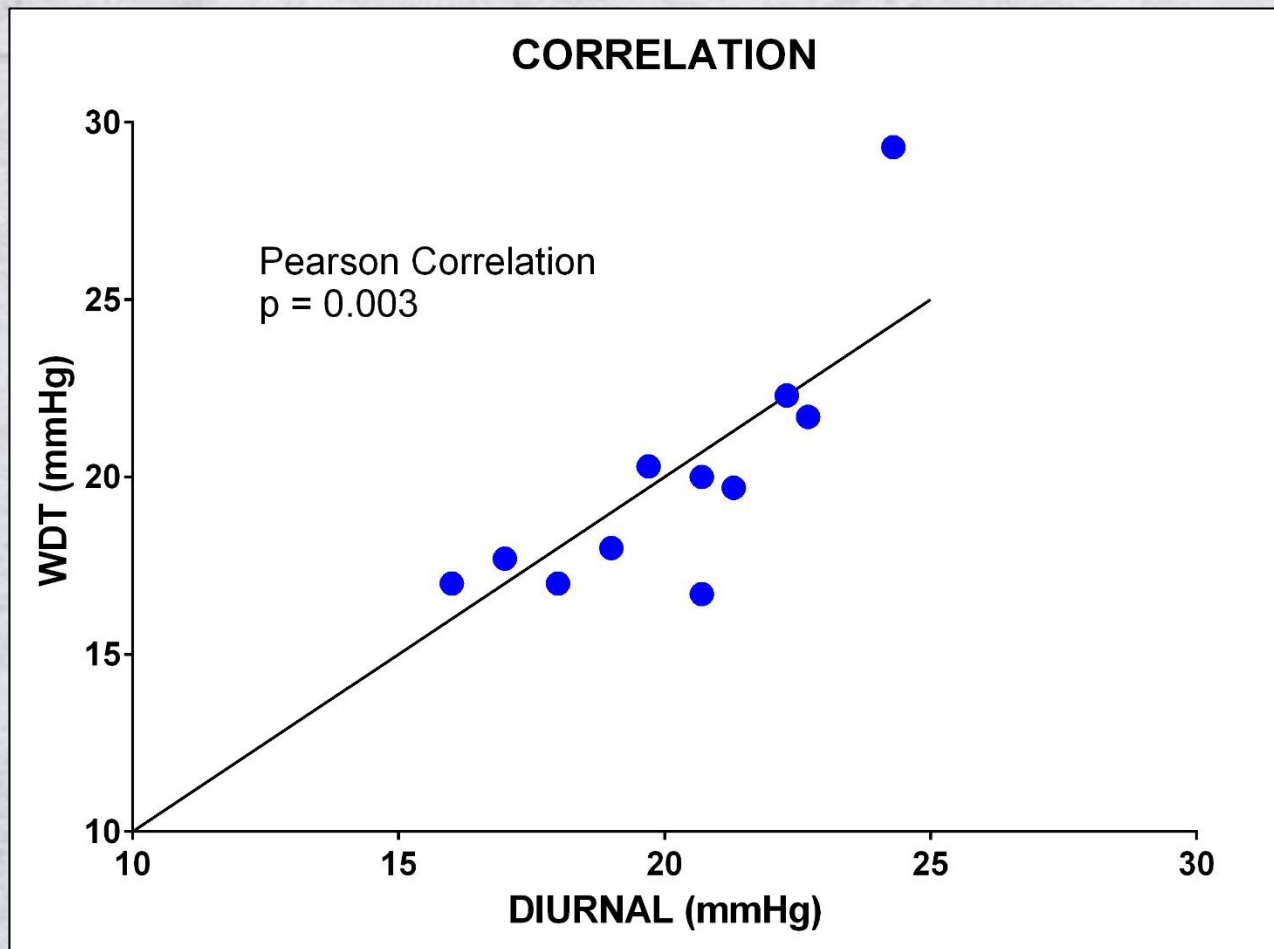
TIME	OD	OS
8:30 AM	17	17
9:00 AM	16	15
9:30 AM	15	14
10:30 AM	16	18
11:00 AM	14	16
11:30 AM	13	15
12:30 PM	15	17
1:30 PM	14	16
2:30 PM	14	16
3:30 PM	16	14
4:30 PM	16	15

Diurnal Curve



Water Drinking Test

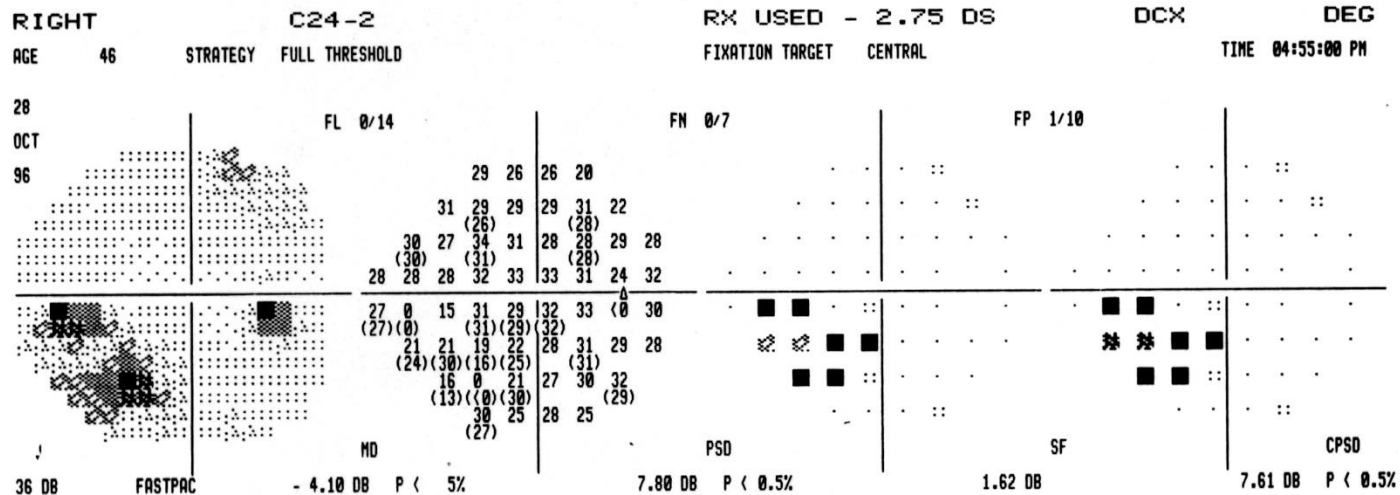
- Estimation of diurnal peak IOP



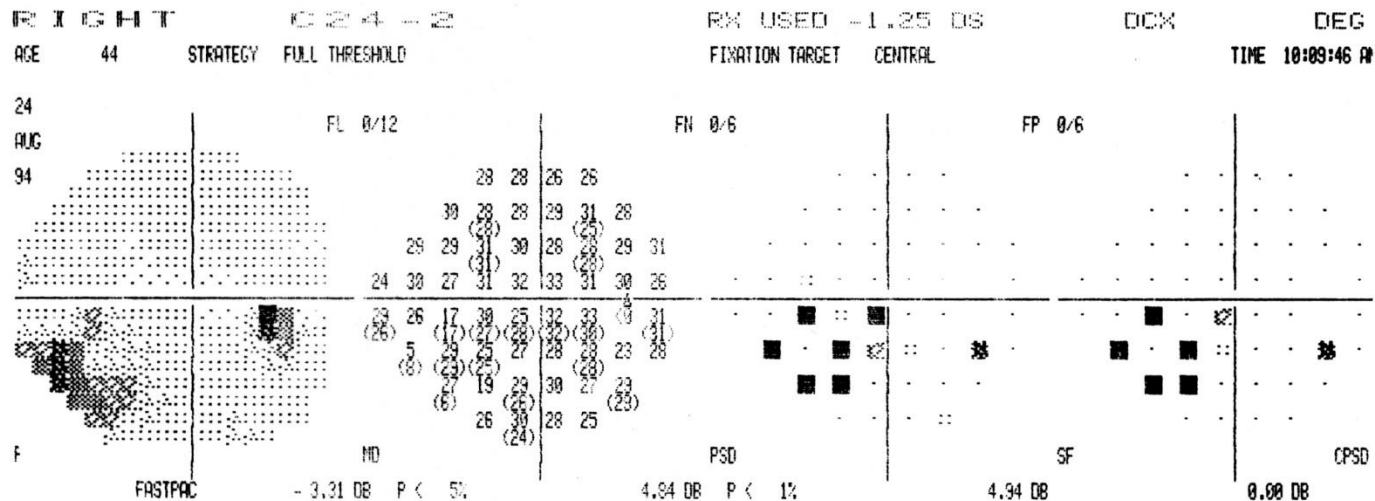
Case 2

- Lost to f/u x 2 years
- Returns with c/o blurry vision
- Vcc
 - 4.00-0.75x060 20/40
 - 4.75 20/40
- Refraction
 - 5.25-1.00x075 20/30
 - 5.25-0.50x105 20/20
- GAT: 18/18 (3:30pm)
- Trace APD OD
- C/D: 0.6/0.5
- IMP: Optic neuropathy OD
- PLAN: VF, CT scan

1996

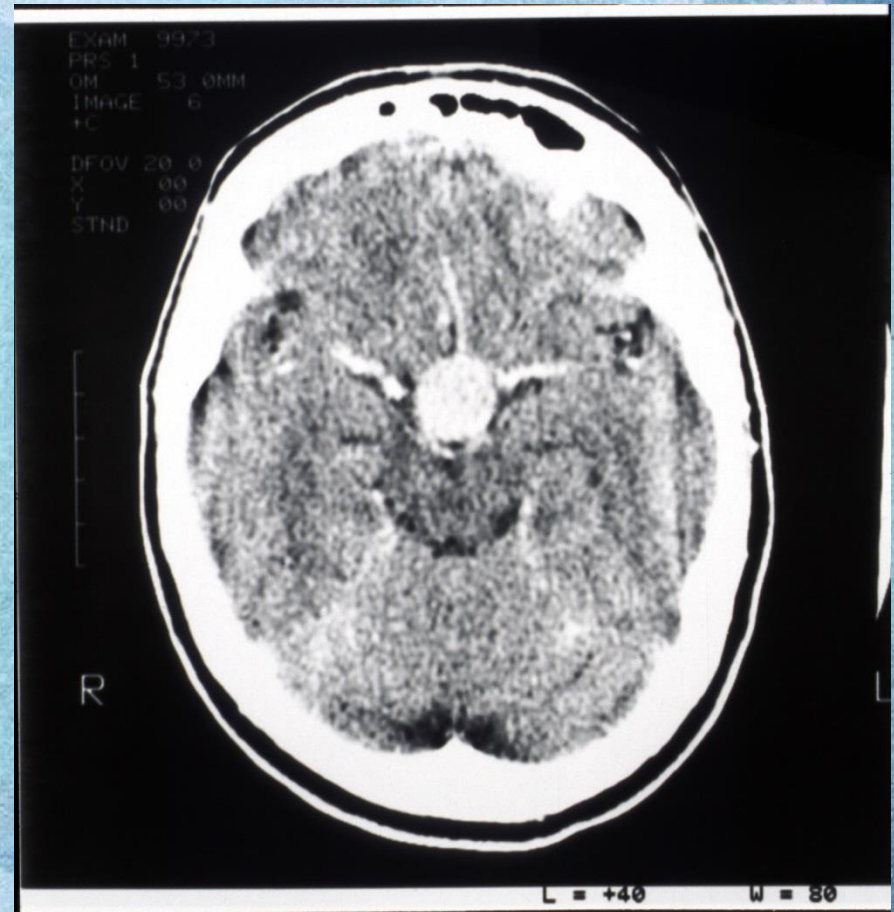
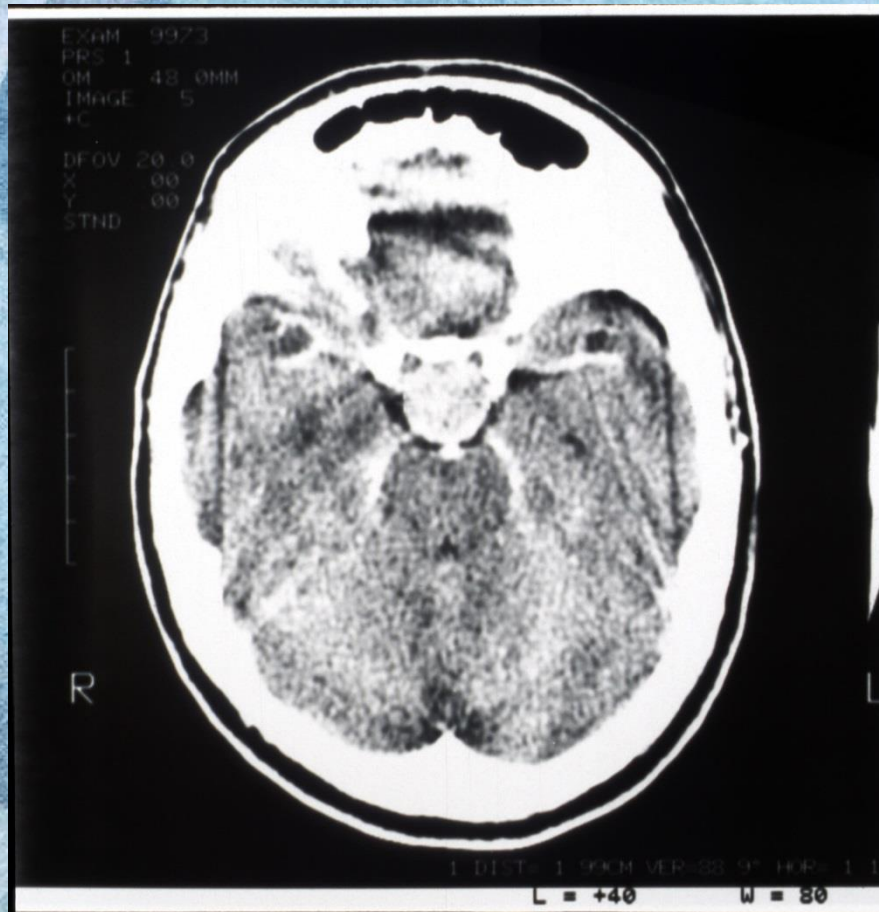


1994



Has progression of the defect occurred?

CT Scan

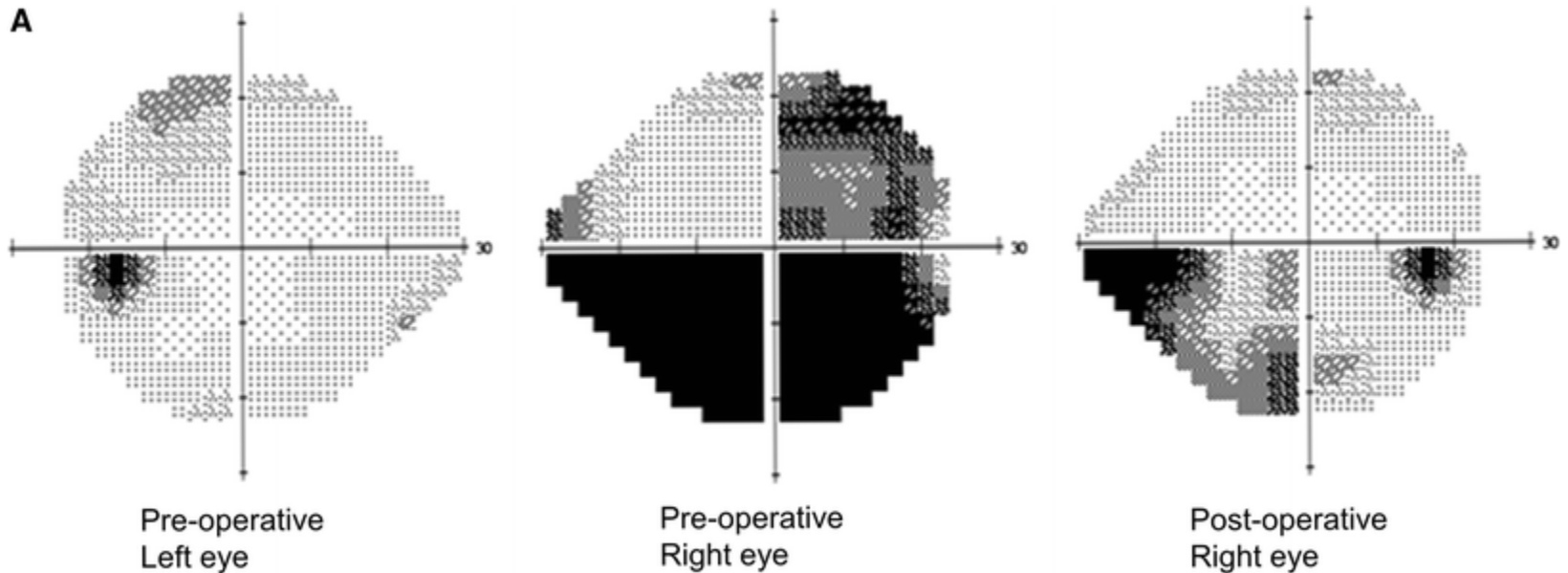


Pituitary adenoma detected on CT scan of brain

LETTER TO THE EDITOR

Unusual chiasmal visual field defects

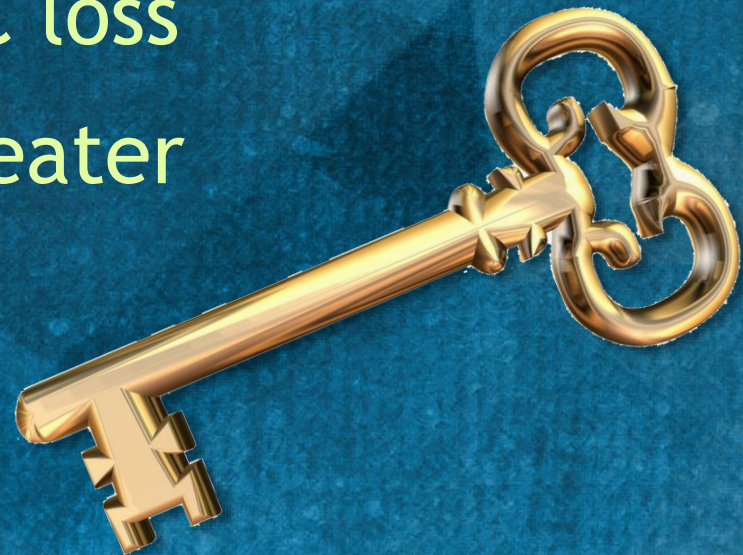
Jae Hyoung Kim · Chae-Yong Kim ·
Hee Kyung Yang · Jeong-Min Hwang



“We present two patients who showed very rare visual field defects, presumably caused by compression between the mass and the anterior cerebral artery.”

Key Points

- Chiasmal syndrome is a subtle, easily missed condition
- Headache and BV complaints are common
- Be suspicious of all NTG suspects
- Look for binasal OCT GCC loss
- Beware VF loss that is greater temporally than nasally



Thank you!