Oculomotor nerve

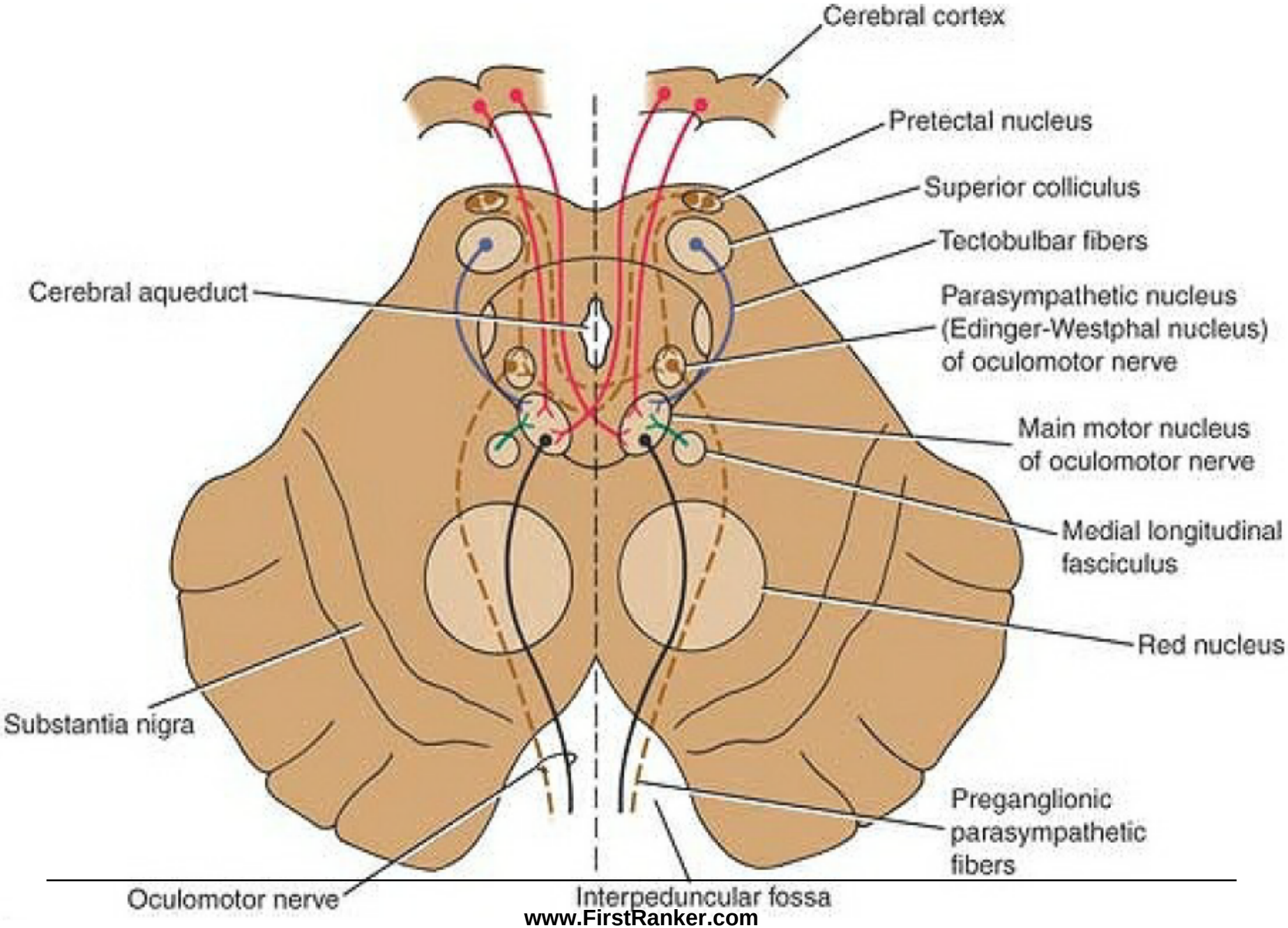
- C N III
- Components - motor (GSE , GVE)

- Nuclei > Main oculomotor nucleus (GSE)
  > Edinger Westphal nucleus (accessory occulomotor nucleus) – GVE

- Functions -
  raises upper eyelid (levator palpabrae superioris),
  turns eyeball upward (superior rectus , inferior oblique)
  downward (inferior rectus)
  medially (medial rectus) .
  constricts pupil (constrictor pupillae muscle in iris),
  accomodates eye (constrictor pupillae , ciliary muscle , medial rectus)

- Opening in skull - superior orbital fissure

Nuclei of CN III and their connections



Main oculomotor nucleus

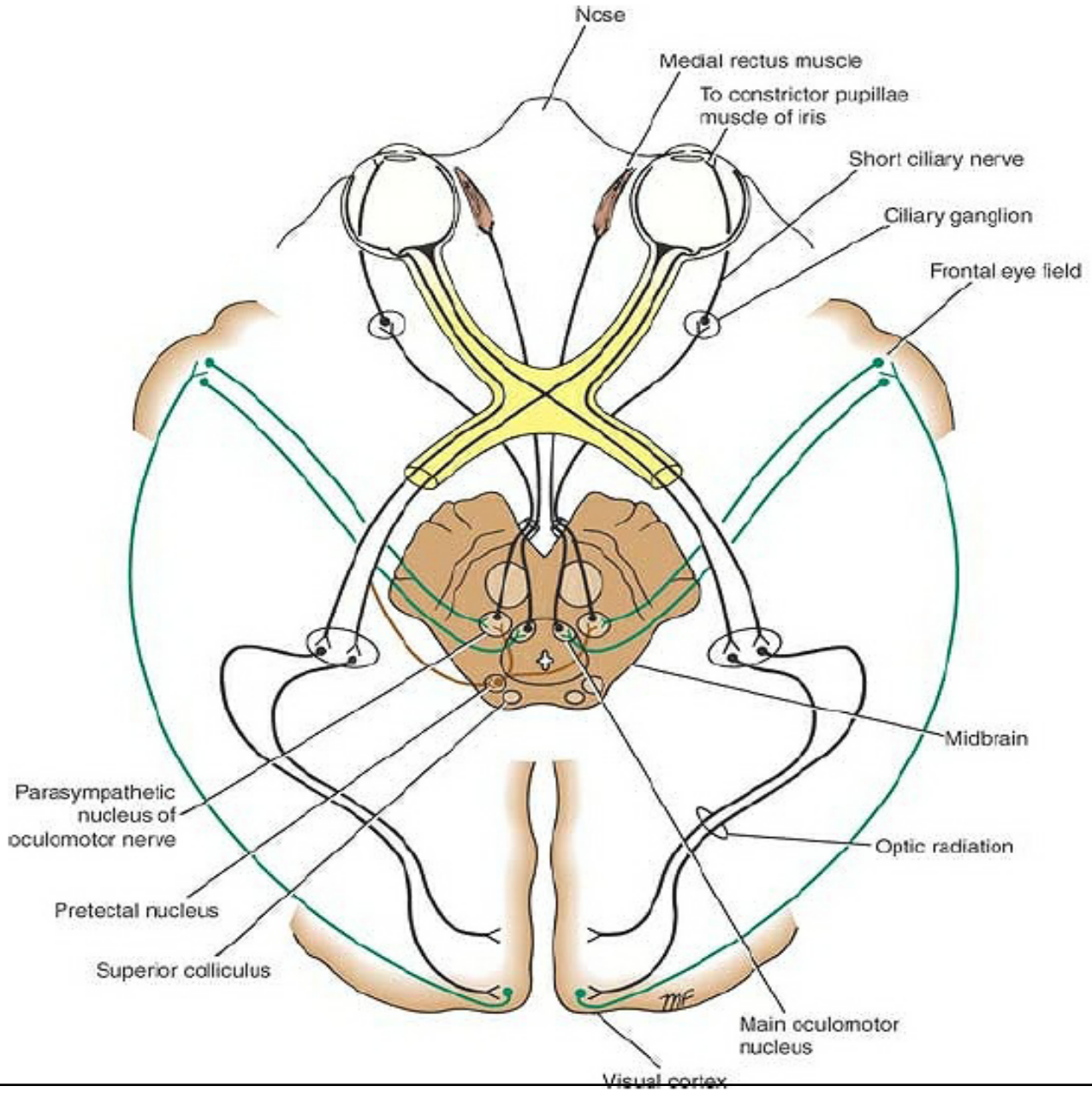
- Is situated in - anterior part of gray matter that surrounds cerebral aqueduct of midbrain .
- It lies at the level of the superior colliculus.
- The nucleus consists of groups of nerve cells that supply all the extrinsic muscles of the eye except the superior oblique and the lateral rectus.
- The outgoing nerve fibers pass anteriorly through red nucleus and emerge on anterior surface of the midbrain in interpeduncular fossa.

- The main oculomotor nucleus receives corticonuclear fibers from both cerebral hemispheres.
- lt receives tectobulbar fibers from superior colliculus and, through this route, receives information from visual cortex.
- It also receives fibers from medial longitudinal fasciculus, by which it is connected to the nuclei of the fourth, sixth, and eighth cranial nerves.

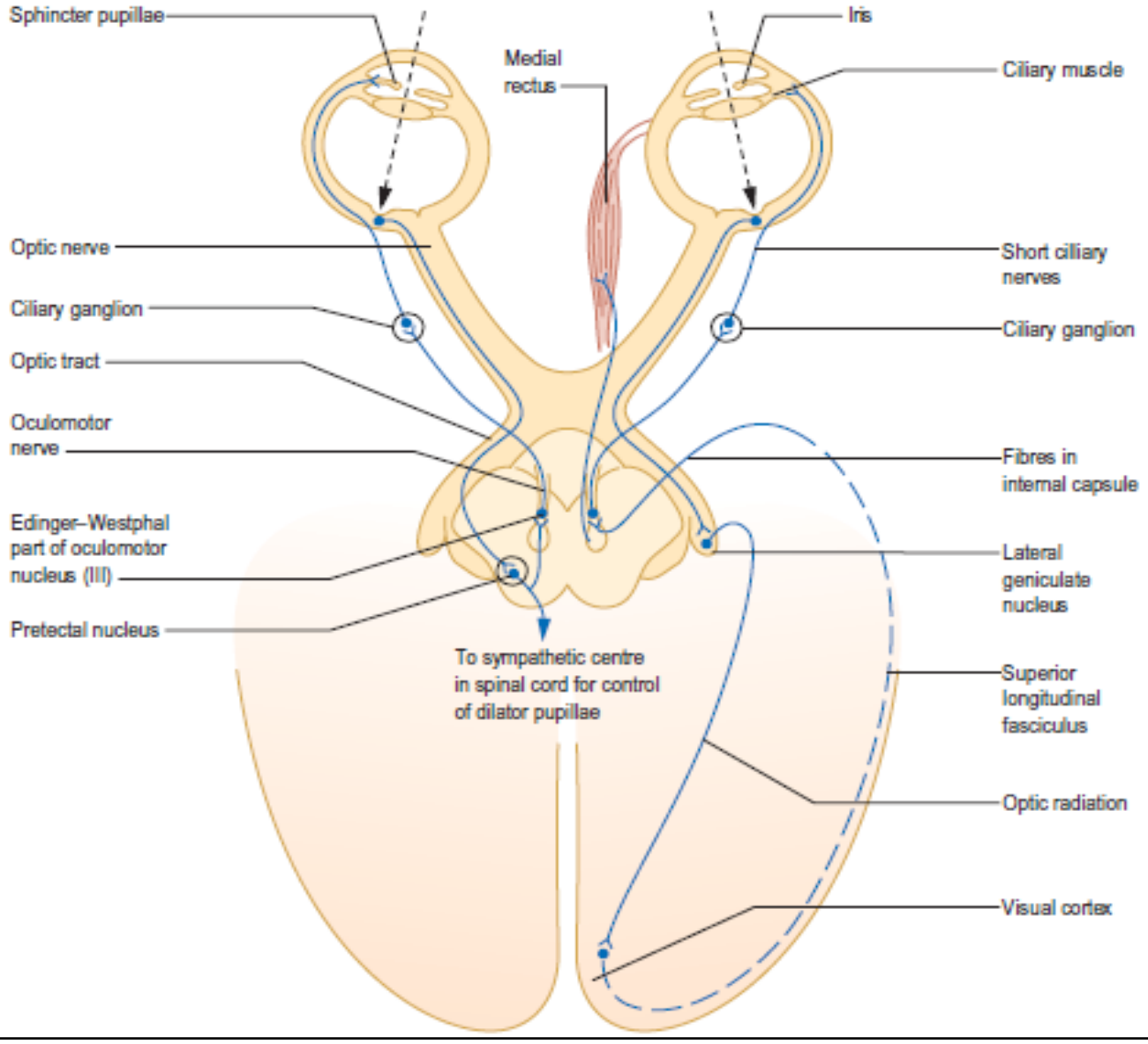
Edinger Westphal Nucleus

- Accessory parasympathetic nucleus
- Is situated posterior to the main oculomotor nucleus .
- The axons of nerve cells, which are preganglionic, accompany other oculomotor fibers to the orbit.
- Here, they synapse in the ciliary ganglion, and postganglionic fibers pass through the short ciliary nerves to the constrictor pupillae of the iris and the ciliary muscles.
- Receives
  - > corticonuclear fibers for the accommodation reflex and
  - > fibers from pretectal nucleus for direct and consensual light reflexes.

Optic pathway and visual reflexes



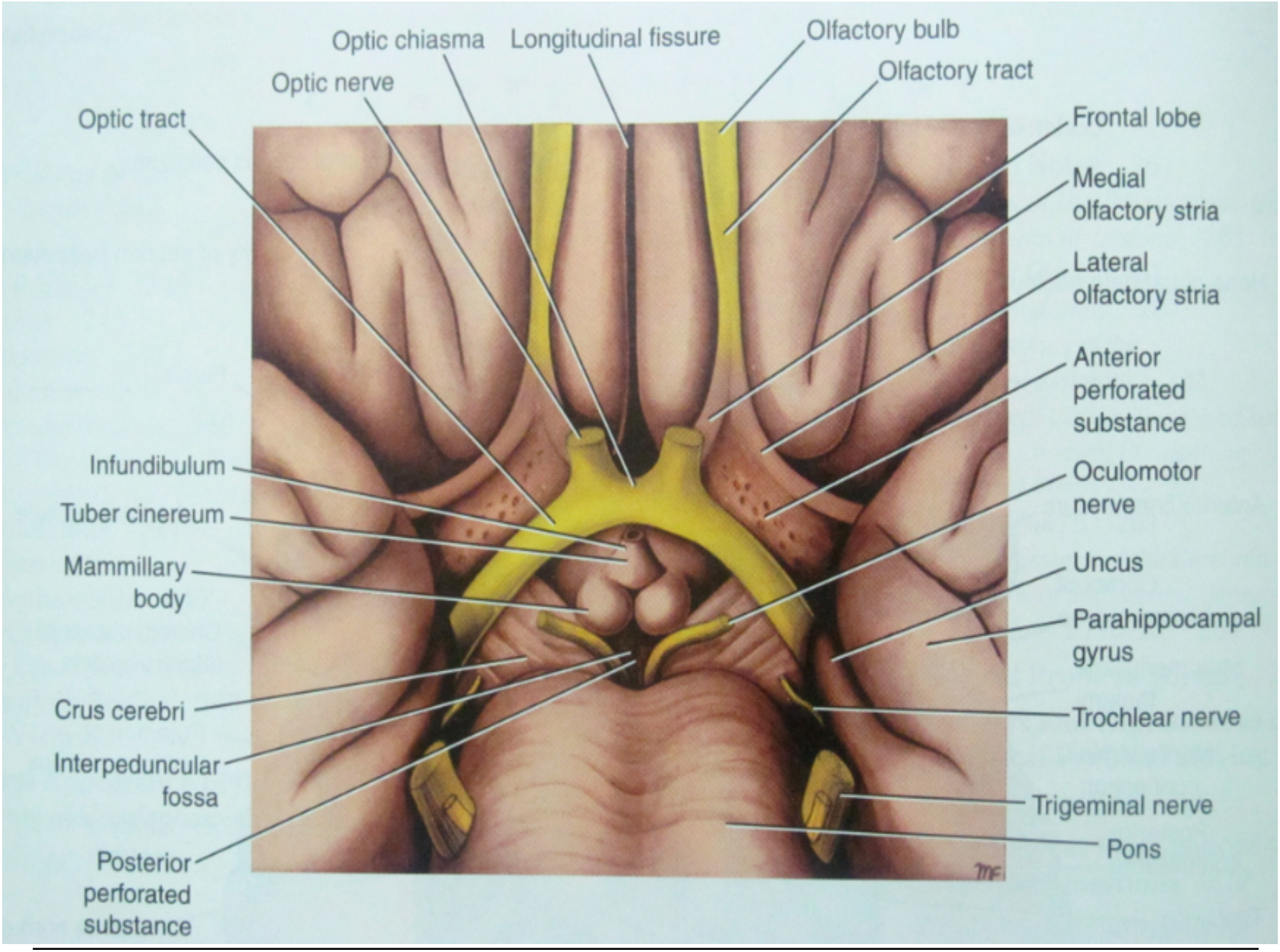
Neural pathways of pupillary light reflex (left) and accommodation reflex (right).



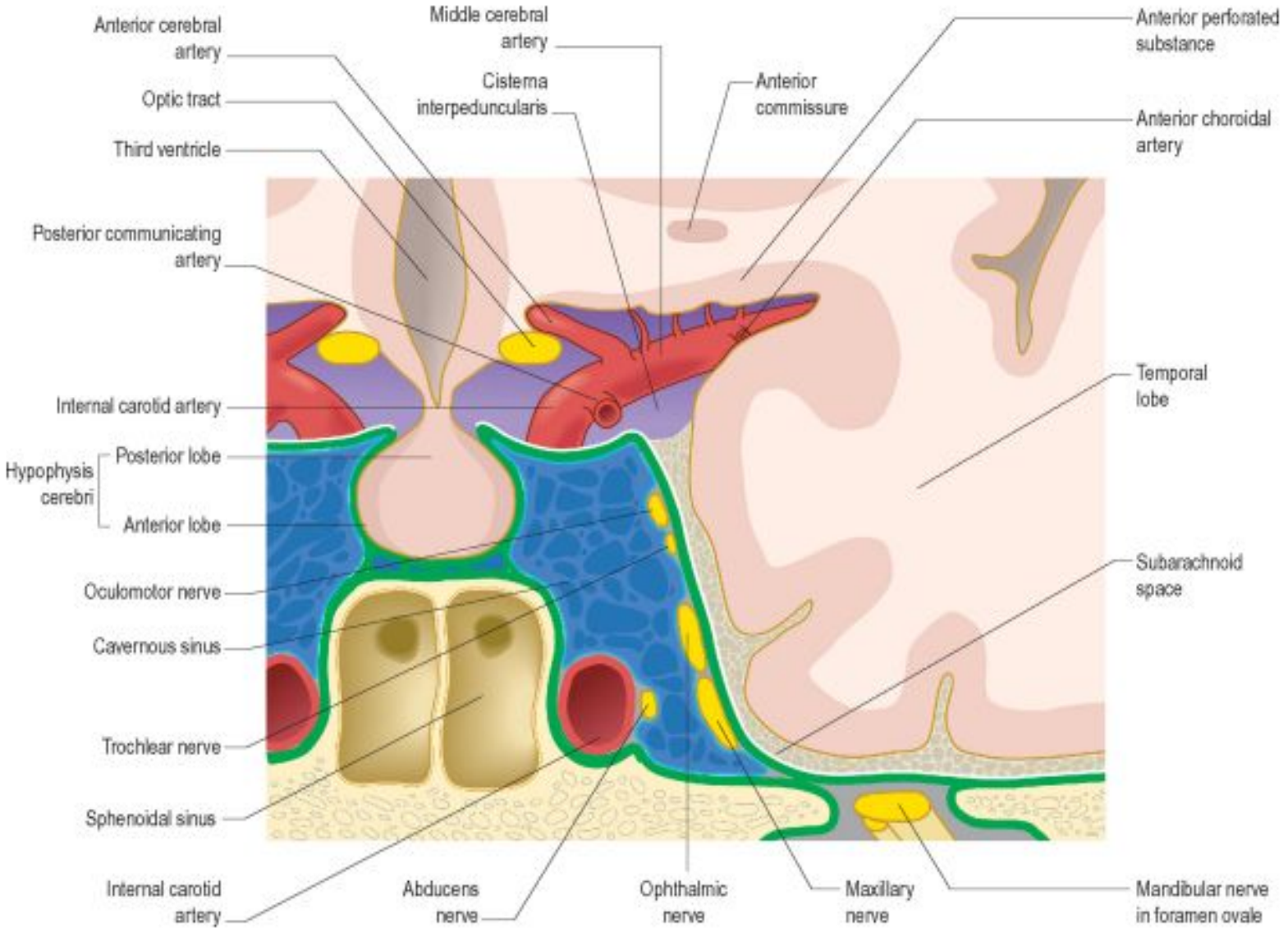
Oculomotor Nerve Course

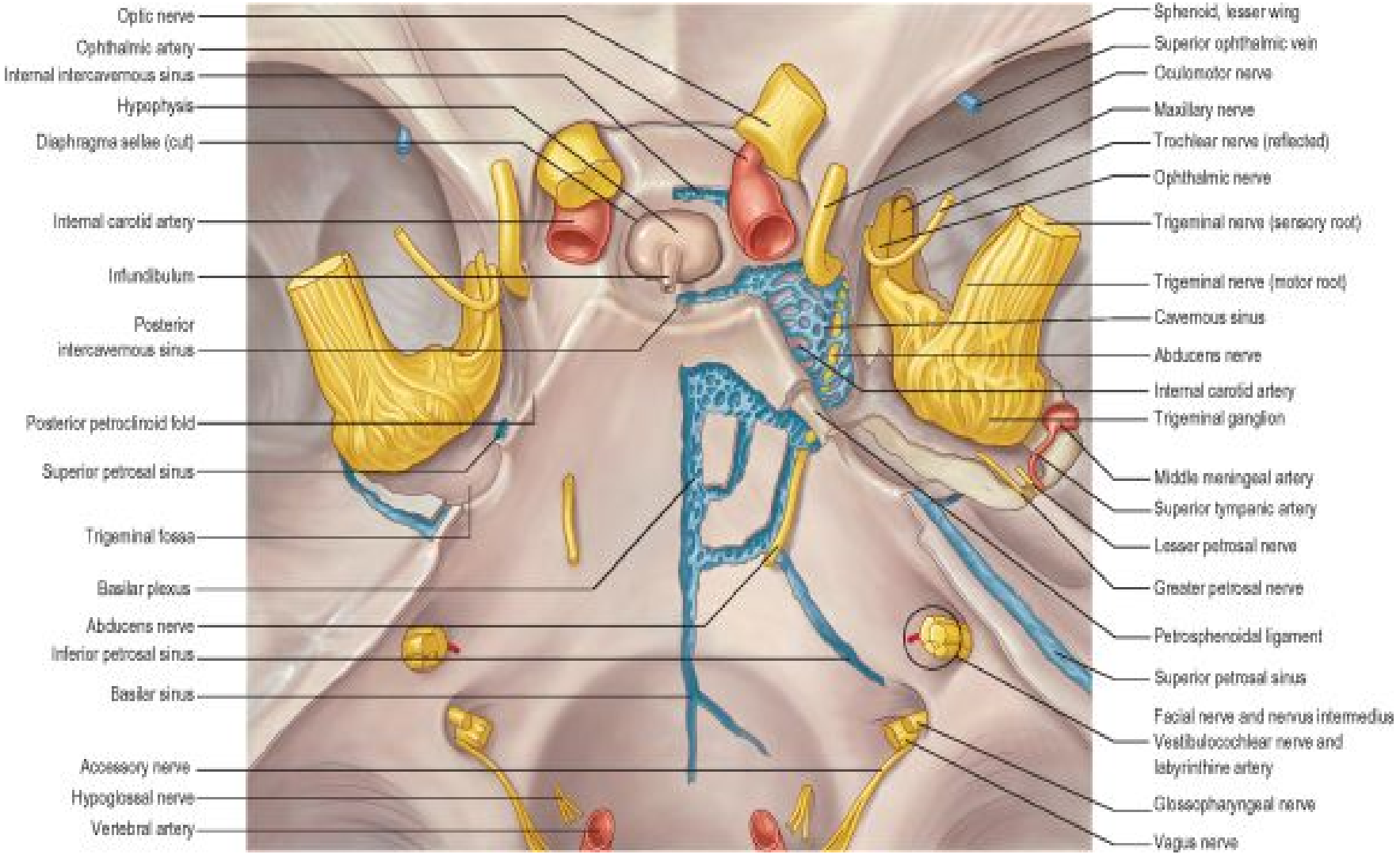
- The oculomotor nerve emerges on the anterior surface of the midbrain .
- It passes forward between the posterior cerebral and the superior cerebellar arteries.
- It then continues into the middle cranial fossa in the lateral wall of the cavernous sinus.
- Here, it divides into a superior and an inferior ramus, which enter the orbital cavity through the superior orbital fissure.

- The oculomotor nerve supplies the following extrinsic muscles of the eye:
  levator palpebrae superioris,
  superior rectus,
  medial rectus,
  inferior rectus, and inferior oblique.
- It also supplies, through its branch to the ciliary ganglion and the short ciliary nerves, parasympathetic nerve fibers to the following intrinsic muscles:
  constrictor pupillae of the iris
  ciliary muscles.
- Therefore, the oculomotor nerve is entirely motor and is responsible for
  lifting the upper eyelid;
  turning eye upward, downward, and medially;
  constricting pupil and accommodating the eye.

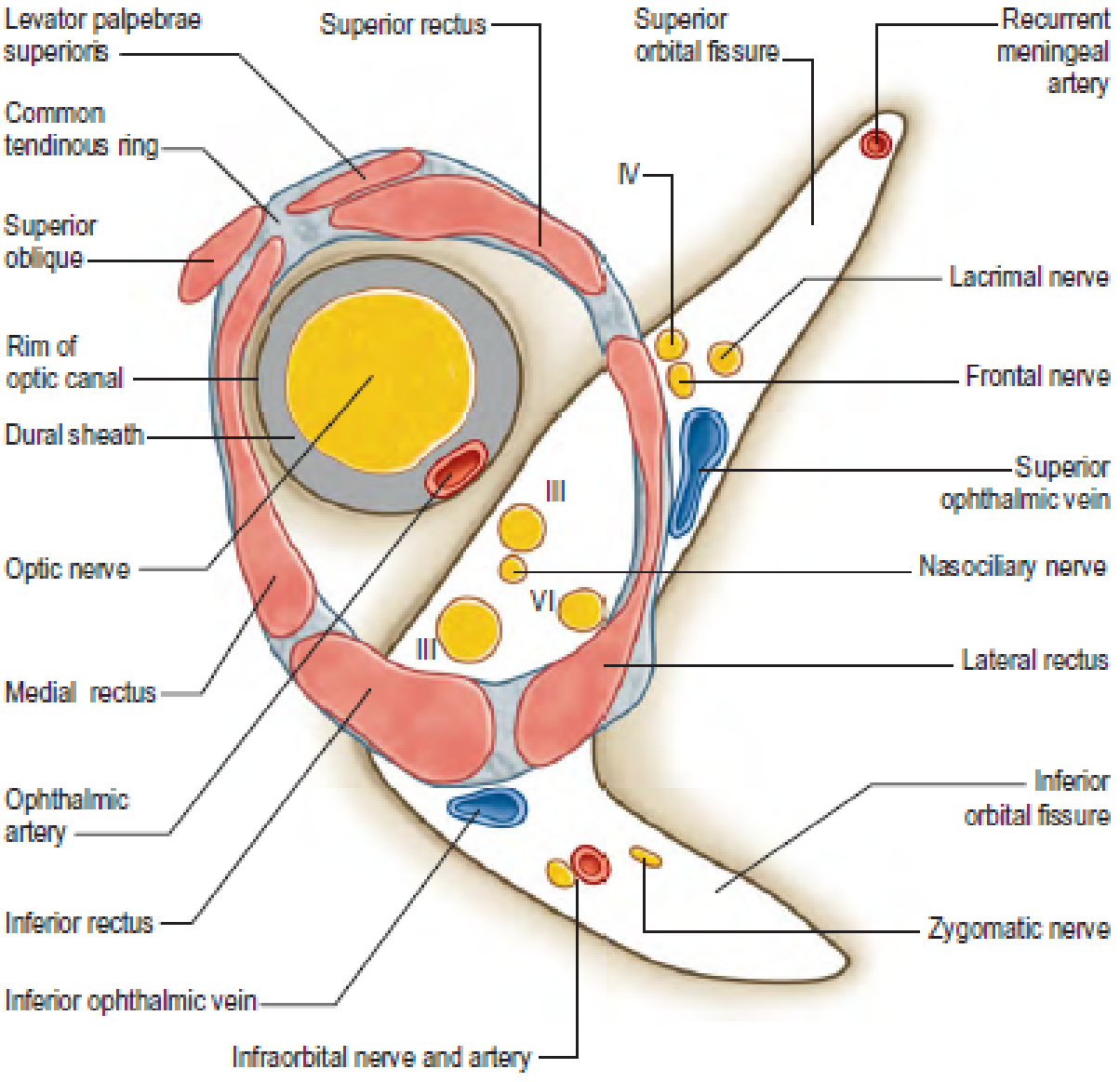


CS through brain at level of cavernous sinus

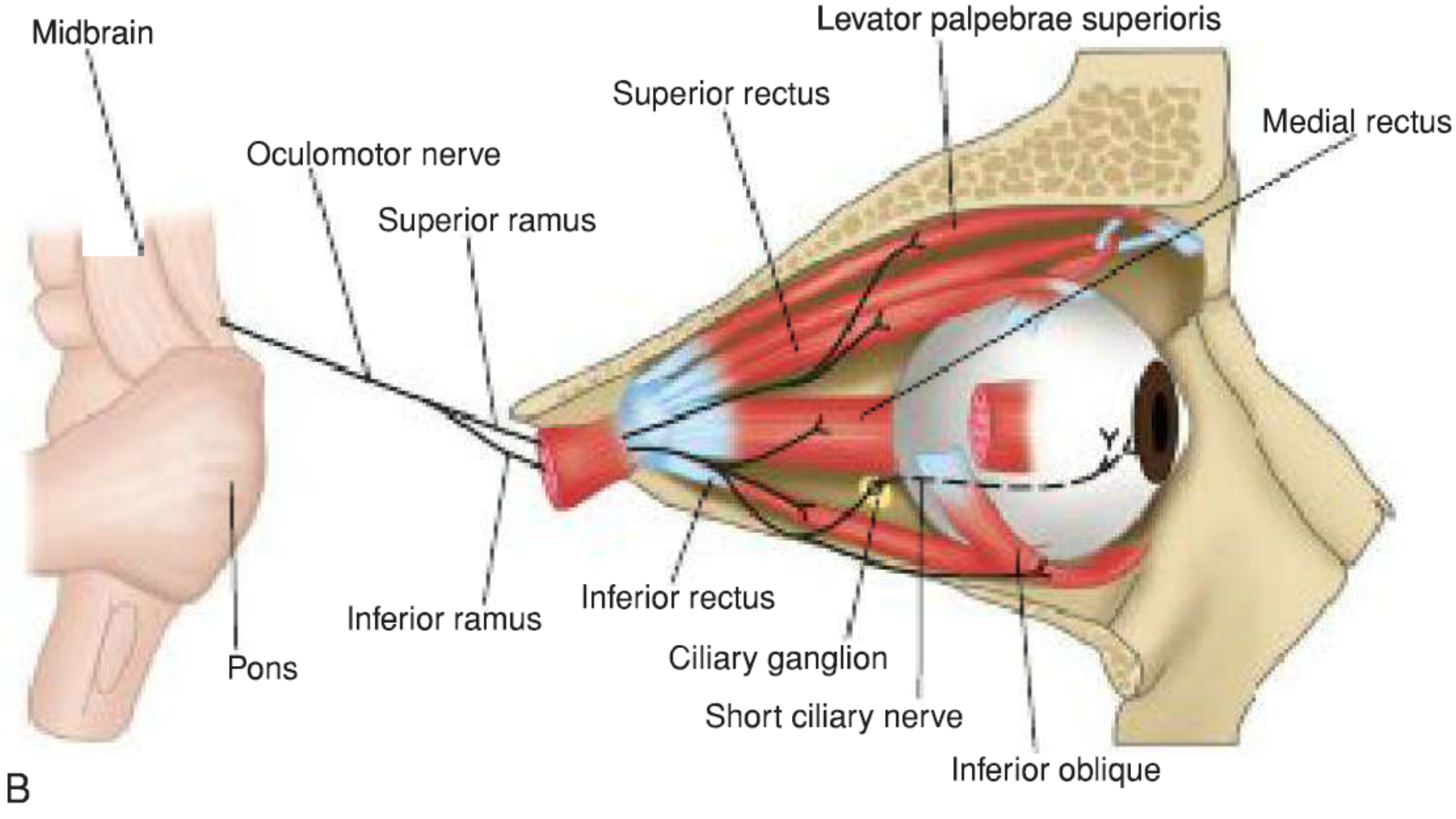




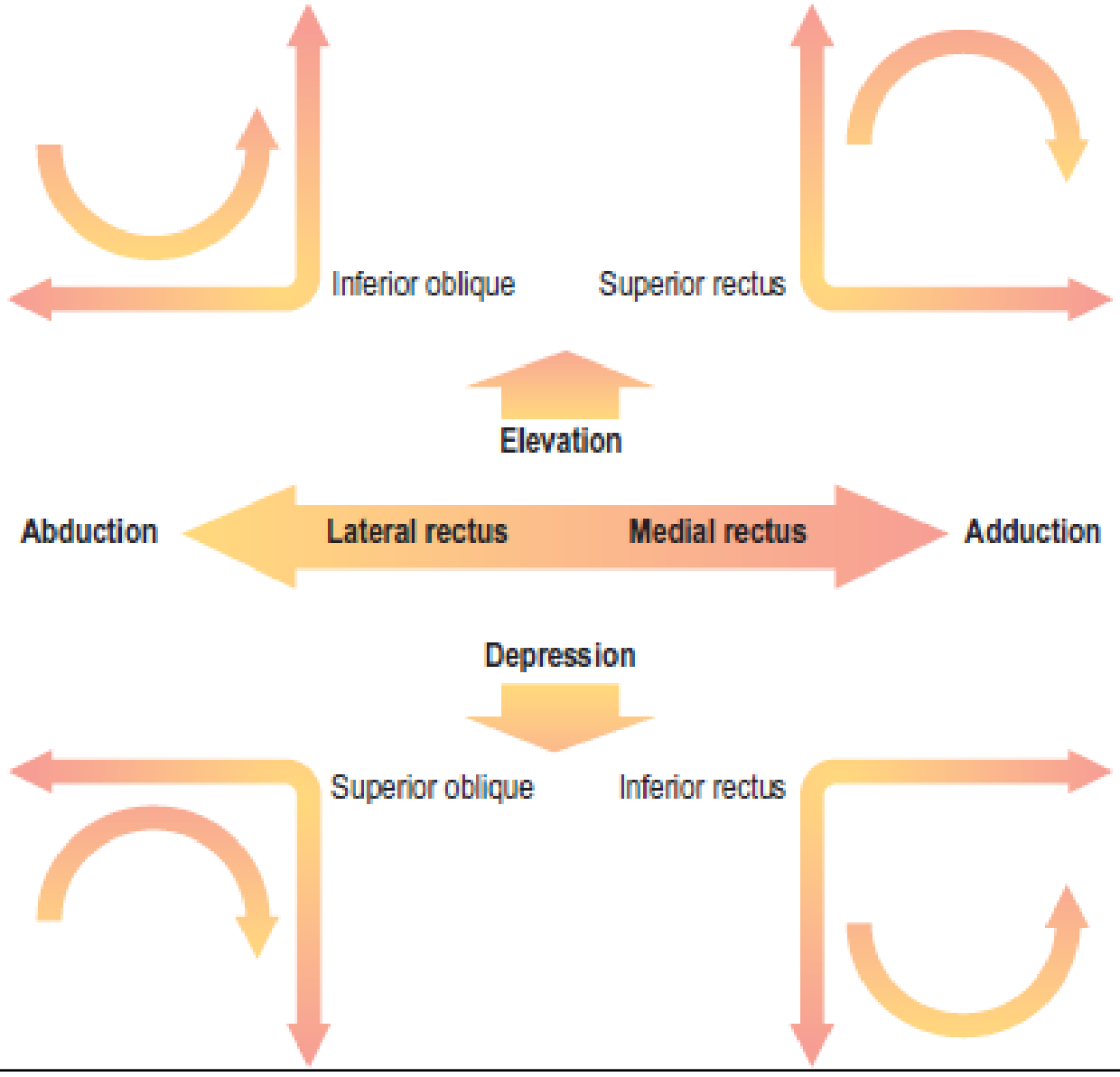
Structures passing through superior orbital fissure and optic canal



Distribution of occulomotor nerve



Simplified summary of actions of extraocular muscles.

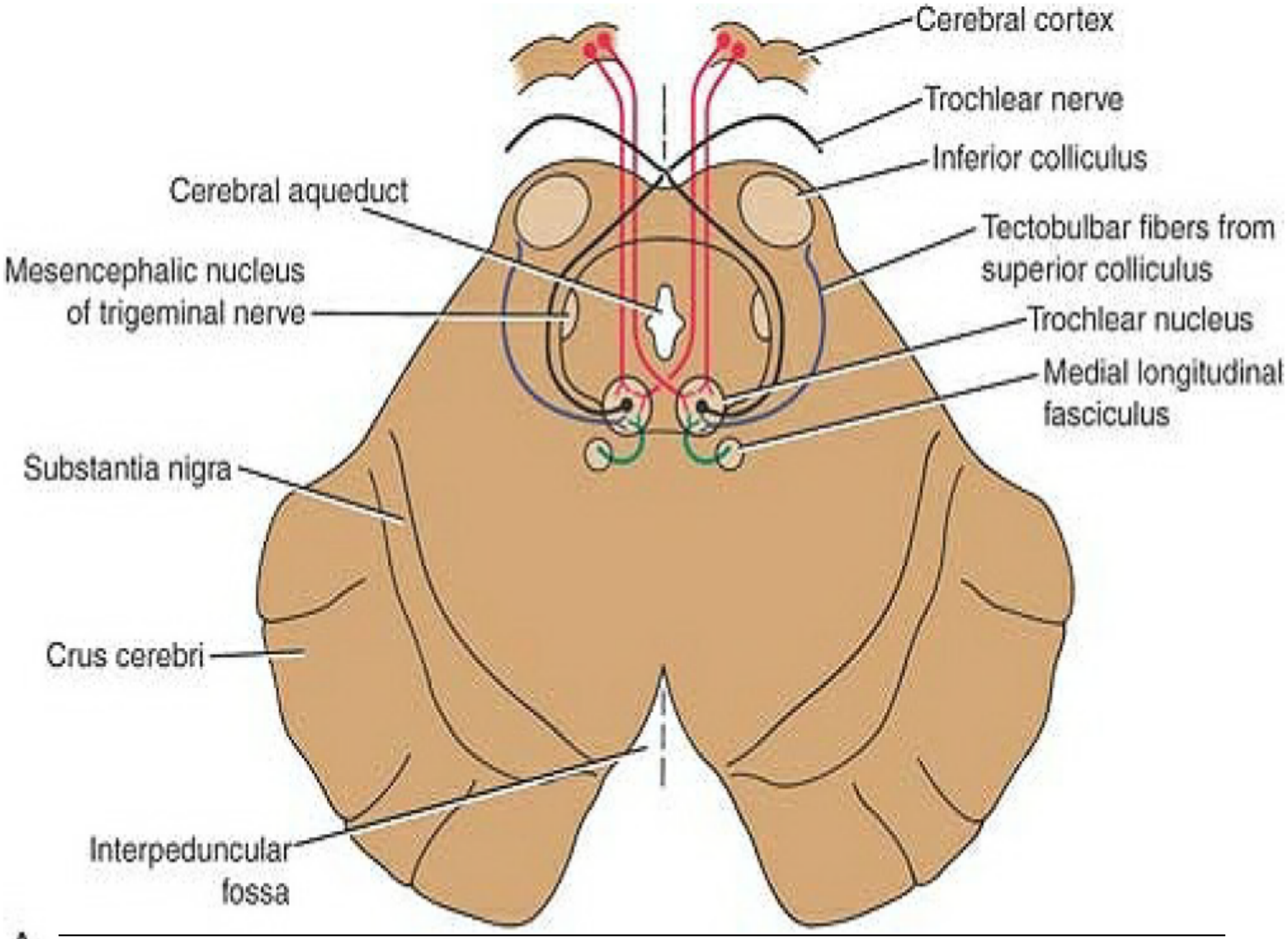


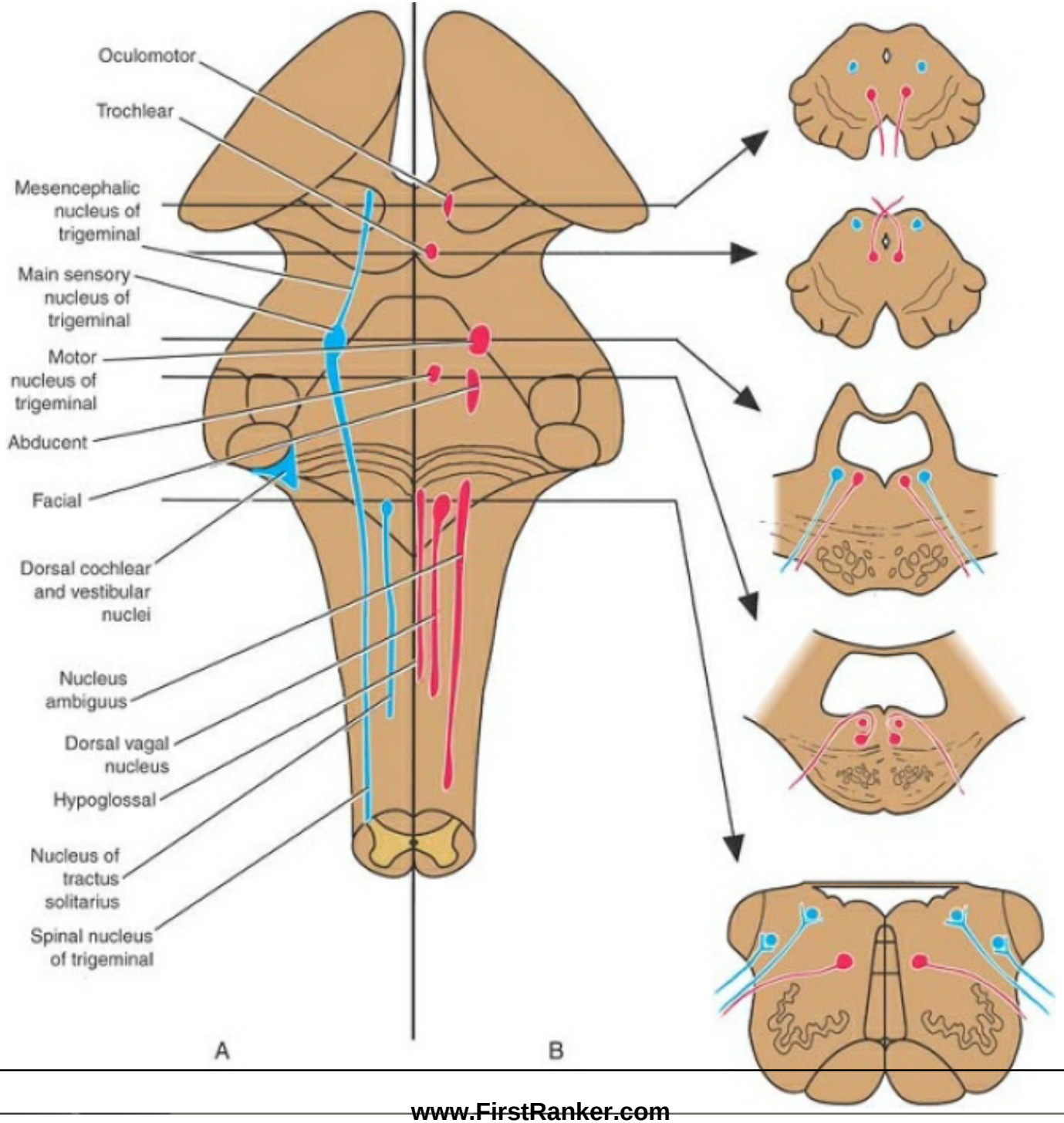
Trochlear nerve

- C N IV
- Components - motor (GSE) – Trochlear nucleus
- Supplies - superior oblique muscle
- Function - assists in turning eyeball downward and laterally , intorsion of the eyeball
- Opening in skull - superior orbital fissure

Trochlear Nerve Nucleus

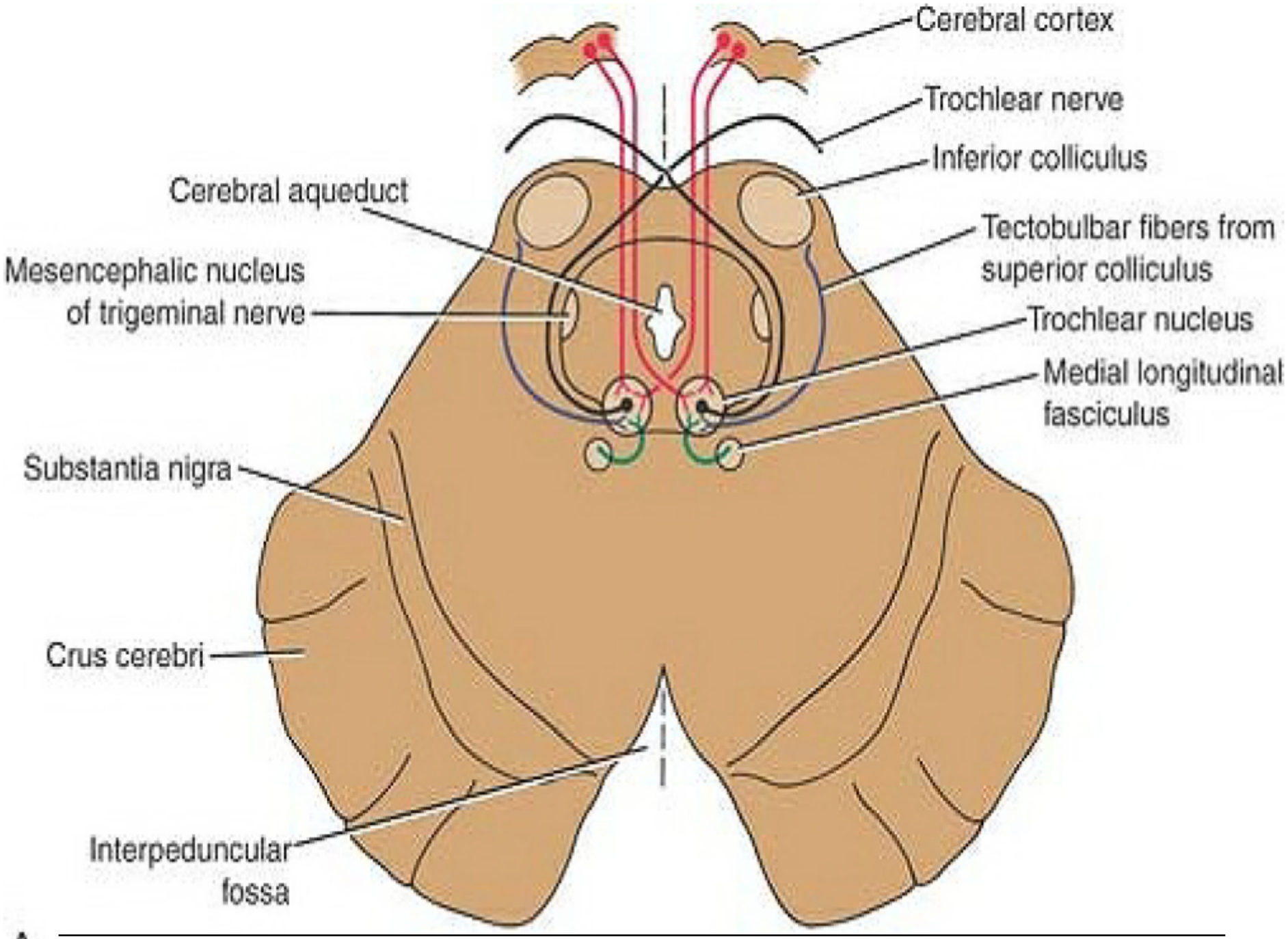
- Is situated in anterior part of gray matter that surrounds cerebral aqueduct of the midbrain.
- It lies inferior to oculomotor nucleus at level of the inferior colliculus.
- The nerve fibers, after leaving the nucleus, pass posteriorly around the central gray matter to reach the posterior surface of the midbrain.
- The trochlear nucleus receives corticonuclear fibers from both cerebral hemispheres.
- It receives the tectobulbar fibers, which connect it to the visual cortex through the superior colliculus .
- It also receives fibers from the medial longitudinal fasciculus, by which it is connected to the nuclei of the third, sixth, and eighth cranial nerves.

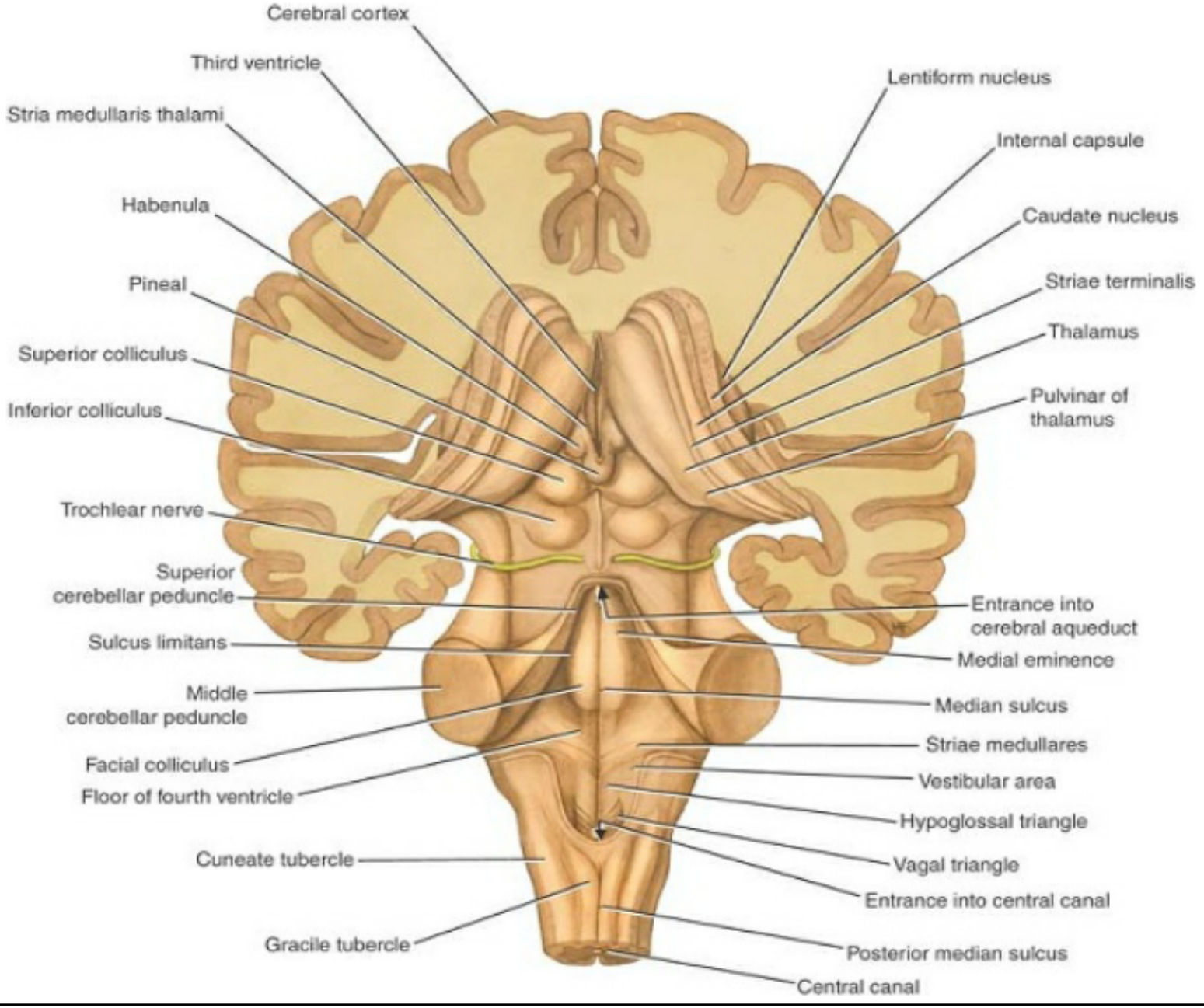


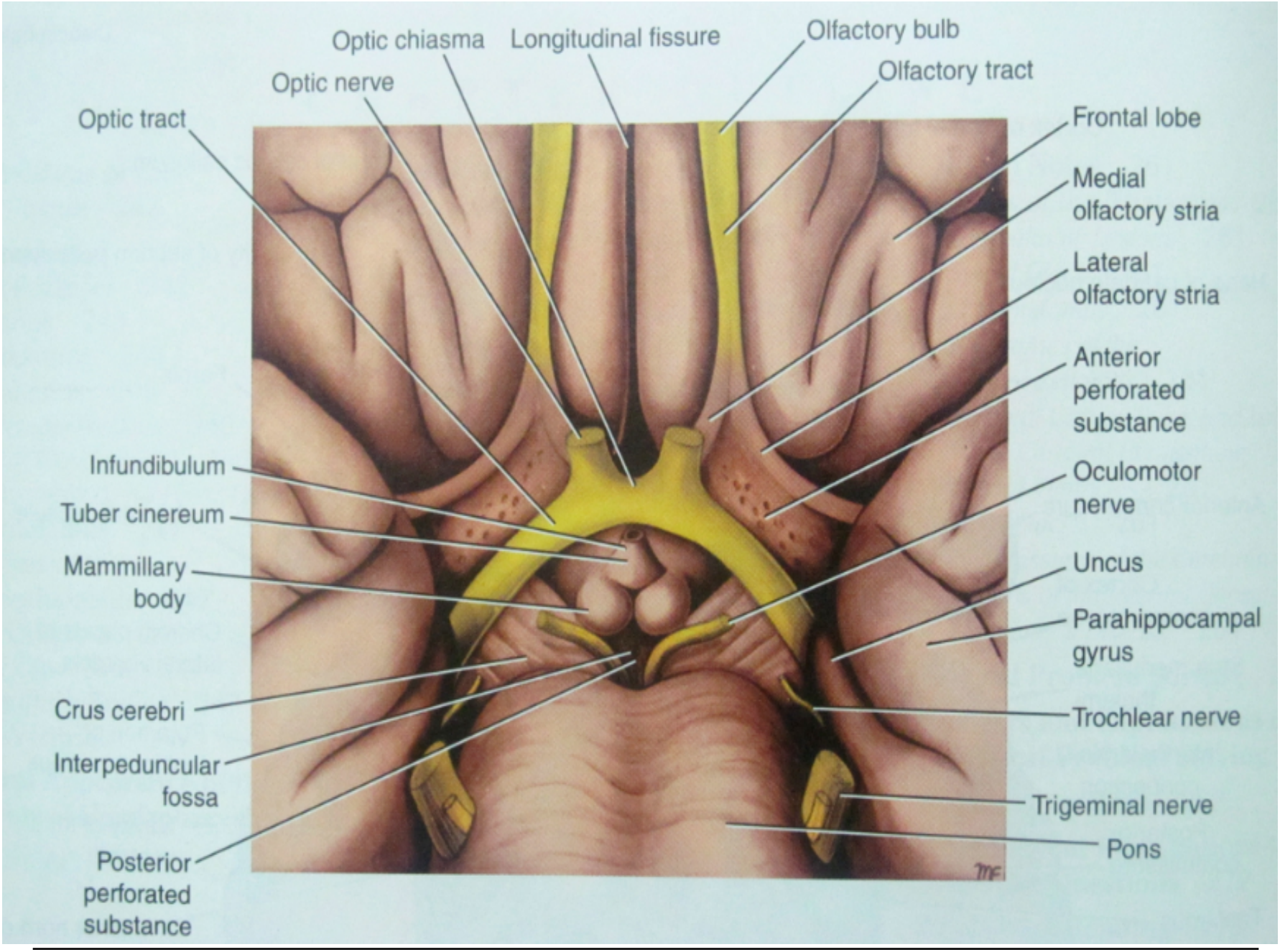


Trochlear Nerve Course

- Is most slender of the cranial nerves .
- Is only CN which comes out through posterior surface of brainstem .
- It emerges from midbrain and immediately decussates with nerve of opposite side.
- The trochlear nerve passes forward through the middle cranial fossa in the lateral wall of cavernous sinus .
- Enters the orbit through superior orbital fissure .
- The nerve supplies the superior oblique muscle of the eyeball.
- The trochlear nerve is entirely motor
- It assists in turning the eye downward and laterally.







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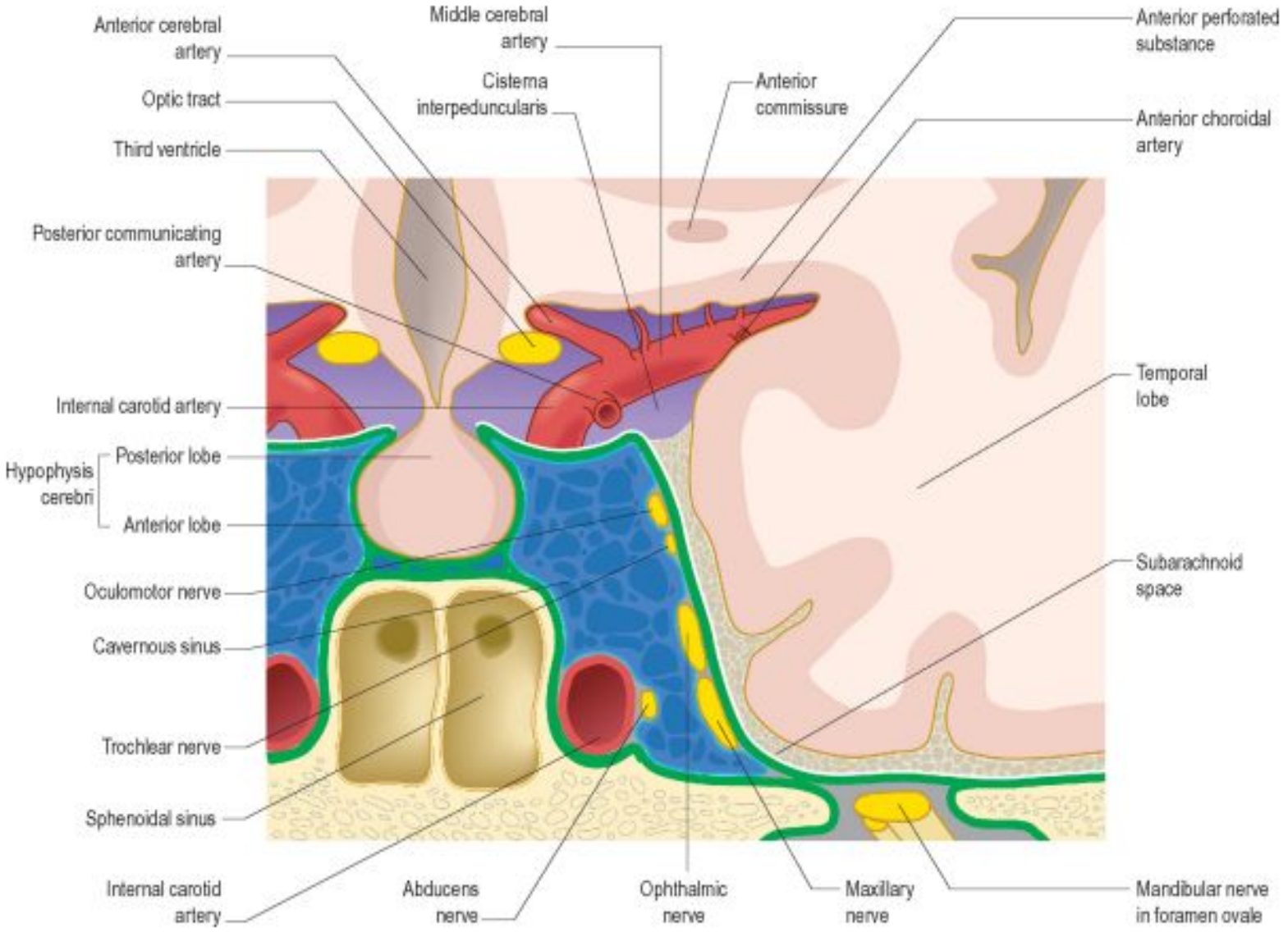

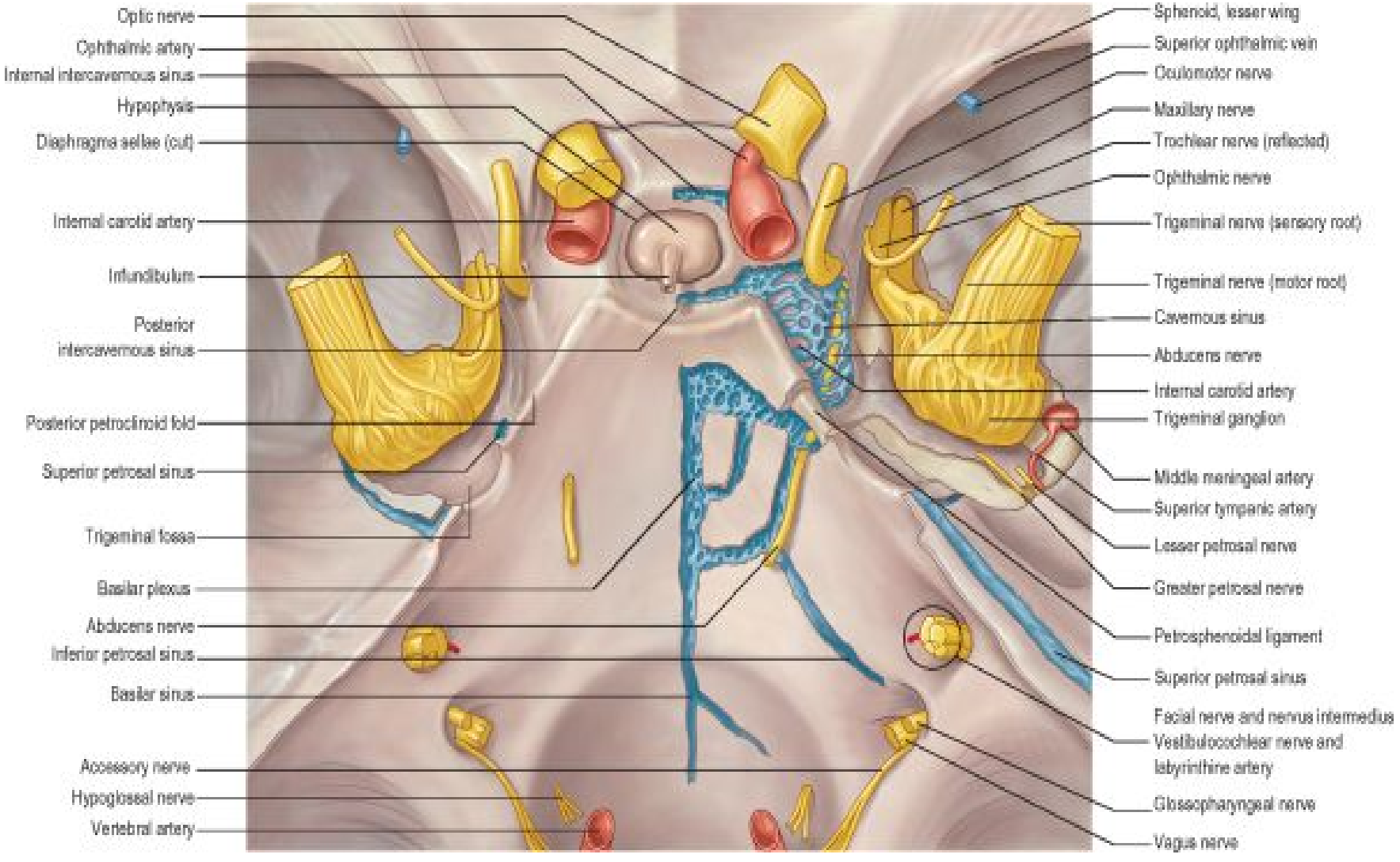

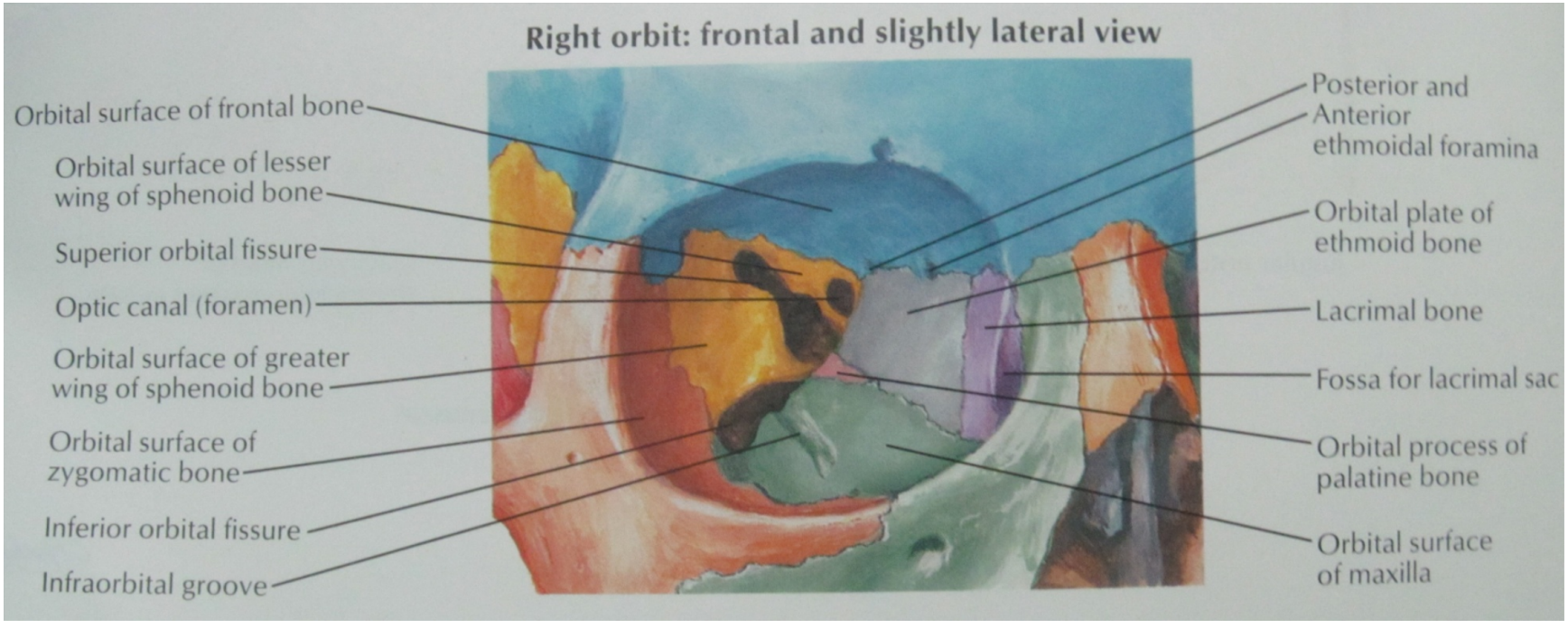

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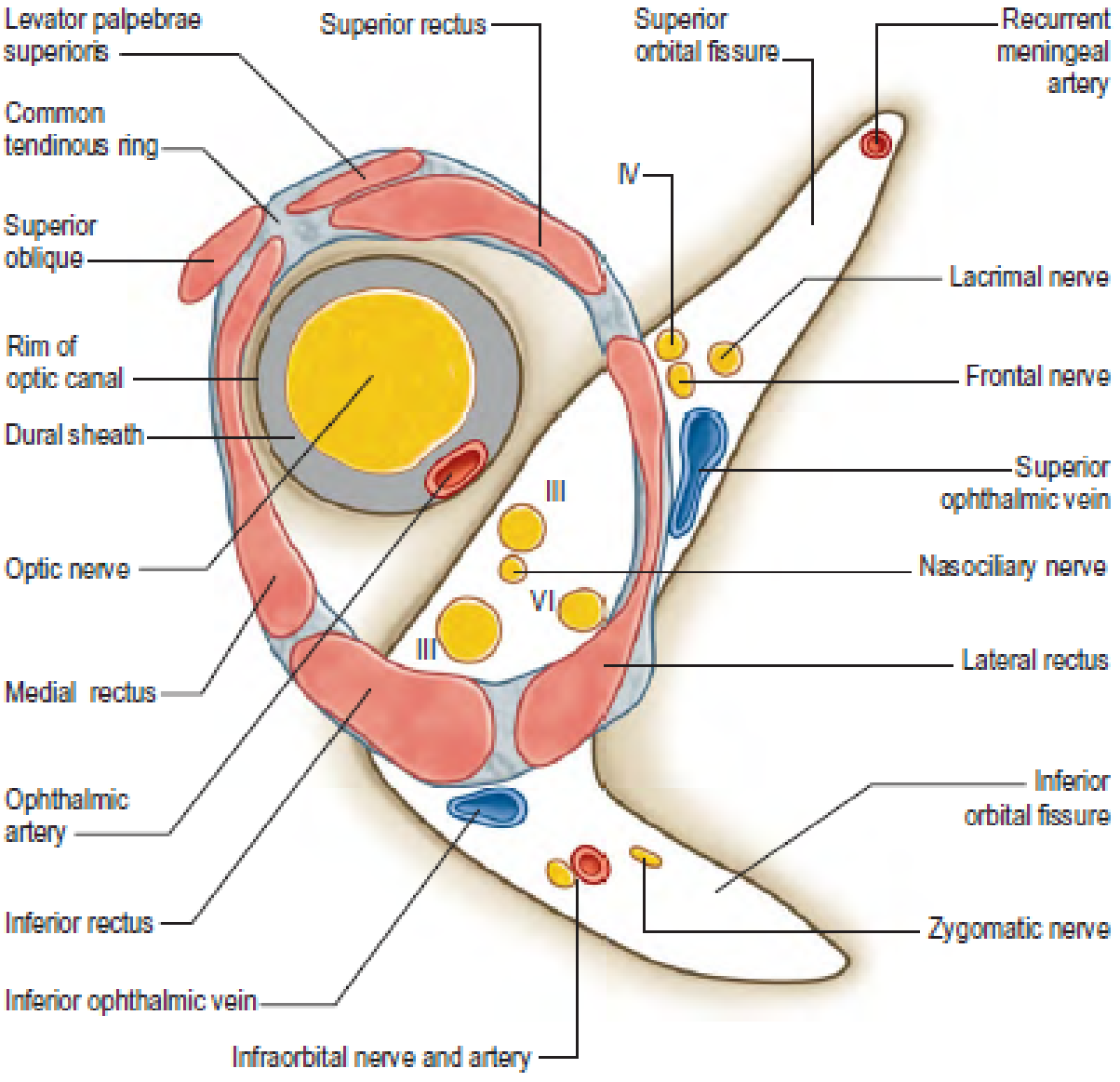
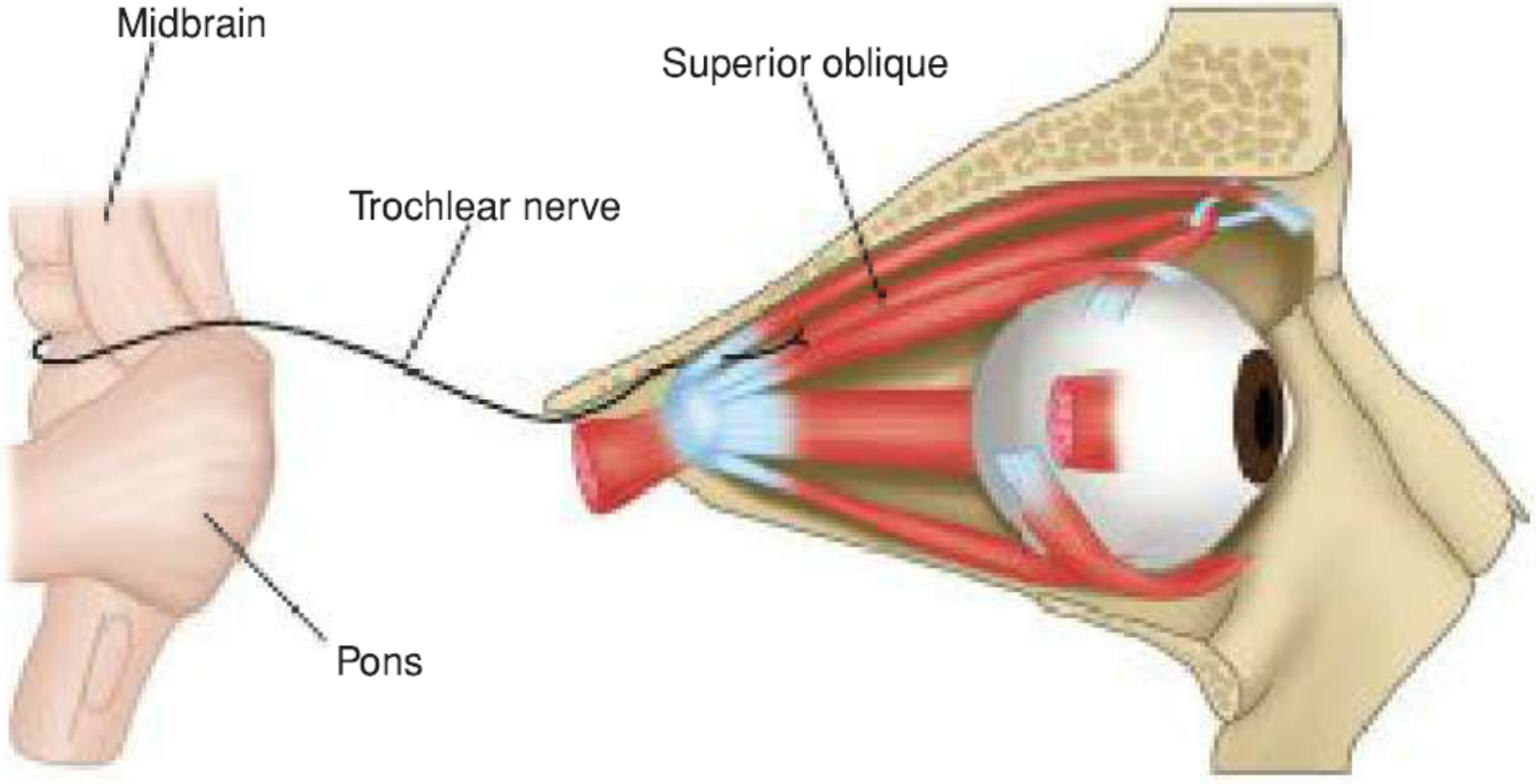


CN IV Course and distribution



Abducent nerve

- C N VI
- Components - motor (GSE)
- Supplies - lateral rectus muscle
- Function - turns eyeball laterally
- Opening in skull - superior orbital fissure

Abducens Nerve Nucleus

- The small motor nucleus is situated beneath the floor of the upper part of the fourth ventricle, close to the midline and beneath the colliculus facialis .
- The nucleus receives afferent corticonuclear fibers from both cerebral hemispheres.
- It receives the tectobulbar tract from the superior colliculus, by which the visual cortex is connected to the nucleus.
- It also receives fibers from the medial longitudinal fasciculus, by which it is connected to the nuclei of the third, fourth, and eighth cranial nerves.

Abducens Nerve Course

- The fibers of the abducens nerve pass anteriorly through the pons and emerge in the groove between the lower border of the pons and the medulla oblongata .
- It passes forward through the cavernous sinus, lying below and lateral to the internal carotid artery.
- The nerve then enters the orbit through the superior orbital fissure.
- The abducens nerve is entirely a motor nerve and supplies the lateral rectus muscle and, therefore, is responsible for turning the eye laterally.