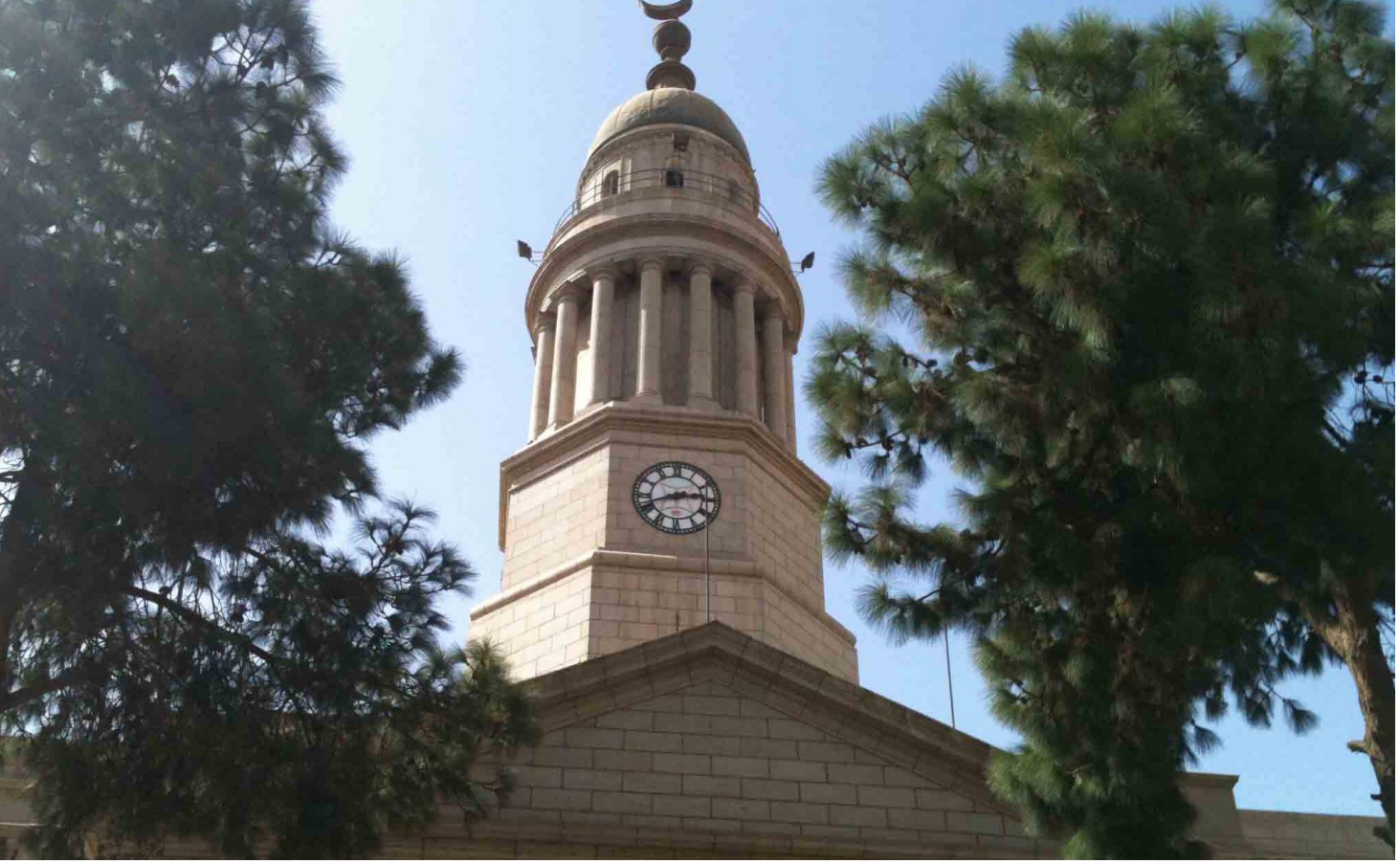
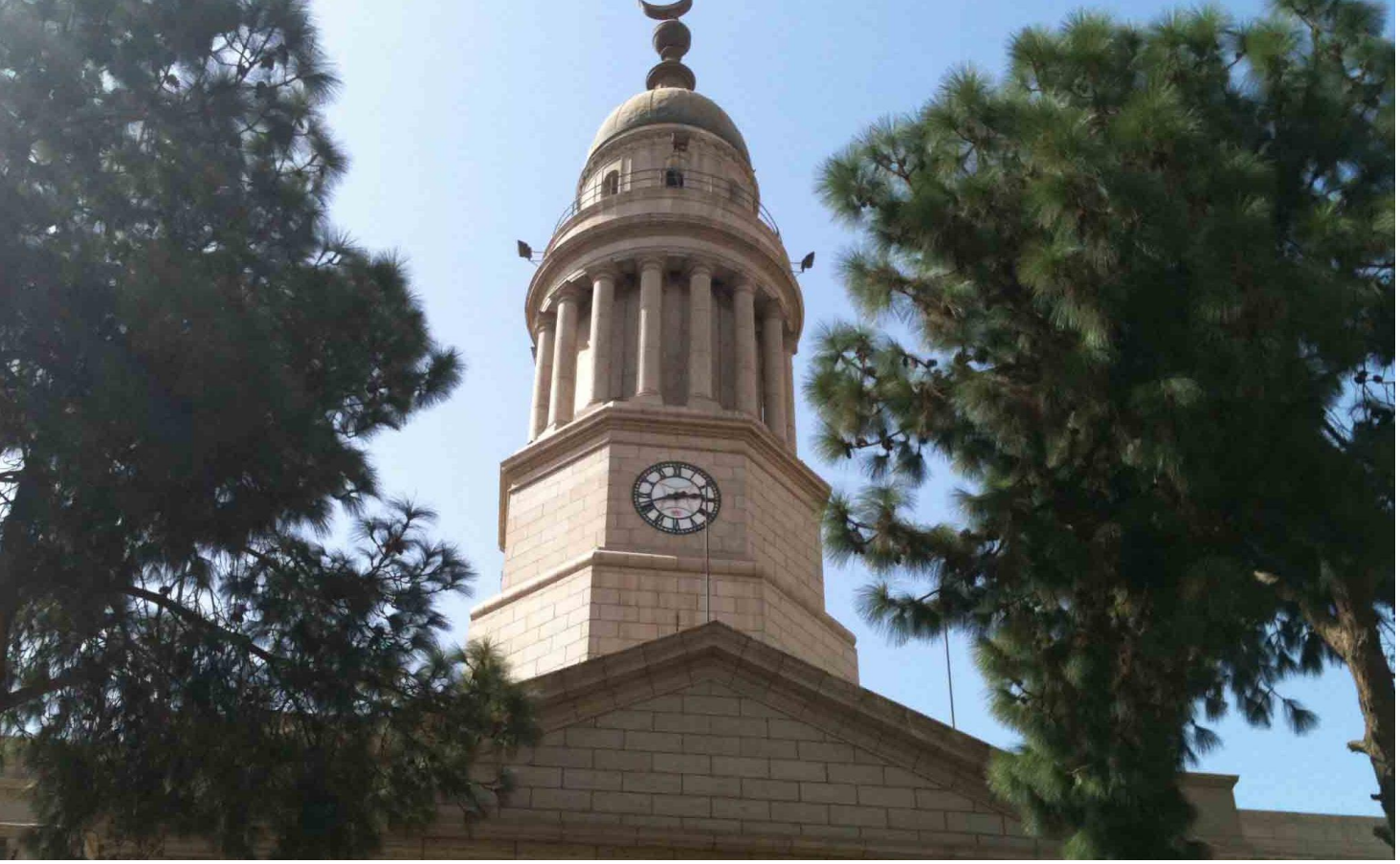


Oculomotor Nerve



Amr Hasan, MD,FEBN

Associate Professor of Neurology - Cairo University

Oculomotor Nerve

- ANATOMY
- CAUSES OF 3rd NERVE PALSY
- HOW TO LOCALIZE THE LESION

Oculomotor Nerve

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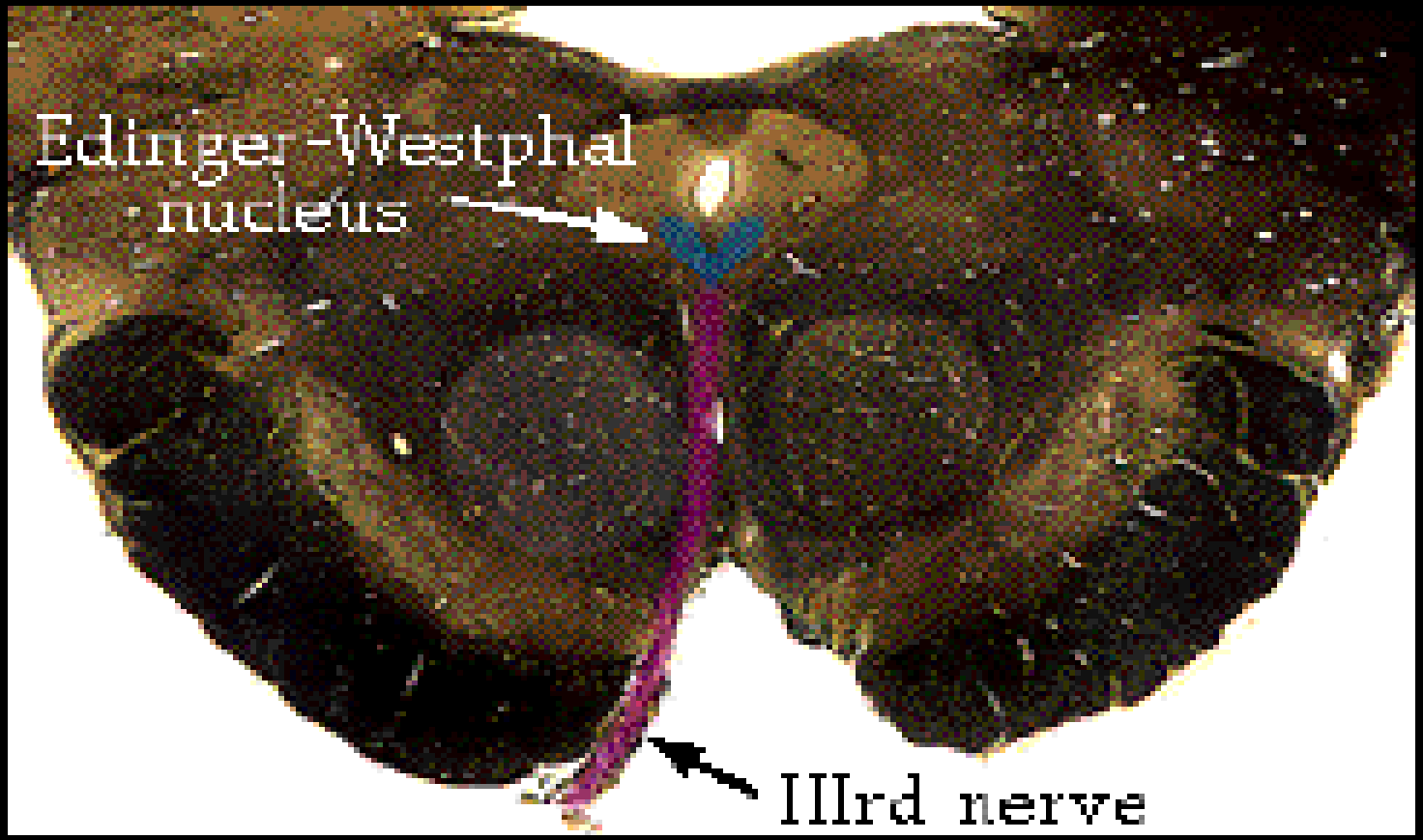
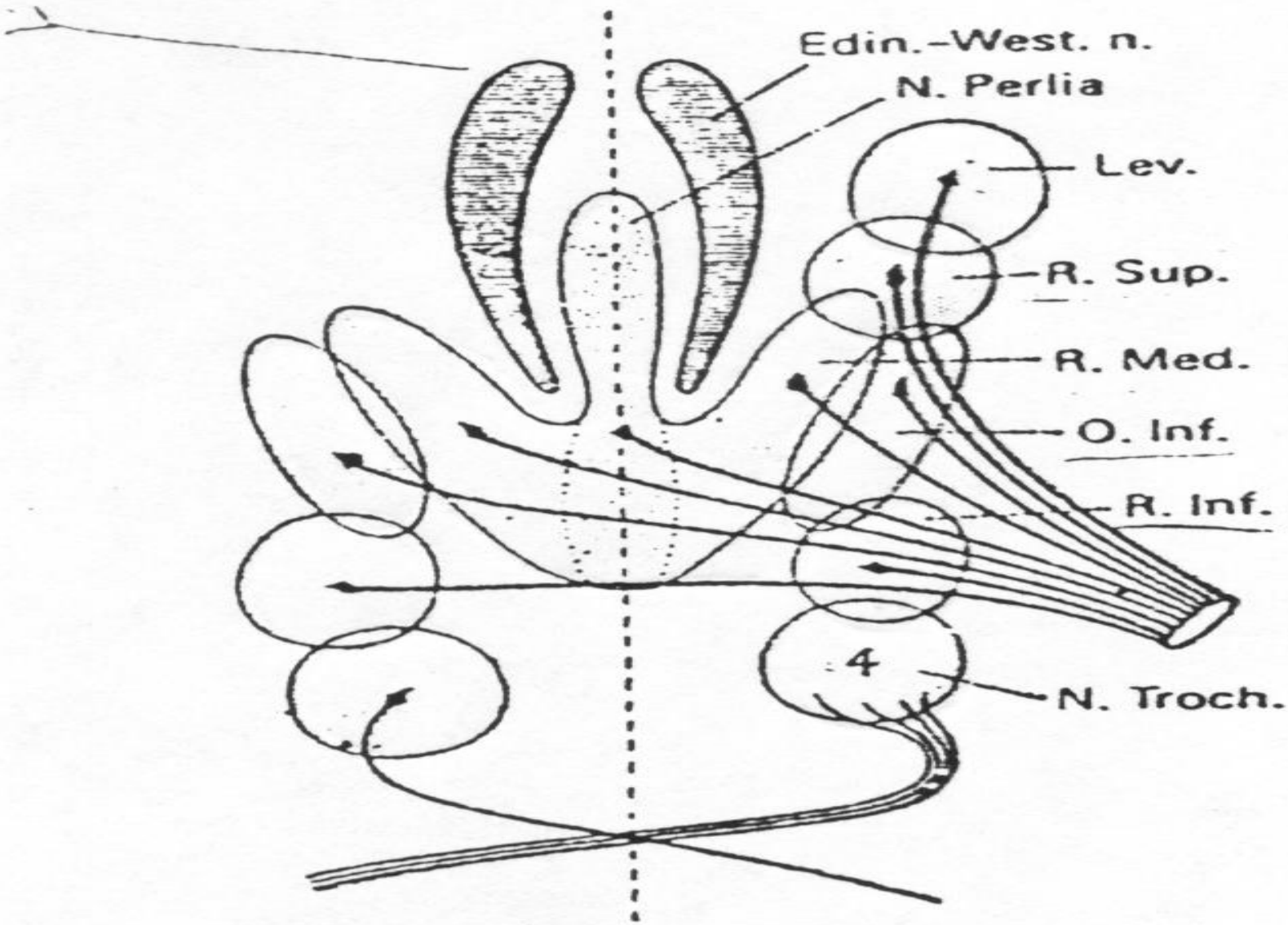
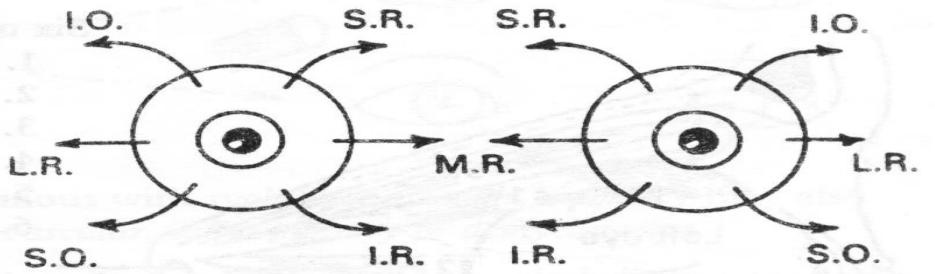
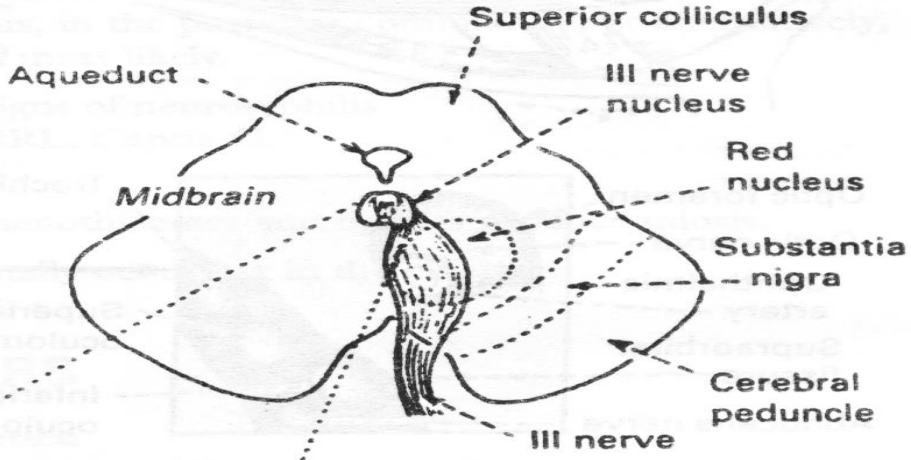
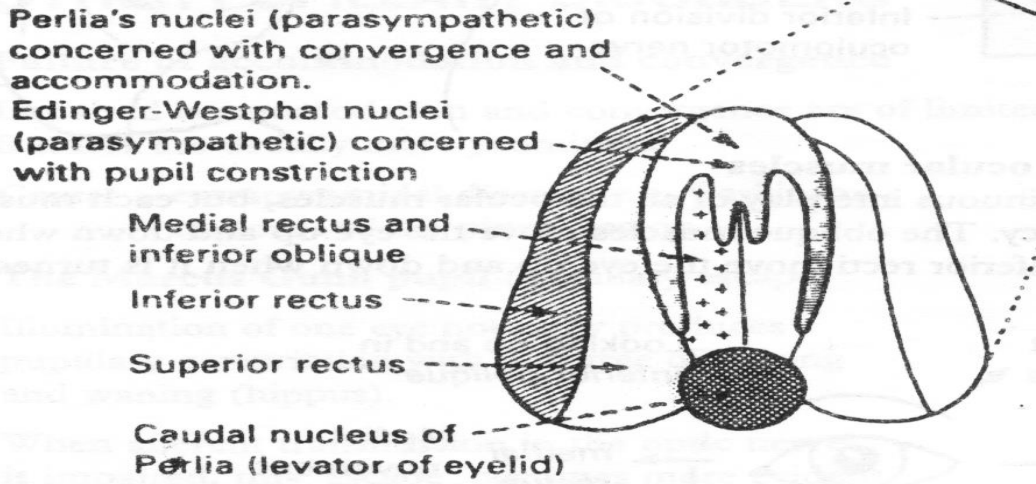
Oculomotor Nerve



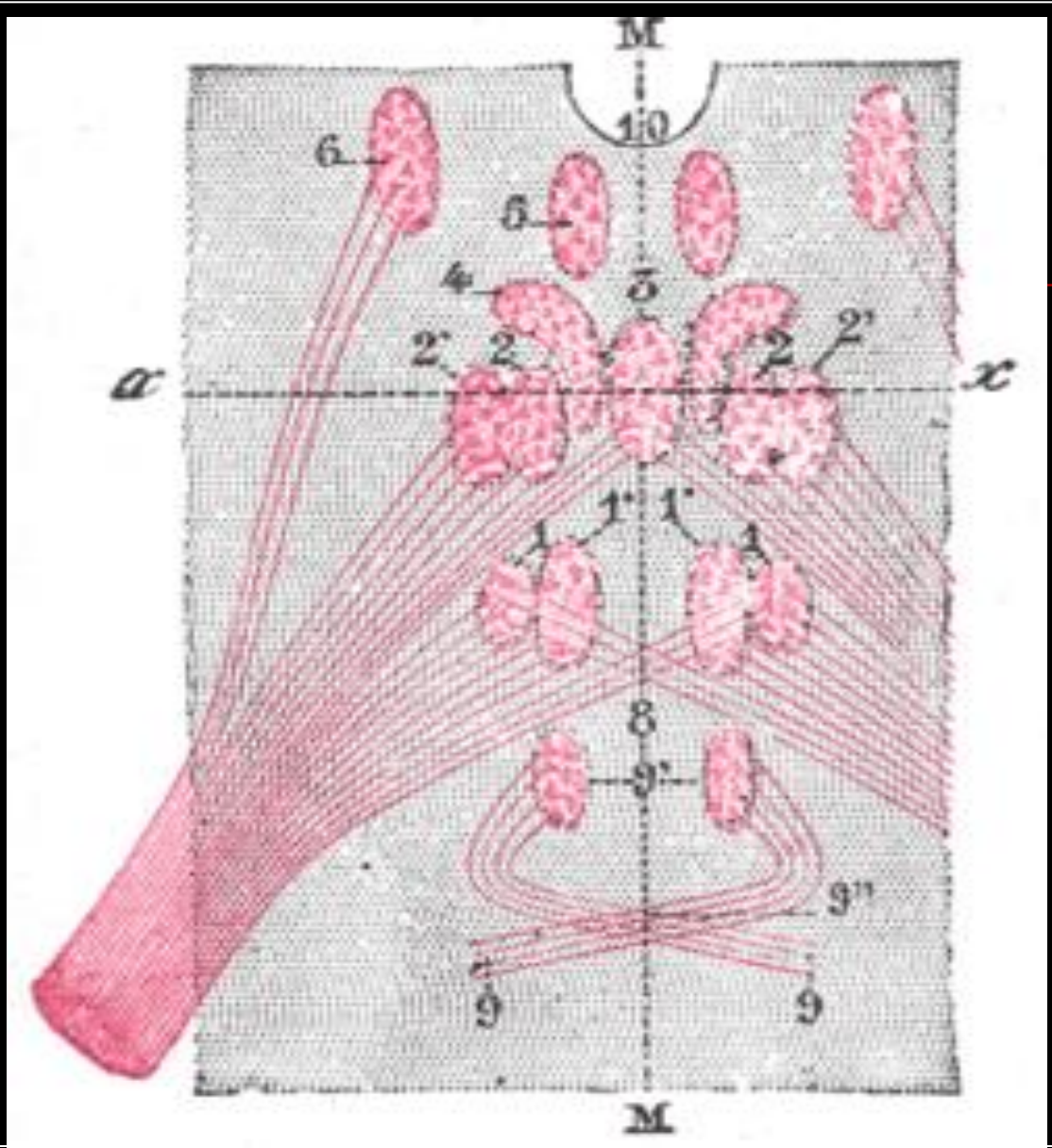

Edin.–West. n.
N. Perlia
Lev.
R. Sup.
R. Med.
O. Inf.
R. Inf.
4
N. Troch.



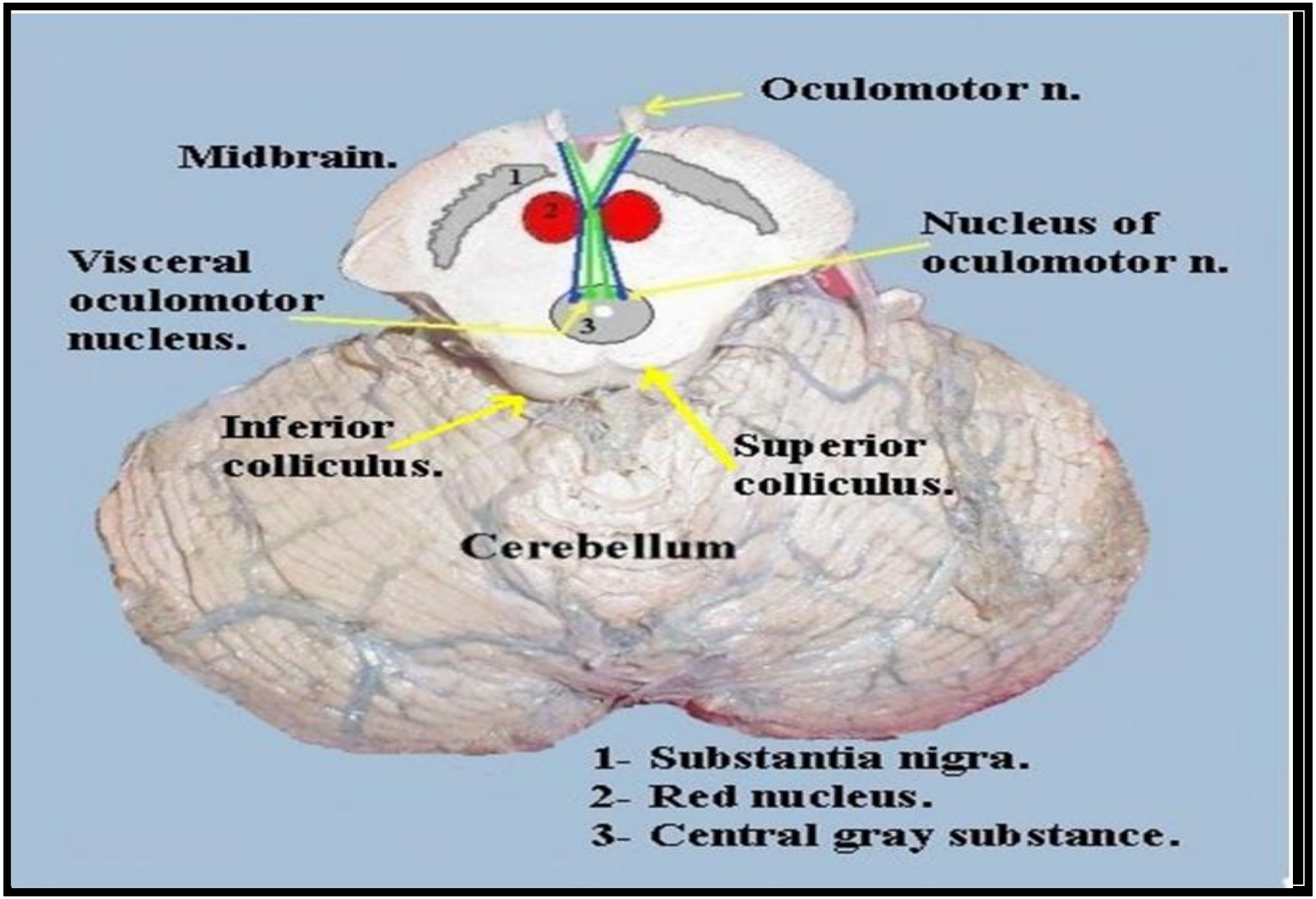


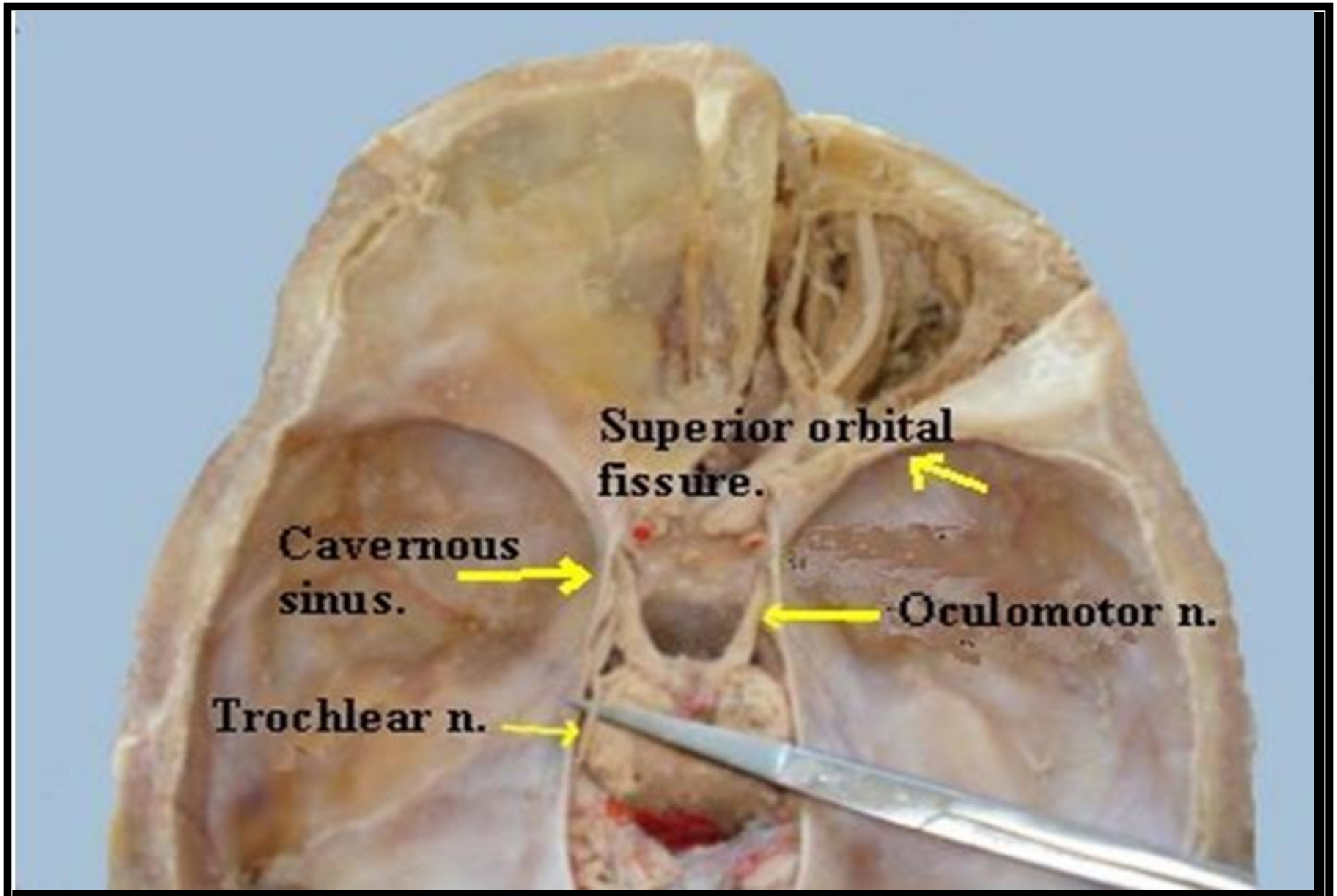


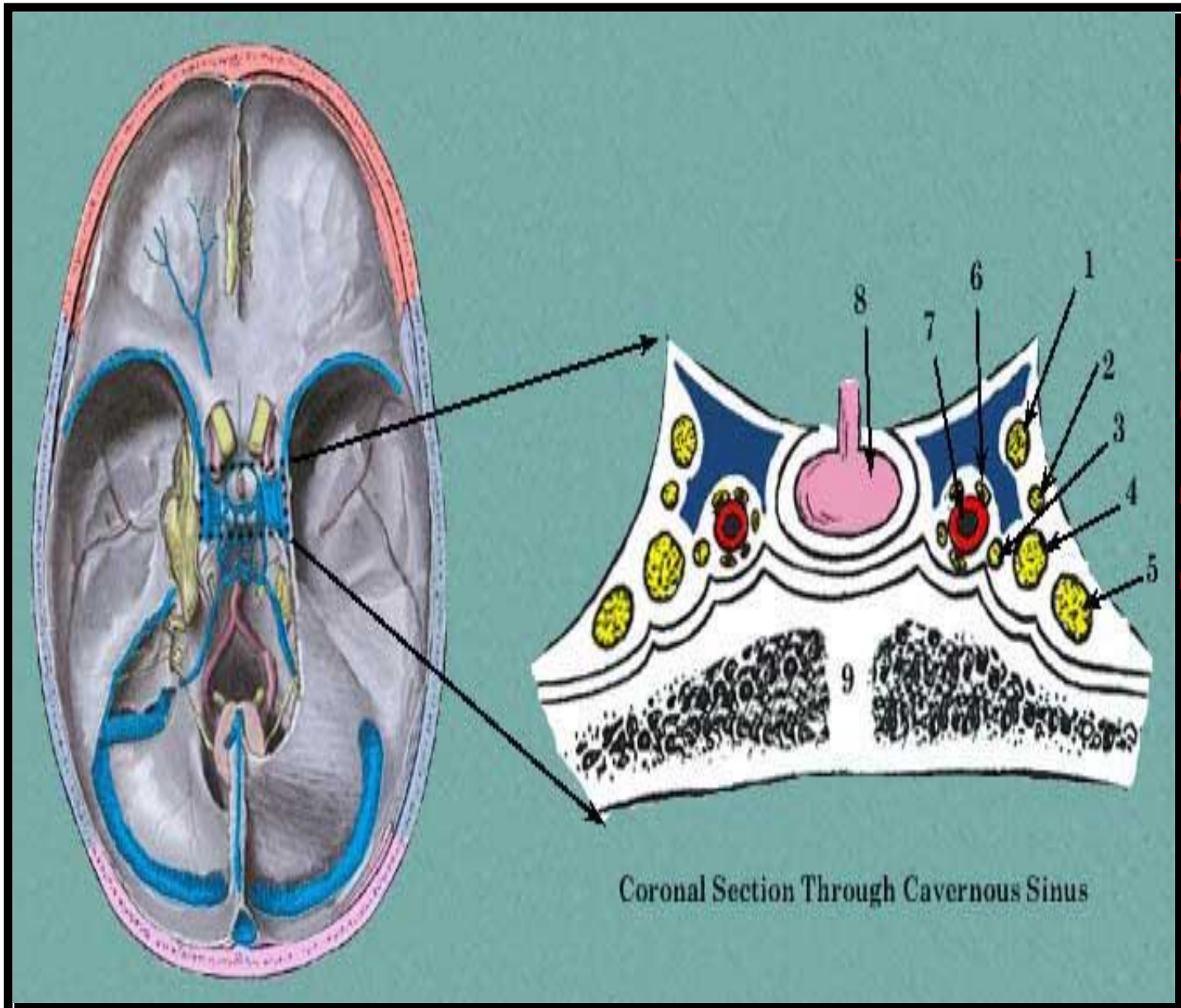
The nucleus is a paired structure which lies close to the midline, the portion representing the medial rectus abutting its neighbour.



- The nucleus of origin of the oculomotor nerve.
  1. Posterior dorsal nucleus.
  1'. Posterior ventral nucleus.
  2. Anterior dorsal nucleus.
  2'. Anterior ventral nucleus.
  3. Central nucleus.
  4. **Nucleus of Edinger and Westphal**.
  5. Antero-internal nucleus.
  6. Antero-external nucleus.
  8. Crossed fibers.
  9. Trochlear nerve, with 9', its nucleus of origin, and 9'', its decussation.
  10. Third ventricle.
  M, M. Median line.


Oculomotor n.
Midbrain.
1
2
3
Nucleus of oculomotor n.
Visceral oculomotor nucleus.
Inferior colliculus.
Superior colliculus.
Cerebellum
1- Substantia nigra.
2- Red nucleus.
3- Central gray substance.


Superior orbital fissure.
Cavernous sinus.
Oculomotor n.
Trochlear n.



Coronal Section Through Cavernous Sinus

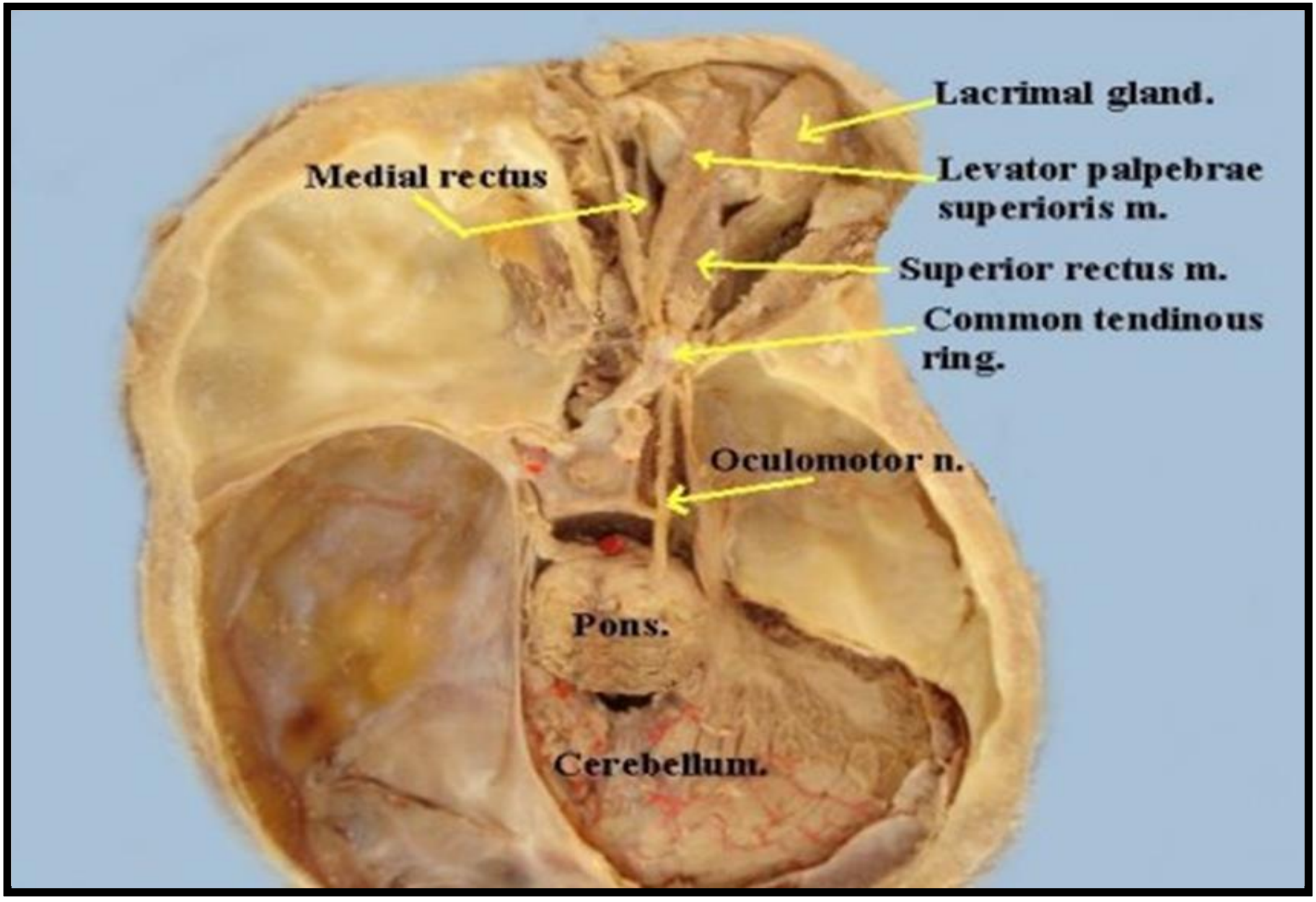
In the walls :

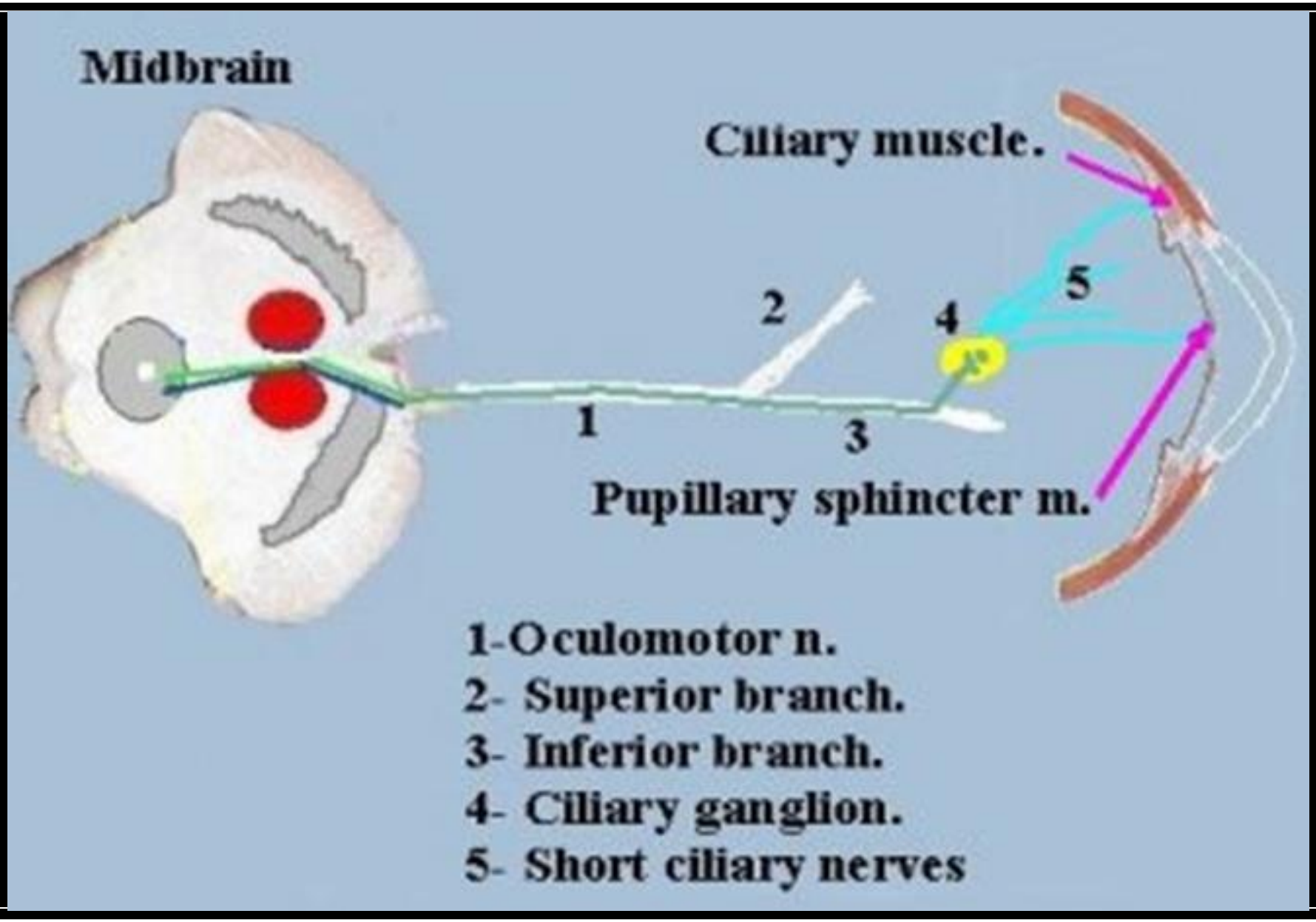
- 1-oculomotor
- 2- trochlear
- 4-V1
- 5-V2

Within :

- 3-abducens
- 6- autonomic plexus
- 7-internal carotid artery
- 8-pituitary gland

9- body of sphenoid bone


Lacrimal gland.
Medial rectus
Levator palpebrae superioris m.
Superior rectus m.
Common tendinous ring.
Oculomotor n.
Pons.
Cerebellum.



1-Oculomotor n.
2- Superior branch.
3- Inferior branch.
4- Ciliary ganglion.
5- Short ciliary nerves

Oculomotor Nerve

The superior division innervates:

- The levator palpebrae muscle .
- The superior rectus muscles .
- The medial rectus muscle

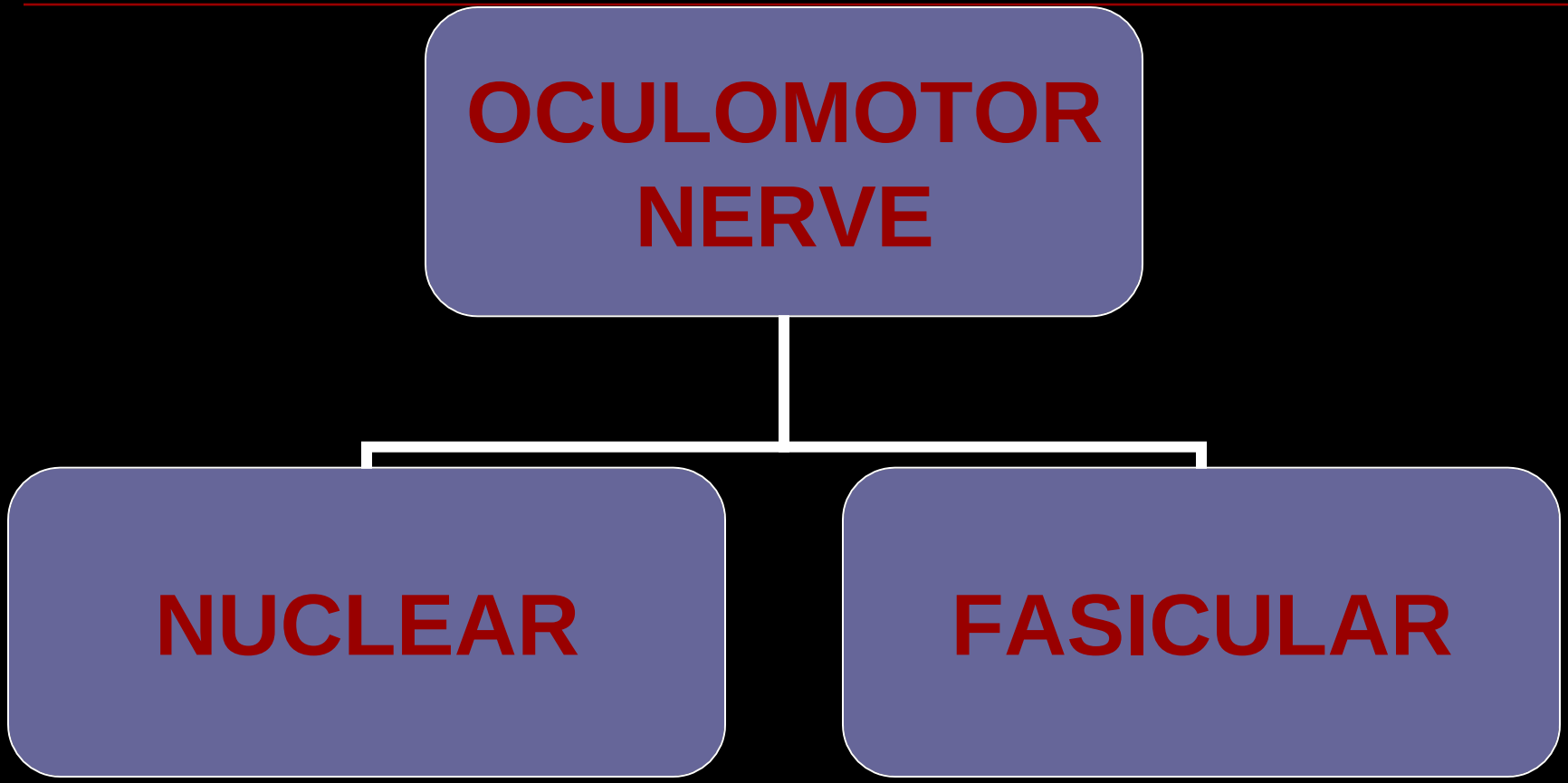
The inferior division innervates:

- The inferior oblique .
- Inferior rectus
- Also contain parasympathetic fiber for the ciliary and sphincther of the pupil muscles

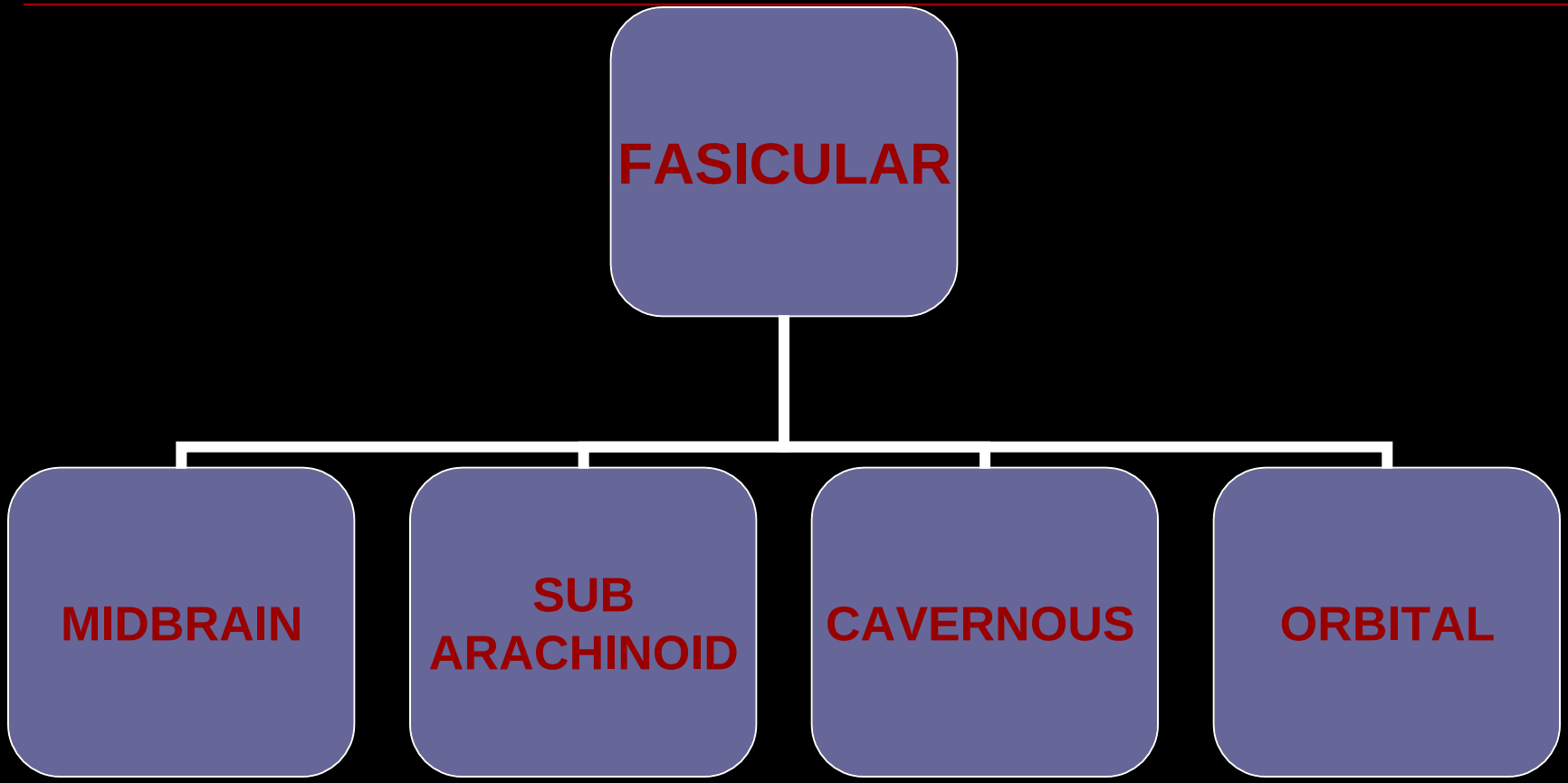
Oculomotor Nerve

- The pupil fibers are located very superficially which can be involved in surgical causes of 3rd n palsy. On the other hand, pupil-sparing third cranial nerve palsy is a hallmark of ischemic lesions that tend to involve the central core of the nerve. This is the type of nonsurgical or medical third cranial nerve palsy that often results from microvascular disease and tends to resolve uneventfully within a few weeks.

Oculomotor Nerve



Oculomotor Nerve



Oculomotor Nerve

- ANATOMY
- CAUSES OF 3rd NERVE PALSY
- HOW TO LOCALIZE THE LESION

Oculomotor Nerve

CAUSES OF 3rd NERVE PALSY

Nuclear portion

- Infarction
- Hemorrhage
- Neoplasm
- Abscess

Oculomotor Nerve

CAUSES OF 3rd NERVE PALSY

Fascicular midbrain portion

- Infarction
  - Benedikt syndrome
  - Weber syndrome
  - Nothnagel syndrome
  - Claude syndrome
- Hemorrhage
- Neoplasm
- Abscess

Oculomotor Nerve

CAUSES OF 3rd NERVE PALSY

Fascicular subarachnoid portion

- PCA Aneurysm
- Infectious meningitis - Bacterial, fungal/parasitic,
- Carcinomatous /lymphomatous /leukemic infiltration, granulomatous
- inflammation (sarcoidosis, lymphomatoid granulomatosis, Wegener granulomatosis)

Oculomotor Nerve

CAUSES OF 3rd NERVE PALSY

Fascicular portion (at the tentorial edge)

- Trauma
- Uncal Herniation
- ↑ ICT

Oculomotor Nerve

CAUSES OF 3rd NERVE PALSY

Fascicular cavernous sinus portion

- Tumor - Pituitary adenoma, meningioma, craniopharyngioma, metastatic carcinoma
- Vascular
- Giant intracavernous aneurysm
- Carotid artery-cavernous sinus fistula
- Carotid dural branch-cavernous sinus fistula
- Cavernous sinus thrombosis
- Ischemia from microvascular disease in vasa nervosa
- Inflammatory - Tolosa-Hunt syndrome (idiopathic or granulomatous inflammation)

Oculomotor Nerve

CAUSES OF 3rd NERVE PALSY

Fascicular orbital portion

- Orbital inflammatory pseudotumor, orbital myositis
- Endocrine (thyroid orbitopathy)
- Tumor (eg, hemangioma, lymphangioma, meningioma)

Oculomotor Nerve

- ANATOMY
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- HOW TO LOCALIZE THE LESION

Oculomotor Nerve

Nuclear portion

- Nuclear third cranial nerve palsy demonstrates in addition to the **ipsilateral findings, contralateral partial ptosis and elevation palsy**
- The contralateral partial ptosis stems from the bilateral distribution of innervation to the levator from the caudal central subnucleus.
- Ptosis is more complete ipsilateral to the lesion because function is lost in both the ipsilateral neural cell bodies and their fibers on the lesioned side, plus the crossed fibers coursing through the lesion from the other side.
- There is partial ptosis contralateral to the lesion because of the residual integrity of the uncrossed neural cell bodies and fibers from the caudal central subnucleus contralateral to the lesion.

Oculomotor Nerve

Nuclear portion

- Superior rectus nucleus output is totally contralateral with fascicles from the nucleus on one side coursing through the opposite superior rectus subnucleus. A lesion of the superior rectus subnucleus on one side causes bilateral elevation palsy. The deficit ipsilateral to the lesioned nucleus reflects involvement of fascicles coming from cell bodies on the opposite side, and the deficit contralateral to the lesion reflects loss of the cell bodies in the lesioned nucleus.

Oculomotor Nerve

Nuclear portion

Conditions which cannot represent nuclear lesions

- Unilateral external ophthalmoplegia + normal contralateral SR function
- Unilateral internal ophthalmoplegia
- Unilateral ptosis

Oculomotor Nerve

Nuclear portion

Conditions which may be nuclear lesions

- Bilateral TOTAL palsy
- Bilateral internal ophthalmoplegia
- Bilateral ptosis

Oculomotor Nerve

Nuclear portion

Condition which must be nuclear lesions

- Unilateral 3rd n palsy + abnormal contralateral SR function + bilateral partial ptosis

Oculomotor Nerve

Fasicular portion

Fasicular third cranial nerve palsy demonstrates **ONLY** ipsilateral findings (impaired ocular elevation,depression,adduction,ptosis&pupillary paralysis) with **NO** contralateral partial ptosis and elevation palsy

Oculomotor Nerve

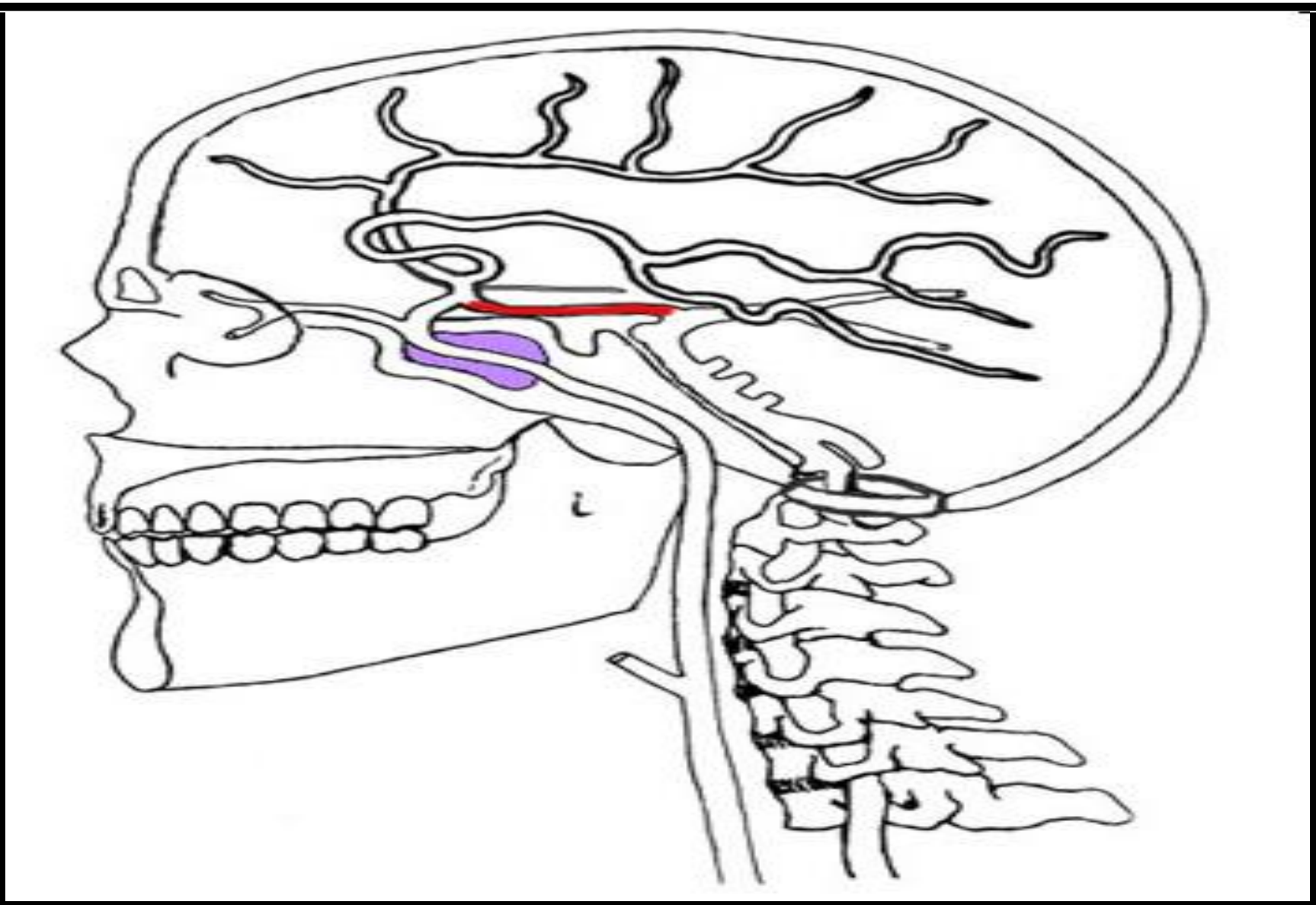
Fascicular midbrain portion

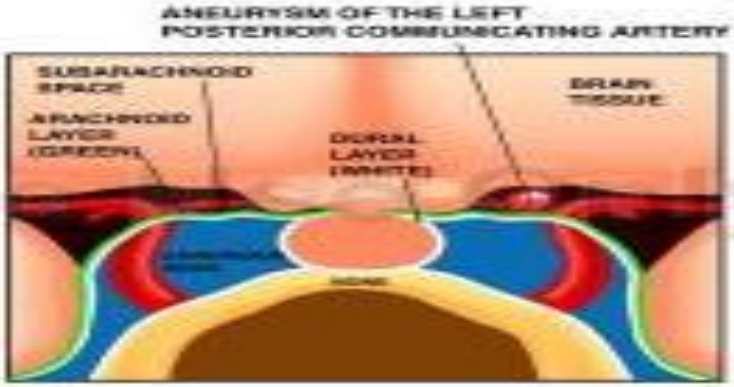
- Benedikt syndrome → contralateral tremor
- Weber syndrome → contralateral hemiplegia
- Nothnagel syndrome → contralateral cerebellar tremor
- Claude syndrome →contralateral tremor & hemiplegia

Oculomotor Nerve

Fascicular subarachnoid portion

- SAH from rupture of a berry aneurysm → DCL and may be difficult to examine. Even if they cannot co-operate with ocular motility assessment, the findings of a dense third cranial nerve palsy should be obvious. The eye on the involved side is deviated "down and out" from residual tone in the fourth cranial nerve (superior oblique muscle) and the sixth cranial nerve (lateral rectus muscle).





CUT-AWAY ENLARGEMENT OF
ANEURYSM FROM THE FRONT

ENLARGEMENT OF ANEURYSM
FROM THE BOTTOM

Oculomotor Nerve

Fascicular subarachnoid portion

- Usually, there is prominent ptosis also, but this may be difficult to observe if the patient is unconscious with eyes closed. Efforts should be made to arouse the patient at least to the point that there is some effort at eye opening, when the ptosis should be apparent.

Oculomotor Nerve

Fascicular subarachnoid portion.

- The dilated, light-fixed pupil should be apparent on inspection without requiring any co-operation from the patient.
- Pupillary involvement is the rule in third cranial nerve palsy resulting from posterior communicating artery aneurysm, with or without overt subarachnoid hemorrhage. This is probably because the pathophysiology of the third cranial nerve lesion involves leakage of blood from the aneurysm dome into the nerve across its outer margin.

Oculomotor Nerve

Fascicular cavernous sinus portion

- Fourth cranial nerve palsy is difficult to diagnose in the presence of third cranial nerve palsy because the small increment of depressor deficit (superior oblique muscle) cannot be discerned readily from the depressor palsy that results from weakness of the third nerve innervated depressor (inferior rectus muscle).
- The superior oblique muscle depresses the globe most efficiently with the eye in adduction, a position that may not be achievable with medial rectus palsy from third cranial nerve involvement.

Oculomotor Nerve

Fascicular cavernous sinus portion

- The best marker for fourth cranial nerve function in the presence of dense third cranial nerve palsy is intorsion of the globe on attempted down gaze.
- If no intorsion is present, one should suspect concomitant fourth cranial nerve palsy as part of a cavernous sinus syndrome.
- Torsion of the globe can be discerned by simultaneously watching landmarks such as conjunctival vessels lateral and medial to the iris. With intorsion the lateral vessels rise and the nasal vessels drop.

Oculomotor Nerve

Fascicular cavernous sinus portion

- Trigeminal nerve sensory function can be tested with the aid of a cotton-tipped applicator. Tease a few fibers of the cotton into a pointed bundle by twirling it between the thumb and the forefinger after a small tuft of cotton is pulled free of the tip.
- This little wisp of cotton can be touched to the cornea near the limbus to test the corneal reflex. It should elicit a blink response that is symmetric between the sides.

Oculomotor Nerve

Fascicular cavernous sinus portion

- Failure to blink may indicate reduced sensory function in the first division of the trigeminal nerve on the side of decreased response. The cotton wisp can be dragged lightly across the skin in various locations. With the eyes closed, the patient is asked to indicate when it is felt.

Oculomotor Nerve

Fascicular cavernous sinus portion

- Asymmetry of light touch between sides should be sought. The wooden stick, when broken, can serve as a "pinprick" tester. Usually, the break is jagged and there is a pointed end that can be used like a pin to test for pain sensation. Lightly tap the point on the skin at various points. The patient should compare the "sharpness" of the feeling at homologous points on the right and left sides of the face.

Oculomotor Nerve

Fascicular orbital portion

- Orbital signs are usually matters for direct inspection, including conjunctival injection and chemosis; proptosis; and lid swelling.
- Obtain exophthalmometry measurements with a Hertel instrument or similar equipment since it provides a more sensitive measure of relative proptosis.

Oculomotor Nerve

Localization uncertain

- Migraine
- Viral infections
- Arteritis
- LGB
- Following immunization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THANK YOU