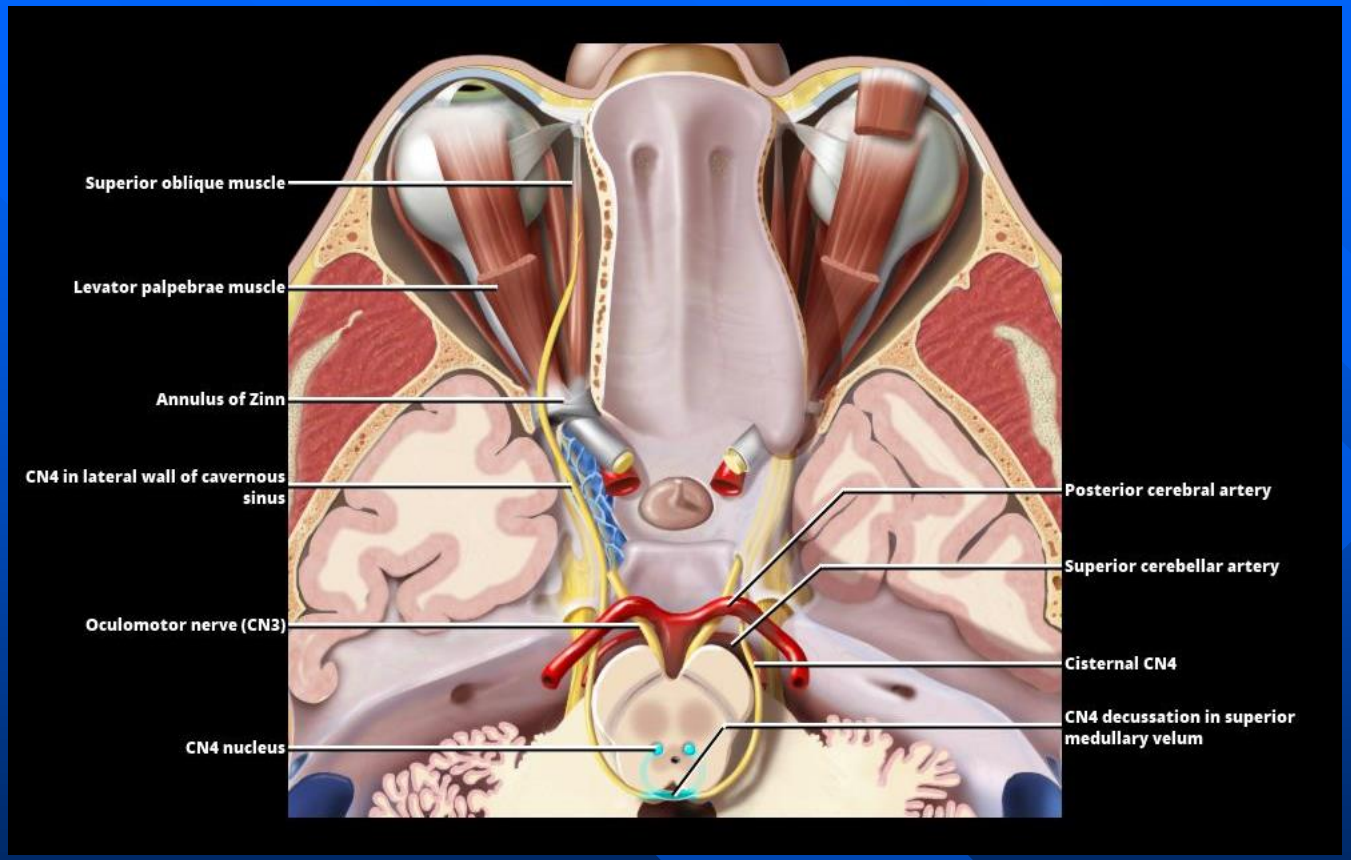
CN4 is smallest cranial nerve
CN4 has longest intracranial



Axial graphic shows trochlear nerves originating from the trochlear nuclei & decussating in the superior medullary velum.

CN4 runs lateral to the oculomotor nerve between posterior cerebral artery and superior cerebellar artery to continue inferolateral with CN3 through cavernous sinus.

It crosses over CN3 to enter orbit above annulus of Zinn, then courses medially over levator palpebrae muscle to innervate superior oblique muscle.

Trochlear Nerve

- CN4 is a pure motor nerve
- Four segments:
  - Intra-axial
  - Cisternal
  - Cavernous
  - extracranial
- Courses anterolaterally in ambient cistern
- Key concept:
  - Each superior oblique muscle is innervated by **contralateral** trochlear nucleus
- CN4 exists dorsal midbrain just inferior to inferior colliculus
- Key concept:
  - CN4 is the only cranial nerve to exit dorsal brainstem
- CN4 is smallest cranial nerve
- CN4 has longest intracranial course (~ 7.5 cm)

Clinical Importance

- CN4 neuropathy divided into **simple and complex**
- **Simple** CN4 neuropathy (isolated)
  - Most common form; usually secondary to trauma
  - Cisternal segment injury by free edge of tentorium cerebelli or from posterior cerebral or superior cerebellar artery aneurysm
  - Contusion of superior medullary velum
- **Complex** CN4 neuropathy (associated with other CN injury, CN3 ± CN6)
  - Brainstem stoke or tumor
  - Cavernous sinus thrombosis, tumor
  - Orbital tumor

Clinical Findings

- Paralysis of superior oblique muscle results in **extorsion** (outward rotation) of affected eye
- Extorsion is secondary to unopposed action of inferior oblique muscle
- Patient complaints: Diplopia, weakness of downward gaze, neck pain from head tilting
- Physical exam: Compensatory head tilt usually away from affected side

Cavernous Segment

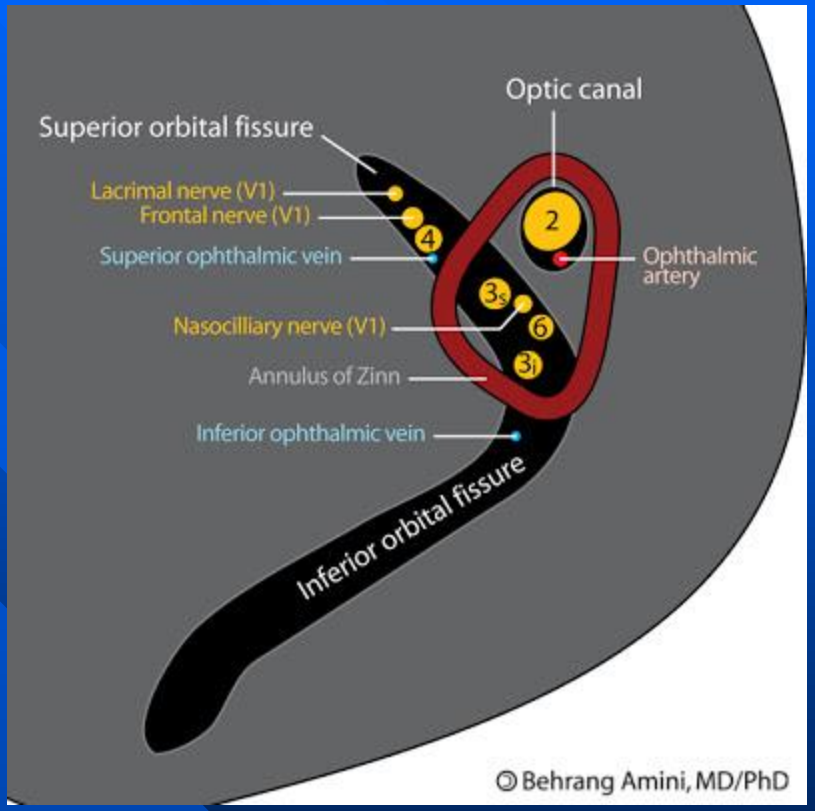
- Courses anteriorly through lateral dural wall of cavernous sinus
- Intracavernous relationships of CN4
  - Remains inferior to CN3
  - Superior to ophthalmic division of trigeminal nerve (CNV1)
  - Lateral to cavernous internal carotid artery

Extracranial Segment

- CN4 enters orbit through **superior orbital fissure** together with CN3 and CN6
- Crosses over CN3 and courses medially
- Passes **above** annulus of Zinn (CN3 and CN6 go through annulus)
- Supplies motor innervation to superior oblique muscle

Annulus of Zinn

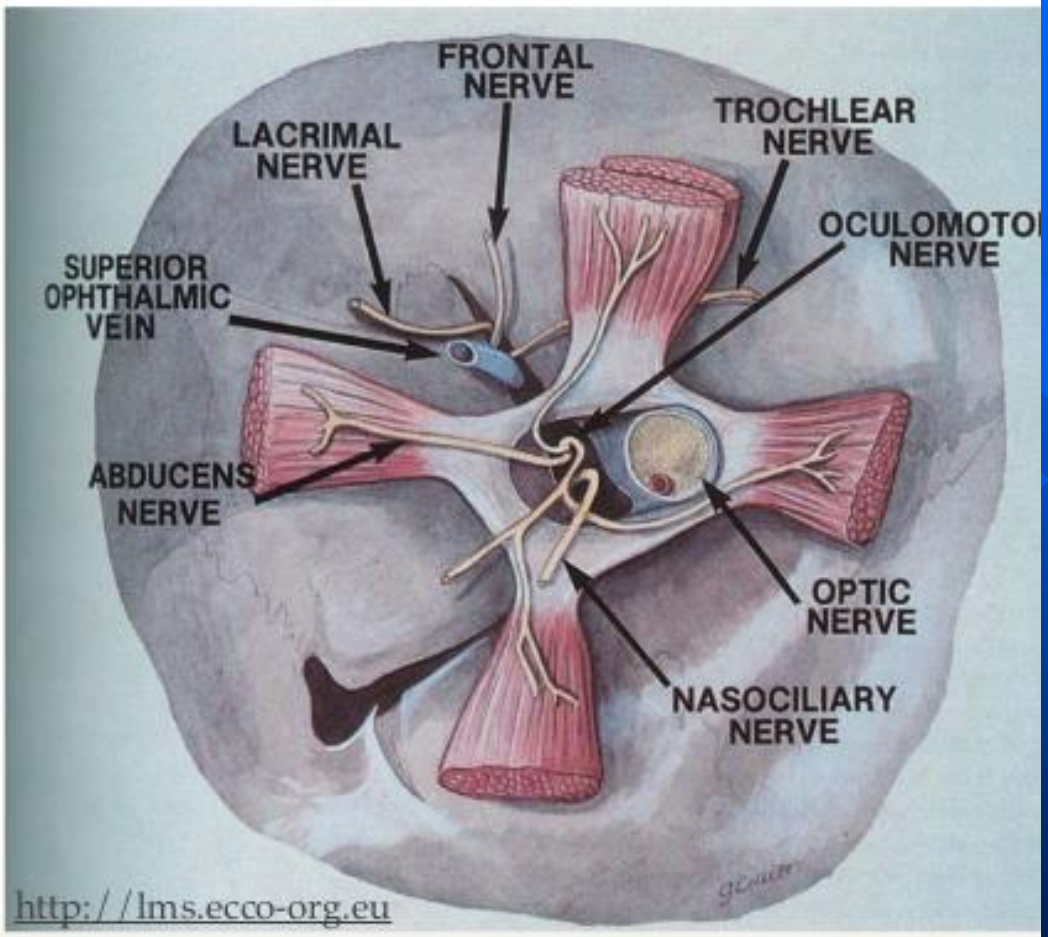
- Annular tendon or common tendinous ring, is a ring of fibrous tissue surrounding the optic nerve at its entrance at the apex of the orbit.
- It is the common origin of the four rectus muscles (extraocular muscles).



Orbital Apex

Annulus of Zinn
Nerve Supply

Figure 2. Right superior orbital fissure viewed anteriorly



Trochlear nerve

CN IV