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Tallmadge, OH

UNDERSTANDING THE NEURO-OPHTHALMOLOGICAL EXAM AND ITS CLINICAL APPLICATIONS

COMPONENTS OF A NEURO-OPHTHALMOLOGICAL EXAM

HISTORY: CHIEF COMPLAINT

- Language
  - Lack of Medical Jargon
  - Colloquialism vs Testimony
    - Pronoun Pandemic
  - Congenital Anomaly
  - Verbal Surgery
- Diplopia
- Loss of Vision
- Giant Cell Arteritis

EXAMINATION: VISUAL ACUITY

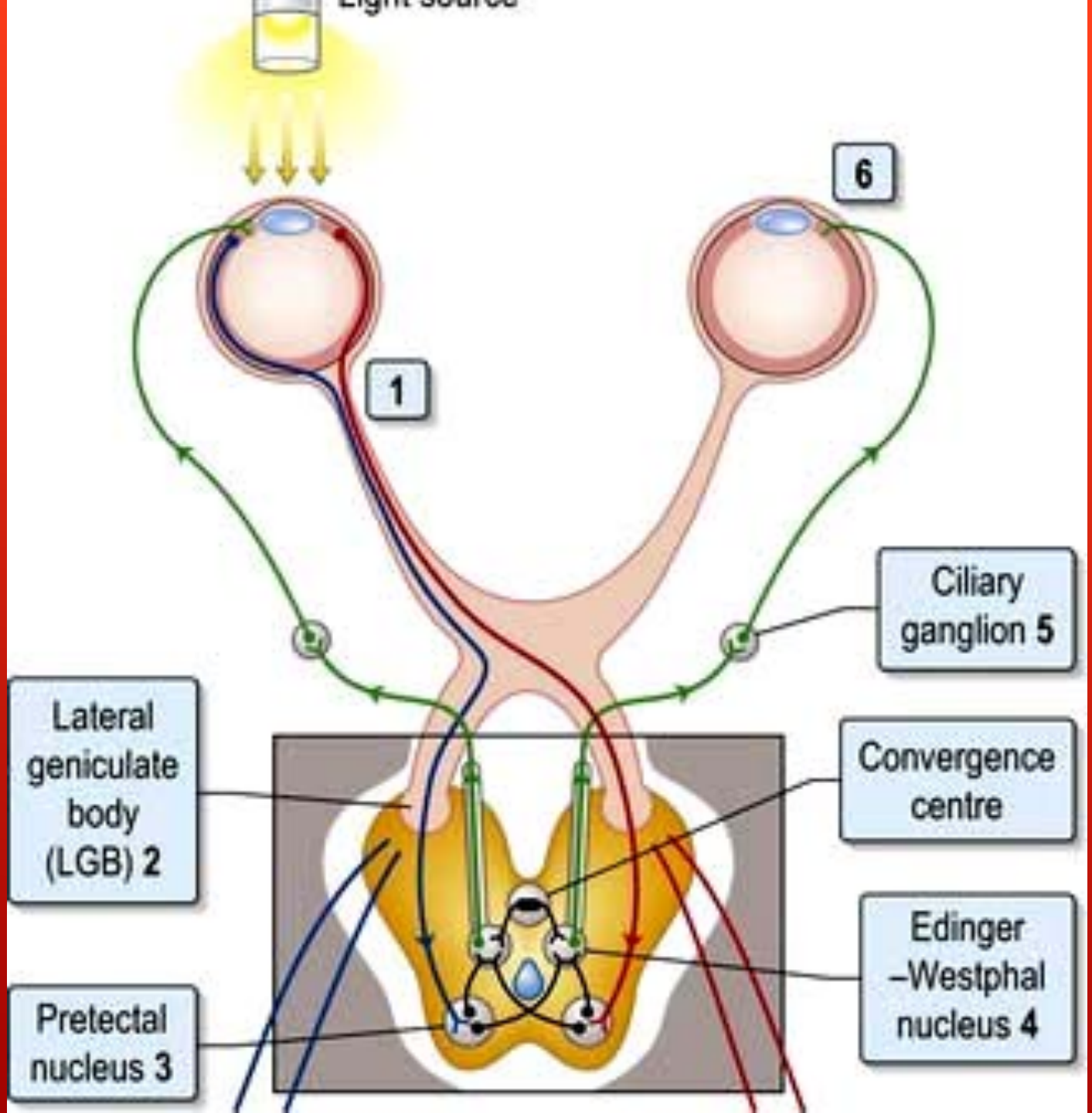
- BCVaCC or PH
- OD/OS no OU
- Eye Chart, CF, HM, LP, NLP
- Illiterate E's
- Children's Picture Chart

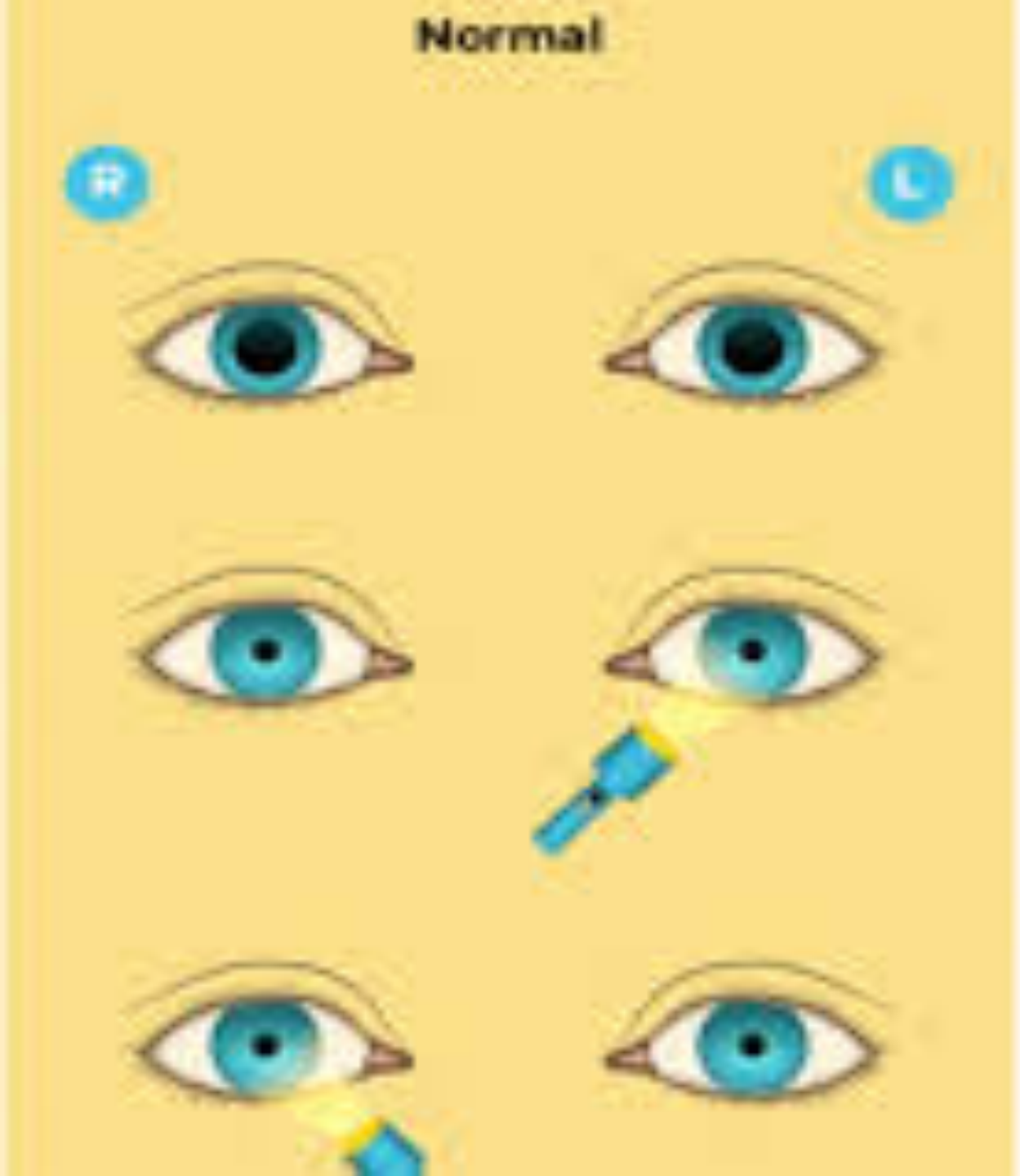
EXAMINATION: COLOR VISION

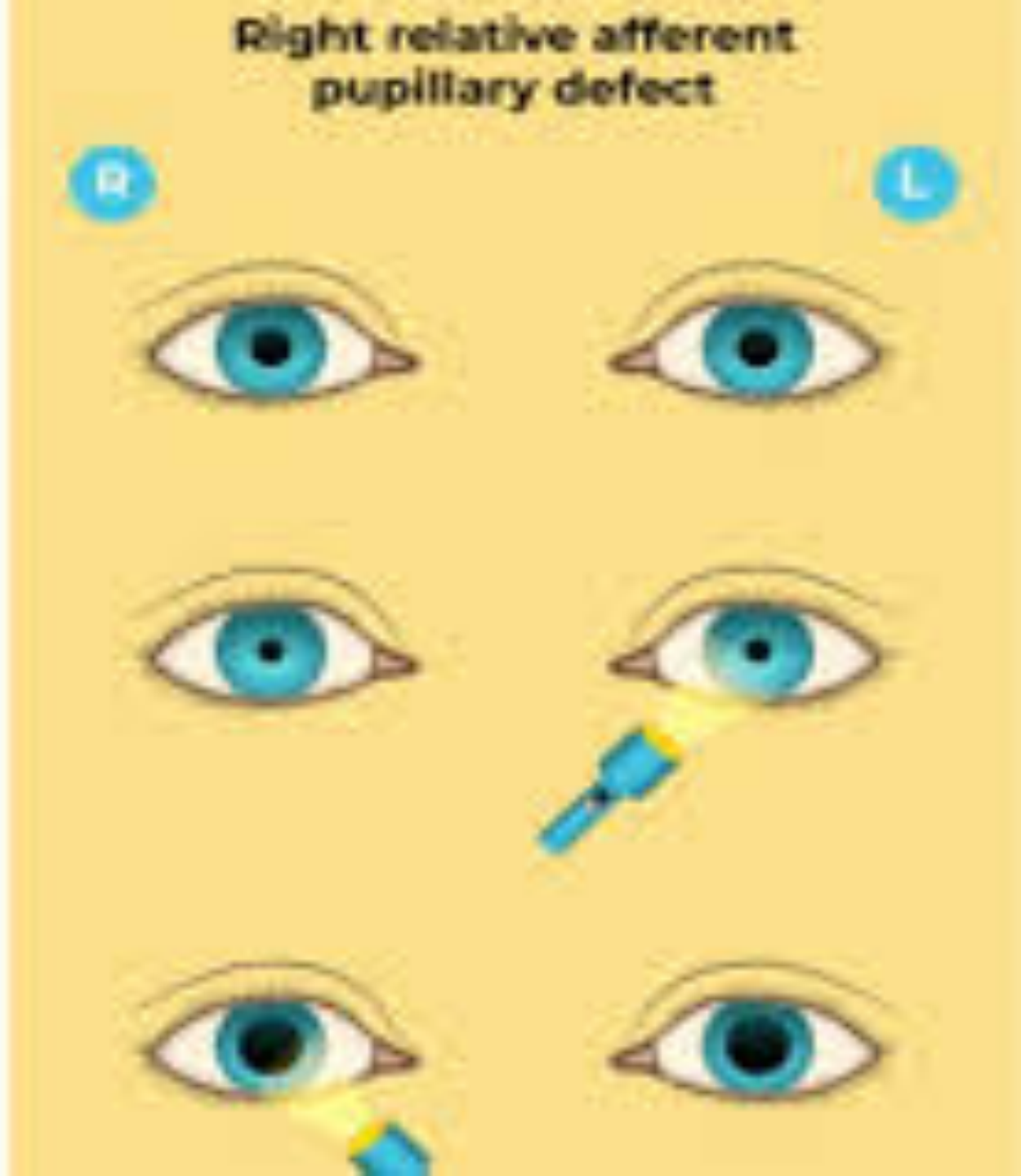
- Ishihari Pseudoisochromatic Plates
  - 10/14
- Farnsworth-Munsell 100 Hue Test
- Red Desaturation

EXAMINATION: PUPIL

- Direct Pupillary Light Reflex
  - Measure Photopic and Scotopic Pupil
- Consensual Light Response
- "Swinging Flashlight Test" aka, RAPD aka, Marcus Gunn Pupil
- Near Synkinesis Triad
  - Pupil Constriction, Adduction, Accommodation


Light source
6
1
Ciliary ganglion 5
Lateral geniculate body (LGB) 2
Convergence centre
Edinger –Westphal nucleus 4
Pretectal nucleus 3


Normal
R
L


Right relative afferent pupillary defect
R
L

EXAMINATION: MARCUS GUNN PUPIL

- Unilateral Optic Neuropathy
- Extensive Retinal Damage
- "No" Maculopathy
- "No" Amblyopia
- "No" Ocular Opacities
  - Corneal Scar, Cataract, Vitreous Hemorrhage

EXAMINATION: ABNORMAL PUPIL

- Physiologic Anisocoria
  - 20% of Population
  - Variable
  - Switch Sides
- What is the Company with Which the Pupil keeps?

EXAMINATION: ADIE'S TONIC PUPIL

- 80% Unilateral
- 70% Female Predilection
- 20-40 Years Old
- Dilated Pupil w/ Poor Light Response
- Slow Constriction w/Near Testing and Slow Re-dilation
- Lesion of Ciliary Body (Parasympathetic)
- Sensitive to Dilute Pilo (0.125%)
- Vermilliform Iris Movements on SLE
- Absent Deep Tendon Reflexes

EXAMINATION: ARGYLL ROBERTSON PUPIL

- Miotic, Bilateral, Irregular
- Absent Light Response
- Responds to Near
- Neurosyphilis, DM, Alcoholism, MS, Sarcoid

EXAMINATION: LIGHT NEAR DISSOCIATION

- Near Response> Light
  - Optic Neuropathy
  - Severe Retinopathy
  - Adie's Tonic Pupil
  - Argyll Robertson Pupil
  - Dorsal Midbrain Syndrome
    - AKA, Parinaud's Syndrome
      - Light Near Dissociation
      - Supranuclear Upgaze Paresis
      - Convergence Retraction Nystagmus

EXAMINATION: MISC PUPIL ANOMALIES

- Hutchinson's Pupil
  - Unilateral Dilated Pupil
  - Uncal Herniation
  - Tumor, Subdural Hematoma
- Miosis
  - Morphine, Pilocarpine
- Unilateral Dilated Pupil
  - Atropine, Traumatic
  - Pilo 1% Unreactive

EXAMINATION: HORNER'S SYNDROME

- Miosis of Affected Pupil
  - Worse in Dim Illumination
- Ptosis of Upper/Lower Lid
- Anhydrosis of Affected Side
- Heterochromia of Affected Iris (Congenital)

EXAMINATION: HORNER'S SYNDROME

- Diagnostic Steps
  - Cocaine 10% gtts Block Norepinephrine at Myoneural Junction
  - Requires NL Functioning Sympathetic Pathway
  - Any Lesion of the 3 Neuronal Pathway will Cause Increased Anisocoria

EXAMINATION: HORNER'S SYNDROME

- Diagnostic Steps
  - Paredrine (1% Hydroxyamphetamine)
  - Releases Norepinephrine from the Myoneural Junction
  - Subnormal Dilation of the Pupil with 3rd Order Neuron Lesion
  - Normal Dilation with 1st or 2nd Order Neuron Lesion

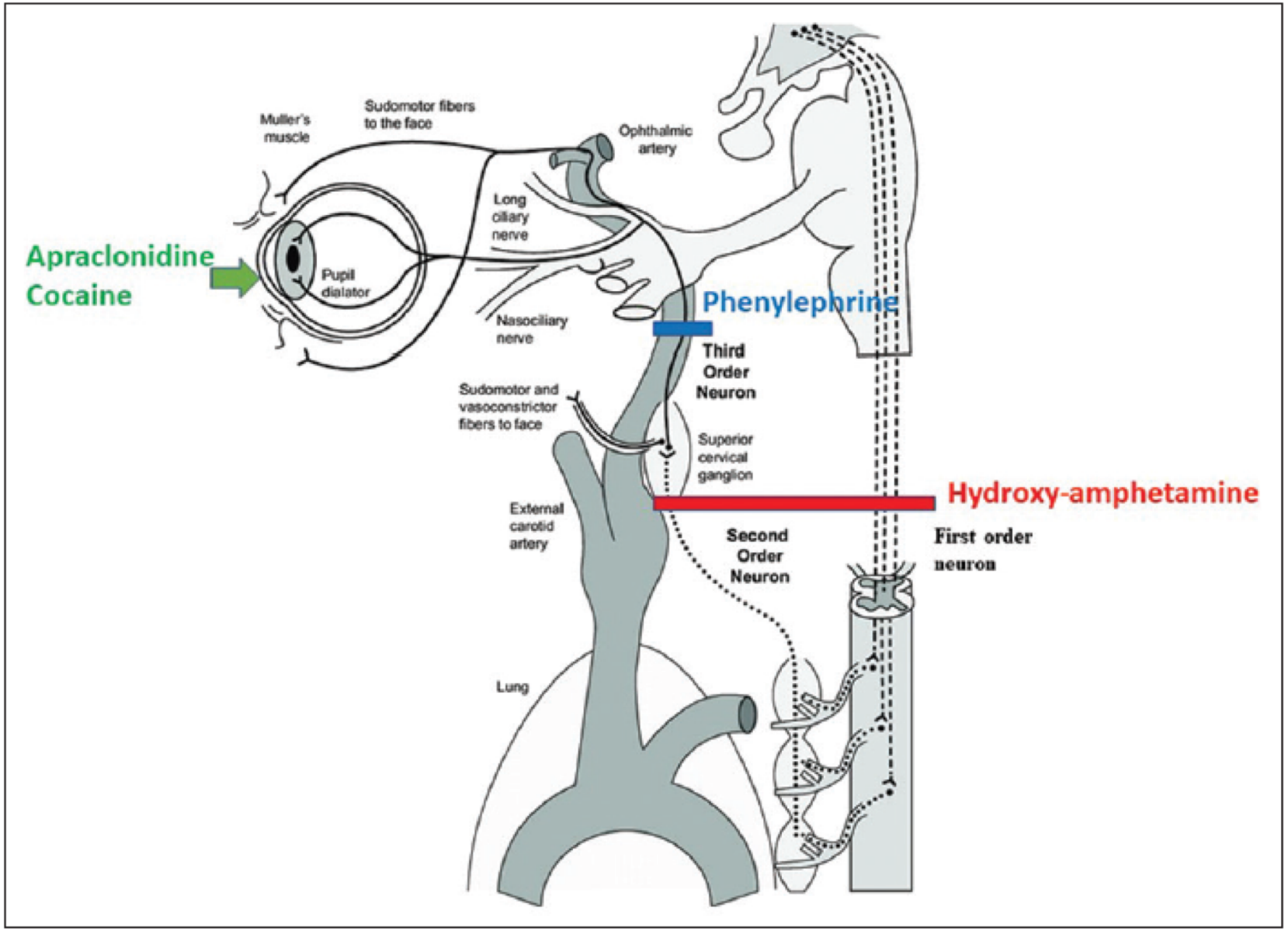


Figure 2: Shows a diagrammatic representation of the utility of different pharmacological agents at different levels of the oculo-sympathetic system

EXAMINATION: HORNER'S SYNDROME DIFFERENTIAL DIAGNOSIS

- First Order Neuron Lesions (Brainstem and Spinal Cord)
  - CVA
  - Neck Trauma
  - Tumor
  - Demyelinating Disease

EXAMINATION: HORNER'S SYNDROME DIFFERENTIAL DIAGNOSIS

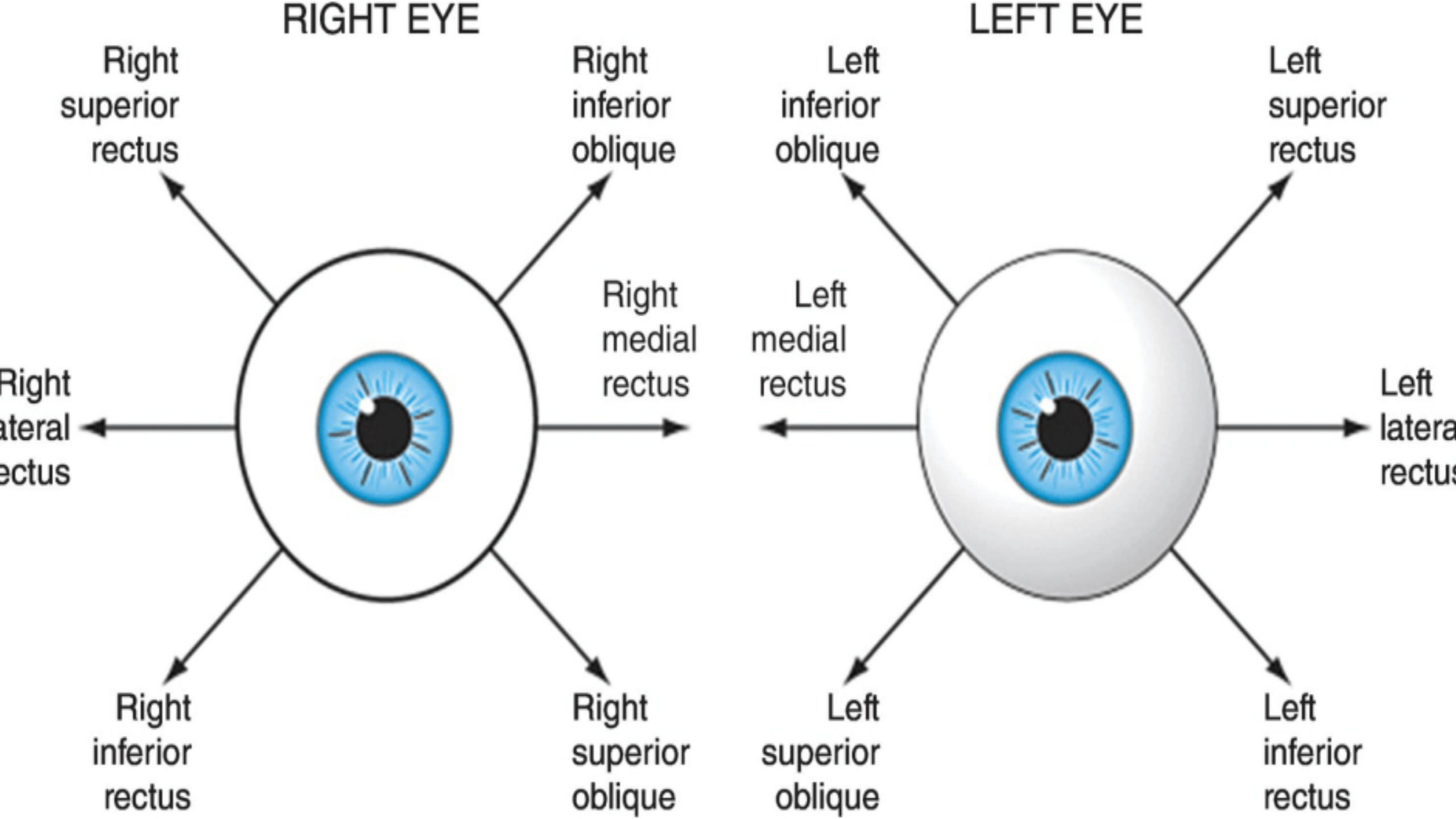
- Second Order Neuron Lesion (Preganglionic)
  - Chest Lesions: Pancoast Tumor of Lung Apex, Cervical Rib, Mediastinal Mass
  - Neck Lesions: Trauma, Abscess, Thyroid Neoplasm, Lymphadenopathy
  - Surgery: Thyroidectomy, Radical Neck Surgery, Carotid Angiography (Direct Carotid Puncture)

EXAMINATION: HORNER'S SYNDROME DIFFERENTIAL DIAGNOSIS

- Third Order Neuron Lesion (Post Ganglionic)
  - Migraine Variants
  - Complicated Otitis Media
  - Cavernous Sinus Lesion
  - Superior Orbital Fissure Lesion
  - Nasopharyngeal Carcinoma

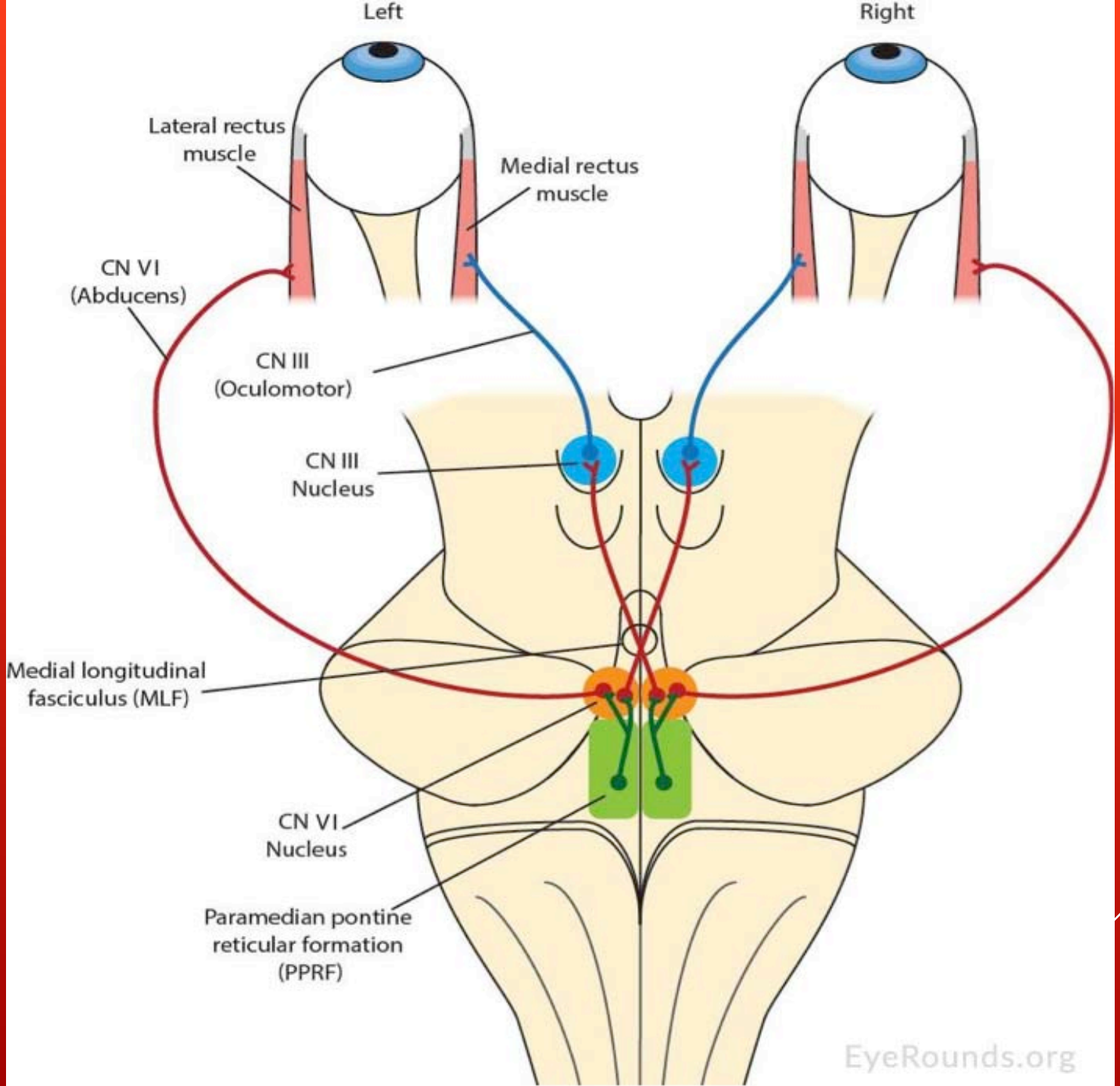
EXAMINATION: MOTILITY

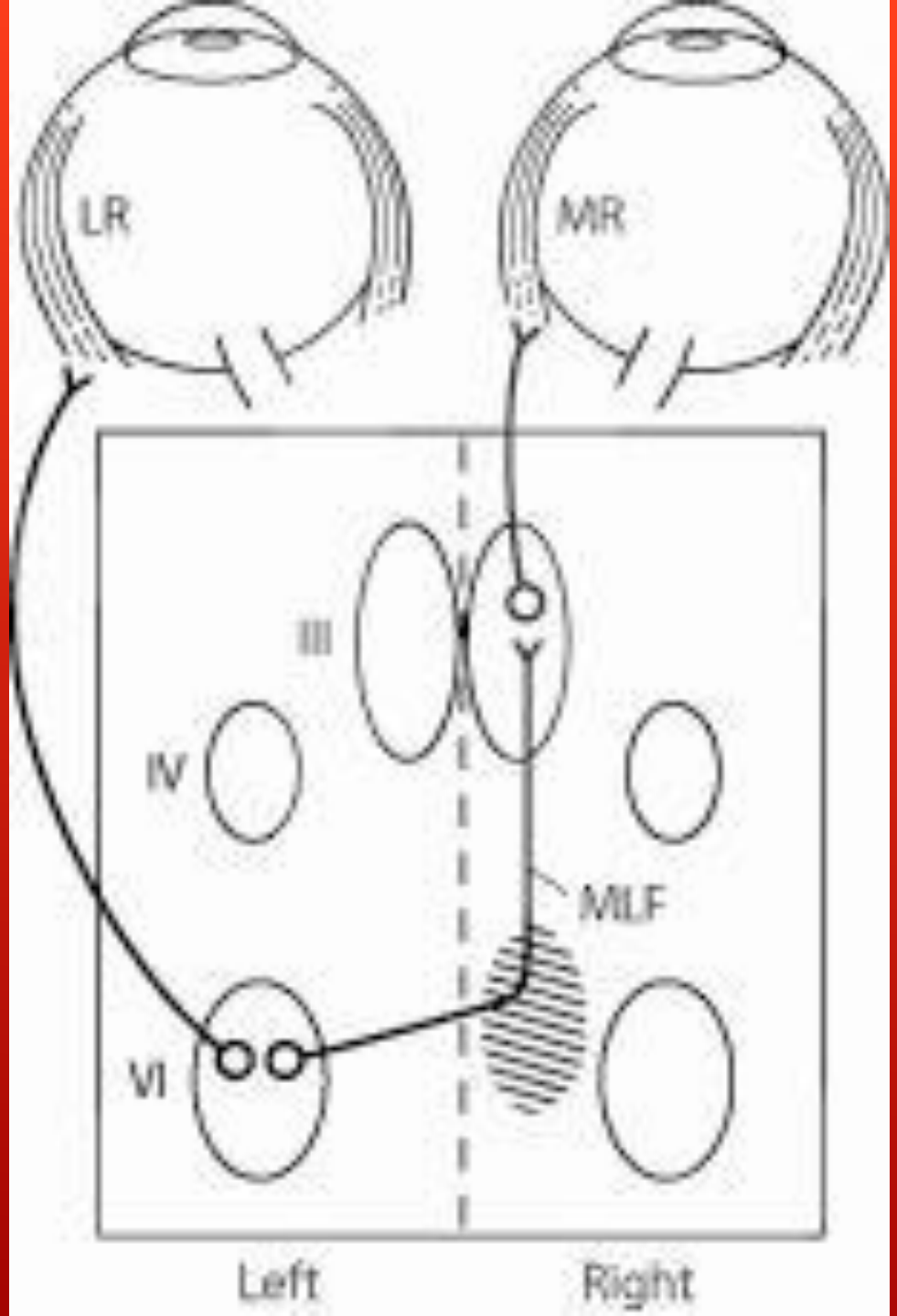
- Six Cardinal Positions of Gaze
- Convergence/Divergence
  - Eyes Move in Opposite Direction
- Saccadic Movements (FEM)
  - 300 to 700 degrees/sec
  - Frontal Lobe
- Smooth Pursuit Movements (SEM)
  - 20 to 50 degrees/sec
  - Parieto-Occipito-Temporal Lobe


RIGHT EYE
Right superior rectus
Right inferior oblique
Right medial rectus
Right lateral rectus
Right inferior rectus
Right superior oblique
LEFT EYE
Left inferior oblique
Left superior rectus
Left medial rectus
Left lateral rectus
Left superior oblique
Left inferior rectus

EXAMINATION: MOTILITY INTERNUCLEAR CONNECTIONS

- Paramedian Pontine Reticular Formation (PPRF)
  - Horizontal Gaze Center
  - PPRF sends Fibers to the Ipsilateral VI Nerve Nuclei
    - VI Nerve Sends Fibers to Ipsilateral LR (Abduction)
    - VI Nerve Sends Fibers to Contralateral:
      - MLF, III N Nuclei, MR (Adduction)

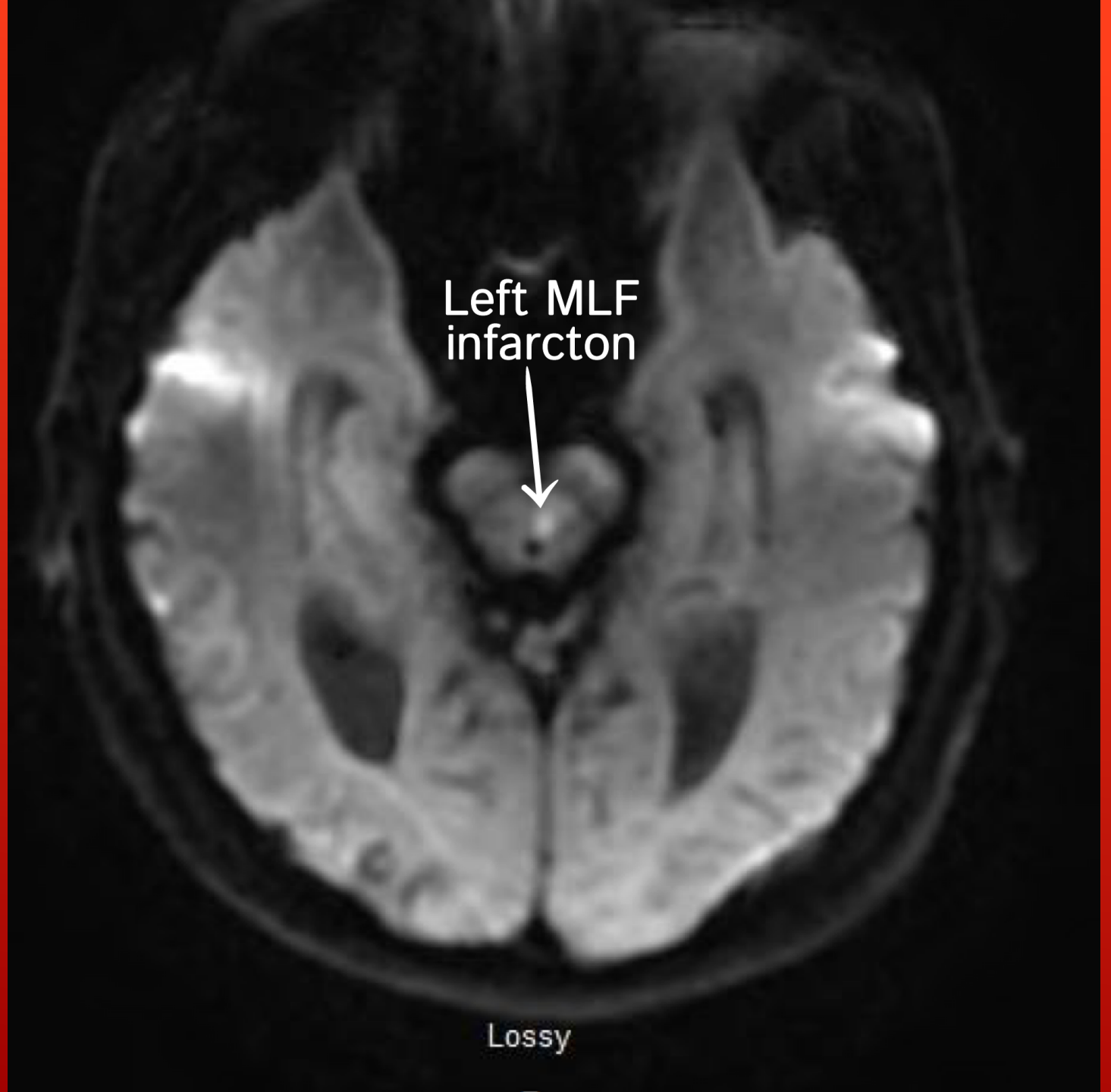

Left
Right
Lateral rectus muscle
Medial rectus muscle
CN VI (Abducens)
CN III (Oculomotor)
CN III Nucleus
Medial longitudinal fasciculus (MLF)
CN VI Nucleus
Paramedian pontine reticular formation (PPRF)
EyeRounds.org


LR
MR
III
IV
MLF
VI
Left
Right

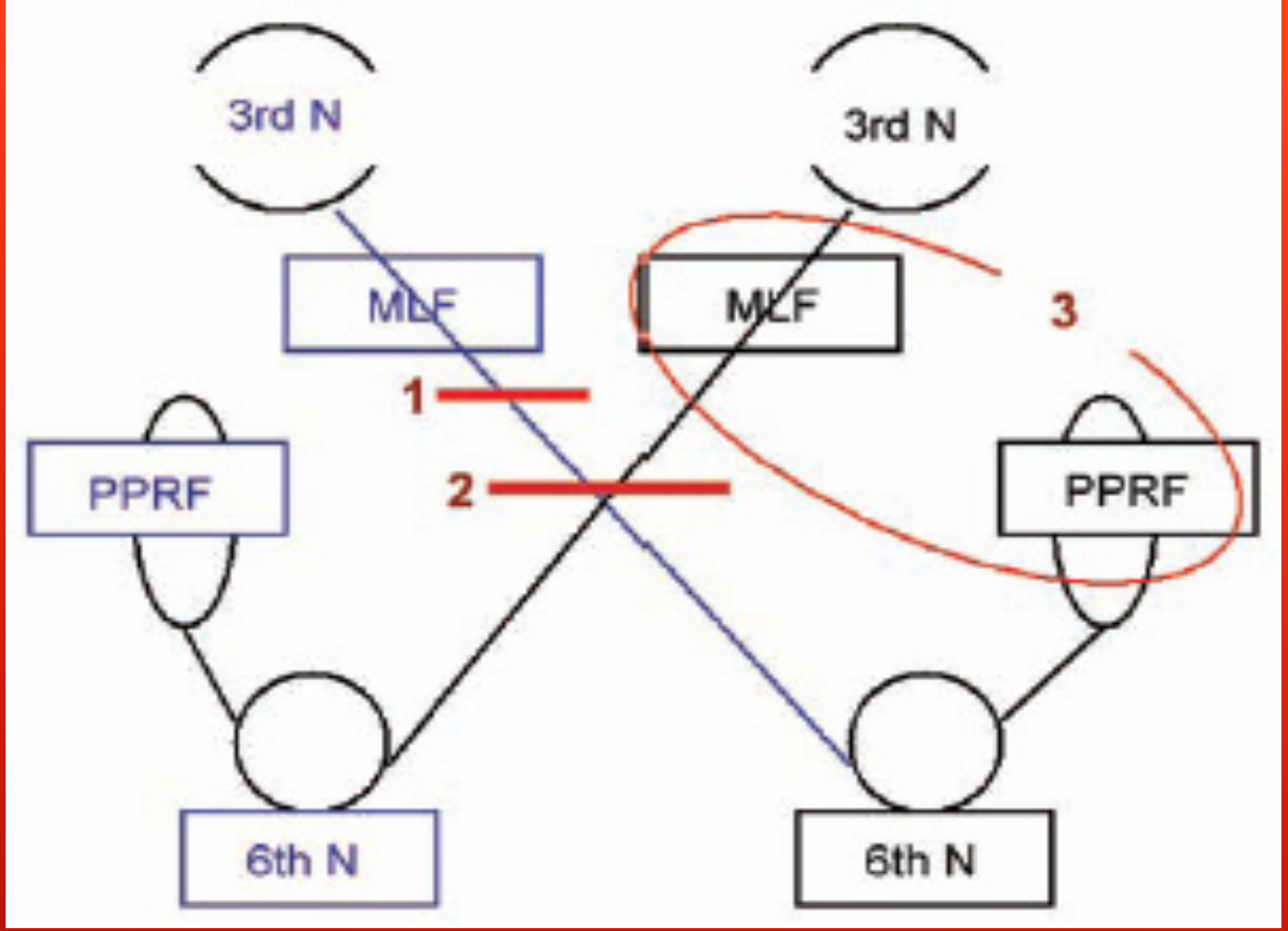
INO on left gaze (right MLF lesion)

Right eye adducting saccade 20°/s

No adduction of right eye beyond primary position


Left MLF
infarcton
Lossy

WHAT IS THIS CLINICAL PRESENTATION?



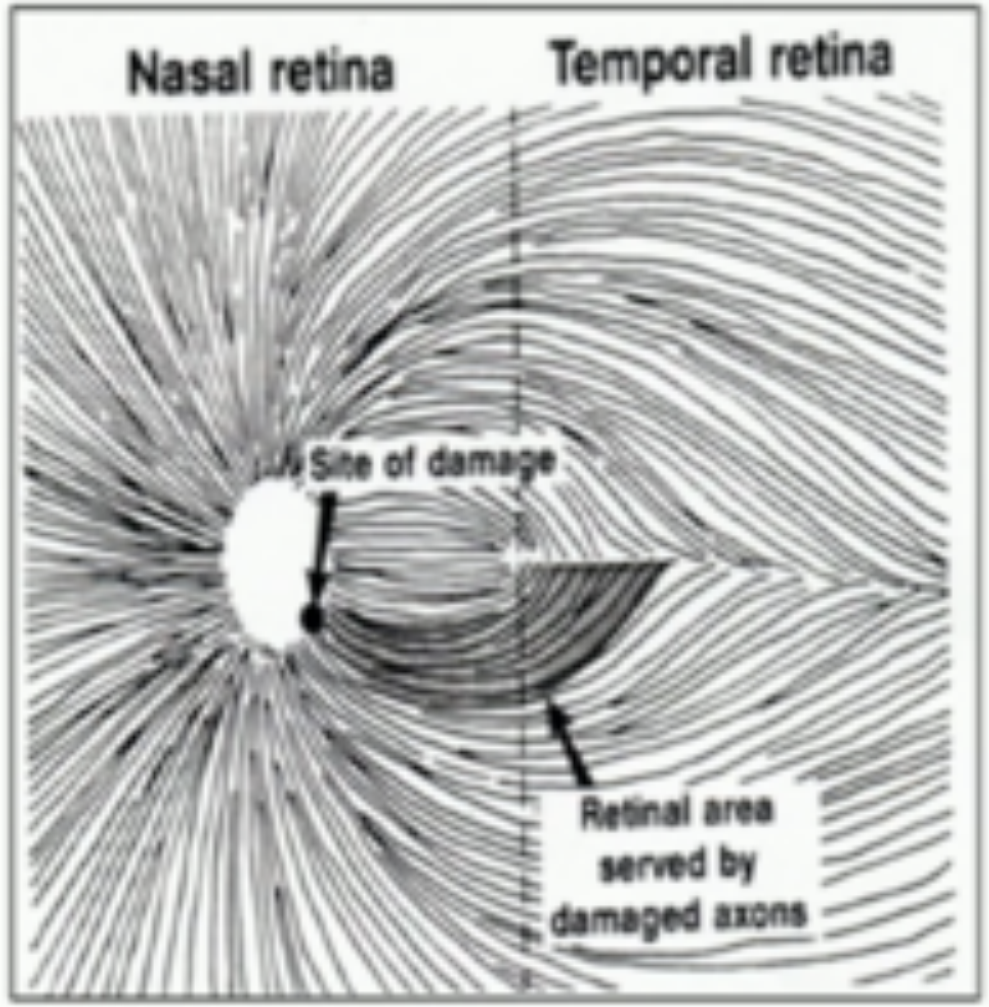
ONE AND A HALF SYDROME

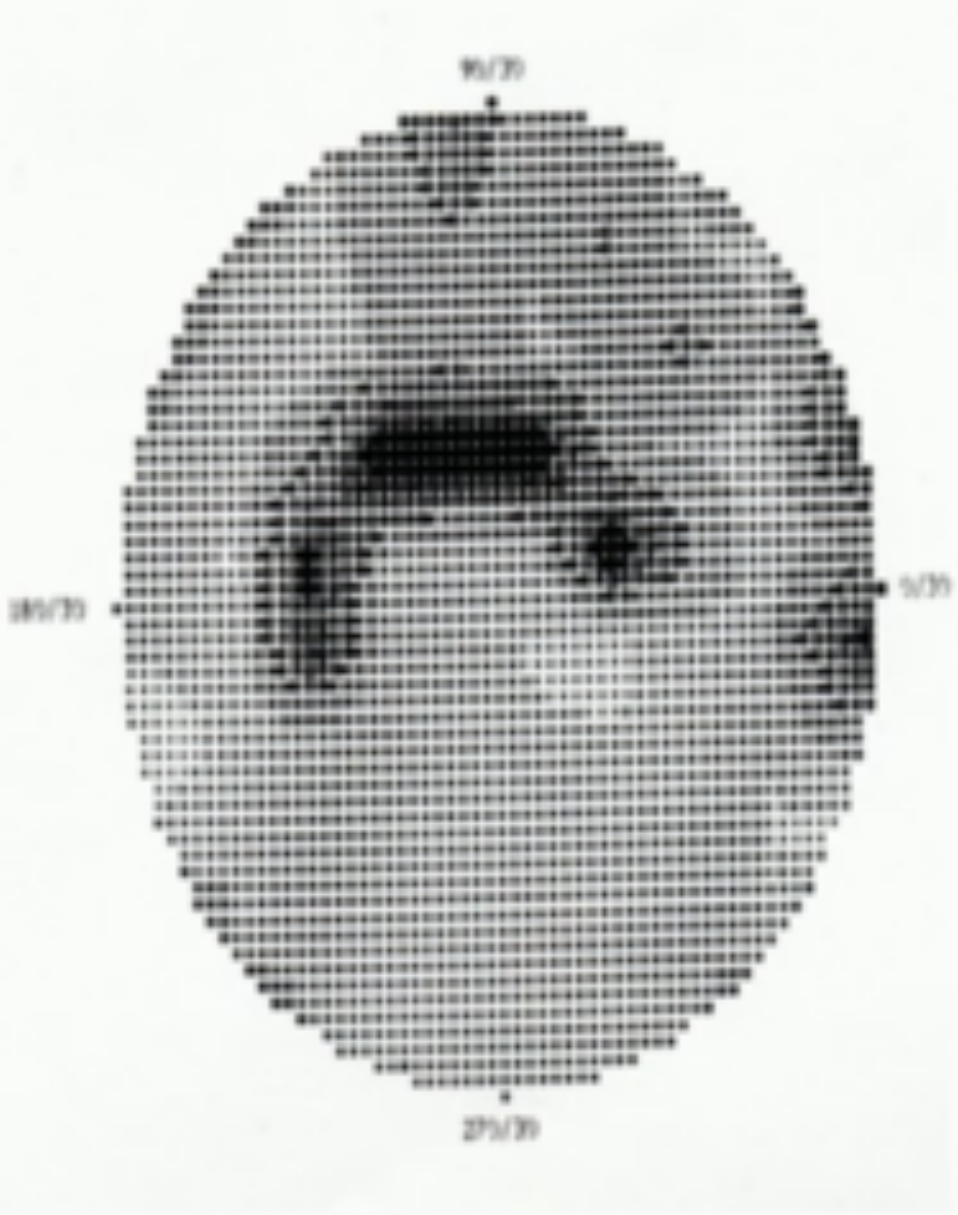
EXAMINATION: VISUAL FIELD

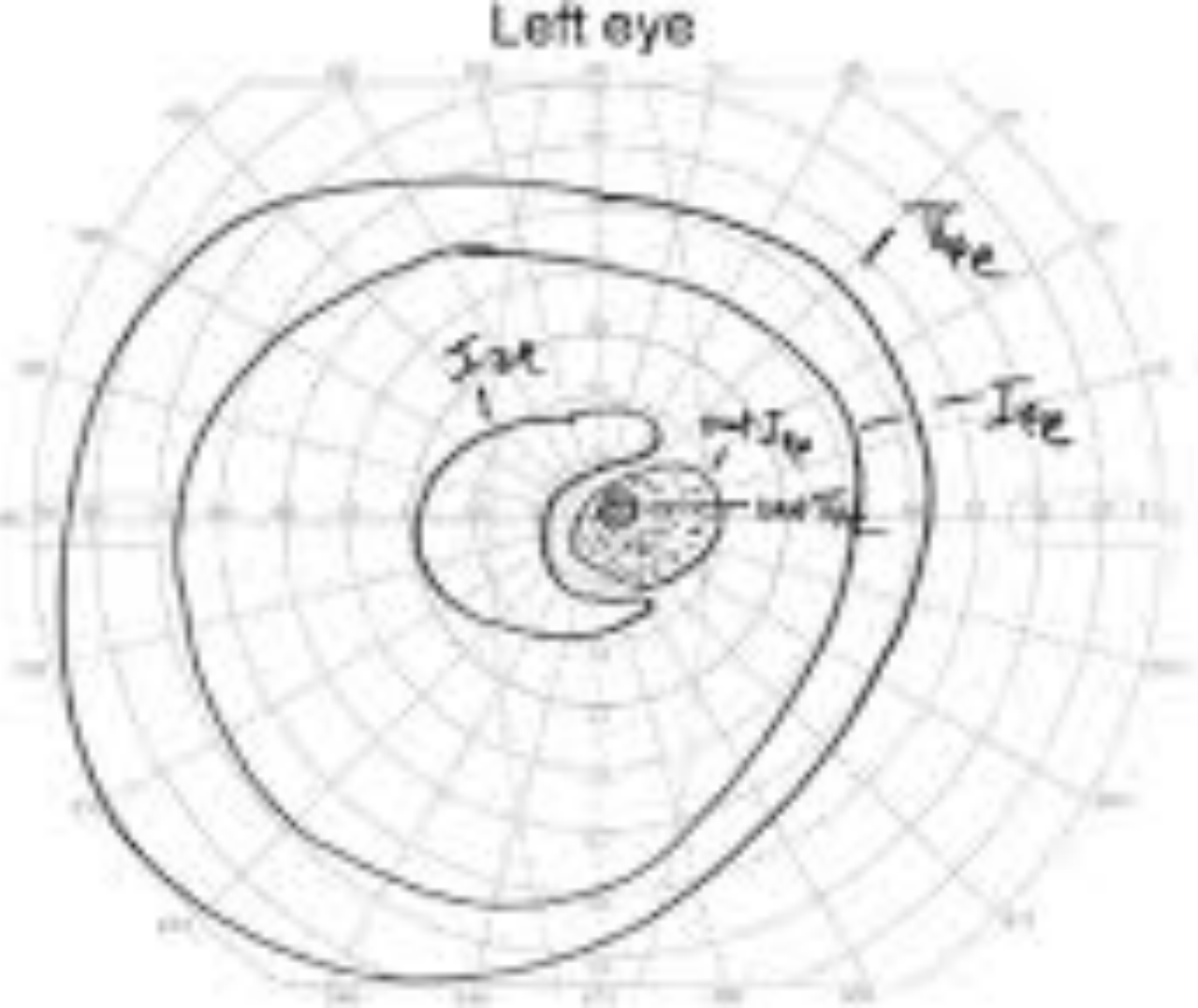
- Confrontation Visual Fields
- Amsler Grid
- Tangent Screen
- Goldman Bowl Perimeter
- Computerized VF

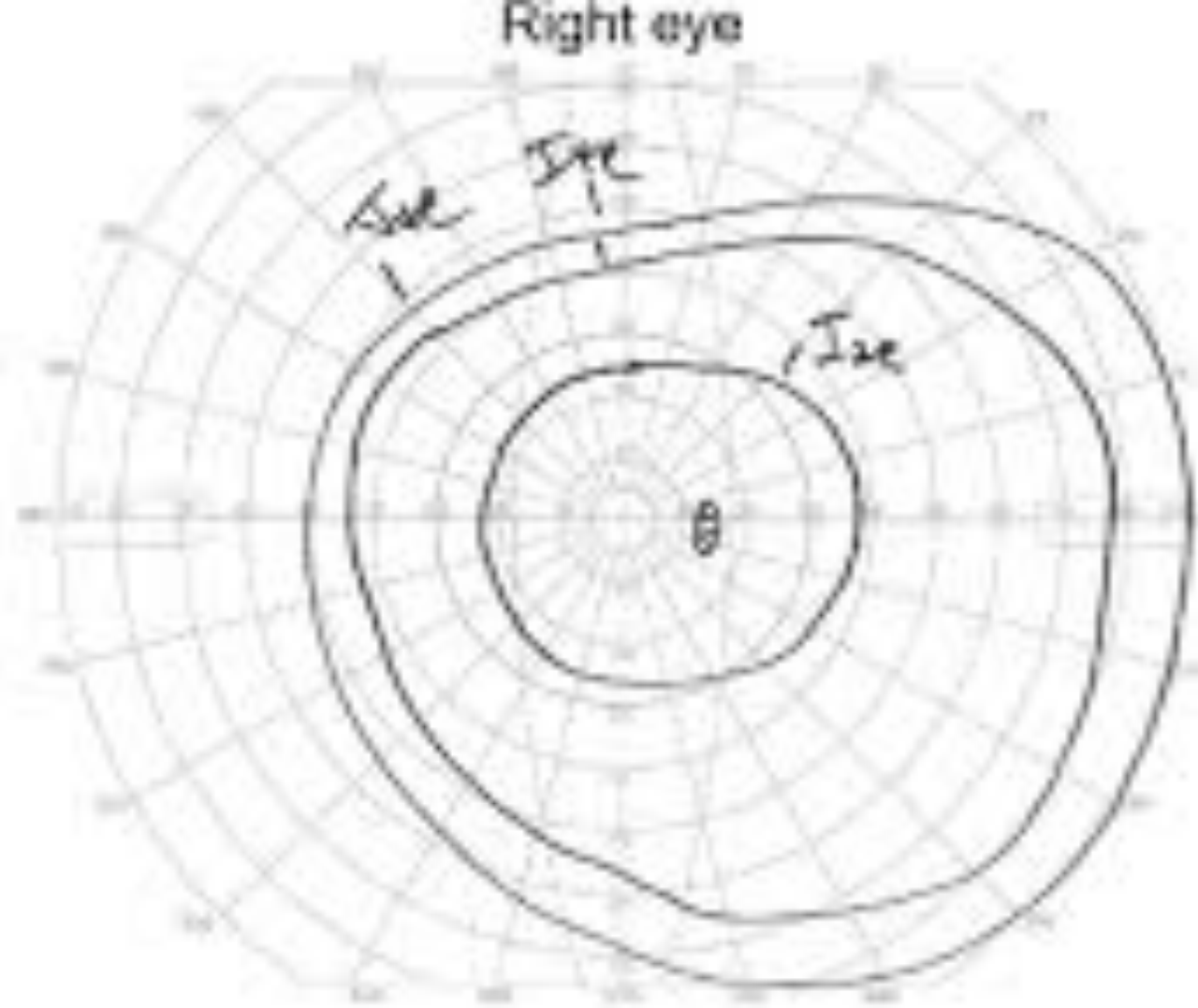
EXAMINATION: VISUAL FIELD OPTIC NERVE DEFECTS

- Retinal Nerve Fibers Respect the Horizontal Meridian
- Course of the Papillomacular Bundle
  - Central, Cecocentral, Paracentral Scotomas
- Arcuate Nerve Fiber Bundle
  - Bjerrum/Arcuate (15 degrees from Fixation)
  - Seidel Scotoma involving BS
  - Nasal Step

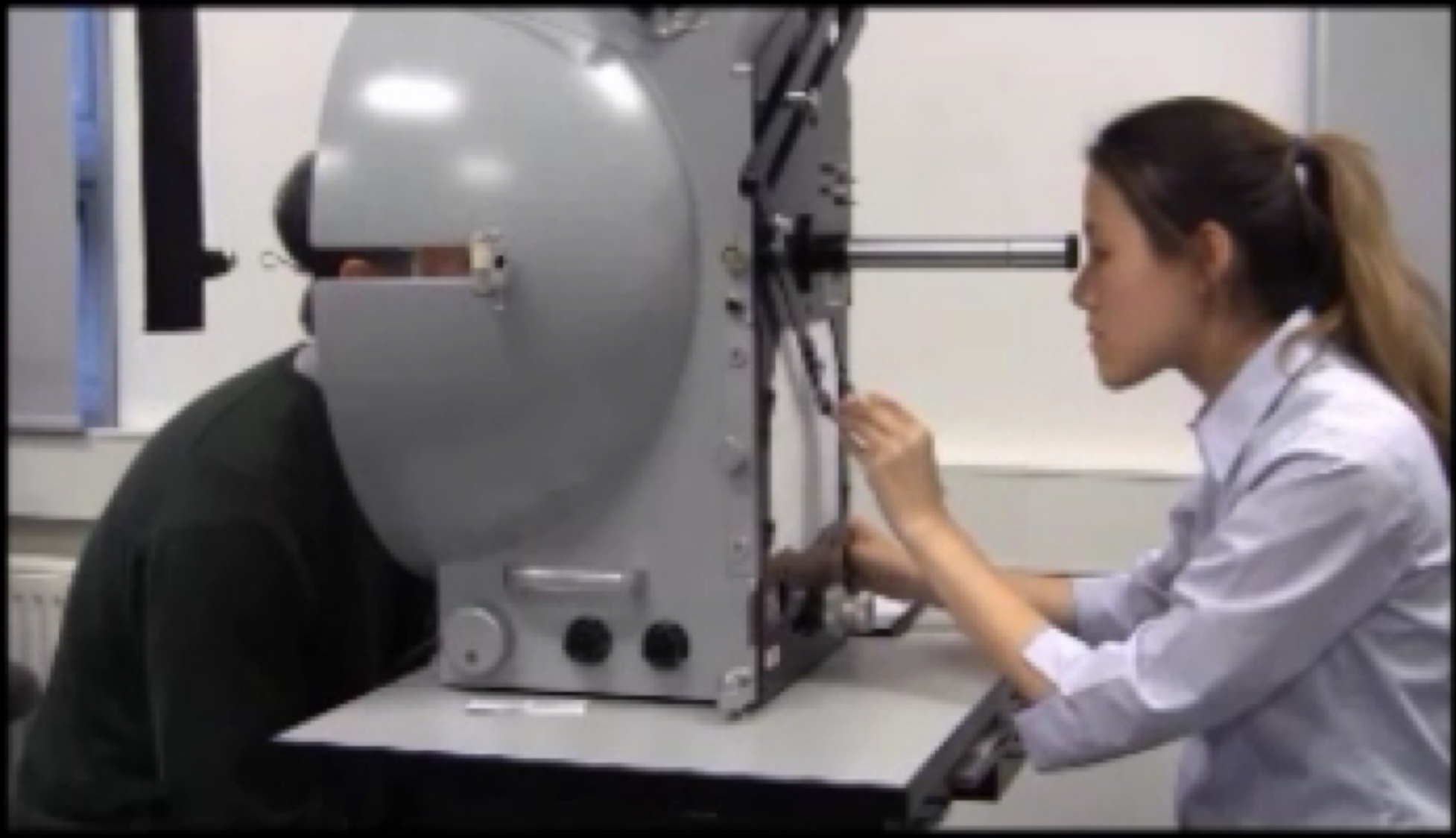

Nasal retina
Temporal retina
Site of damage
Retinal area
served by
damaged axons

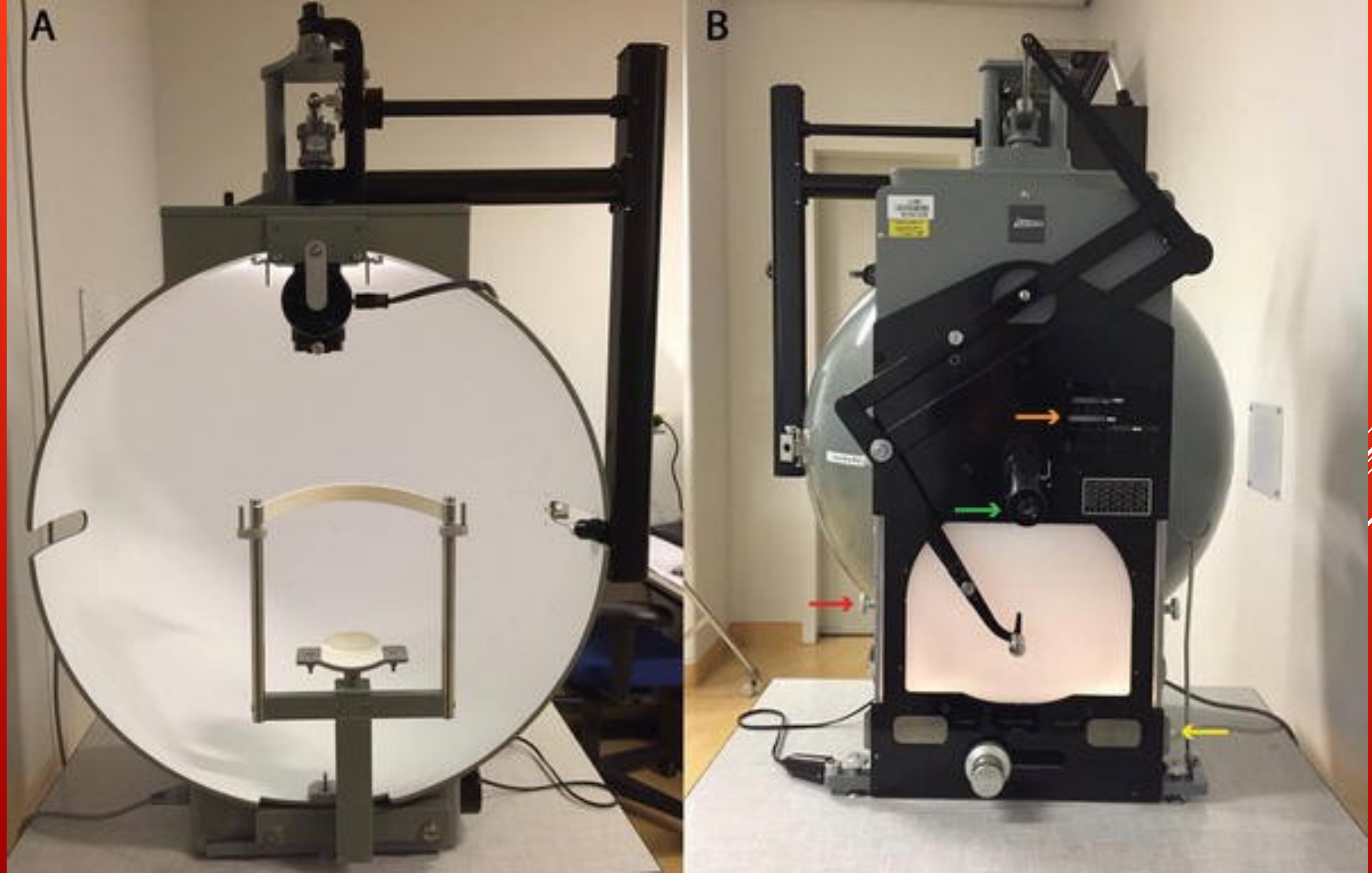






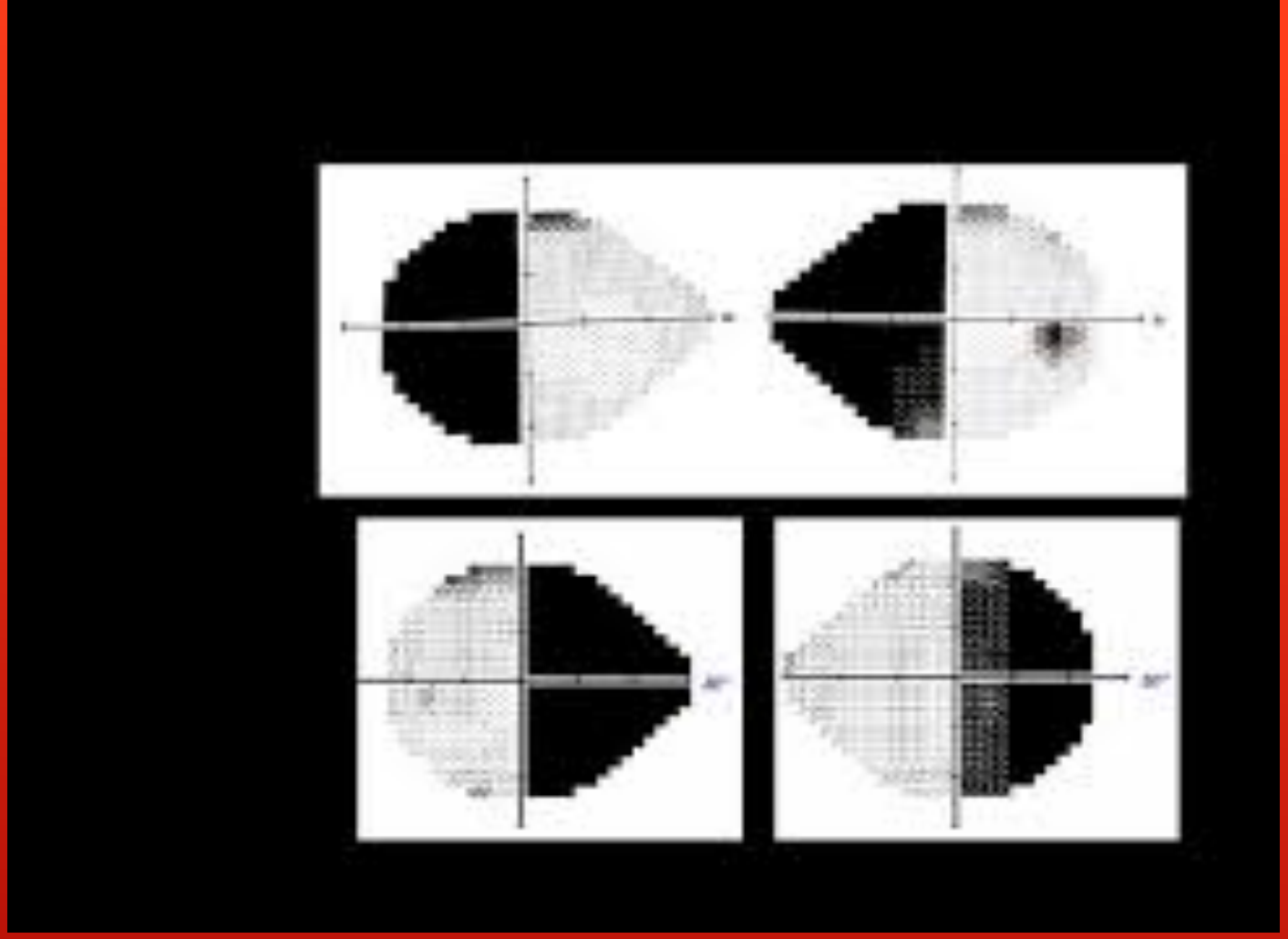
LEFT CENTRAL SCOTOMA



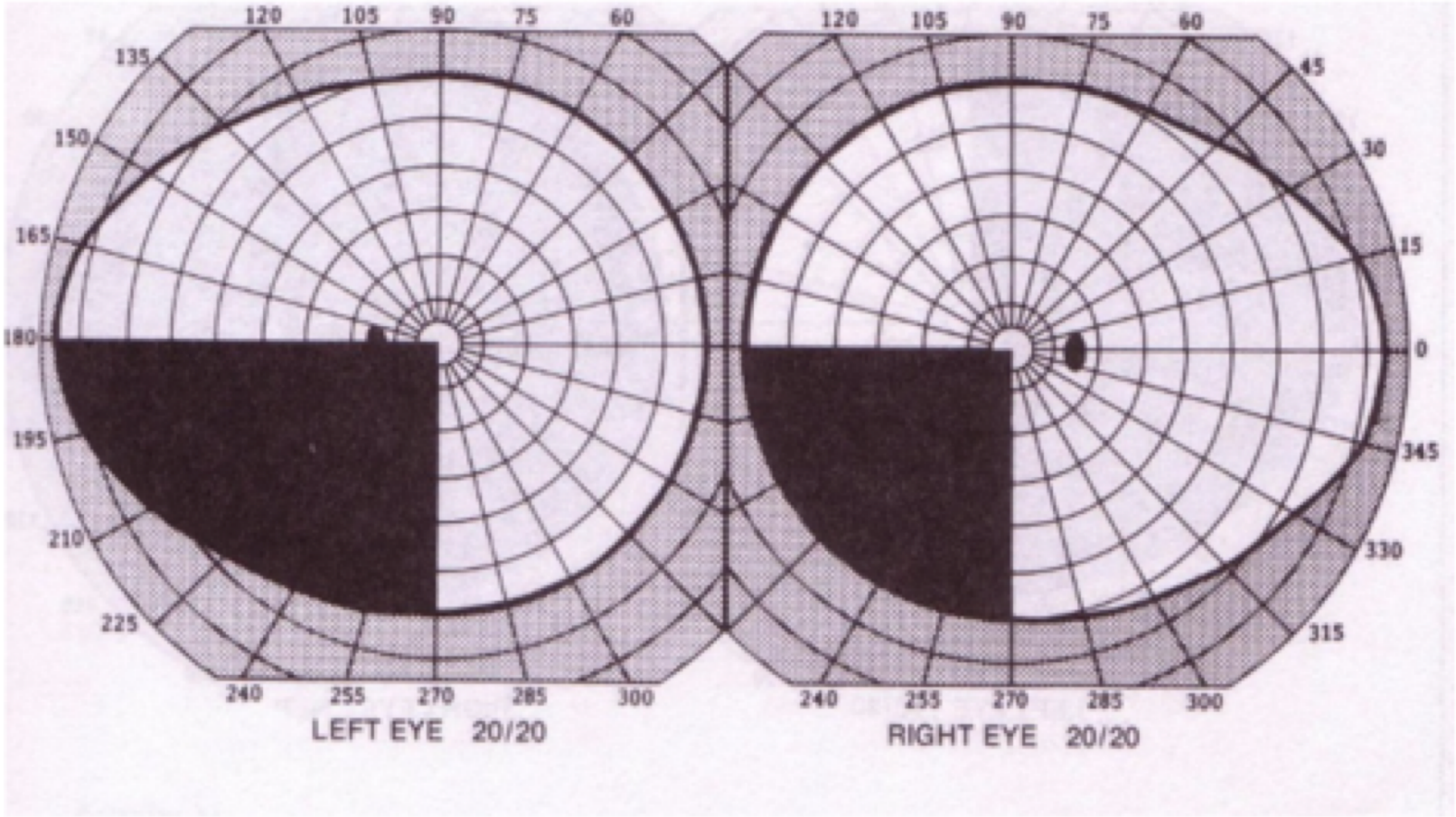

A
B

EXAMINATION: VISUAL FIELD POST CHIASM DEFECTS

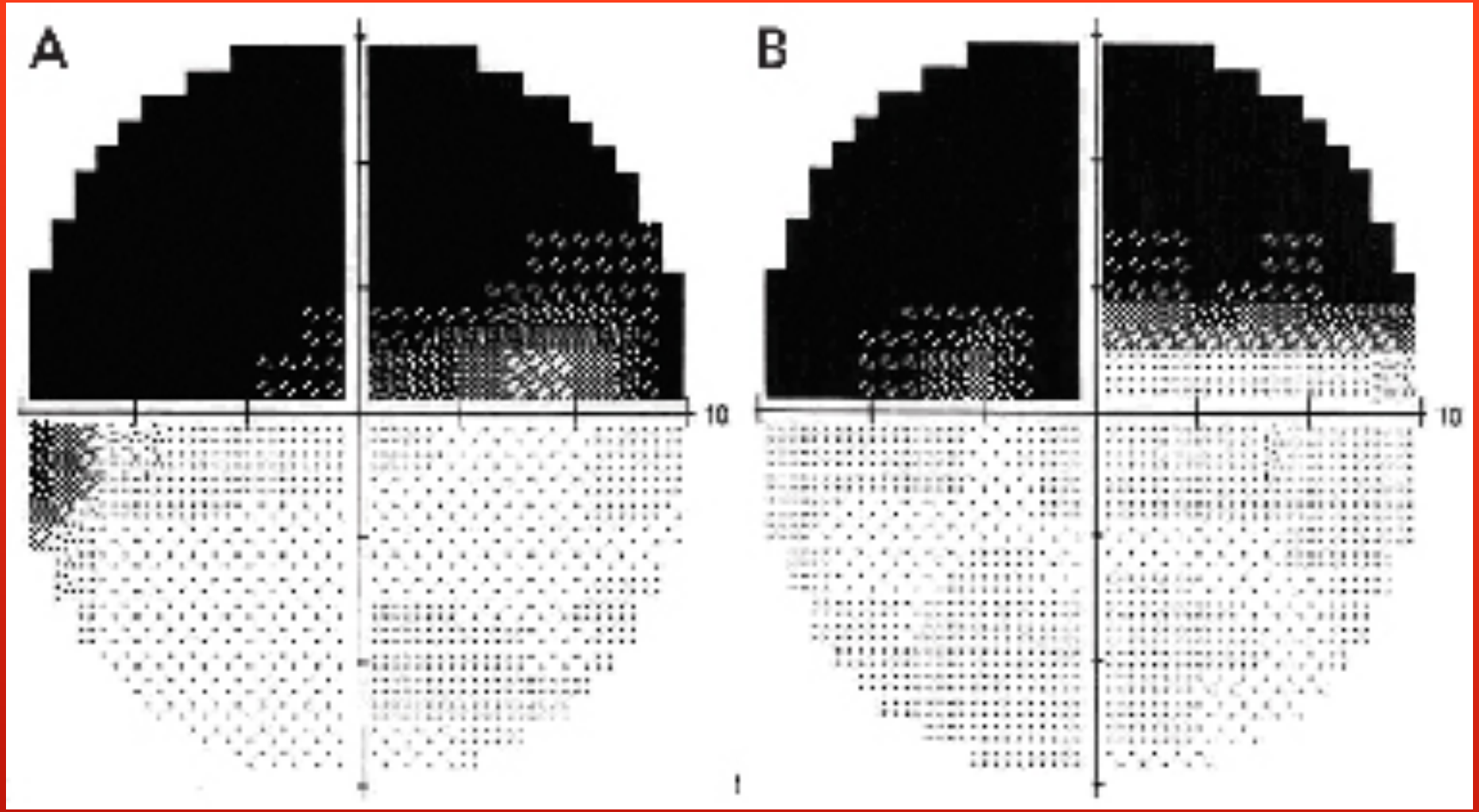
- Contralateral Homonymous Hemianopic Defects
- Respect Vertical Meridian
- The More Posterior the Lesion, the More Congruous The Defect
- Macular Sparing Occurs in Watershed Areas of the Occipital Lobes



LEFT HOMONYMOUS HEMIANOPSIA
RIGHT HOMONYMOUS HEMIANOPSIA



LEFT INFERIOR HOMONYMOUS QUADRANTINOPIA



LEFT SUPERIOR HOMONYMOUS QUADRANTINOPIA AND RIGHT SUPERIOR HOMONYMOUS QUADRANTINOPIA

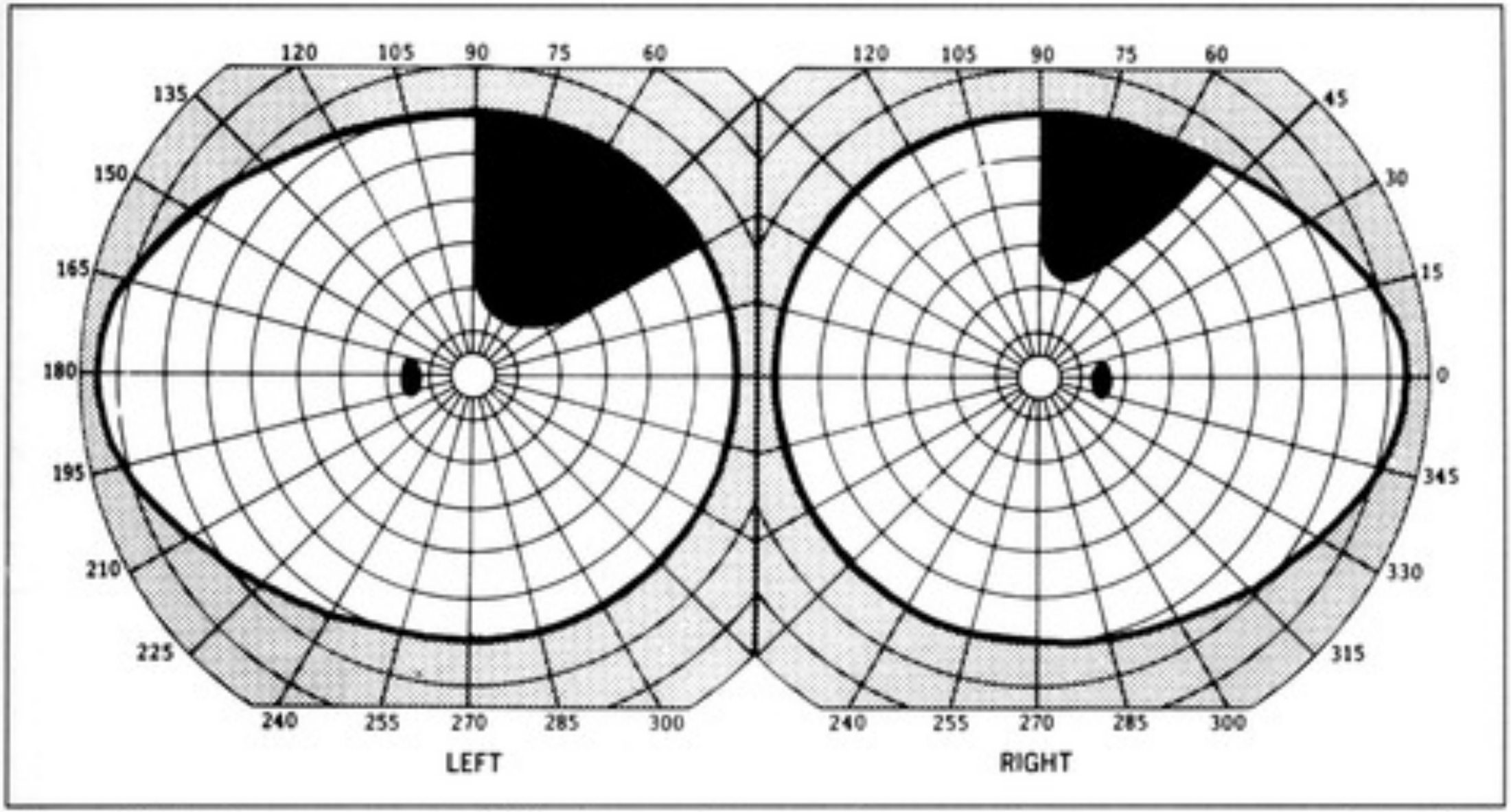
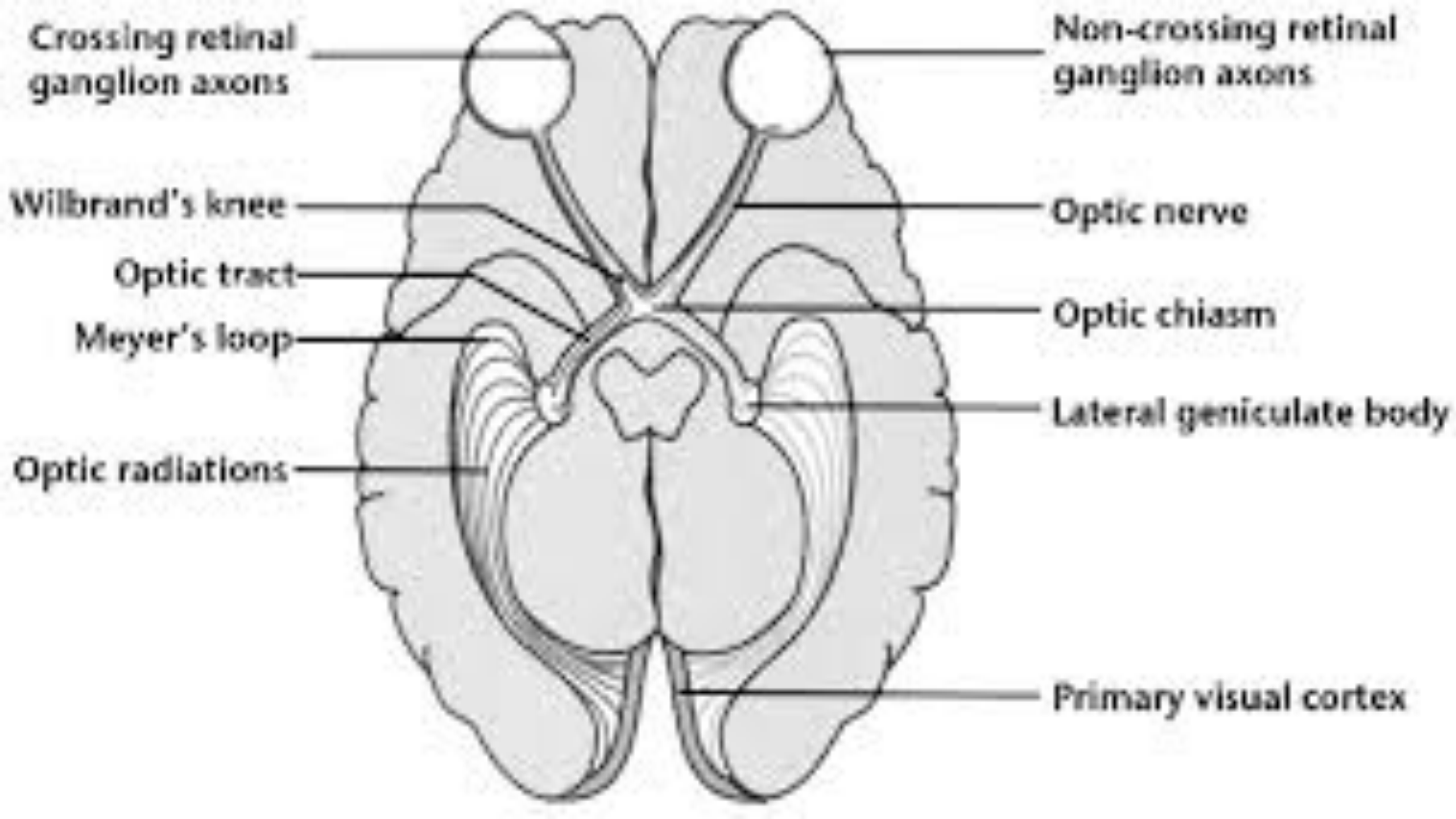
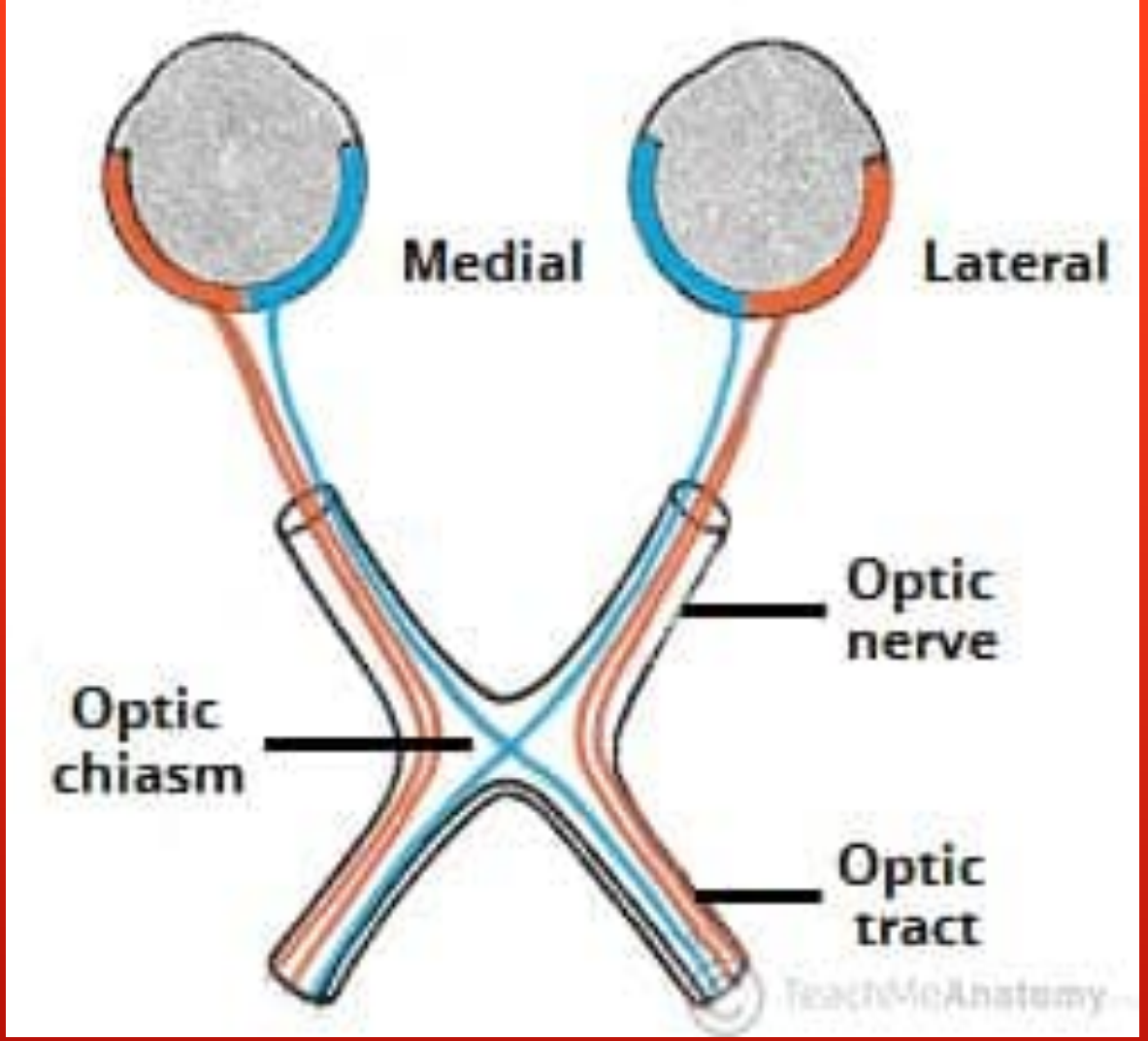


Figure 1-15. Anterior temporal lobe lesion of Meyer's loop produces incongruous, midperipheral and peripheral-contralateral, homonymous, superior ("pie in the sky") quadrantanopia. This is an example of a patient with a left temporal lobe lesion.


Crossing retinal ganglion axons
Non-crossing retinal ganglion axons
Wilbrand's knee
Optic nerve
Optic tract
Optic chiasm
Meyer's loop
Lateral geniculate body
Optic radiations
Primary visual cortex

EXAMINATION: VISUAL FIELD CHIASM DEFECTS

- Nasal Retinal Fibers Cross in the Chiasm
- Temporal Retinal Fibers Remain Uncrossed
- Inferonasal Retinal Fibers Cross in the Chiasm, But Course Anteriorly in the Contralateral Optic Nerve



OPTIC CHIASM

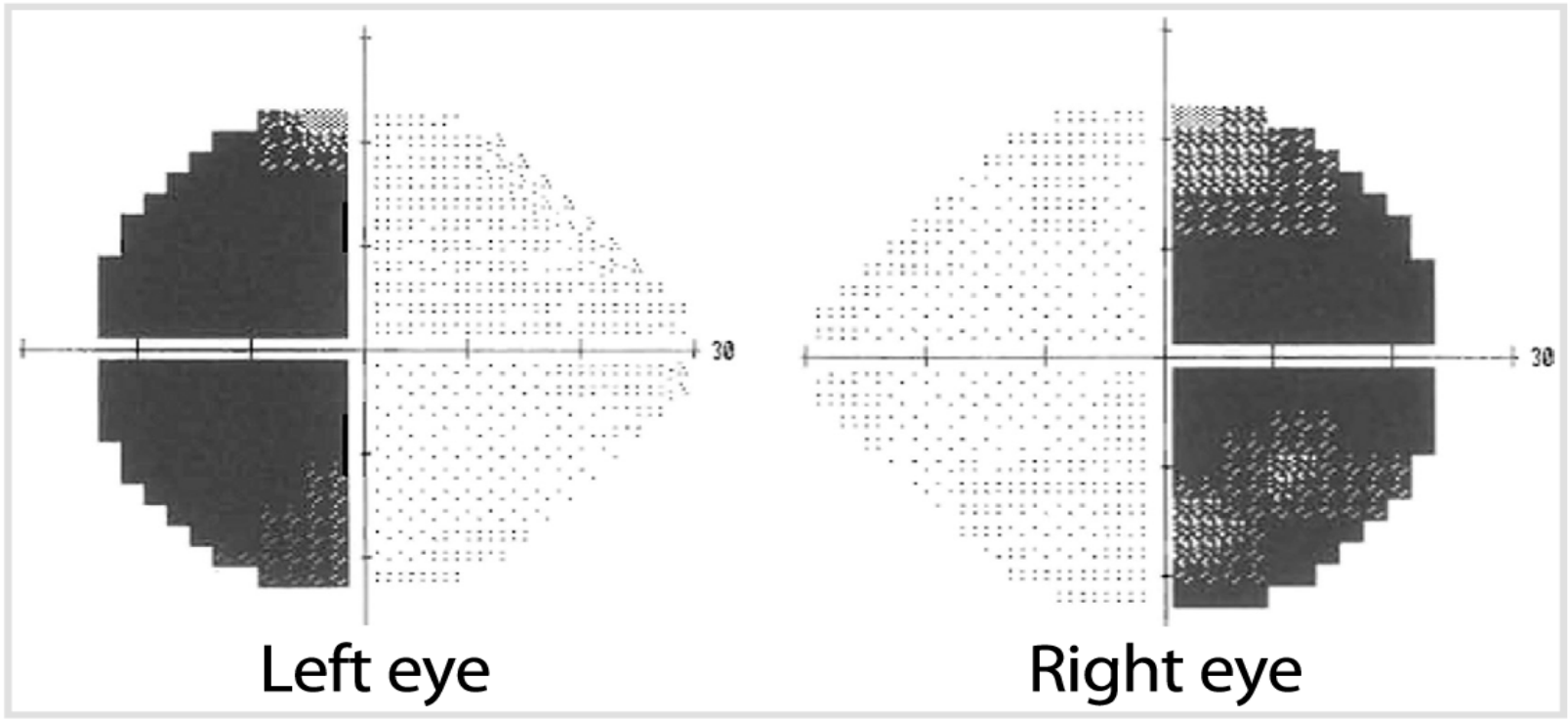
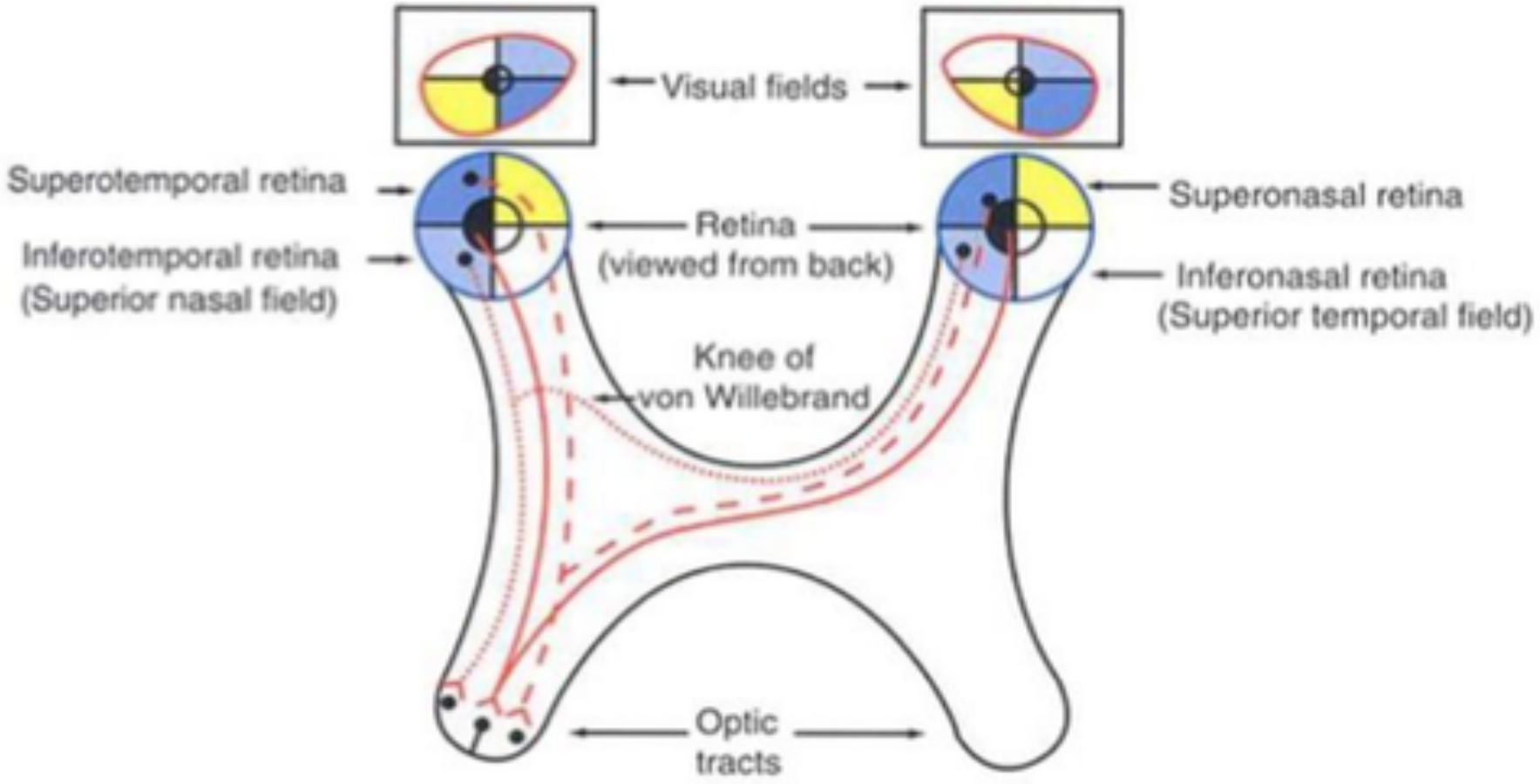


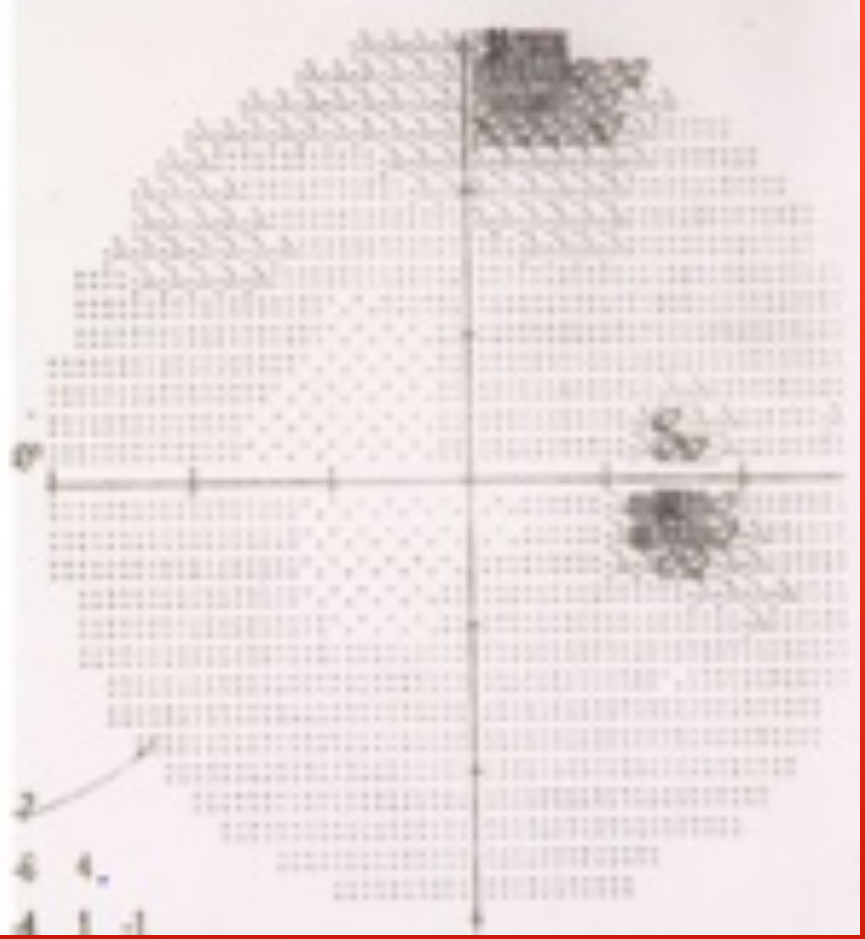
FIGURE 6-2 Humphrey visual field testing demonstrates a dense, bitemporal hemianopsia, with exquisite respect for the vertical meridian.

Continued on page 91

BITEMPORAL HEMIANOPSIA

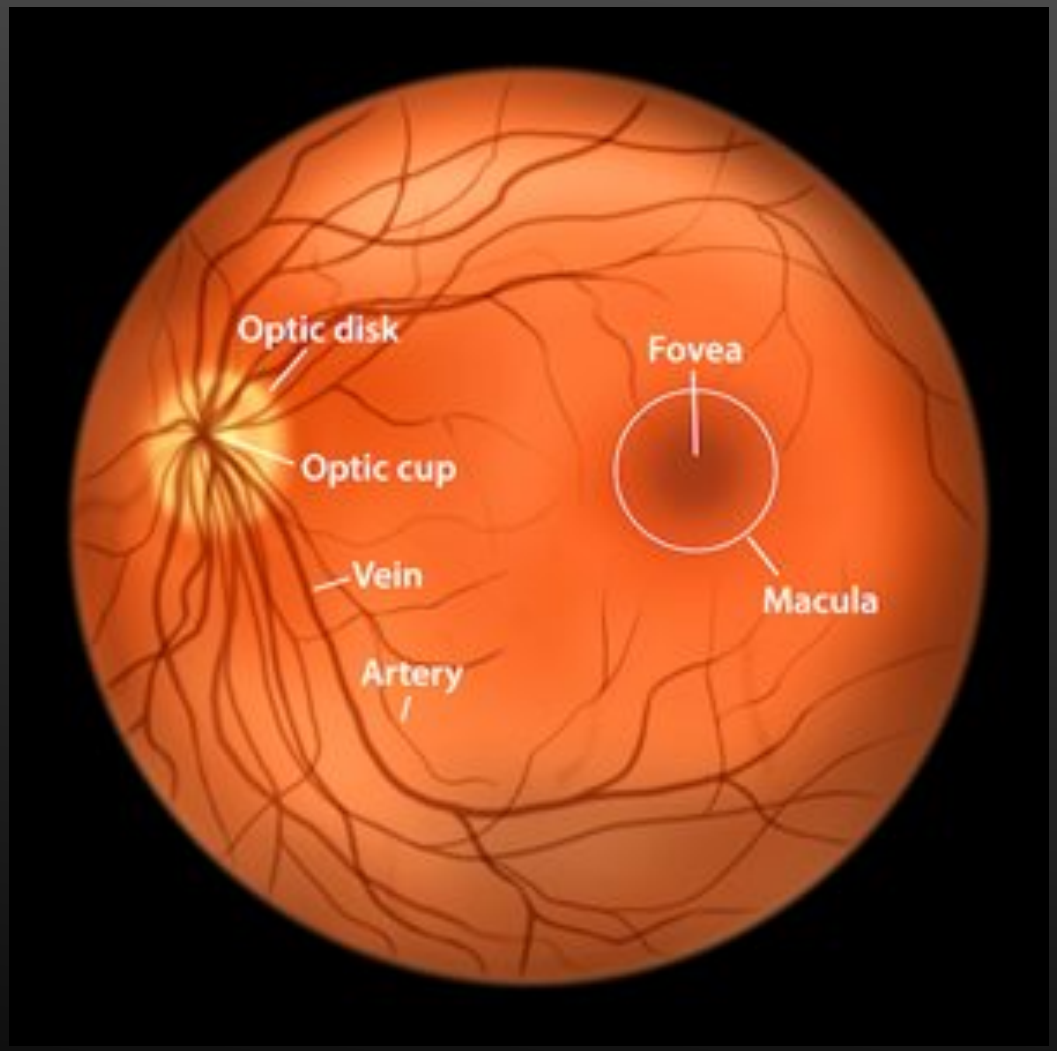


KNEE OF VON WILLEBRAND



JUNCTIONAL SCOTOMA

EXAMINATION: FUNDUS

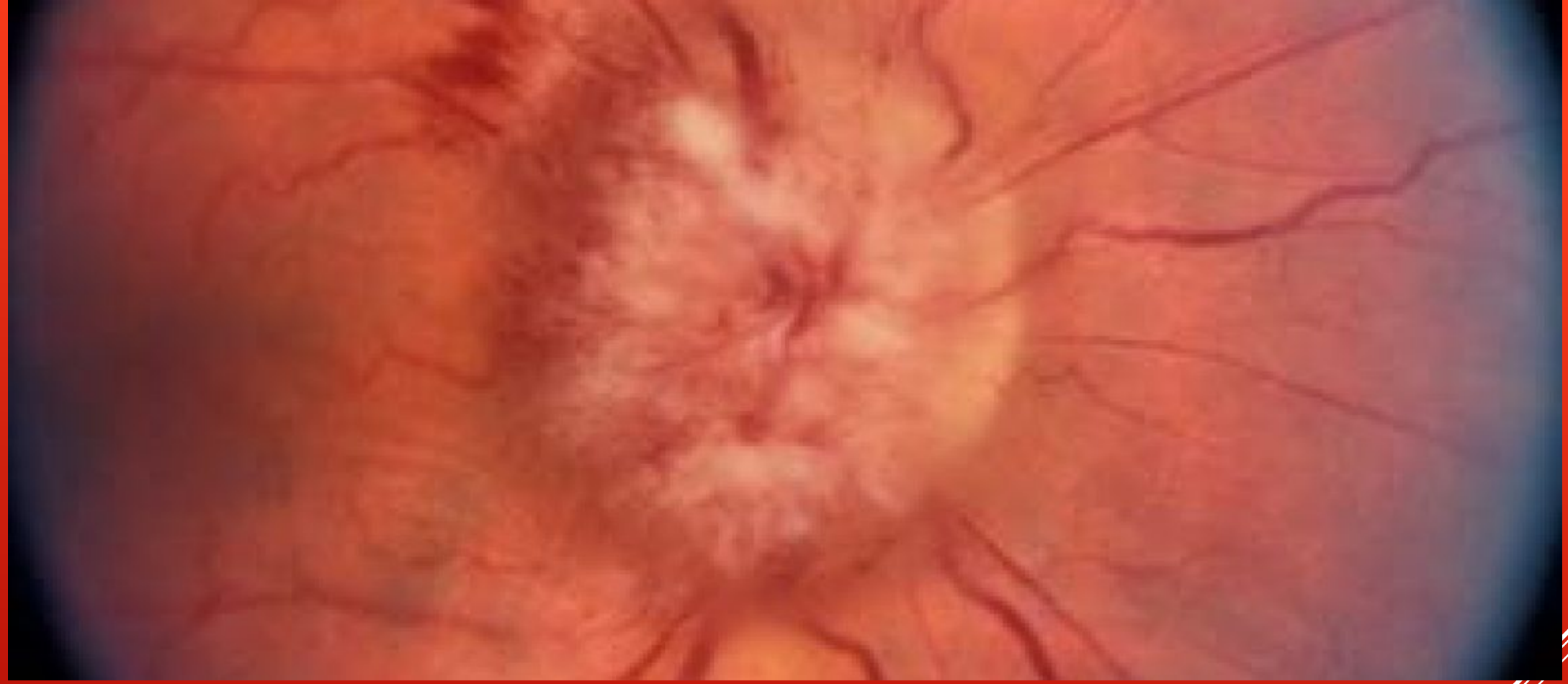


EXAMINATION: FUNDUS PAPILLEDEMA

- Bilateral; May Be Asymmetric
- Hyperemia of Disc
- Absent Spontaneous Venous Pulsations
- Splinter Hemorrhages
- Obliterated Central Cup

EXAMINATION: FUNDUS PAPILLEDEMA

- Implies Increased ICP
- Mass lesion
- Pseudotumor Cerebri, aka Idiopathic Intracranial Hypertension
- Hypertension



PAPILLEDEMA

EXAMINATION: FUNDUS PAPILLITIS

- Primary Inflammation of Optic Nerve
  - Papillitis: Nerve Head Edema
  - Retrobulbar Neuritis: NL Appearing Nerve Head

EXAMINATION: FUNDUS PAPILLITIS HISTORY/EXAM

- Acute, Unilateral Vision Loss
- Occurs Over Several Days
- +Retrobulbar Pain w/Motility
- Decreased VA, Color, +APD,
- Central Scotoma, +/- Disc Edema

OPTIC NEURITIS

EXAMINATION: FUNDUS NEURO-RETINITIS HISTORY/EXAM

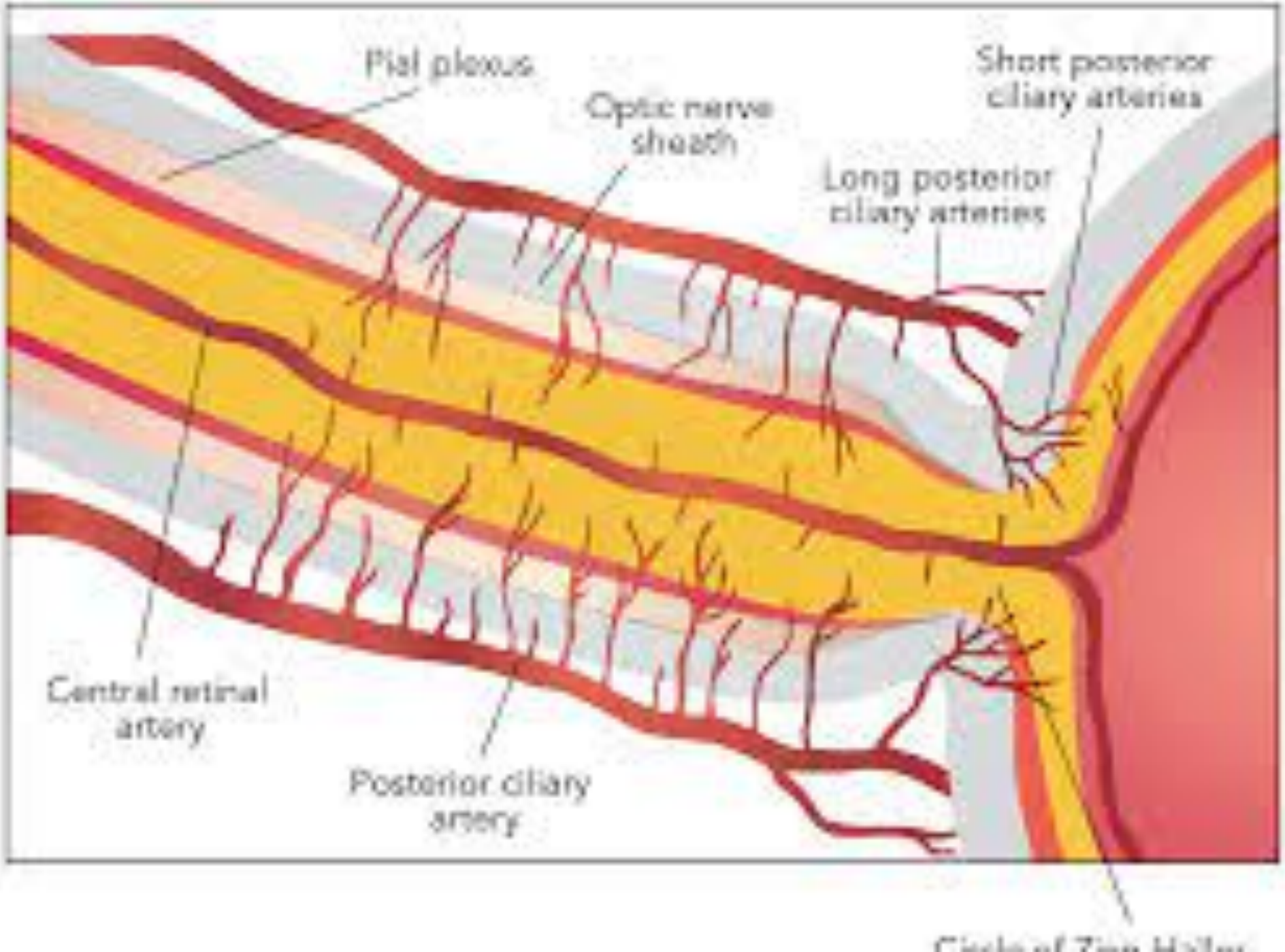
- Inflammation of the Optic Disc with Peripapillary Fluid Exudates, "Macular Star"
  - No MS Correlation
- Idiopathic
- Infectious
  - Bartonella, Lyme, Syphilis, TB, Sarcoid, Histo, ToxoP, ToxoC

NEURO-RETINITIS

EXAMINATION: FUNDUS ISCHEMIA

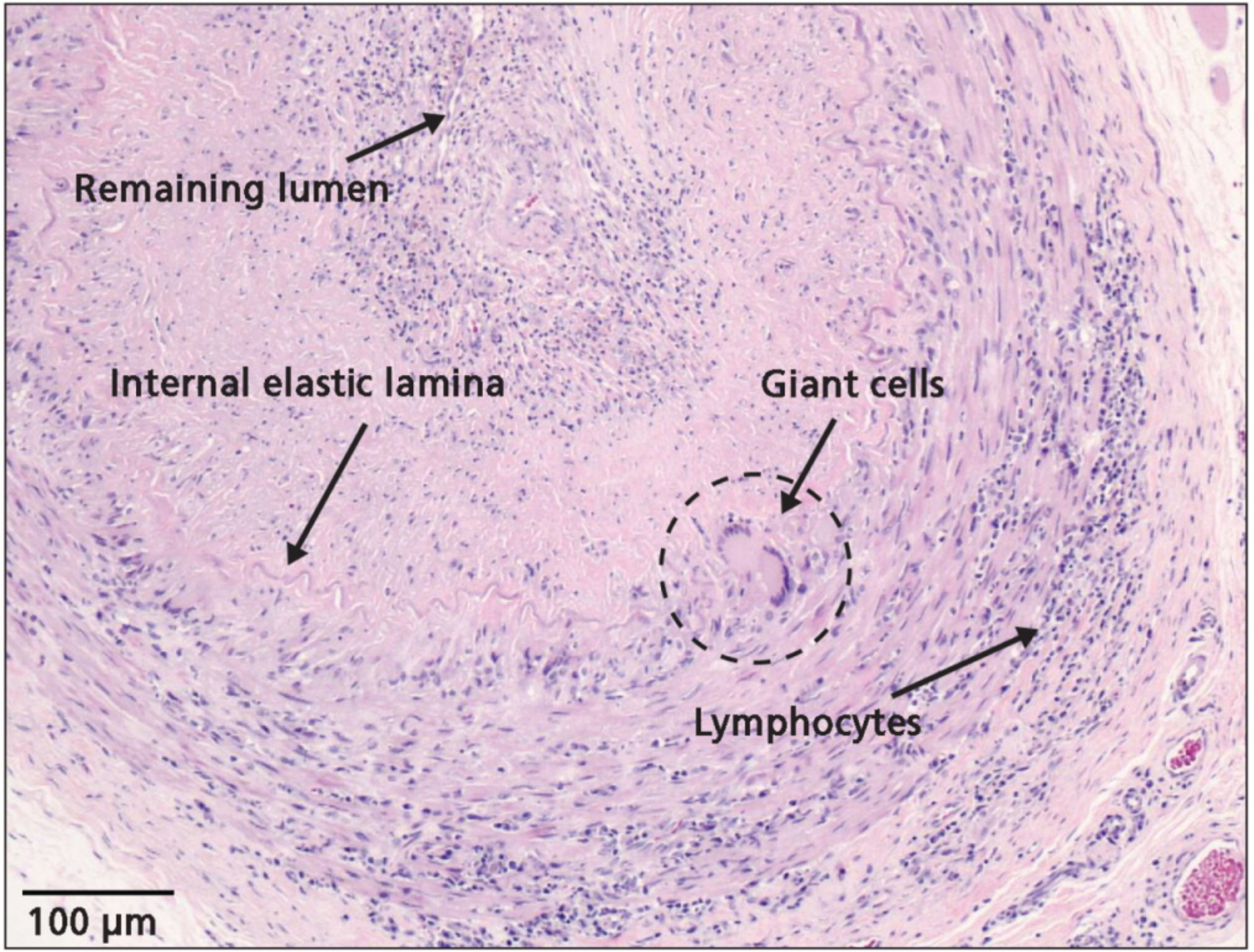
- Ischemic Infarction of the Anterior Portion of Optic Nerve Head
- Disease of Short Posterior Ciliary Artery
- Disc Edema; Small C:D; MRI with Chronic Microvascular Disease
- NA-AION vs A-AION

NA-AION


Pial plexus
Optic nerve sheath
Short posterior ciliary arteries
Long posterior ciliary arteries
Central retinal artery
Posterior ciliary artery

EXAMINATION: FUNDUS ISCHEMIA

- Giant Cell Arteritis
- ROS: HA, Scalp Tenderness, Jaw Claudication, Fevers, Polymyalgias, Weight Loss, Anemia
- ESR, CRP, TA Biopsy
- 1% CRAO
- IV or PO Steroids


Remaining lumen
Internal elastic lamina
Giant cells
Lymphocytes
100 µm

CASE STUDIES AND CLINICAL APPLICATIONS

CASE#1 PRESENTATION

- 75 y/o M Presents to ER with c/o Sudden Loss of Vision OS
- Pt is DC and Referred to Ophthalmology
- VA LP OS, +APD OS, 0/14 Color, + Cherry Red Spot OS

CASE#1 PRESENTATION

- Nurses Note: Pt having Trouble Focusing with Left Eye
- VA 20/20 OD
- VA 20/20 OU

CASE#2 PRESENTATION

- 34 y/o F Presents with c/o Loss of Vision OD
- VA: 20/200 OD; 20/20 OS
- Color: 0/14 OD; 10/14 OS
- Pupil: No RAPD
- Motility: Full OU
- VF: Central Scotoma OD; WNL OS
- Fundus: Discs Flat, C:D 0.3 OU

CASE#2 PRESENTATION

- IMP: Optic Neuritis OD (Consider Resolved Optic Neuritis OS; Consider MS)
- Plan: MRI of Brain and Orbits
- IV Solumedrol t gram IVPB QD x 3 Days Followed by an Oral Taper of Prednisone

CASE#3 PRESENTATION

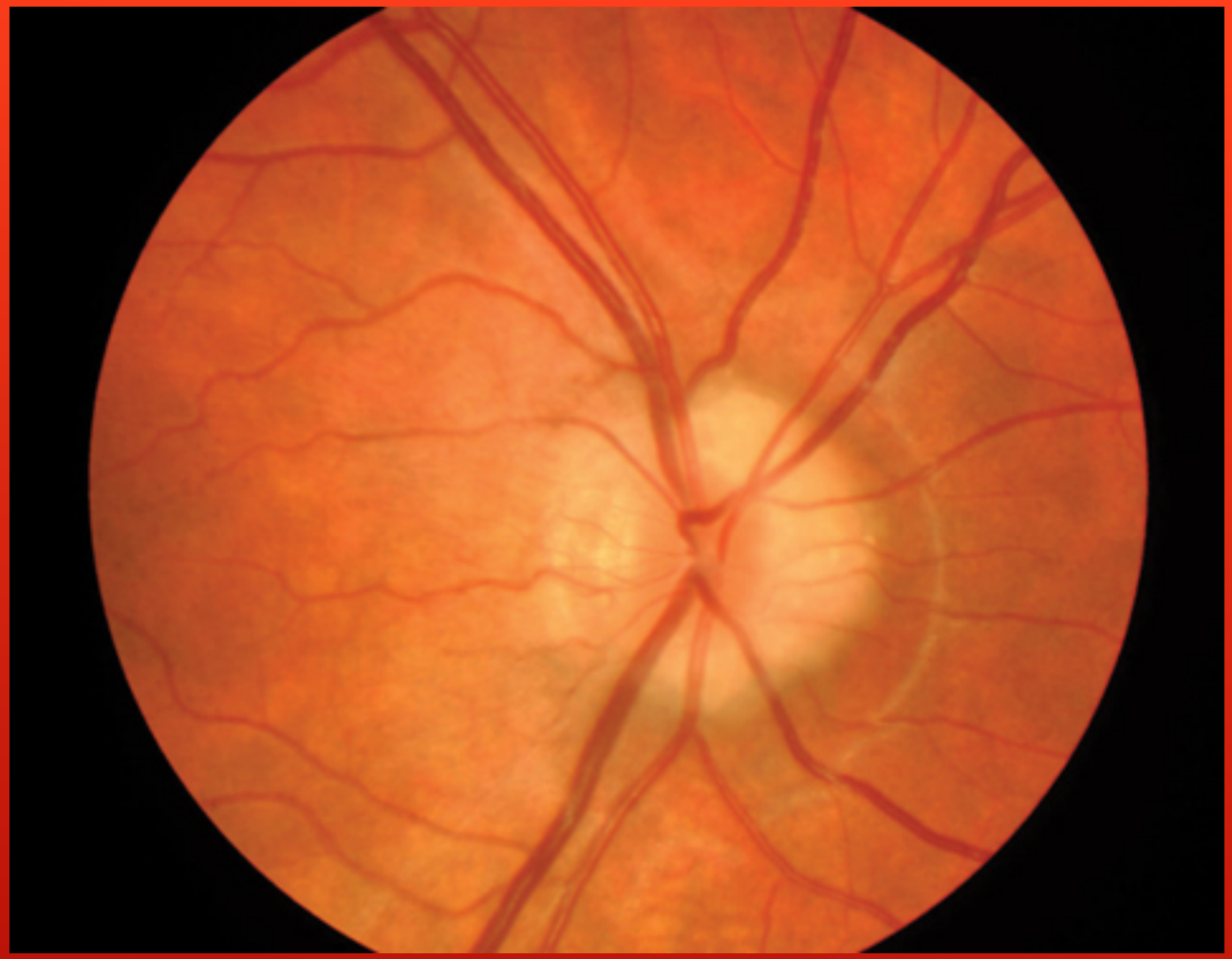
- 25 y/o F c/o Double Vision
- VA: 20/20 OD; 20/20 OS
- Pupils: No APD
- VF: Full OU
- Fundus: Discs Flat; C:D 0.3

WHAT IS THIS CLINICAL PRESENTATION?

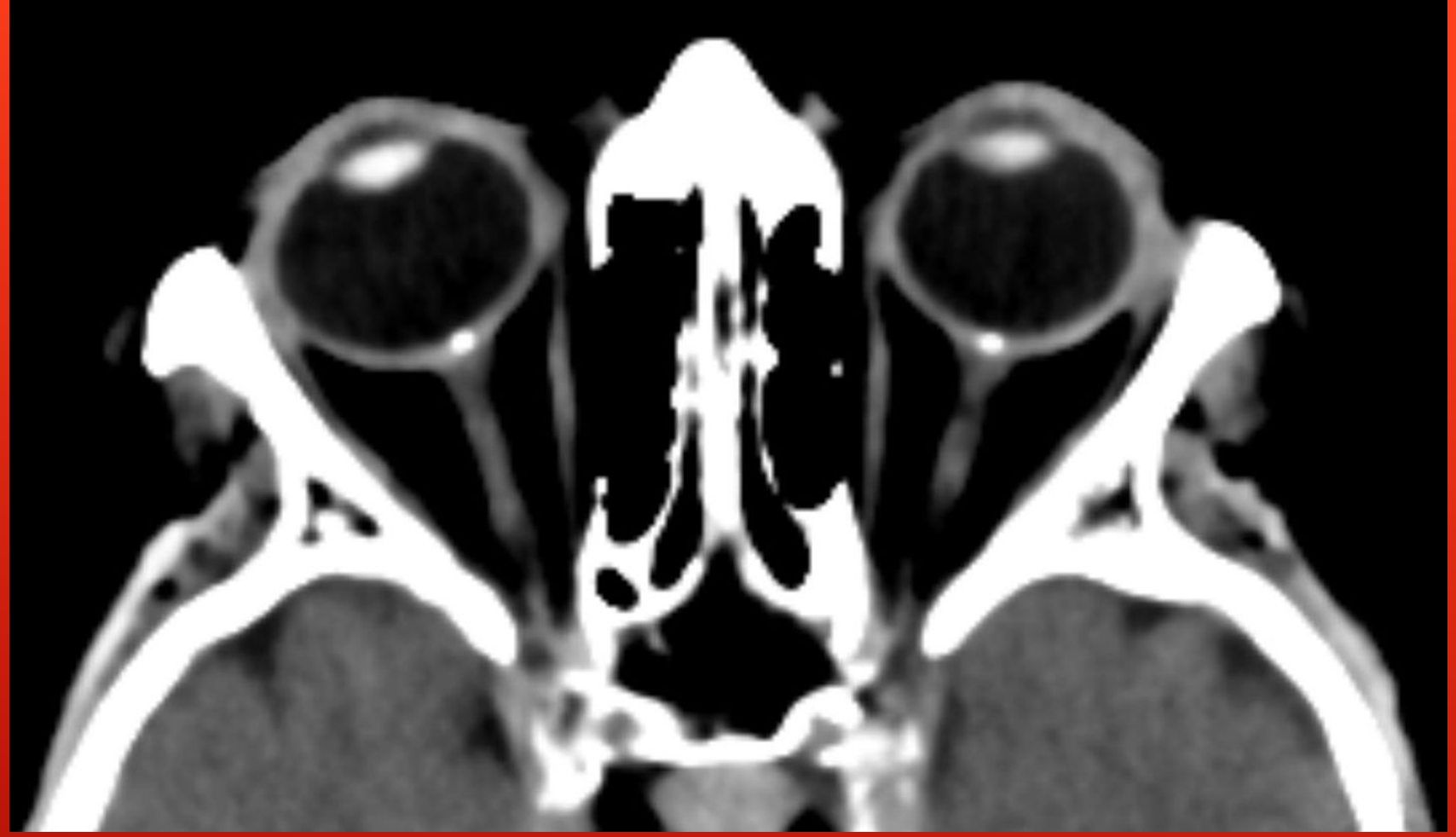
CASE#3 PRESENTATION

- IMP: Bilateral Internuclear Ophthalmoplegia
- Plan: MRI of Brain and Orbits
  - Attn: Midbrain
  - Attn: Demyelinating Lesions of White Matter

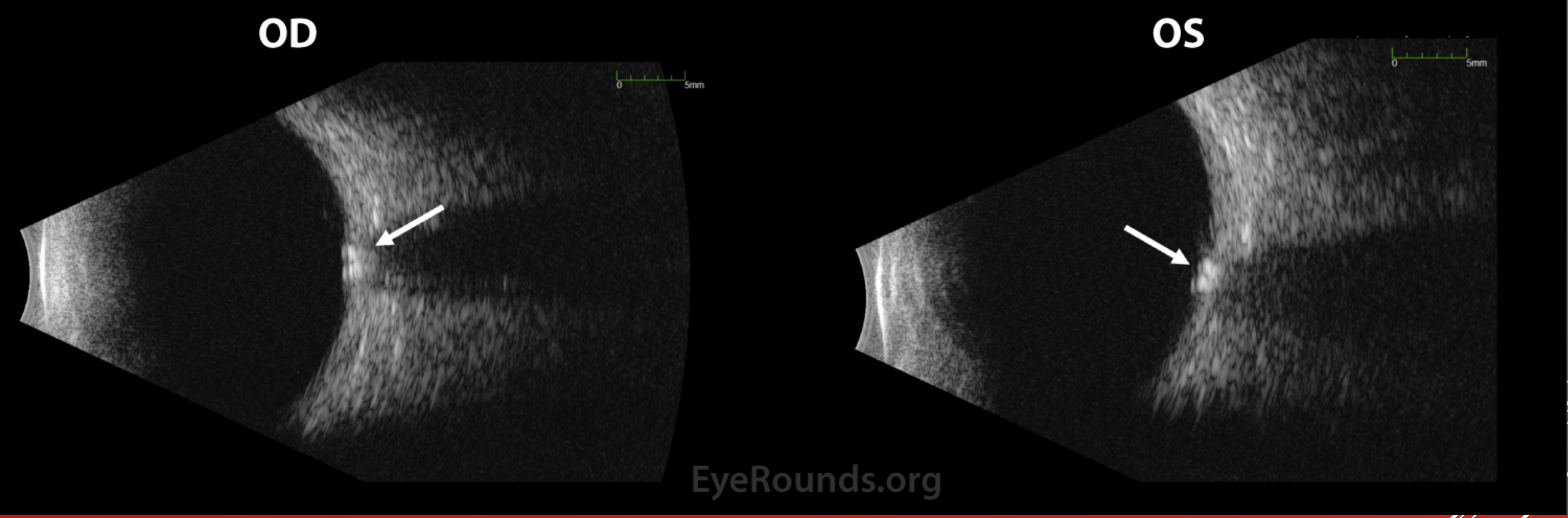
PSEUDO-PAPILLEDEMA



OPTIC DISC DRUSEN



OPTIC DISC DRUSEN



OPTIC DISC DRUSEN

CONCLUSION

Importance of Neuro-Ophthalmological Exam

Neuro-ophthalmological eye exams are essential for diagnosing vision issues resulting from neurological disorders. Clinical correlation to identify systemic disease is paramount to the practice of Neuro-ophthalmology

Ocular Manifestations of Systemic Disease

Understanding these correlations can lead to significantly improved patient care and treatment outcomes.

A WISE

DOCTOR

ONCE WROTE