

PEARLS IN NEURO-OPHTHALMOLOGY

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Cleveland Clinic



Financial Disclosures

- Genentech: Advisor & Research





WHAT WILL YOUR MEDAL COUNT BE...

GIANT SLALOM



FIGURE SKATING



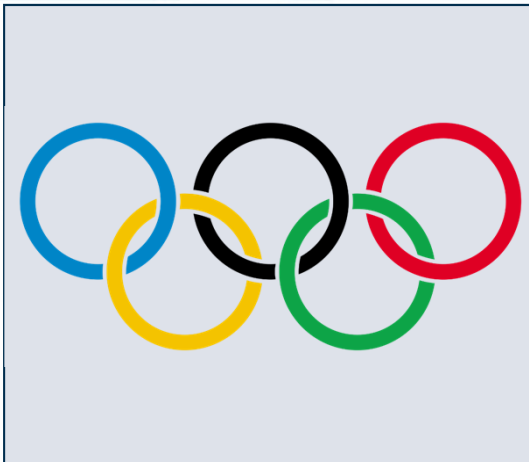
PAIRS SKATING



ICE HOCKEY



SPEED SKATING



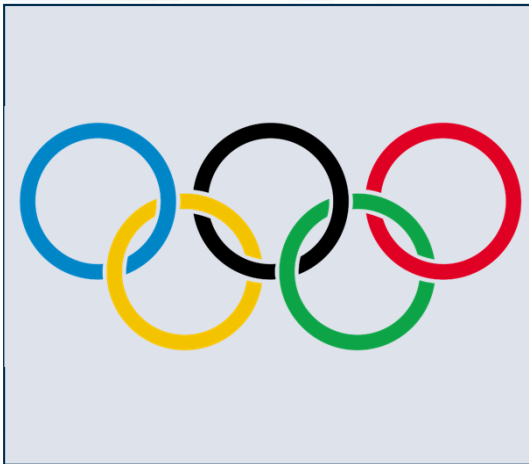
GIANT CELL ARTERITIS



UNILATERAL DISC EDEMA



BILATERAL DISC EDEMA



HEADACHE



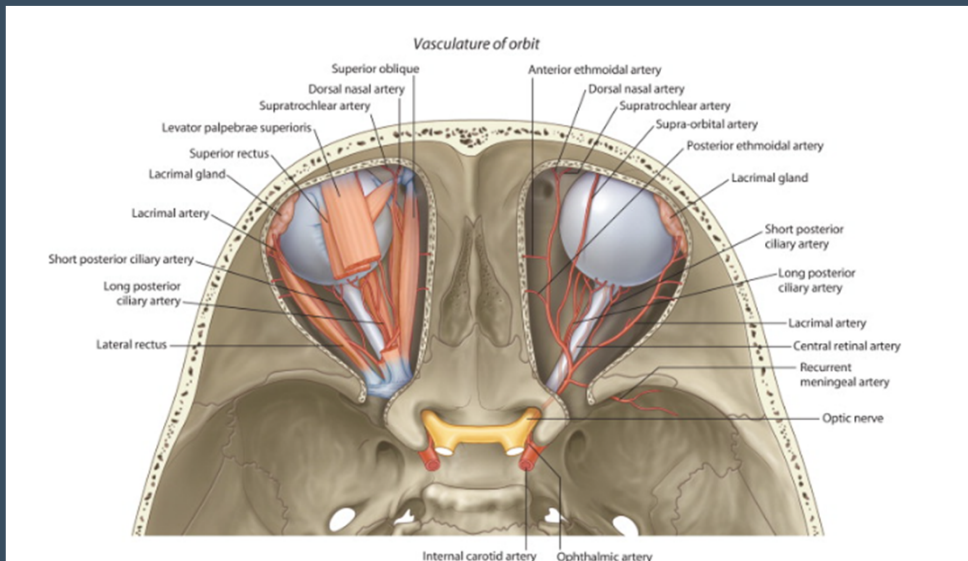
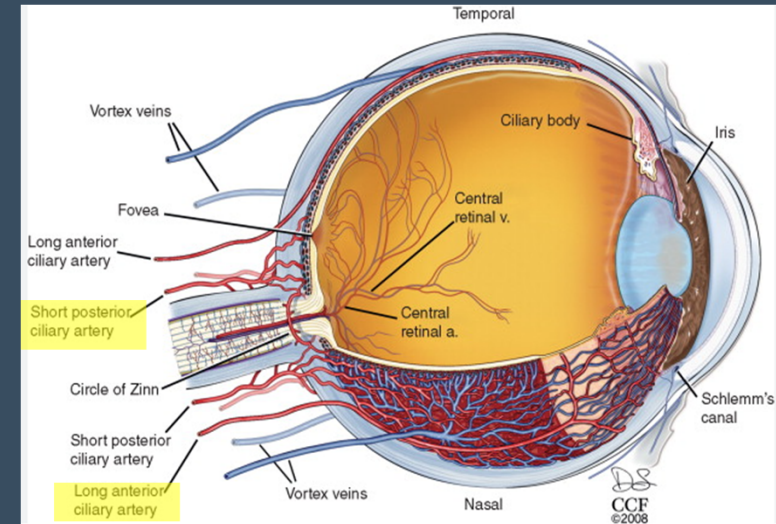
CRANIAL NEUROPATHIES





EVENT 1: GCA

- GCA has a predilection for:
 - Superficial temporal artery
 - Ophthalmic artery
 - Posterior ciliary arteries
 - Vertebral arteries



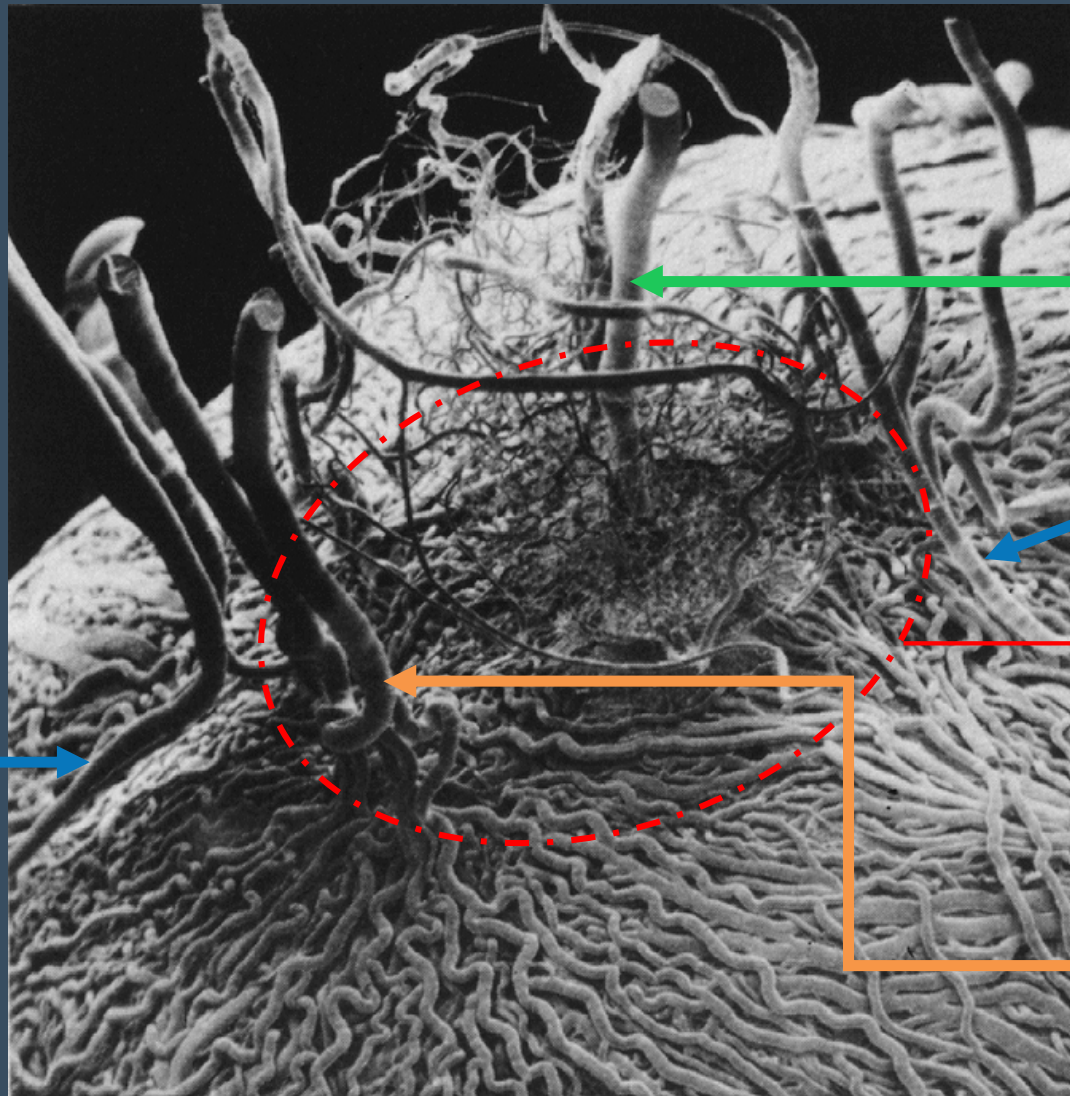
Long Posterior
Ciliary Artery

Central Retinal
Artery

Long Posterior
Ciliary Artery

Annulus of Zinn-
Haller

Short Posterior
Ciliary Artery



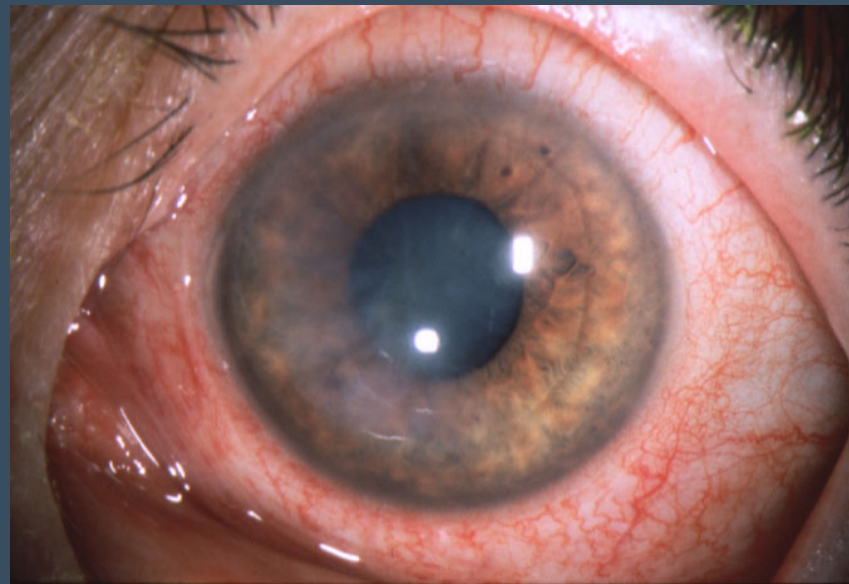
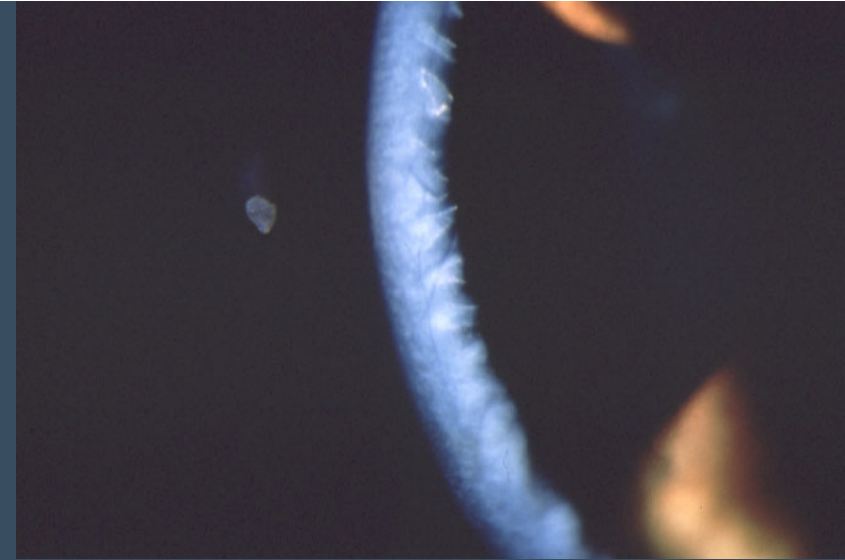
Ophthalmic *Symptoms* of GCA

- Transient Vision Loss
 - Preceded by amaurosis x 7-10 days in 30%
- Diplopia (double vision)
 - May involve multiple muscles
 - May involve the pupil
- Red painful eye
 - Often accompanied by blurry vision



Anterior Segment Ischemia

- Hyperemic conjunctiva and sclera
- Cloudy cornea
 - +/- edema
 - +/- folds
- Hypotony (low intraocular pressure)
- AC reaction



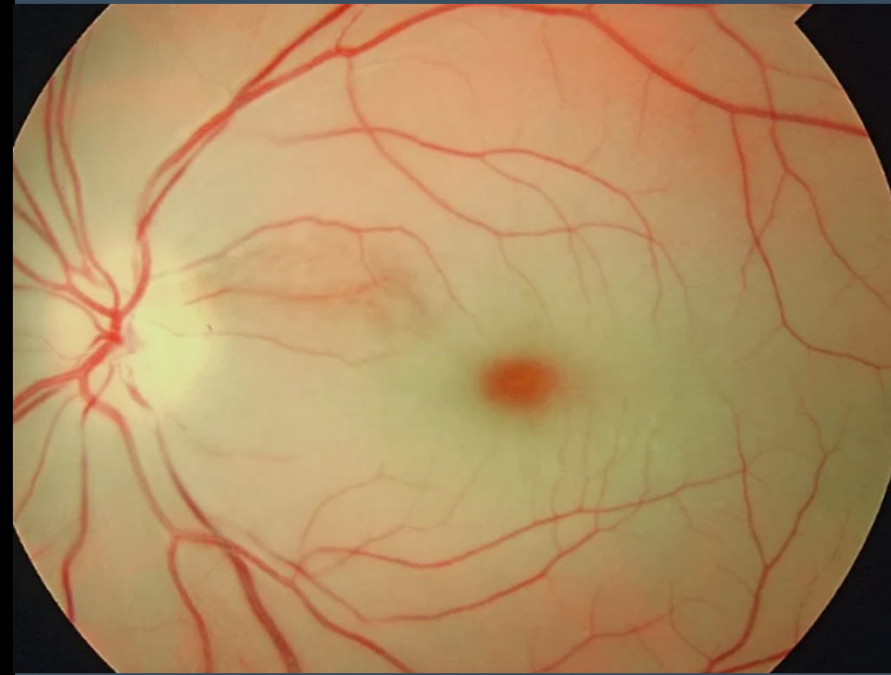
Posterior Ischemia (Retina, Choroid, Optic Nerve)

- Disc edema, disc pallor
- Retinal whitening, box-carring of arterioles
- Cotton wool spots
- Retinal hemorrhages
- Patchy choroidal filling on FA and ICG
- PAMM (paracentral acute middle maculopathy) on OCT
 - Retinal hyperreflectivity on OCT
 - Thinning of inner retina and ganglion cell layer on OCT

Posterior Ischemia: Retinal Artery Occlusion



Retinal
Whitening



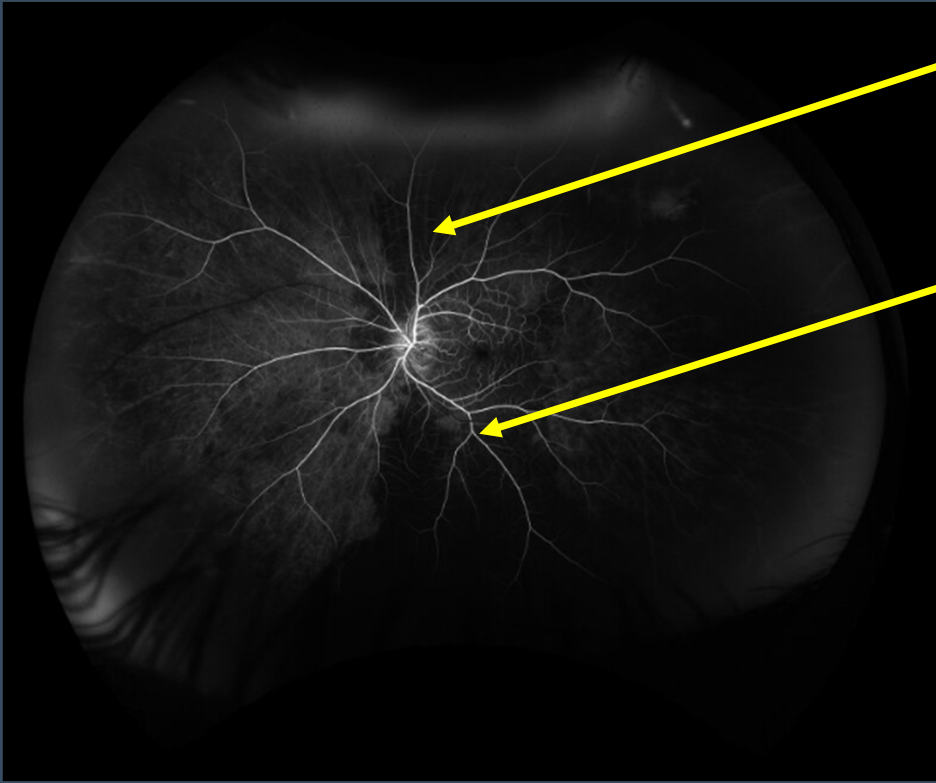
Cherry Red Spot

Posterior Ischemia: Optic Nerve

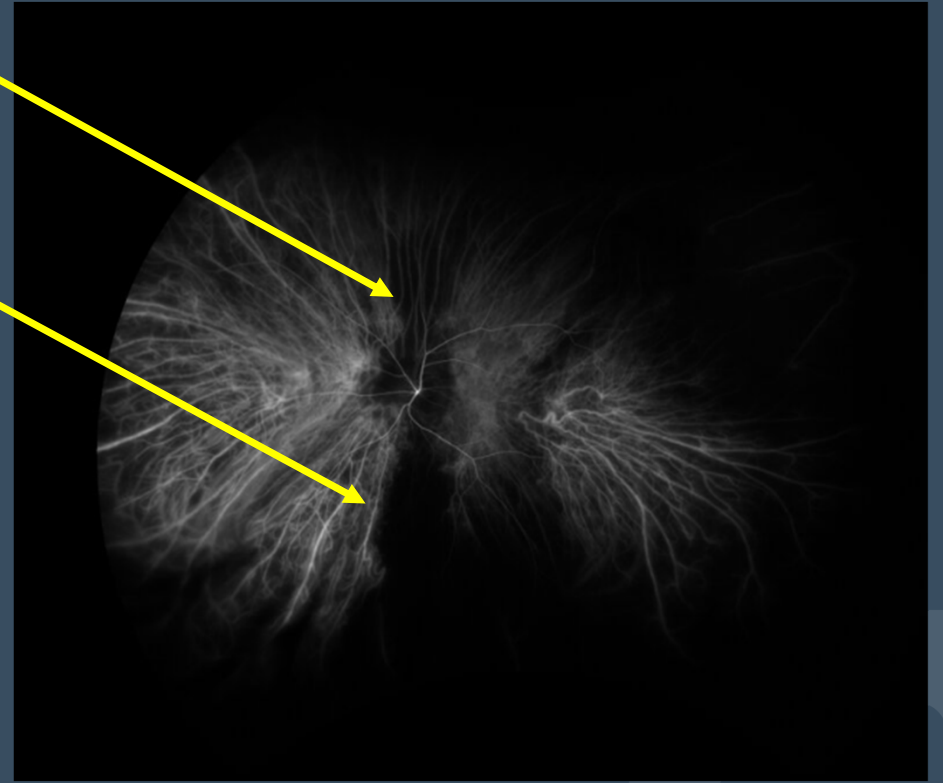


- Cotton Wool Spots
- Hemorrhages
- Pallid Edema

Posterior Ischemia: Choroidal Ischemia



Fluorescein
Angiography



Indocyanine Green
Angiography

16s

19s

23s

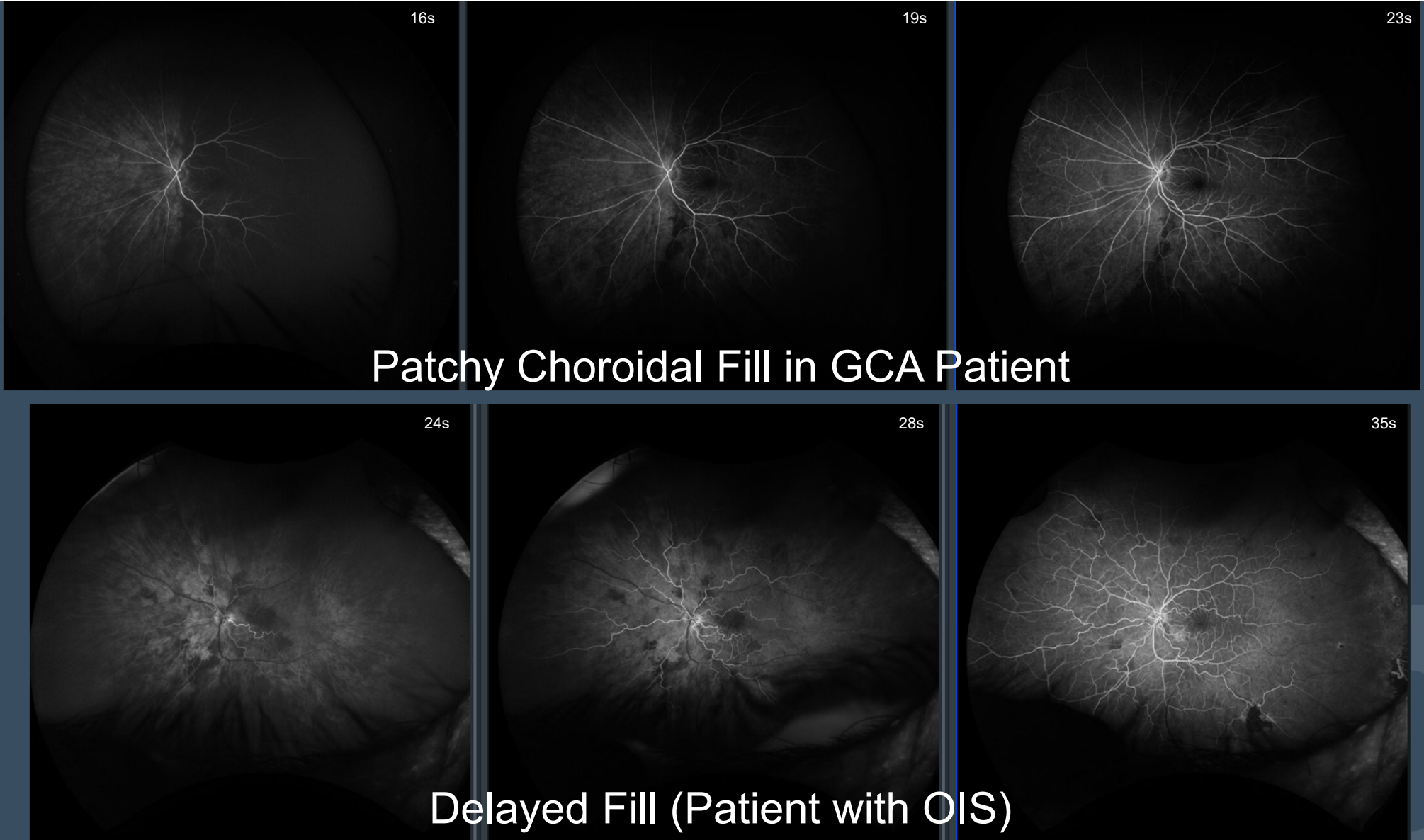
Patchy Choroidal Fill in GCA Patient

24s

28s

35s

Delayed Fill (Patient with OIS)



Ophthalmic *Diagnoses* of GCA

- Optic Nerve
 - Amaurosis Fugax, AION, PION
- Retina
 - CRAO, BRAO, cilioretinal artery occlusion, CWS
- Anterior Segment
 - Pupil abnormalities, conjunctival and scleral injection, intraocular pressure abnormalities
- Extraocular Muscle (EOM)
 - EOM ischemia, CN palsies
- Ocular Ischemic syndrome
- Orbital Inflammatory Syndrome
- Visual field defects
 - Chiasm involvement; Cerebral Ischemic Lesions; Optic tract involvement

Ophthalmic *Findings* in GCA

- Cranial Neuropathies
 - Extraocular motility abnormalities
 - Can involve >1 CN (3,4,6)
 - CN II = Optic Nerve
 - Retrobulbar involvement
 - Chiasmal involvement
 - Optic tract involvement

Ophthalmic *Findings* in GCA

OVER 50 YO WITH ANY
OF THESE →

CRP

CBC

ESR

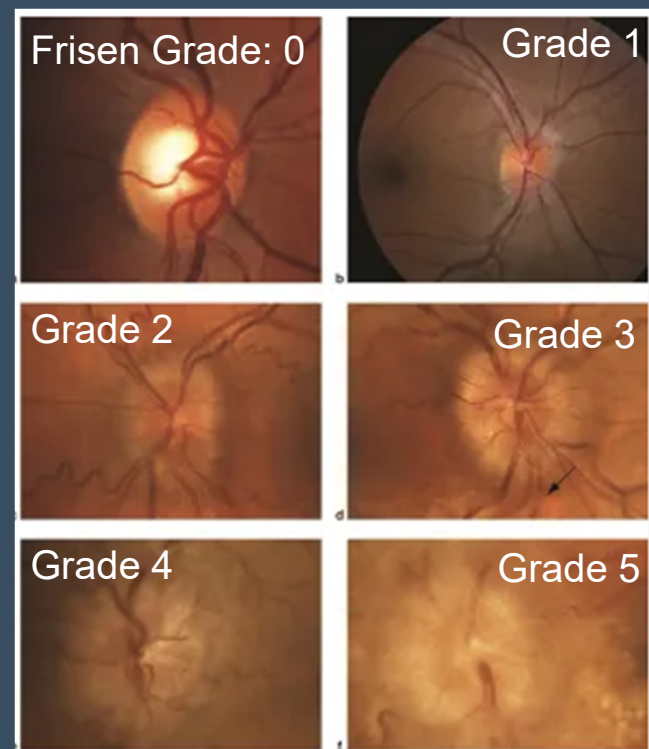
Clinical Utility of ESR,CRP & Platelets

- 3001 patients underwent TABx
- 459 +ve cases
- Elevated values:
 - CRP>2.45
 - ESR>50
 - Platelets>400
- If all 3 were elevated then 8x greater odds of GCA
- CRP & Platelets have a greater predictive value than ESR alone



HOW DID WE DO...





EVENT 2: UNILATERAL DISC EDEMA

AI Image generated by Gemini 3, Google, Feb 2026.

Image Adapted from: <https://www.aao.org/education/image/frisen-grades-3>. Accessed Feb 2026

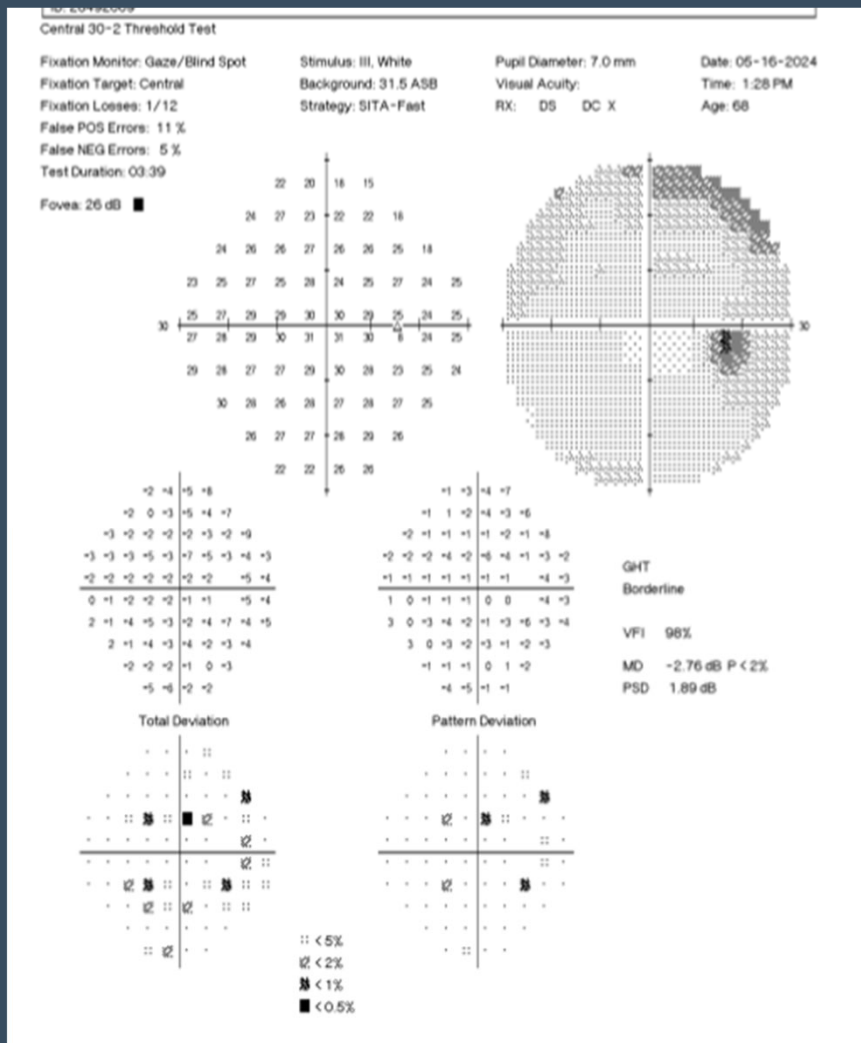
Case 1: Unilateral Disc Edema

- HPI: 5/16/2024
 - 68yo WM presents after awakening with blurry vision in his lower left eye that started about 10 days prior to presentation

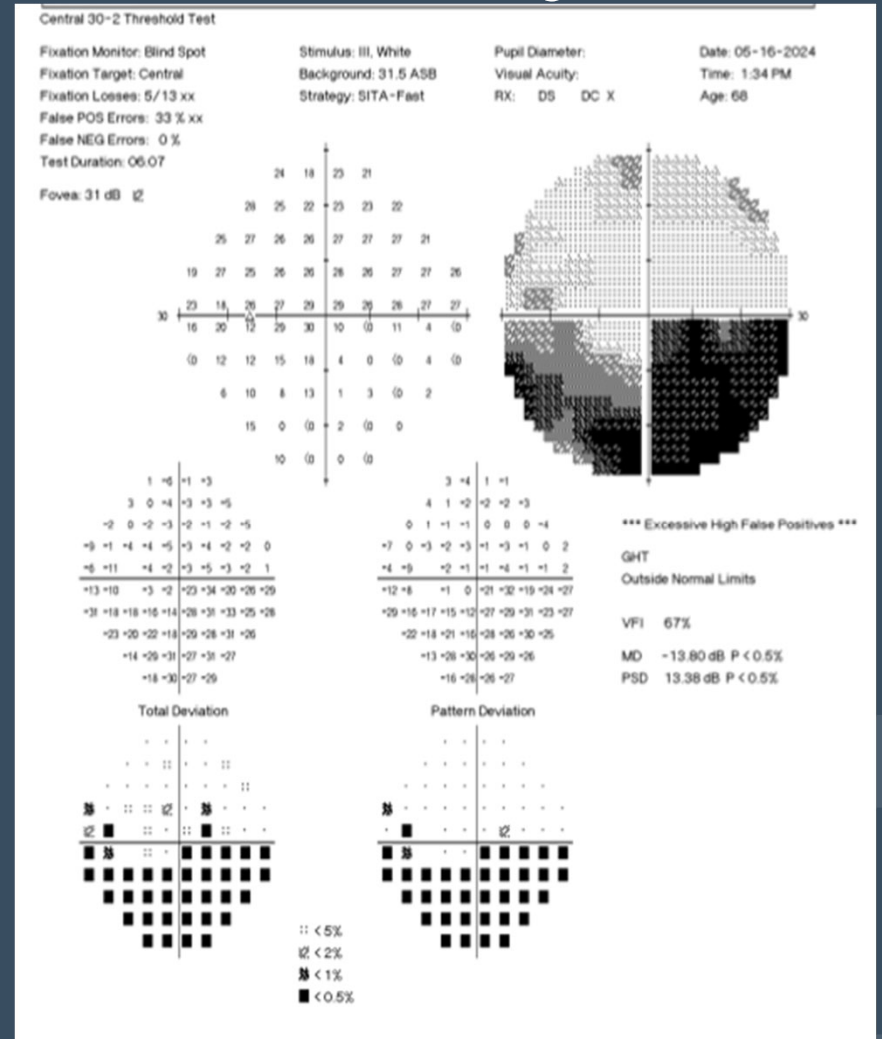
PMH:	Medications:	Ocular Hx:	Baseline Exam:	
spastic gait Prediabetes Parkinsonism	Carbidopa-levodopa ASA 81mg Vitamin B-12 fluoxetine	none	VA	
			OD 20/30-	OS 20/30-
			IOP	
			OD 16	OS 15
			Pupils	
			OD PERRL; No RAPD	OS PERRL; No RAPD

- Normal Anterior SLE

Right Eye



Left Eye

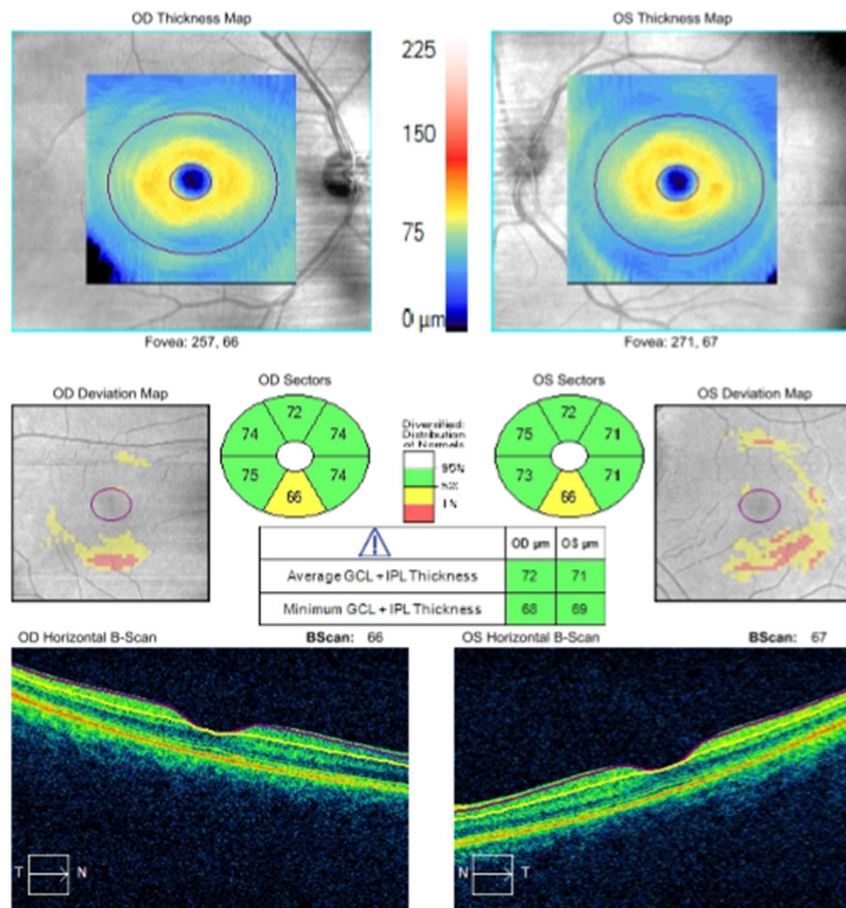


GCL

RNFL

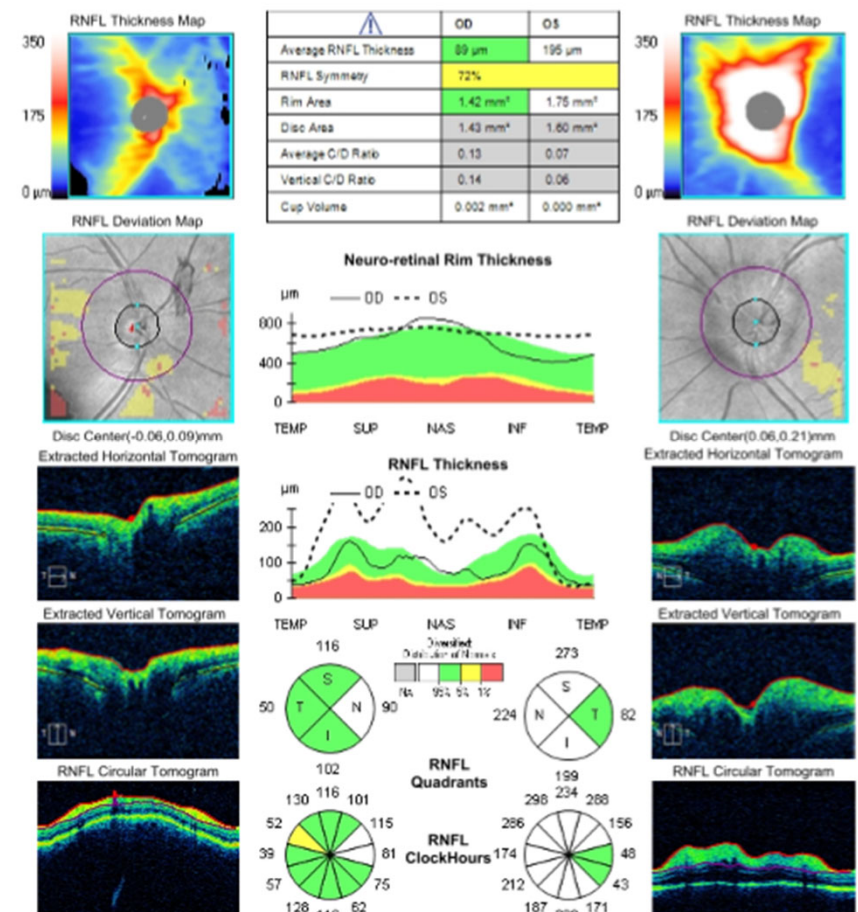
Ganglion Cell OU Analysis: Macular Cube 512x128

OD ● ● OS



ONH and RNFL OU Analysis: Optic Disc Cube 200x200

OD ● ● OS



Initial Work-up

- A1c; CBC; CRP; ESR: normal
- Carotid US: 20-39% stenosis in R&L ICA
- MRI Brain WWO: normal

Typical NAION

- Disc edema resolves within 6-8 weeks
- Altitudinal defect
- 15% risk of developing in fellow eye in 5 years
- Avoid BP meds at night; manage systemic disease
- PDE5 Inhibitors
- GLP-1 association still unclear

Case 2: Unilateral Disc Edema

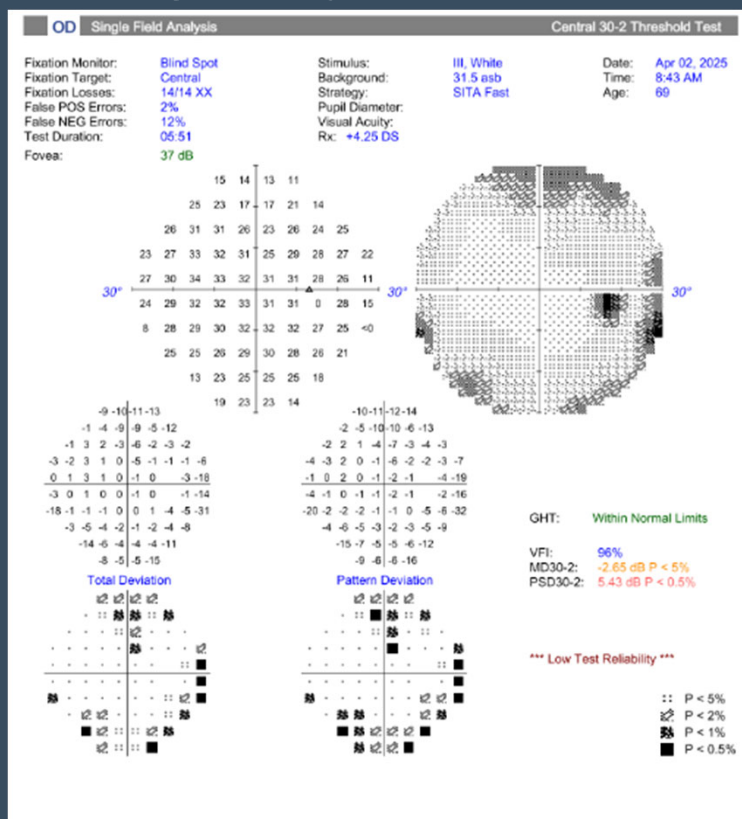
- 4/1/2025: 69 yo WF presents with 2-3 weeks of smudge in her left eye peripheral vision

PMH:	Medications:	Ocular Hx:	Baseline Exam:	
HTN OSA Grave's Dz	Pregabalin Losartan Bupropion Meloxicam Propanolol	none	VA	
			OD 20/20-	OS 20/40-
			IOP	
			OD 16	OS 15
			Pupils	
			OD PERRL; No RAPD	OS PERRL; +APD

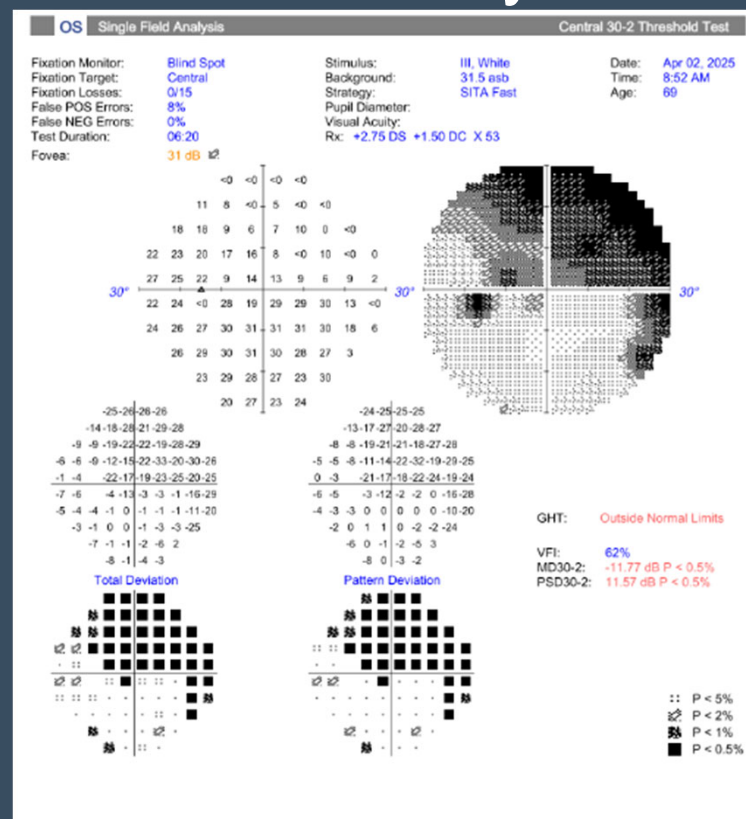
- Normal Anterior SLE

HVF 4/2/2025

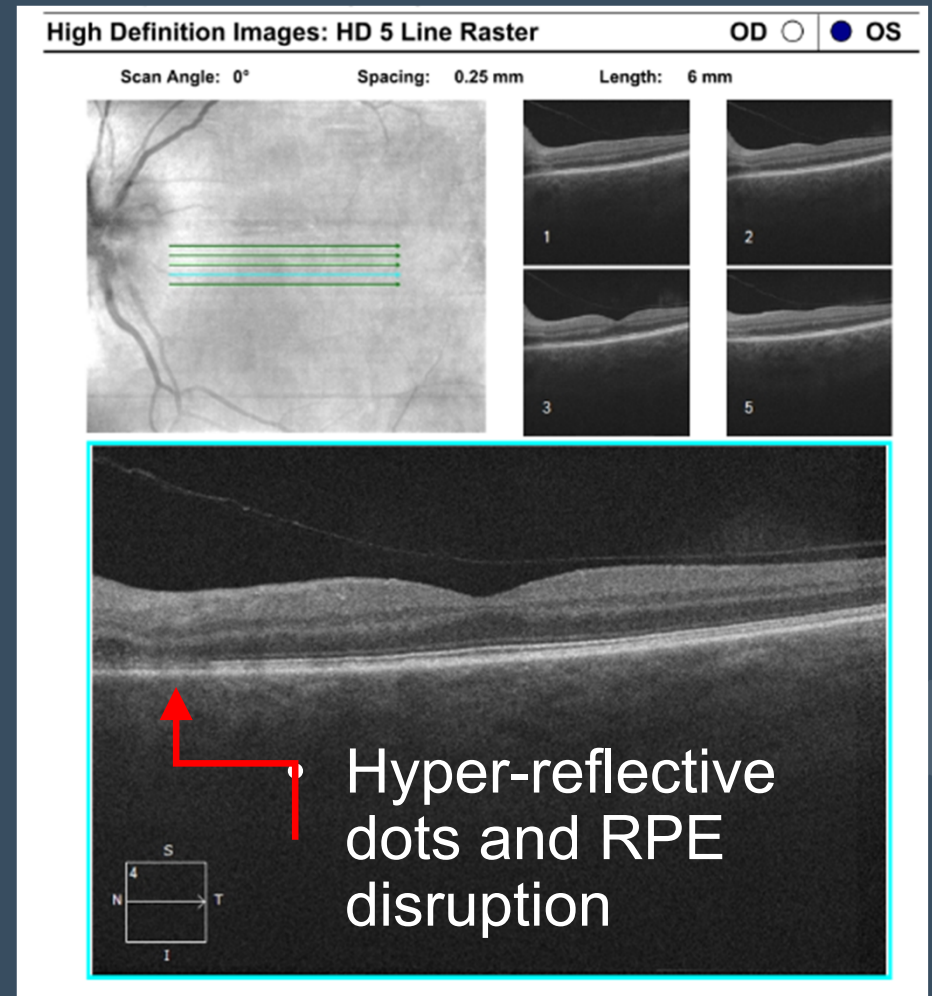
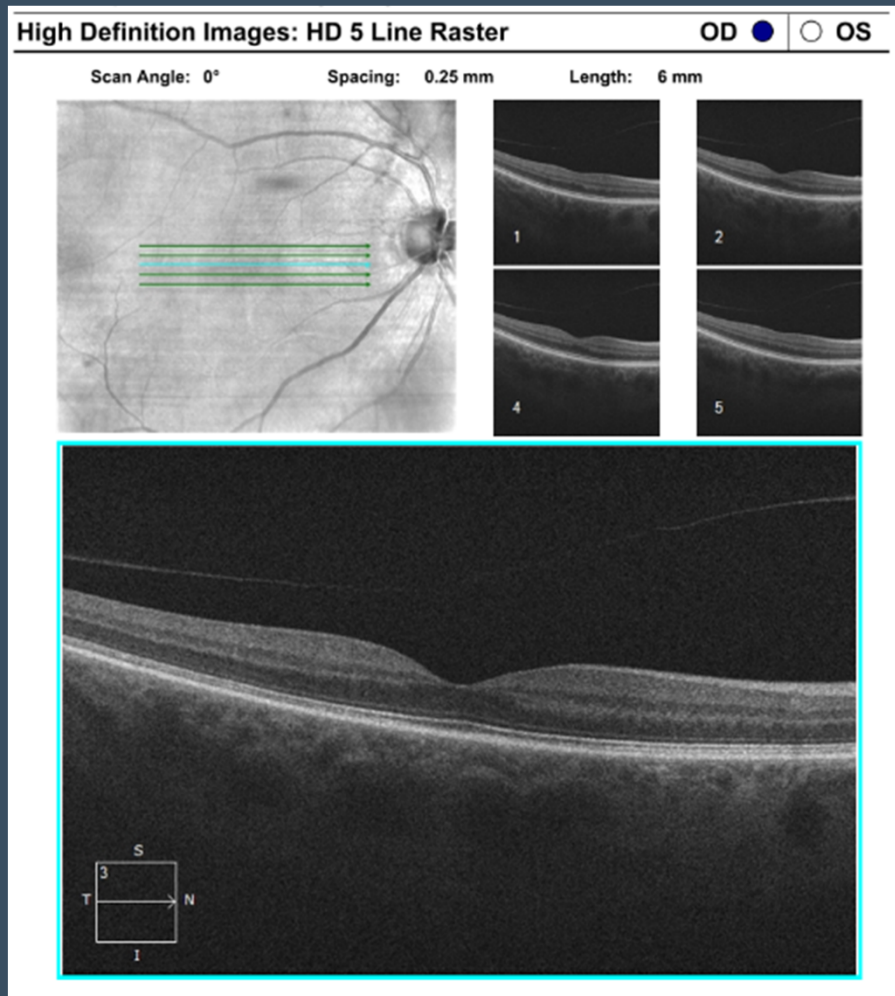
Right Eye

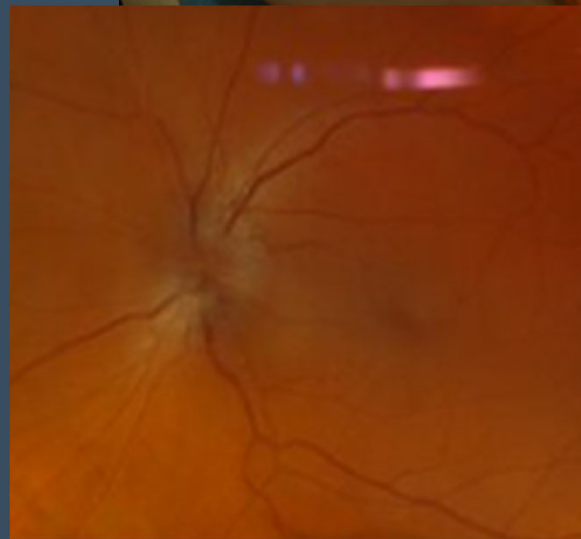
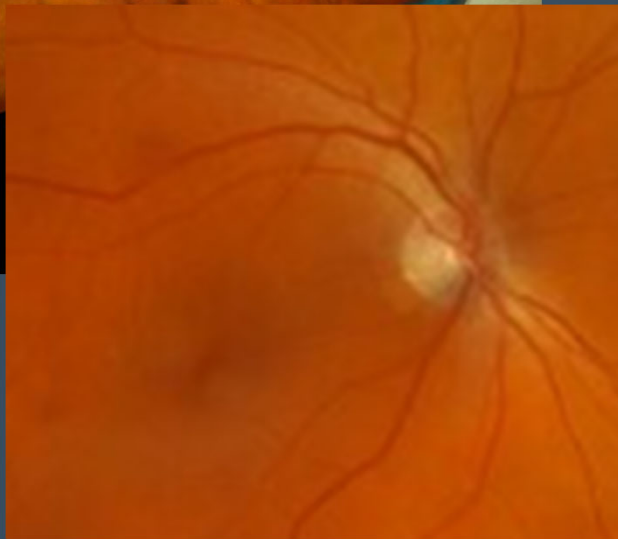
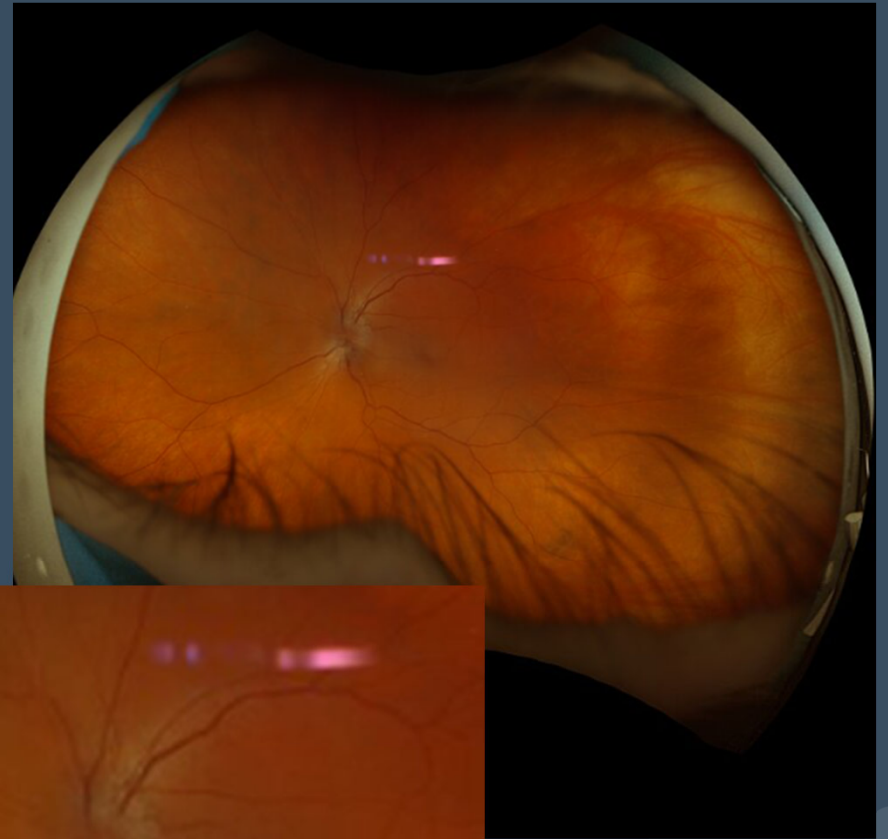
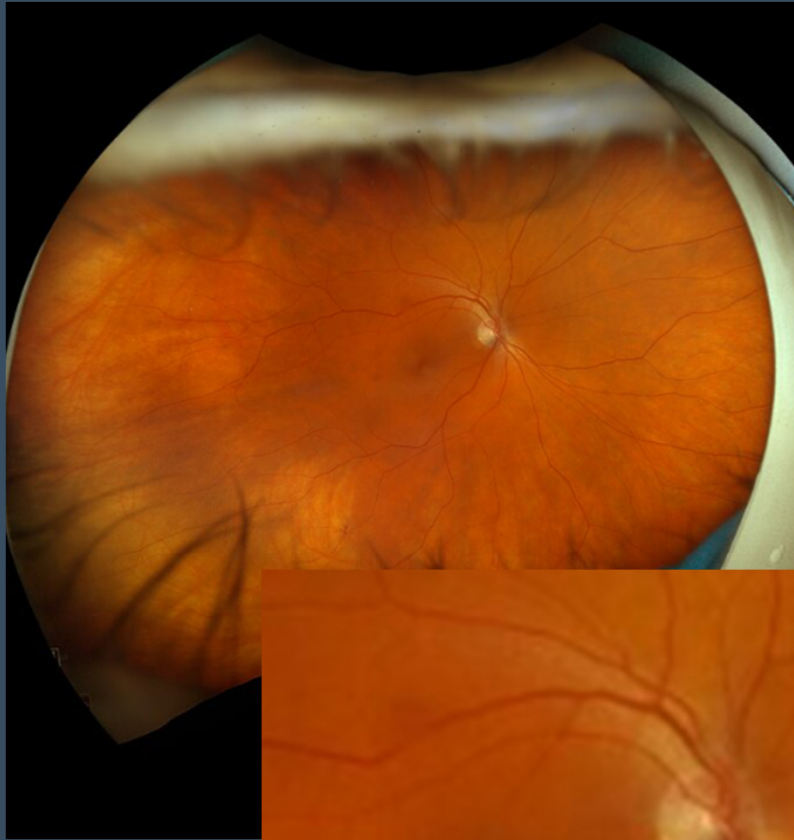


Left Eye



Mac OCT OU:





Right
Eye



Left
Eye



Initial Work-up

- MRI Brain, Orbit, MRV: normal
- CTA Head & Neck: normal
- ESR & CRP: normal
- CBC: elevated WBCs
- ACE, TB, Lyme, Bartonella: NEG

One LAST Clue

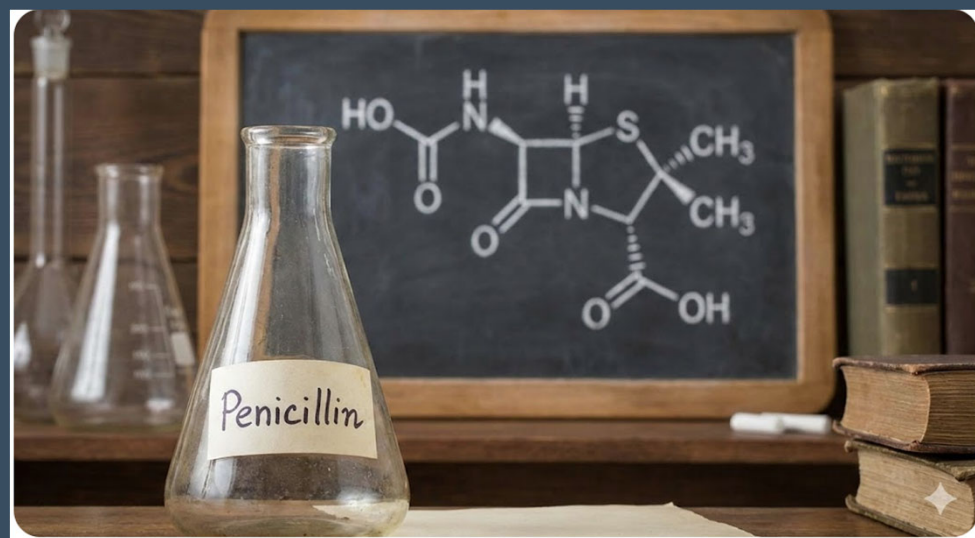


Image Adapted from: https://en.wikipedia.org/wiki/Al_Capone#/media/File:Al_Capone_in_1930.jpg. Accessed Feb 2026.

AI Image generated by Gemini 3, Google, Feb 2026.

Ocular Syphilis = Neuro Syphilis

...Syphilis

Womp Womp

- Admitted to neurology with ID consult
- Underwent LP
- IV PCN therapy

Case 3: Unilateral Disc Edema

- HPI: 8/26/2024
 - 37yo WM presents with one day history of blurry vision OD

PMH:	Medications:	Ocular Hx:	Baseline Exam:	
None	None	None	VA	
			OD 20/30	OS 20/30
			IOP	
			OD 22	OS 19
			Pupils	
			OD PERRL; No RAPD	OS PERRL; No RAPD

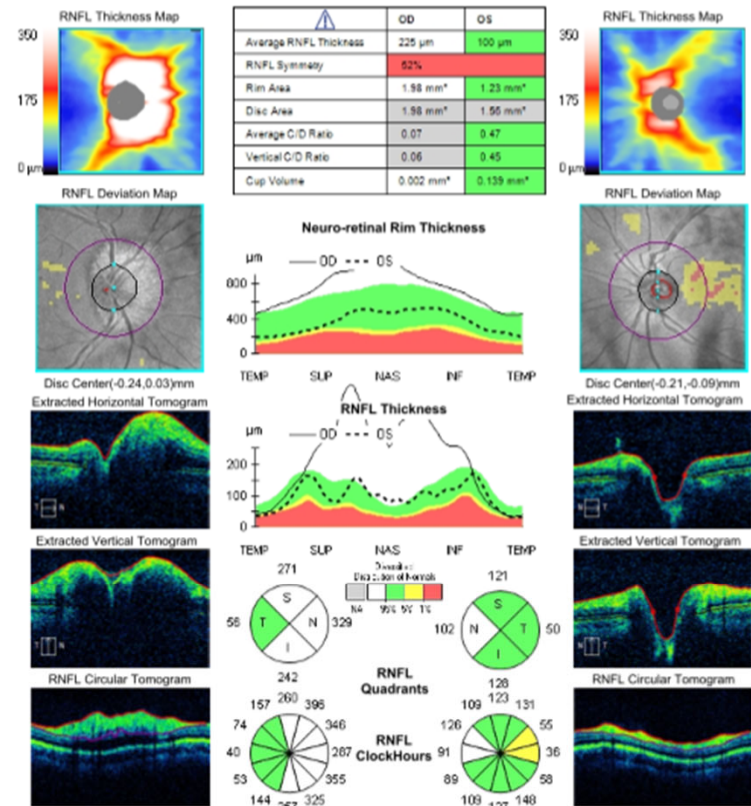
- Normal Anterior SLE



Name: **BADORREK, RYAN A** OD OS
 ID: 88354773 Exam Date: 8/26/2024 8/26/2024 LES_REJ_OCT
 DOB: 10/15/1987 Exam Time: 3:11 PM 3:11 PM
 Gender: Male Serial Number: 5000-5987 5000-5987
 Technician: Operator, Cirrus Signal Strength: 6/10 5/10



ONH and RNFL OU Analysis: Optic Disc Cube 200x200 OD OS

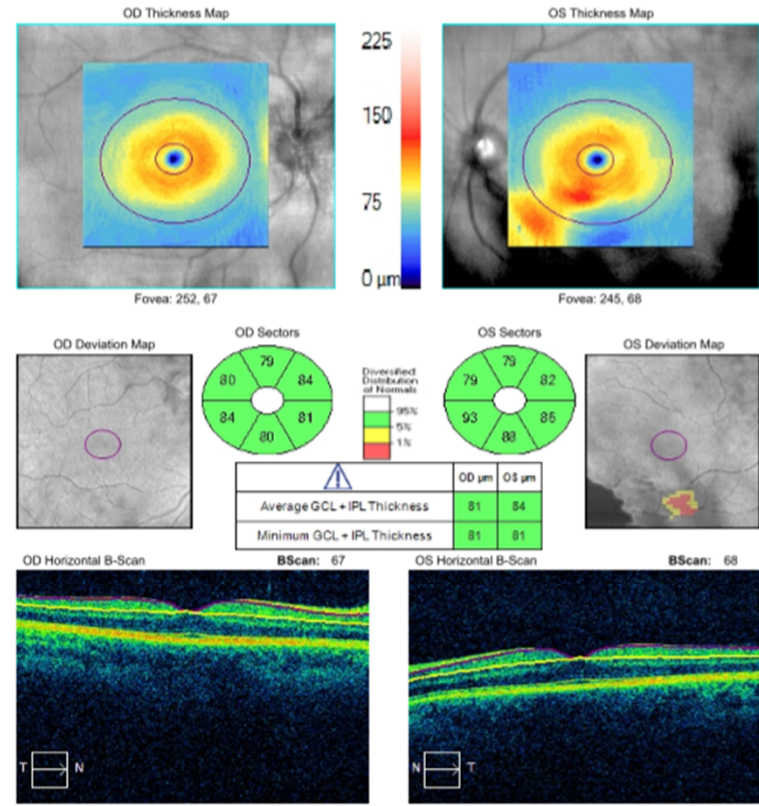


Comments: _____ Doctor's Signature: _____
 LES_REJ_OCT
 SW Ver: 11.5.3.61246
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Name: **BADORREK, RYAN A** OD OS
 ID: 88354773 Exam Date: 8/26/2024 8/26/2024 LES_REJ_OCT
 DOB: 10/15/1987 Exam Time: 3:10 PM 3:12 PM
 Gender: Male Serial Number: 5000-5987 5000-5987
 Technician: Operator, Cirrus Signal Strength: 8/10 6/10

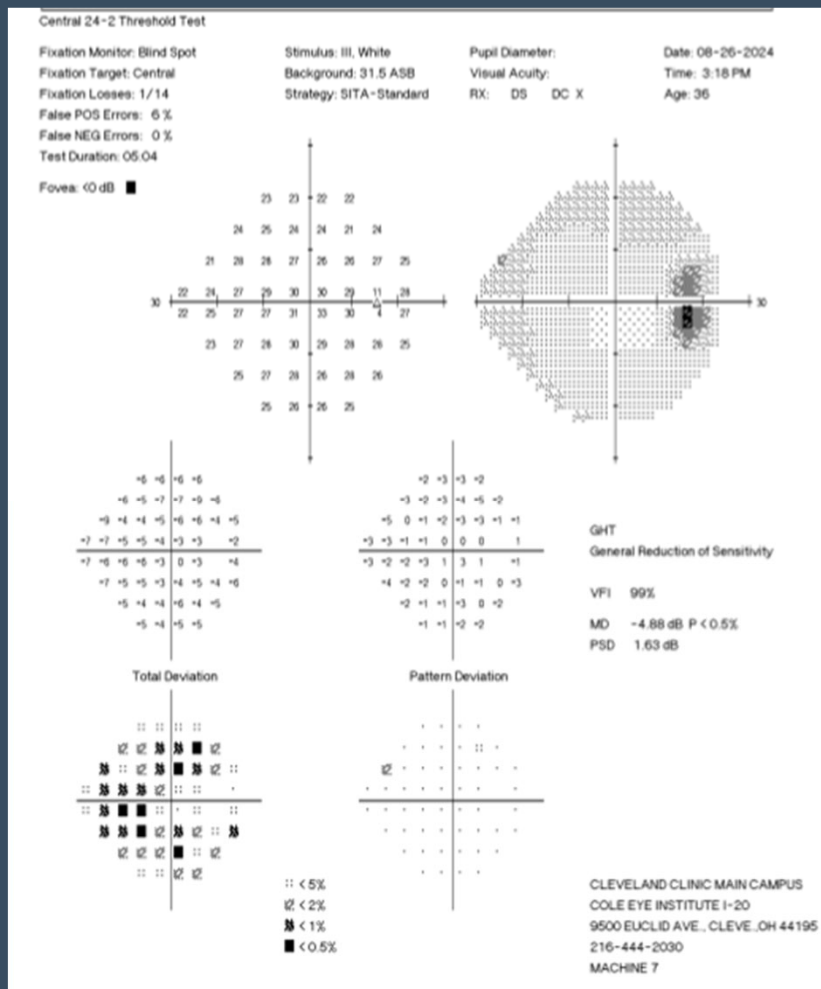


Ganglion Cell OU Analysis: Macular Cube 512x128 OD OS

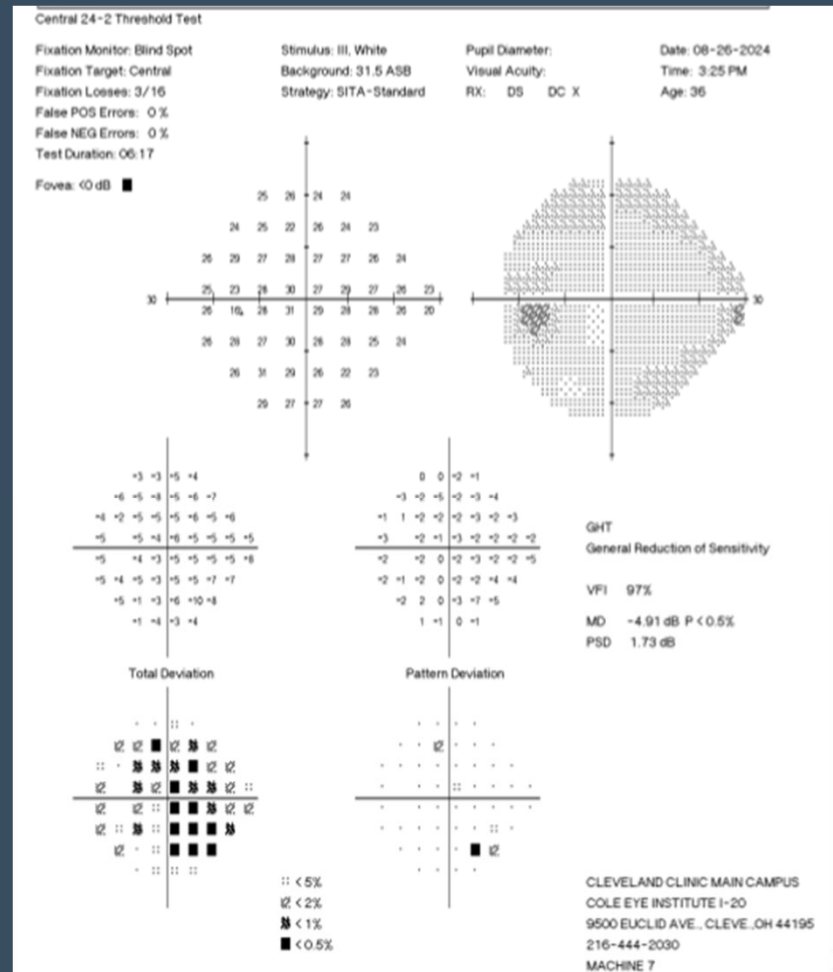


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 LES_REJ_OCT
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Right Eye



Left Eye



Name: BADORREK, RYAN A

ID: 88354773

DOB: 10/15/1987

Gender: Male

Technician: Operator, Cirrus

Exam Date: 9/13/2024

Exam Time: 2:36 PM

Serial Number: 5000-5987

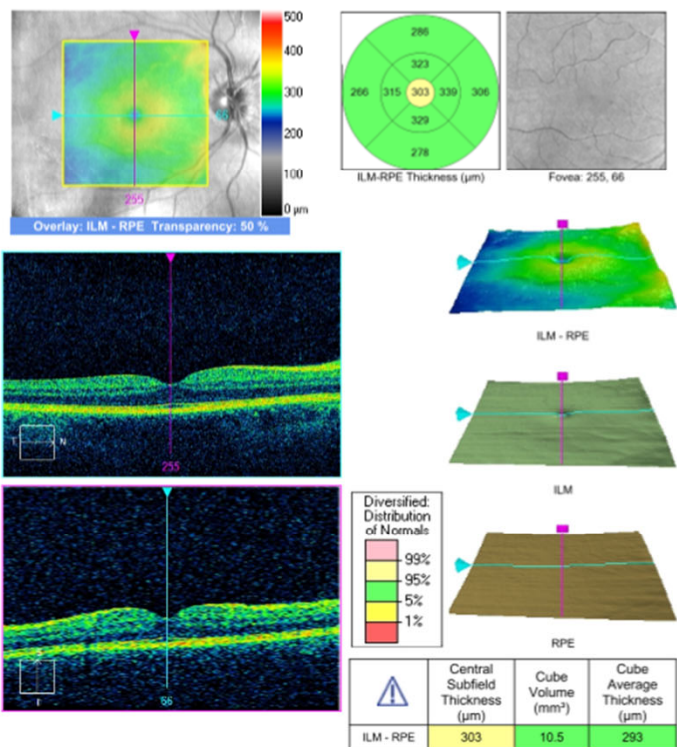
Signal Strength: 7/10

LES_REJ_OCT



Macula Thickness : Macular Cube 512x128

OD ☒ OS ☐



Comments

Doctor's Signature

LES_REJ_OCT
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Name: BADORREK, RYAN A

ID: 88354773

DOB: 10/15/1987

Gender: Male

Technician: Operator, Cirrus

Exam Date: 9/13/2024

Exam Time: 2:38 PM

Serial Number: 5000-5987

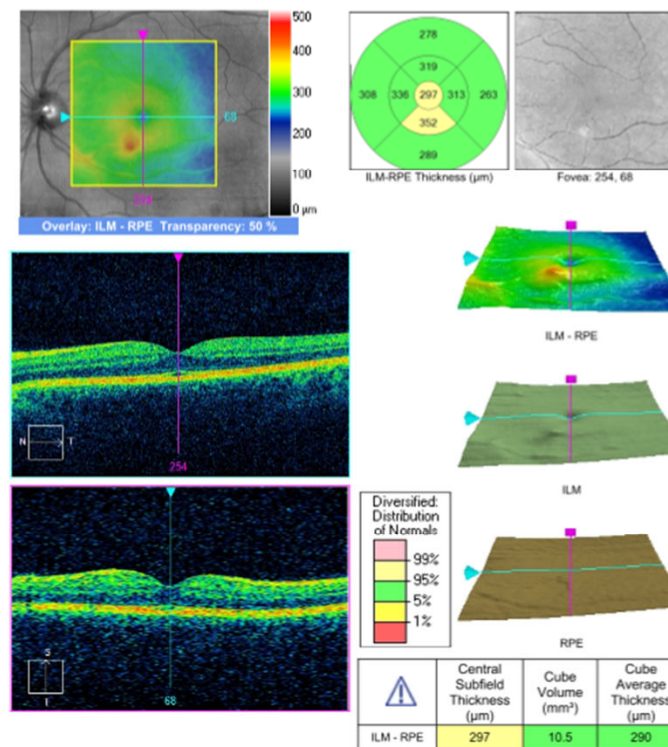
Signal Strength: 8/10

LES_REJ_OCT



Macula Thickness : Macular Cube 512x128

OD ☐ OS ☒



Comments

Doctor's Signature

LES_REJ_OCT
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Initial Work-Up

- CRP; ESR; A1C; CMP; CBC: negative
- ACE; Syphilis: negative
- MRI Brain & Orbit WWO: normal

More Work-Up...

- POSITIVE:
 - Bartonella Ab panel
 - B Henselae IgG - >1:1024
 - B Henselae IgM - < 1:16
 - B Quintana IgG - < 1:16
 - B Quintana IgM - < 1:16
- Treated with doxycycline 100mg bid
- Follow up exam 10/8/2024 shows improved disc edema OD

Unilateral Disc Edema

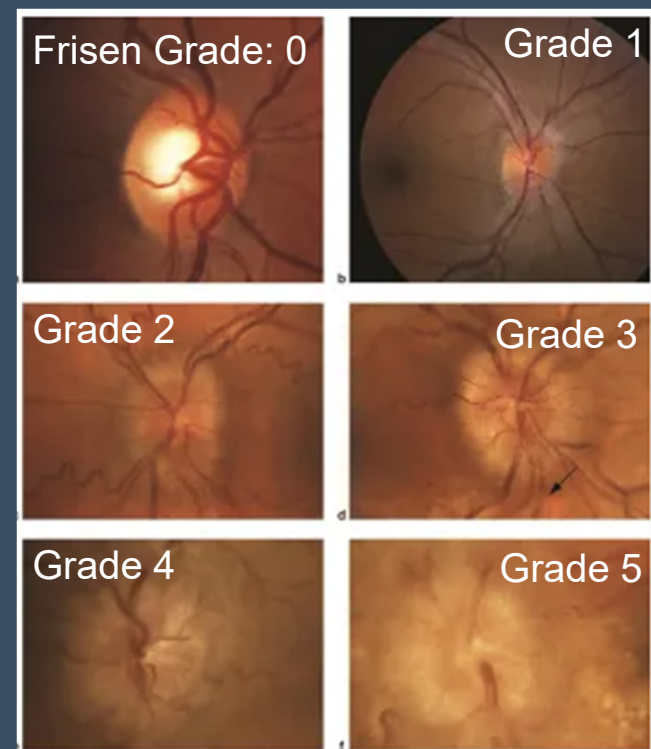
- What can we do in our office??
 - CHECK PUPILS!!!
 - Check Color Vision
 - Get a HVF (24-2 Sita Fast OU)
 - Get photos if you can
 - OCT RNFL & GCL
 - Consider UWFA and FAF

Unilateral Disc Edema

- At minimum in patients >50yo:
 - CBC
 - CRP
 - ESR

Unilateral Disc Edema

- What else is reasonable??
 - Syphilis
 - TB
 - ACE
 - Lyme >30 & < 30 days Ab
 - Bartonella Ab / PCR
 - Toxoplasmosis Ab
 - CNS Demyelinating Panel (MOG & AQP4)
- Do I need to get imaging & what should I get???
 - MRI brain & orbits WWO



HOW DID WE DO...





EVENT 3: BILATERAL DISC EDEMA

Bilateral Disc Edema

- This patient needs neuroimaging
- Send them to the ED – MRI brain & orbits WWO, MRV, BP, LP, etc...





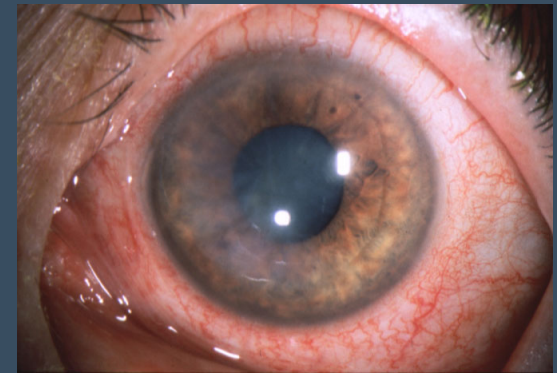


EVENT 4: HEADACHE

- The role of the ophthalmologist...

Our Main Role:

- Rule out:
 - Uveitis: anterior & posterior
 - Scleritis: anterior & posterior
 - Elevated intraocular pressure
 - Anisocoria
 - Papilledema
 - EOM Deficits
 - Refractive Error



Migraine

- Key Points:
 - Aura <60 minutes
 - Followed by headache
 - Known history of migraine
- Send for work-up if:
 - New in onset (especially >50yo)
 - Different from prior migraines or headaches
 - Aura lasting >60 minutes
 - Additional focal neurologic deficits
 - GCA positive ROS & >50yo

Red Flag Headaches

- GCA Symptoms & >50yo
- Thunderclap Description
- Focal neurologic signs / confusion
- Papilledema on exam
- Associated with:
 - Fever, Valsalva, Positional Change, Exertion
- Intractable or progressive worsening





HOW DID
WE DO...





EVENT 5: CRANIAL NEUROPATHIES

Cranial Nerve Palsies

CN III – Oculomotor Nerve

- Elevation, Adduction & Depression of the eye
- Pupil & eye lid (levator palpebrae)
- Diplopia +/- ophthalmoplegia, anisocoria, ptosis

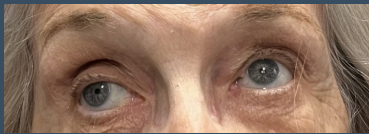
CN IV – Trochlear Nerve

- Extorsion, Elevation & Adduction
- Diplopia & head tilt

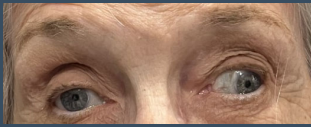
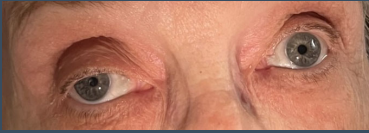
CN VI – Abducens Nerve

- Abduction of the eye
- Diplopia

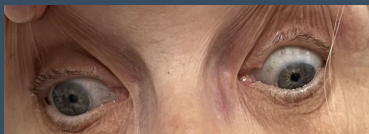
Questions to Ask the Patient:



↻ Elevation



↻ Adduction



↻ Depression

Is the double vision horizontal or vertical?

Does it get worse when you look left or right?

Is it better if you tilt your head to your left or right shoulder?

Did it happen quickly or slowly progressive over time?

Is it present in primary gaze and for how much of the day?

Is it worse in the morning or at night?

Questions to Ask Yourself:

- Is there associated ptosis
- Is there anisocoria
- Is there any eyelid movement (ie: aberrant regeneration) with downgaze or Adduction
- Is it comitant
 - What is comitant again?!
 - When the prismatic measurement is the ~same in every direction of gaze
- Was Parks-Bielschowsky an Olympic cross-country skier?

Multiple Cranial Nerves???

1. Orbital Apex
2. Cavernous Sinus



Optic chiasm

Sellar Mass

Cavernous Sinus



Most Common Causes of Cranial Neuropathies (Adults)

CN	GOLD	SILVER	BRONZE
III	Ischemic	Aneurysm / Compressive	Trauma
IV	Trauma	Ischemia	Congenital
VI	Ischemia	Trauma	Many

Differential Dx of Cranial Neuropathies

- D - demyelinating (MS, MOG, NMO)
- I - infectious (TB, Syphilis, Lyme, HIV, HSV, VZV)
- V - vasculitis (GCA, ANCA, SLE, etc.)
- I - ischemic (HTN, DM, CAD, etc.)
- N - neoplastic (tumor, mets, schwannomas, leptomeningeal dz)
- I - infiltrative (lymphoma, leukemia, germinoma)
- T - trauma
- I - iatrogenic
- C - compressive (aneurysm, meningioma, hemorrhage, vascular malformation)

Locations: midbrain, pons, skull base, cavernous sinus, orbital apex

Cranial Neuropathy Work-Up (Adults)

- MRI brain WWO
- MRA or CTA (CN III with Pupil)
- CBC, CRP, ESR
- Syphilis & TB
- Acetylcholine Receptor Antibody Panel
- Thyroid Testing (TSH, TSI, Thyroglobulin Ab)



HOW DID WE DO...



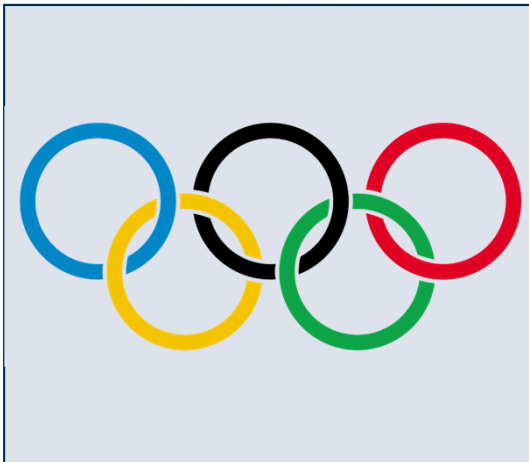
GIANT CELL ARTERITIS



UNILATERAL DISC EDEMA



BILATERAL DISC EDEMA



HEADACHE



CRANIAL NEUROPATHIES



ARE YOU ON THE PODIUM?



WE ARE OLYMPIC NEURO-OPHTHALMOLOGISTS

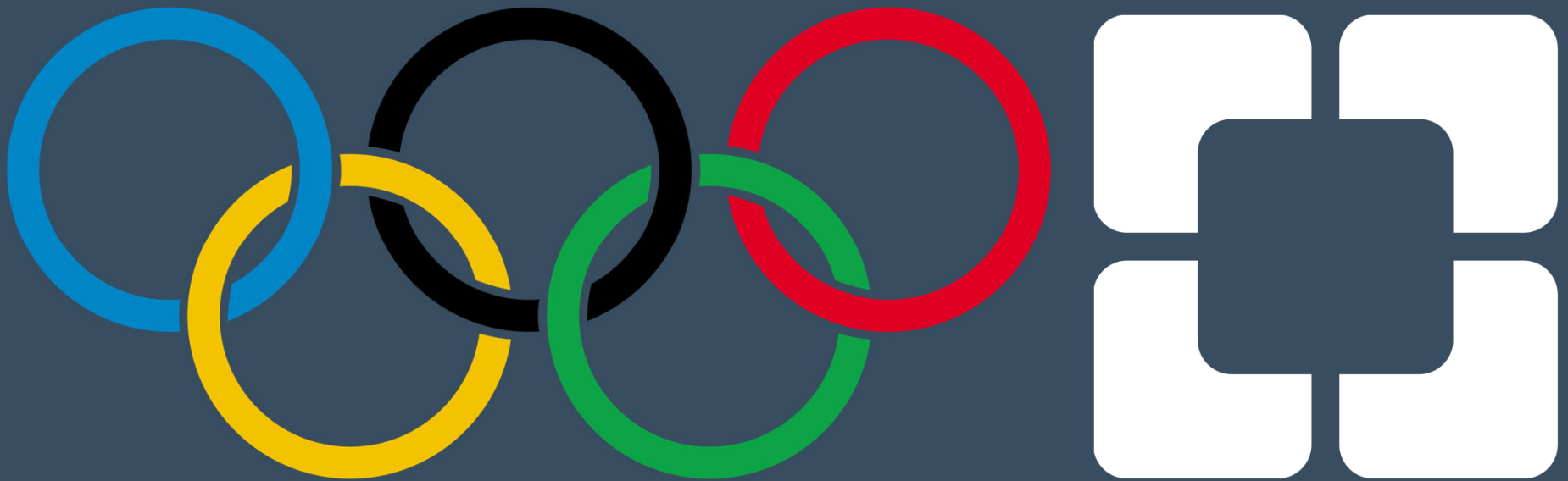
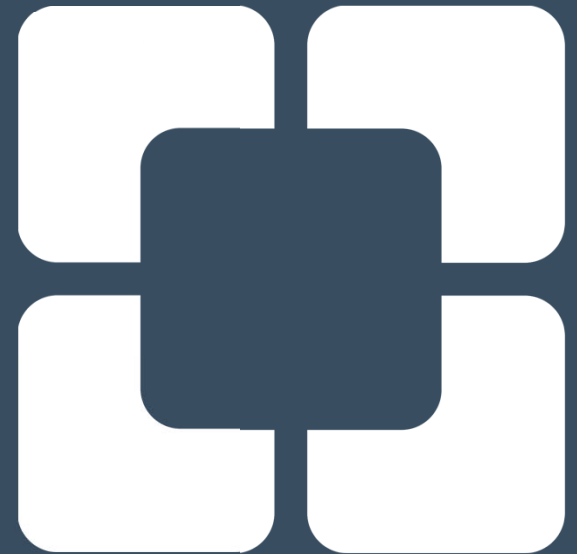


Image Adapted from: https://commons.wikimedia.org/wiki/File:Olympic_rings_with_transparent_rims.svg. Accessed Feb 2026.

WE ARE OLYMPIC
NEURO-OPHTHALMOLOGISTS



THANK YOU!!

