Peripheral Nervous System

THE ORBIT, EXTRAOCULAR MUSCLES

Dr. Aiman Qais Afar
Surgical Anatomist

College of Medicine / University of Mutah

2022-2023

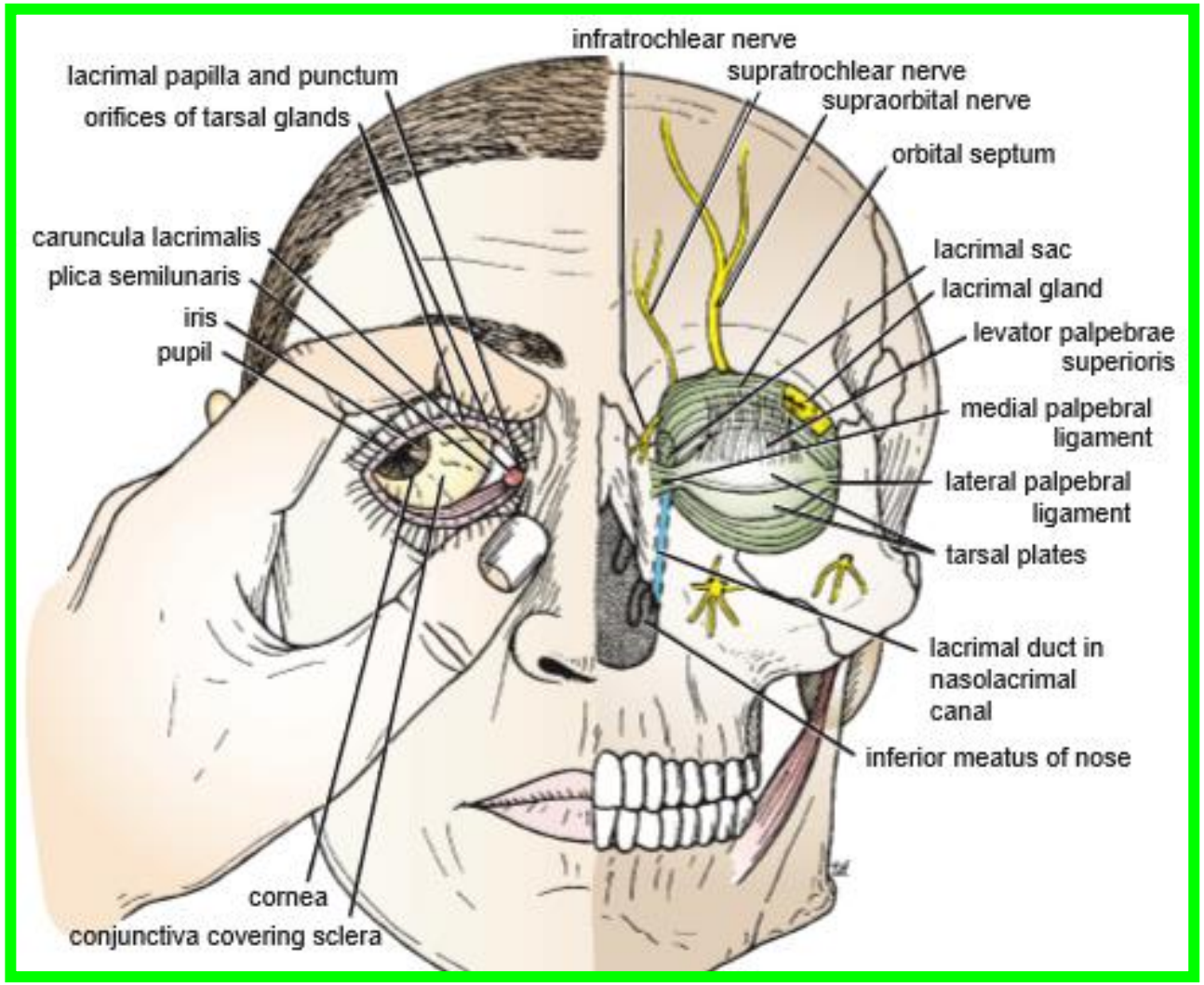
Tuesday 7 March 2023

The Orbital Region

✓**The orbital region** *is the area of the face overlying the orbit and eyeball and includes the upper and lower eyelids and lacrimal apparatus*

✓**The orbits** *are a pair of bony cavities that contain the* ***eyeballs****;* ***their associated muscles****, nerves, vessels, and fat; and most of the lacrimal apparatus.*

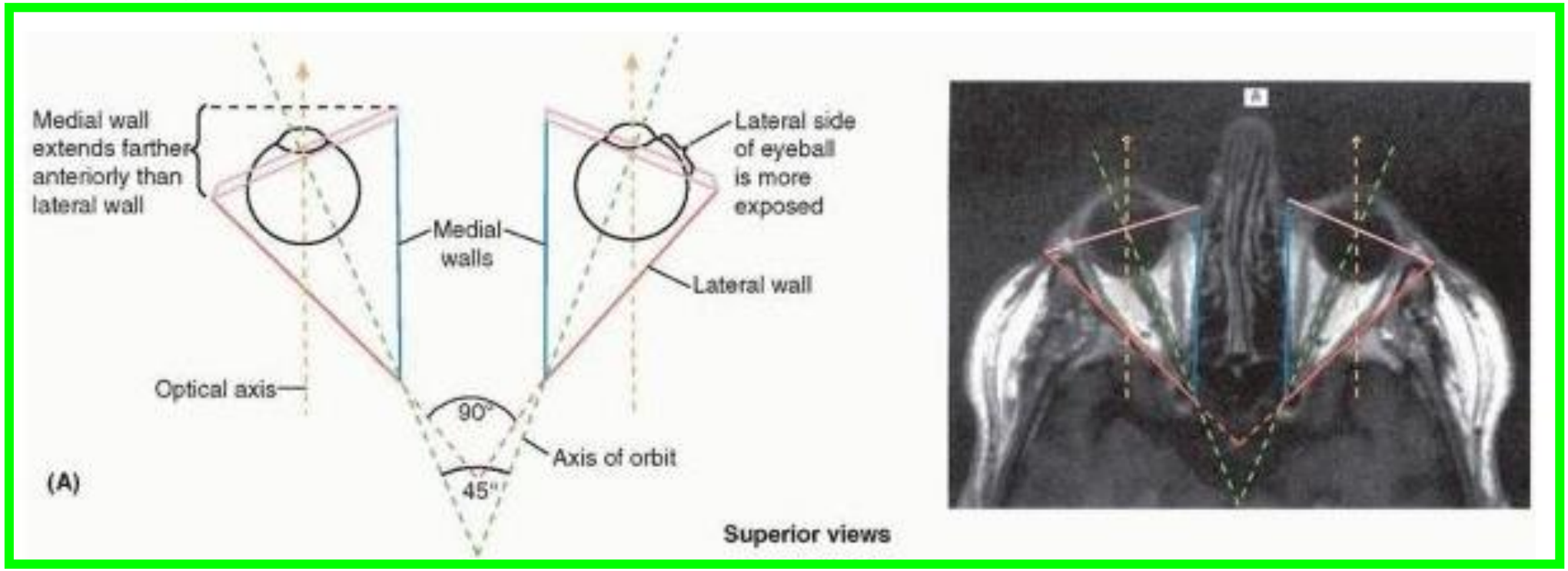
✓**The orbital opening** *is guarded by two thin, movable folds,* ***the eyelids***



Orbits

❖*The orbits are bilateral bony cavities in the facial skeleton that resemble hollow quadrangular pyramids with their bases directed anterolaterally and their apices, posteromedially*

❖*The medial walls of the two orbits, separated by the ethmoidal sinuses and the upper parts of the nasal cavity, are nearly parallel, whereas their lateral walls are approximately at a right (90°) angle.*

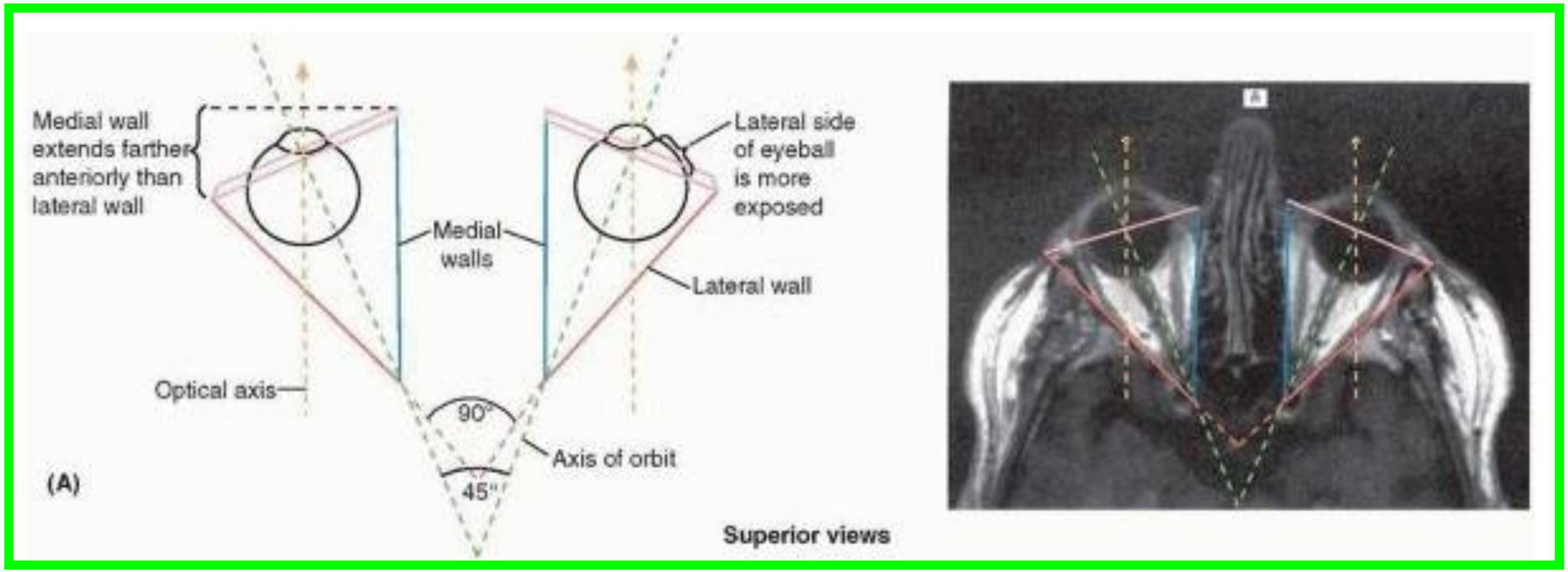


Orbits

✓Consequently, (orbital axes) diverge at approximately 45°.

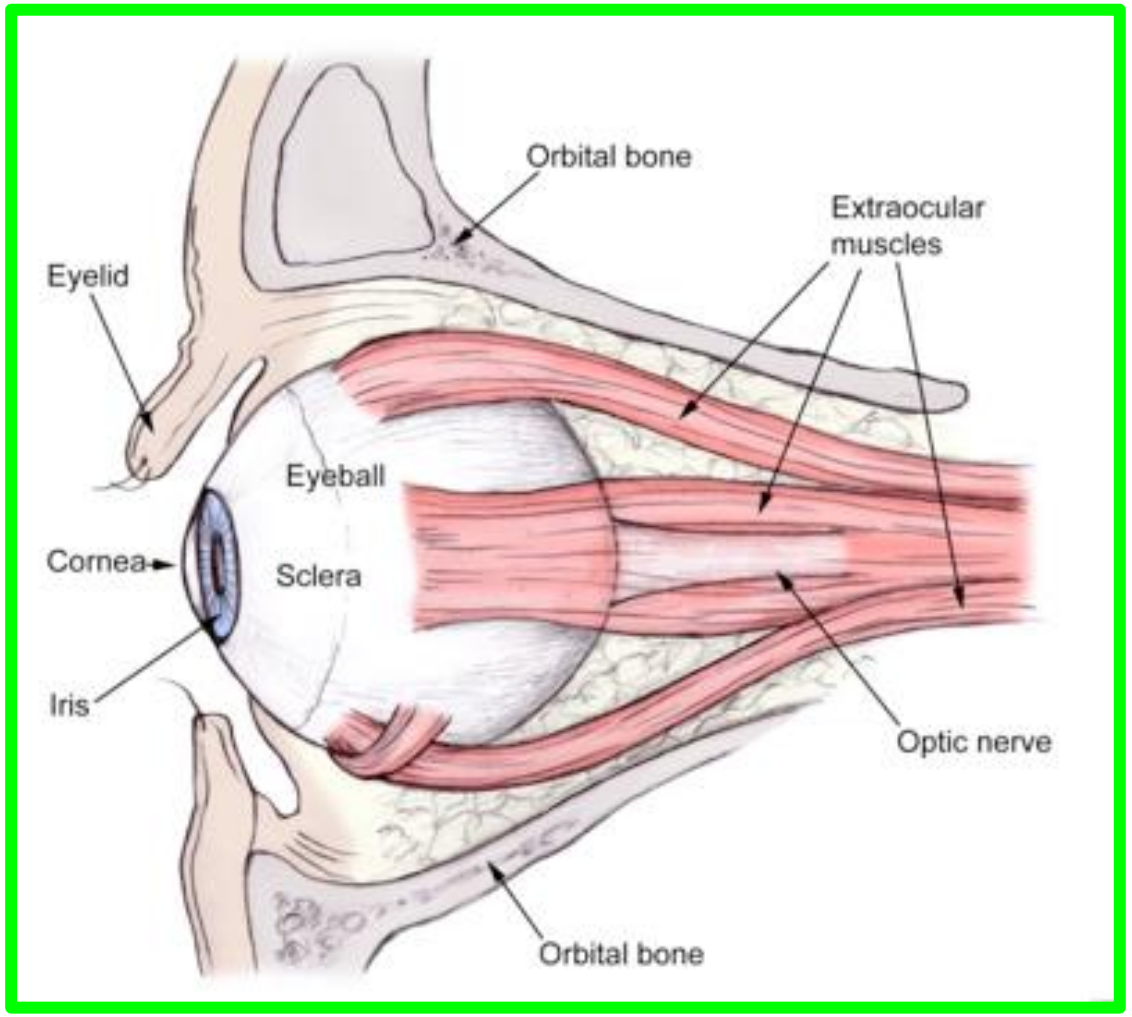
✓ The optical axes (the direction or line of sight) for the two eyeballs, are parallel, ("looking straight ahead"),

✓The orbits anterior to them contain and protect the eyeballs which include the:



Orbits

- Eyelids, ..controlling exposure of the anterior eyeball.
- Extraocular muscles, which position the eyeballs and raise the superior eyelids.
- Nerves and vessels
- Orbital fascia.
- Mucous membrane (conjunctiva) lining the eyelids



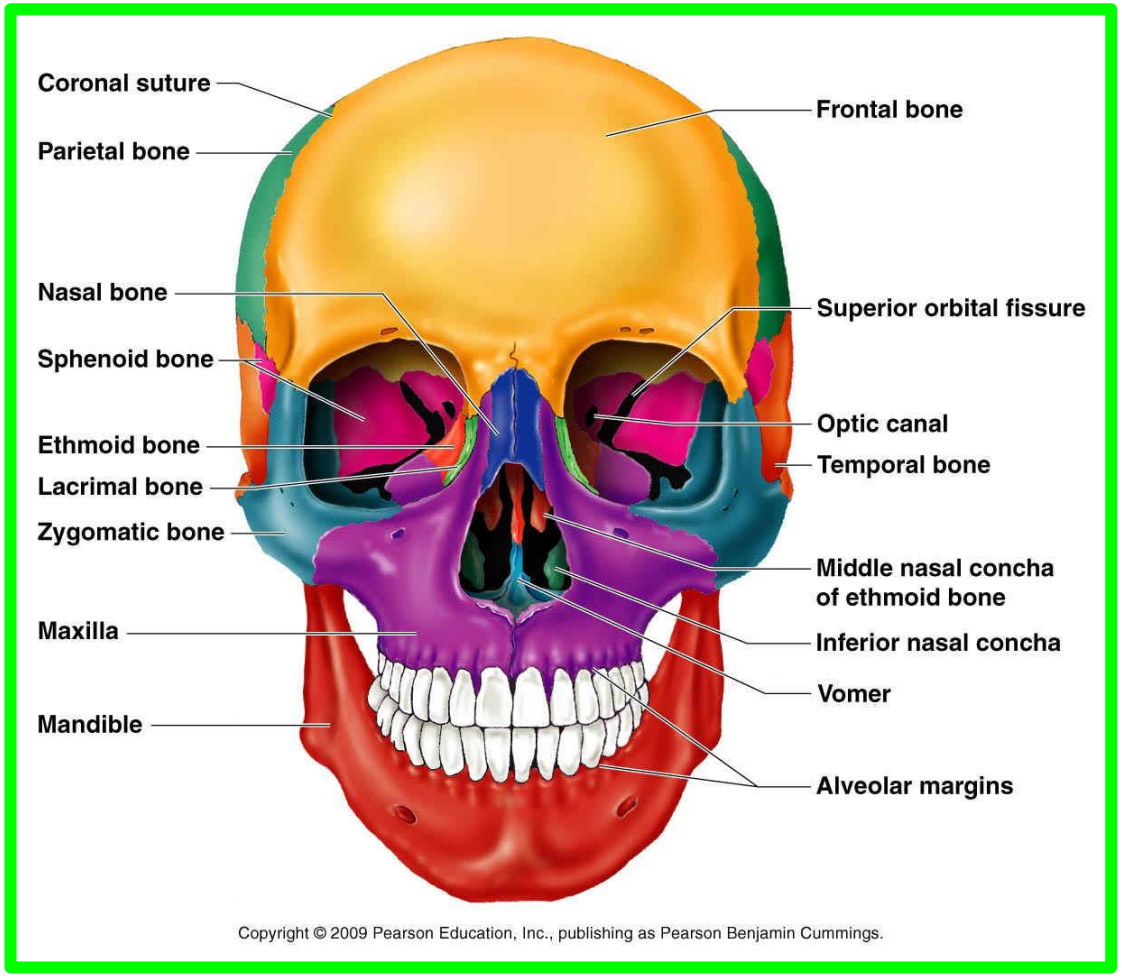
All space within the orbits not occupied by these structures is filled with orbital fat

Orbits

The quadrangular pyramidal orbit has a base, four walls, and an apex

❖The base

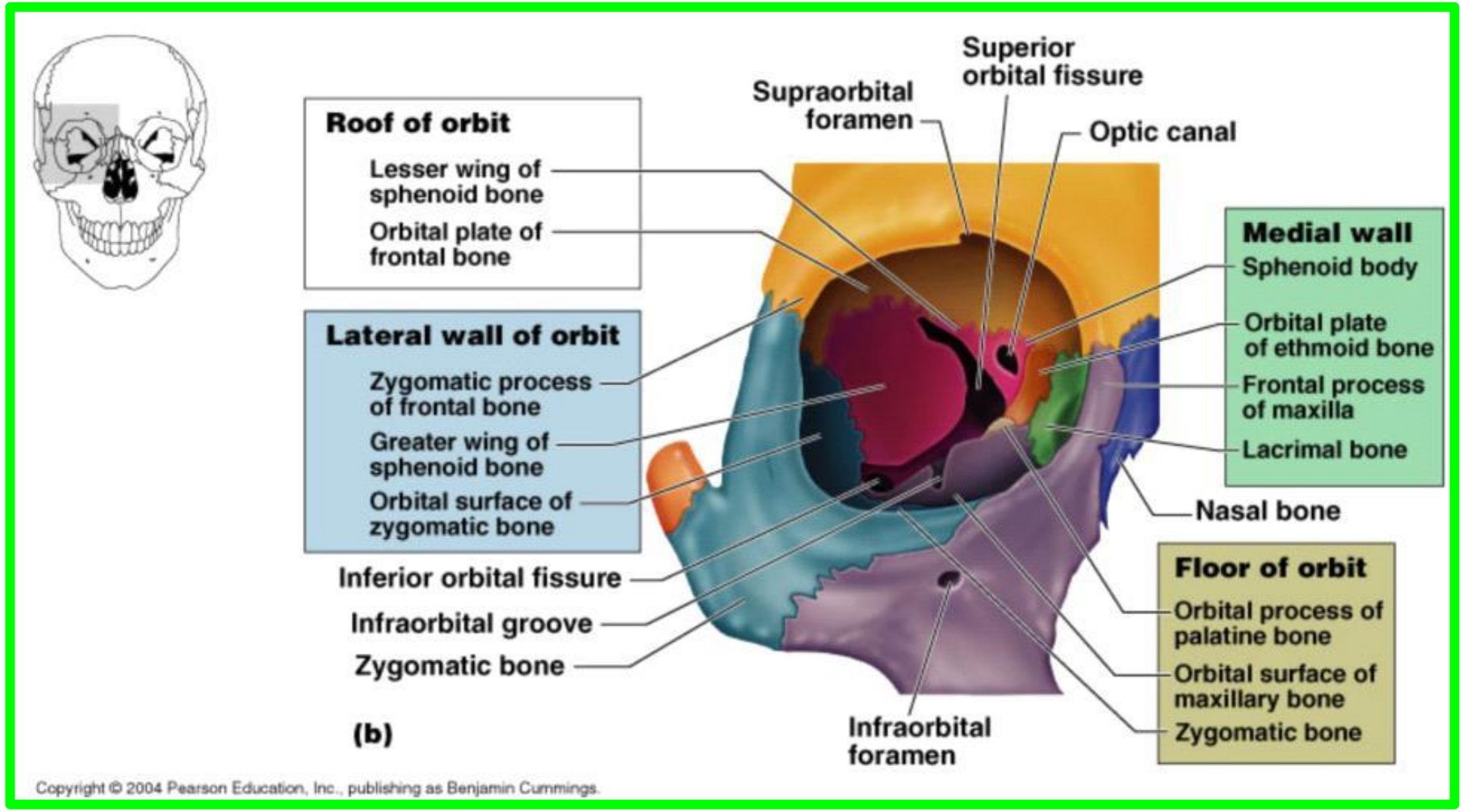
above by the frontal bone, the lateral margin the processes of the frontal and zygomatic bones, the inferior margin is the zygomatic bone and the maxilla, the medial margin the processes of the maxilla and the frontal bone.



❖The apex is at the optic canal in the lesser wing of the sphenoid just medial to the superior orbital fissure.

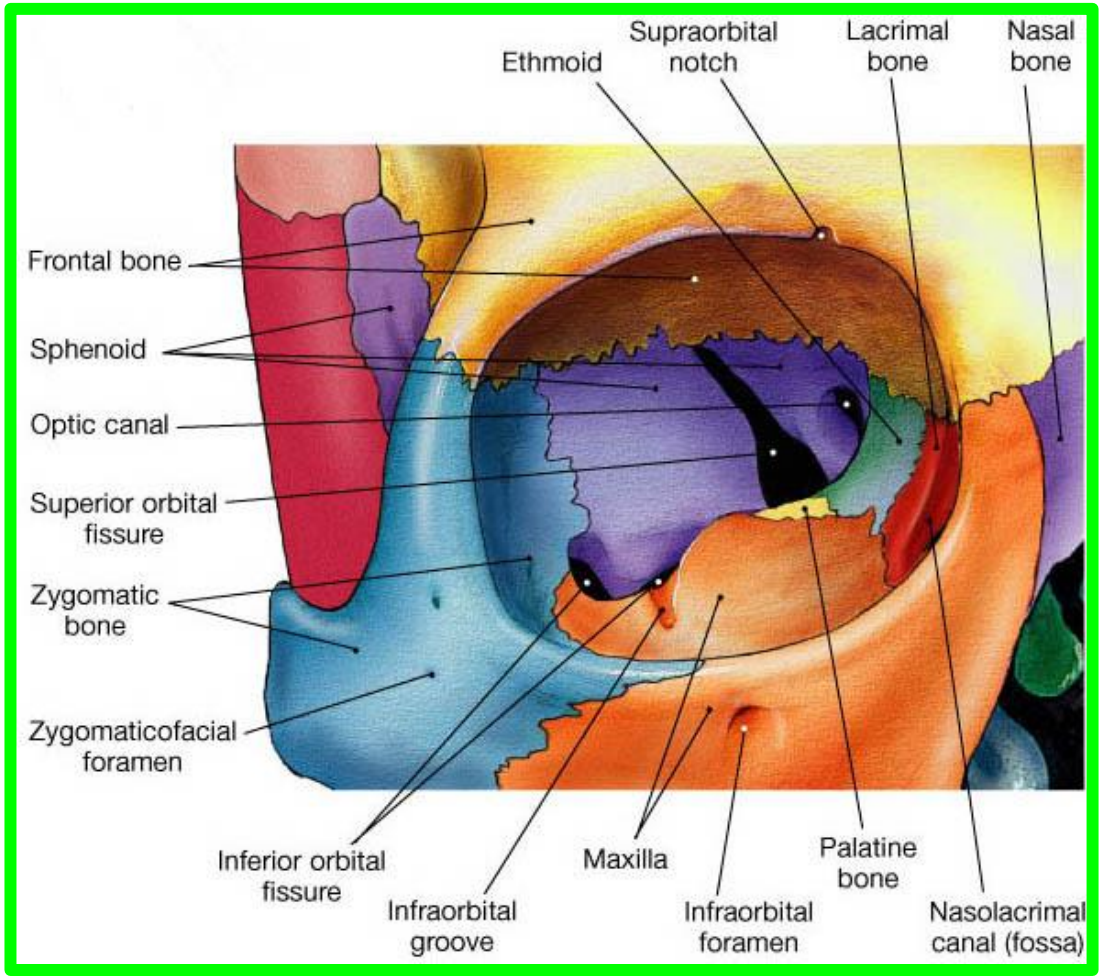
Orbits

- ❖ The superior wall (roof)
- ❖ The medial walls
- ❖ The inferior wall (orbital floor)
- ❖ The lateral wall



Openings into the Orbital Cavity

- **Orbital opening:** About one sixth of the eye is exposed; the remainder is protected by the walls of the orbit.
- **Supraorbital notch (Foramen):** It transmits the supraorbital nerve and blood vessels
- **Infraorbital groove and canal:** in the orbital plate of the maxilla, they transmit the infraorbital nerve and blood vessels.
- **Nasolacrimal canal:** Located anteriorly on the medial wall; it communicates with the inferior meatus of the nose It transmits the nasolacrimal duct.



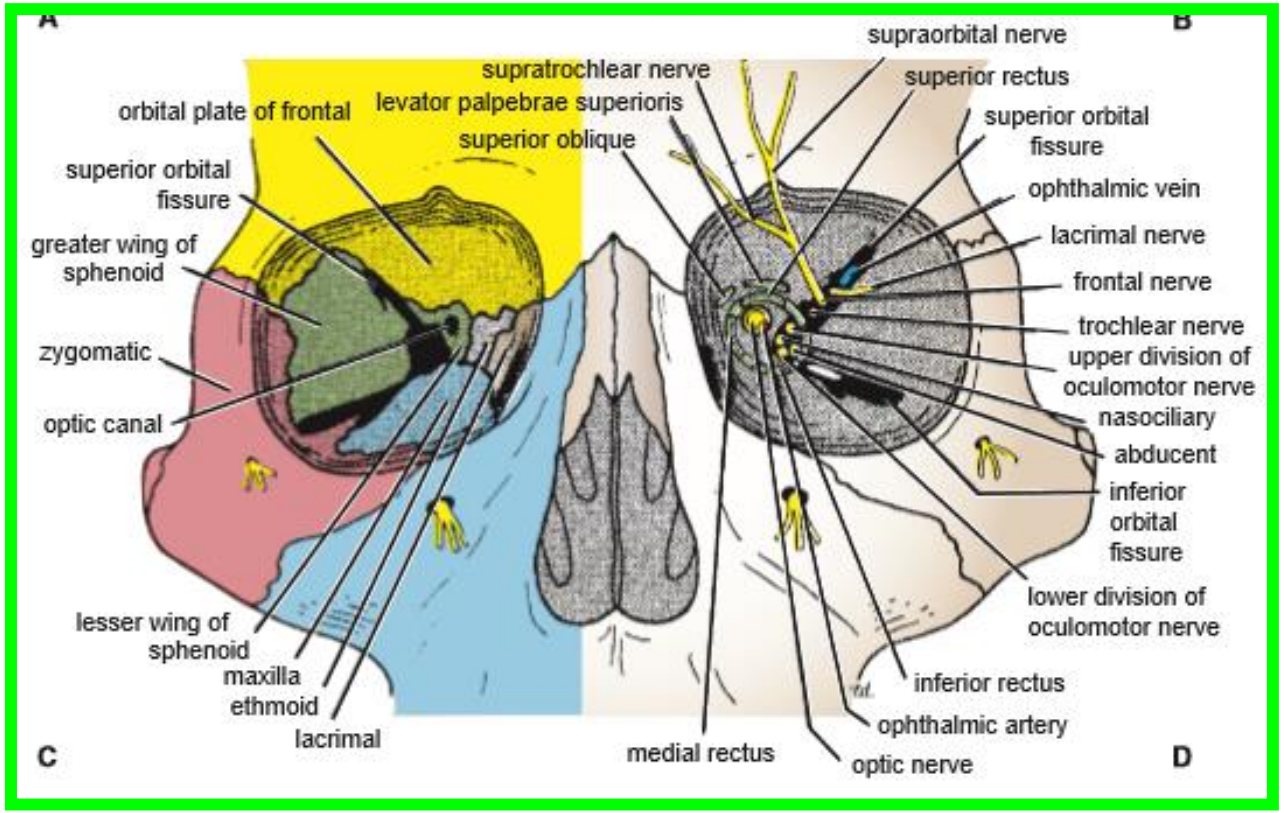
Openings into the Orbital Cavity

Dr. Aiman AL Maathidy

Tuesday 7 March 2023

❑*Inferior orbital fissure:* it communicates with the pterygopalatine fossa. It transmits the maxillary nerve and its zygomatic branch, the inferior ophthalmic vein, and sympathetic nerves.

❑*Superior orbital fissure:* it communicates with the middle cranial fossa. It transmits the lacrimal nerve, the frontal nerve, the trochlear nerve, the oculomotor nerve the abducent nerve, the nasociliary nerve, and the superior ophthalmic vein.



❑*Optic canal:* it communicates with the middle cranial fossa. It transmits the optic nerve and the ophthalmic artery.

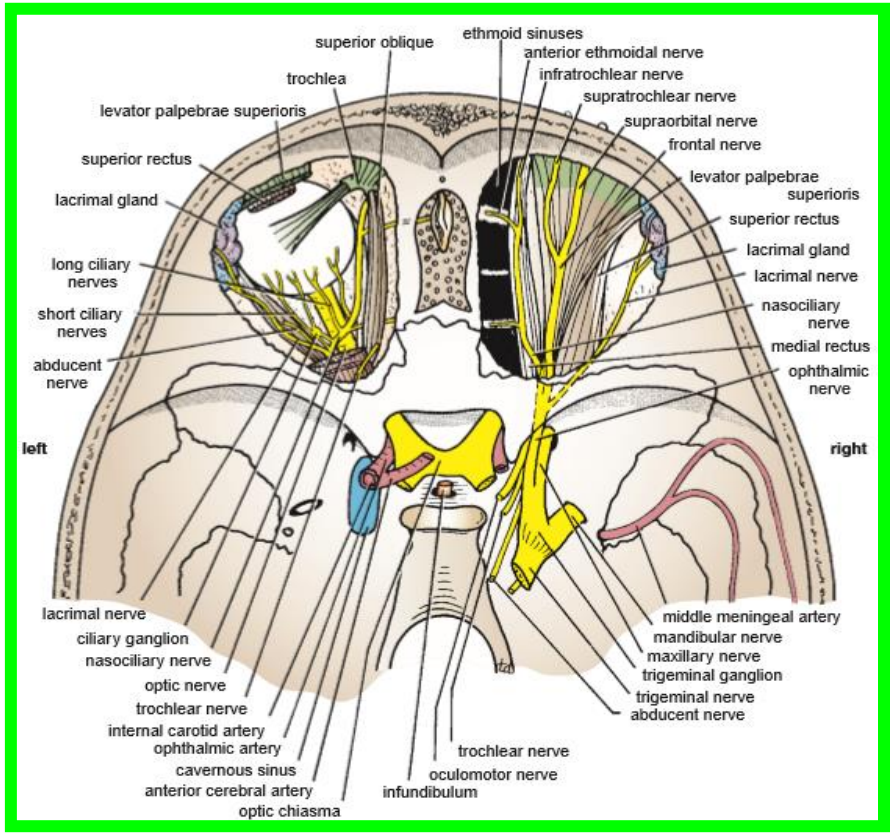
Nerves of the Orbit

Dr. Aiman AL Maathidy

❖**Optic Nerve :** enters the orbit from the middle cranial fossa by passing through the optic canal . It is accompanied by the ophthalmic artery

❖**Lacrimal Nerve:** arises from the ophthalmic division of CN V. It enters the orbit through the upper part of the superior orbital fissure

❖**Frontal Nerve :** from the ophthalmic division of CN V .
It enters the orbit through the upper part of the superior orbital fissure. It divides into the supratrochlear and supraorbital nerves



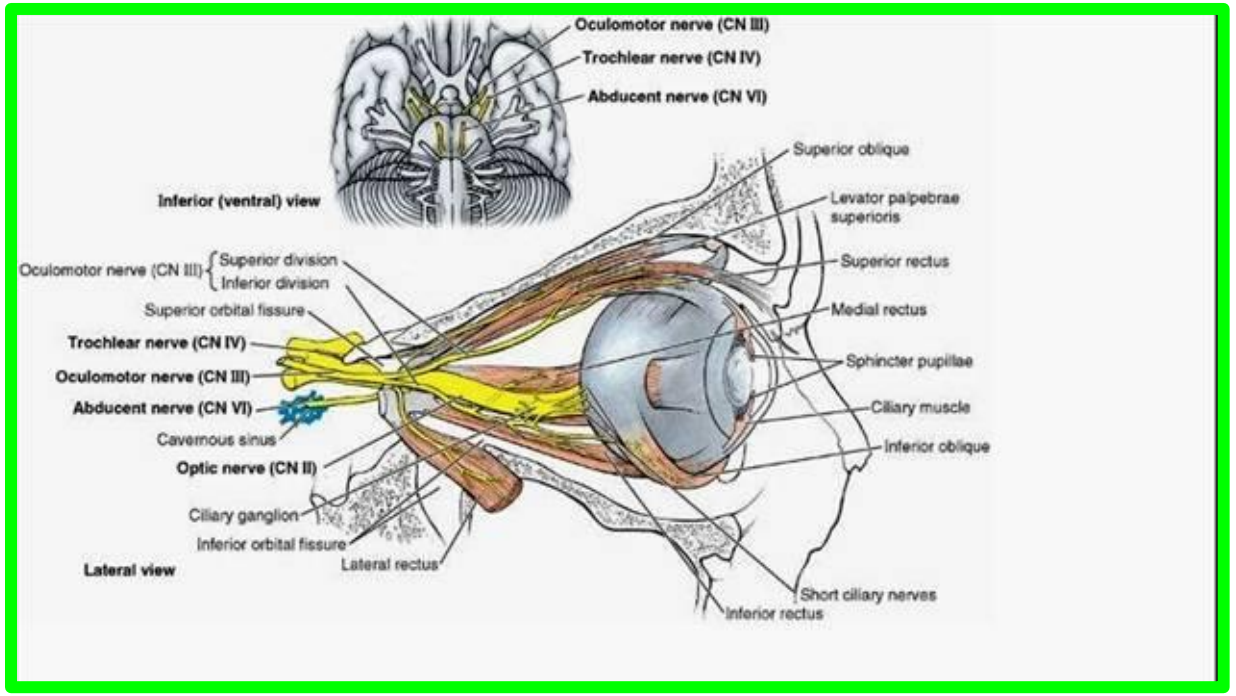
Nerves of the Orbit

❖ *Trochlear Nerve* enters the orbit through *the upper part* of the superior orbital fissure. It runs forward and supplies *the superior oblique muscle*

❖ *Oculomotor Nerve* enters the orbit through *the lower part* of the superior orbital fissure

❖ *Nasociliary Nerve* arises from the *ophthalmic division CN V.* It enters the orbit through *the lower part* of the superior orbital fissure

❖ *Abducent Nerve* enters the orbit through *the lower part* of the superior orbital fissure. It supplies *the lateral rectus muscle*



Nerves of the Orbit

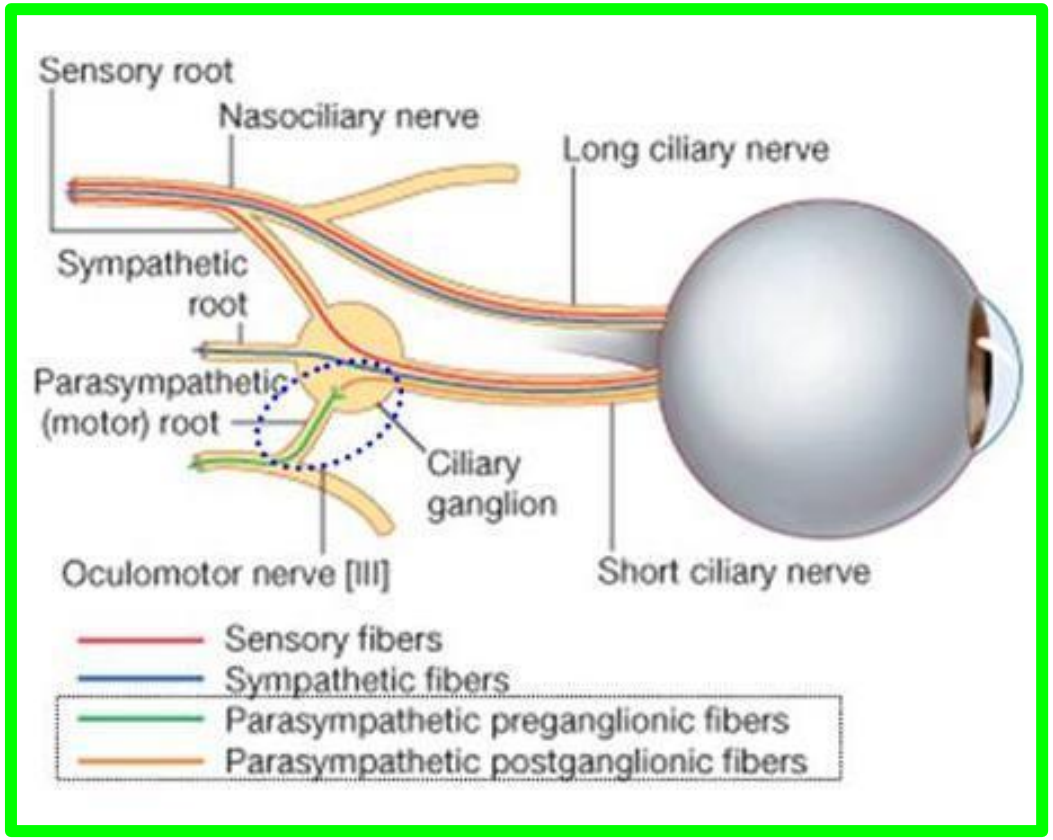
Ciliary Ganglion

- ✓ *is a parasympathetic ganglion about the size of a pinhead*
- ✓ *situated in the posterior part of the orbit*

- ✓ *It receives its preganglionic parasympathetic fibers from the oculomotor nerve via the nerve to the inferior oblique.*

- ✓ *The postganglionic fibers leave the ganglion in the short ciliary nerves, which enter the back of the eyeball and supply the sphincter pupillae and the ciliary muscle.*

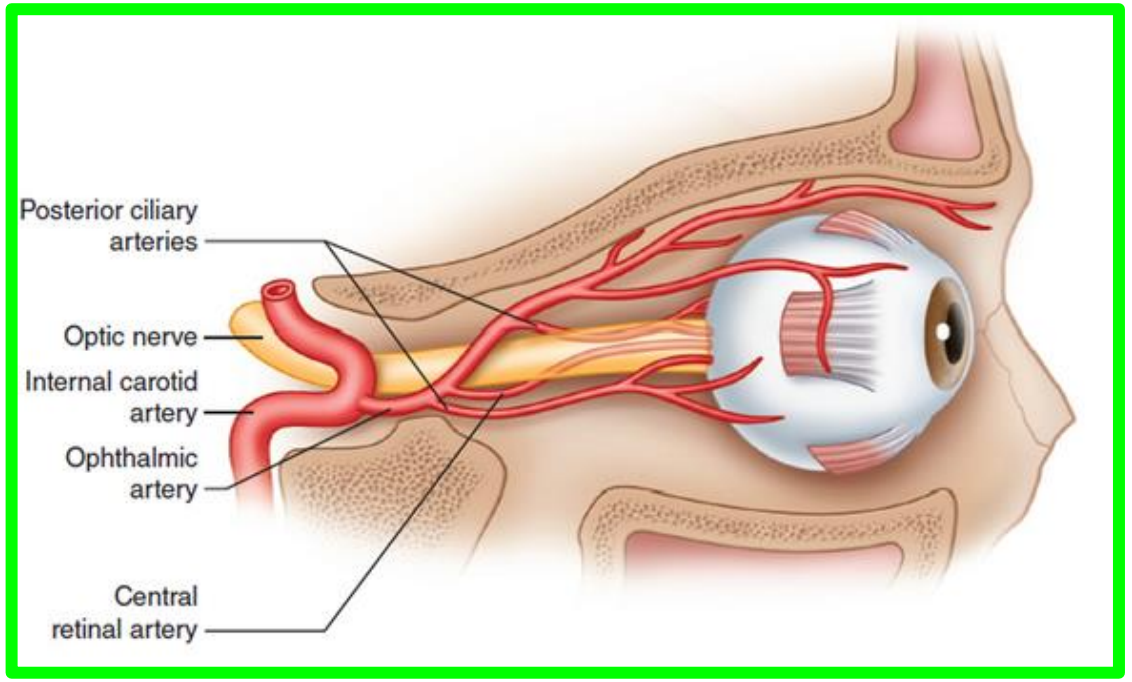
- ✓ *A number of sympathetic fibers pass from the internal carotid plexus into the orbit and run through the ganglion without interruption*



Blood Vessels of the Orbit

Ophthalmic Artery

- *is a branch of the internal carotid artery after that vessel emerges from the cavernous sinus.*
- *It enters the orbit through the optic canal with the optic nerve.*

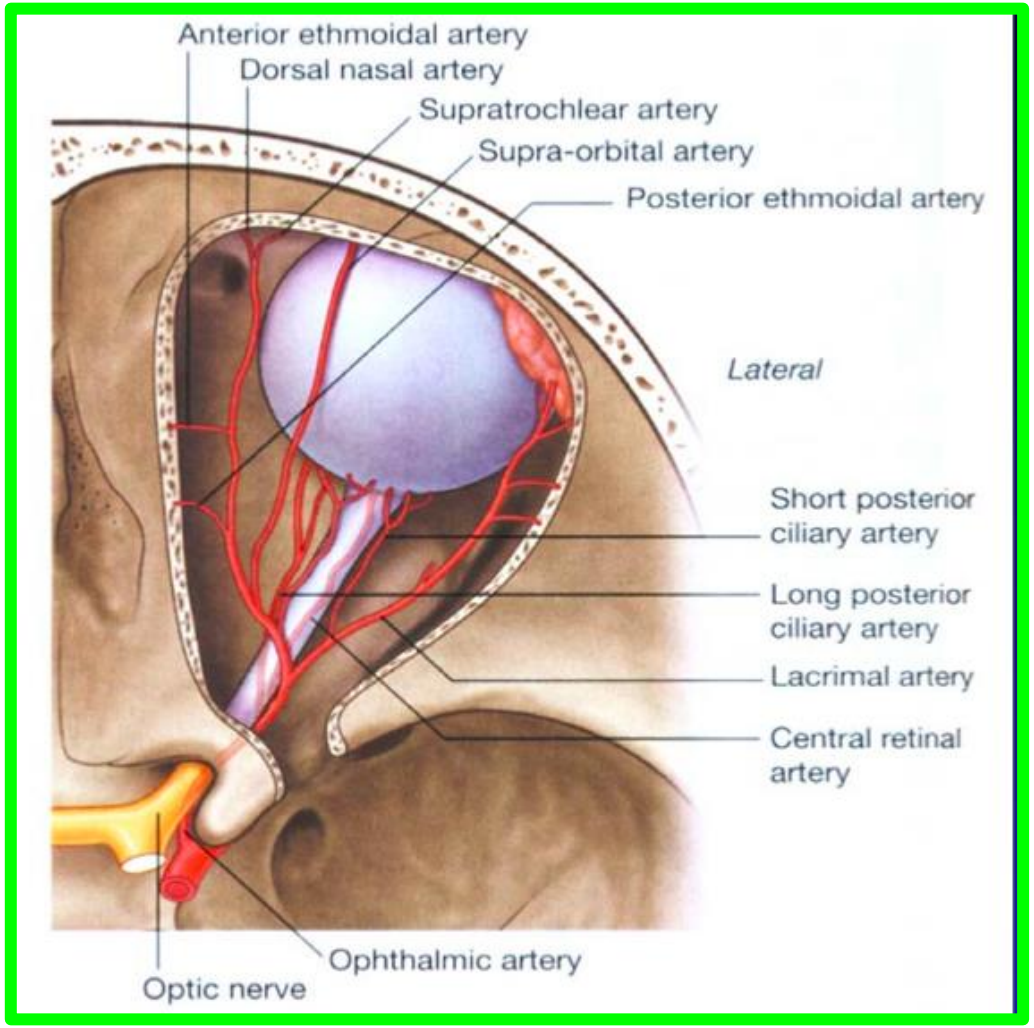


- *It runs forward and crosses the optic nerve to reach the medial wall of the orbit.*
- *It gives off numerous branches, which accompany the nerves in the orbital cavity.*

Branches of the Ophthalmic Artery

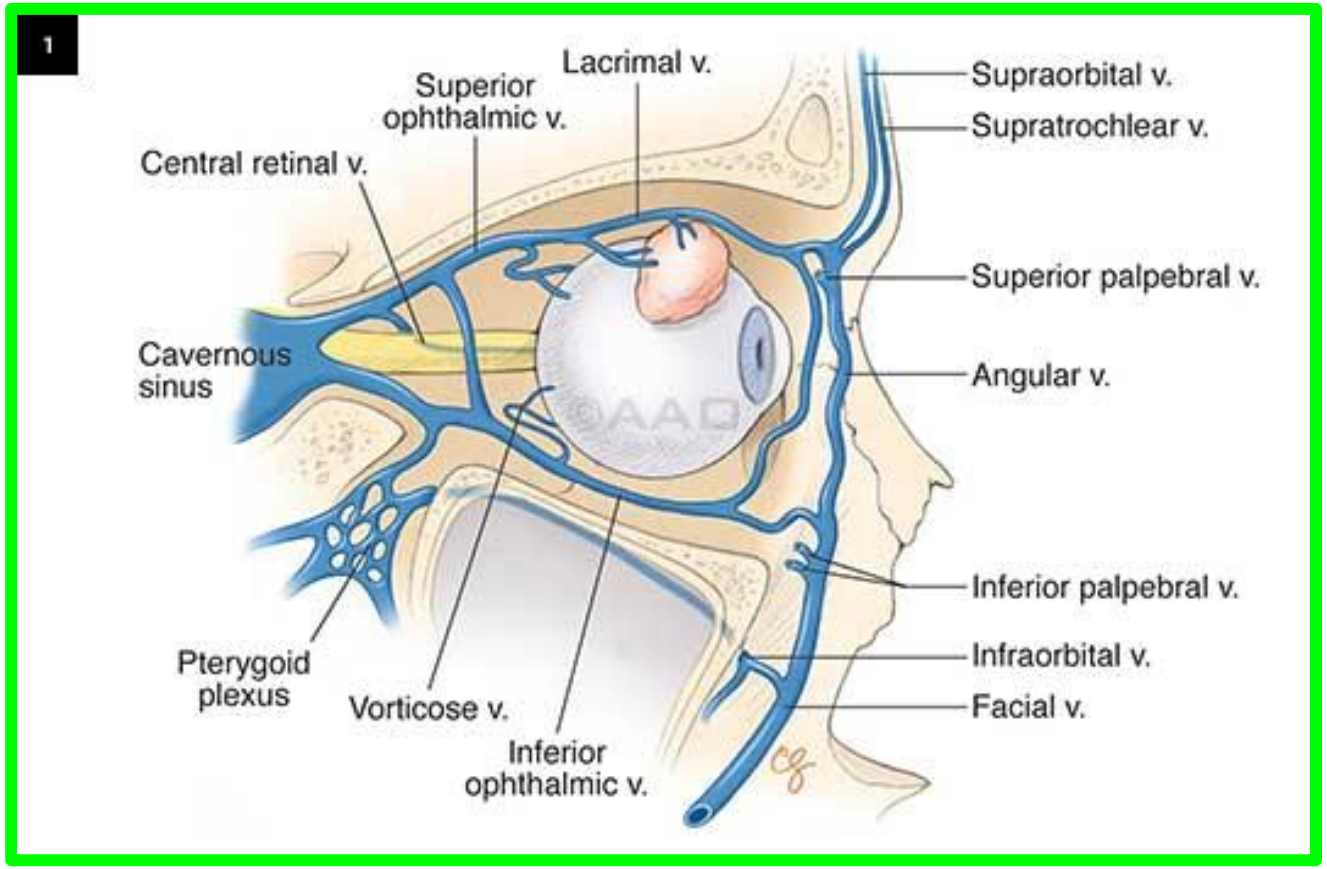
- **The central artery of the retina** is a small branch that pierces the meningeal sheaths of the optic nerve to gain entrance to the nerve and enters the eyeball at the center of the optic disc.

- **The muscular branches**
- **The ciliary arteries** can be divided into **anterior** and **posterior groups**. The former group enters the eyeball near the corneoscleral junction; the latter group enters near the optic nerve.
- **The lacrimal artery** to the **lacrimal gland**
- **The supratrochlear and supraorbital arteries** are distributed to the skin of the forehead



Ophthalmic Veins

- The superior ophthalmic vein communicates in front with the facial vein
- The inferior ophthalmic vein communicates through the inferior orbital fissure with the pterygoid venous plexus.
- Both veins pass backward through the superior orbital fissure and drain into the cavernous sinus



Eyelids

✓The superficial surface of the eyelids is covered by skin, and the deep surface is covered by a mucous membrane called the conjunctiva.

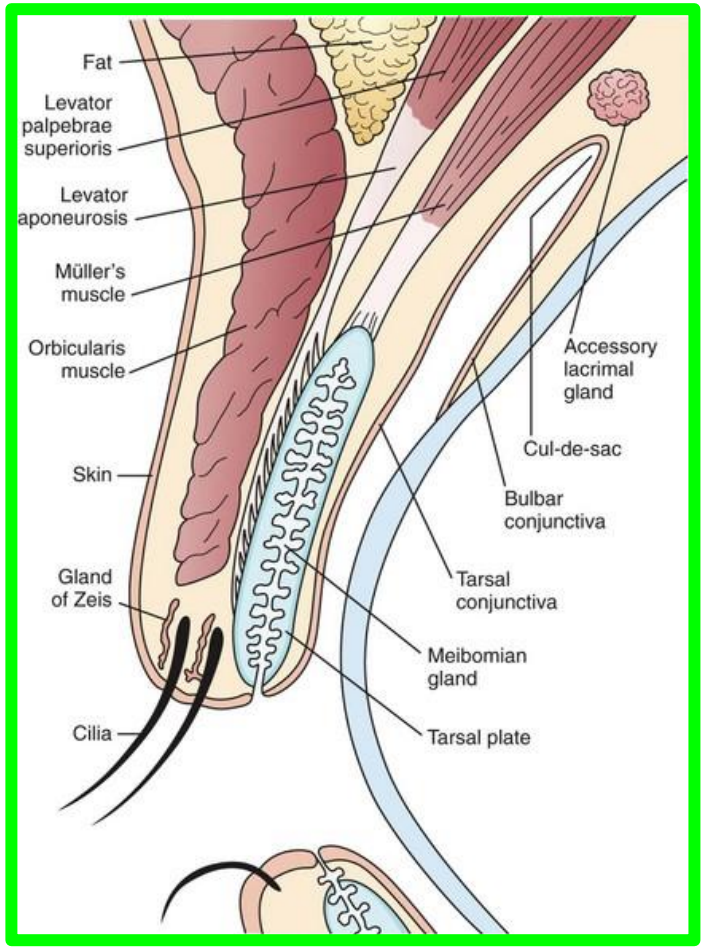
✓The eyelashes are short, curved hairs on the free edges of the eyelids

✓They are arranged in double or triple rows at the mucocutaneous junction.

✓The sebaceous glands (glands of Zeis) open directly into the eyelash follicles.

✓The ciliary glands (glands of Moll) are modified sweat glands that open separately between adjacent lashes

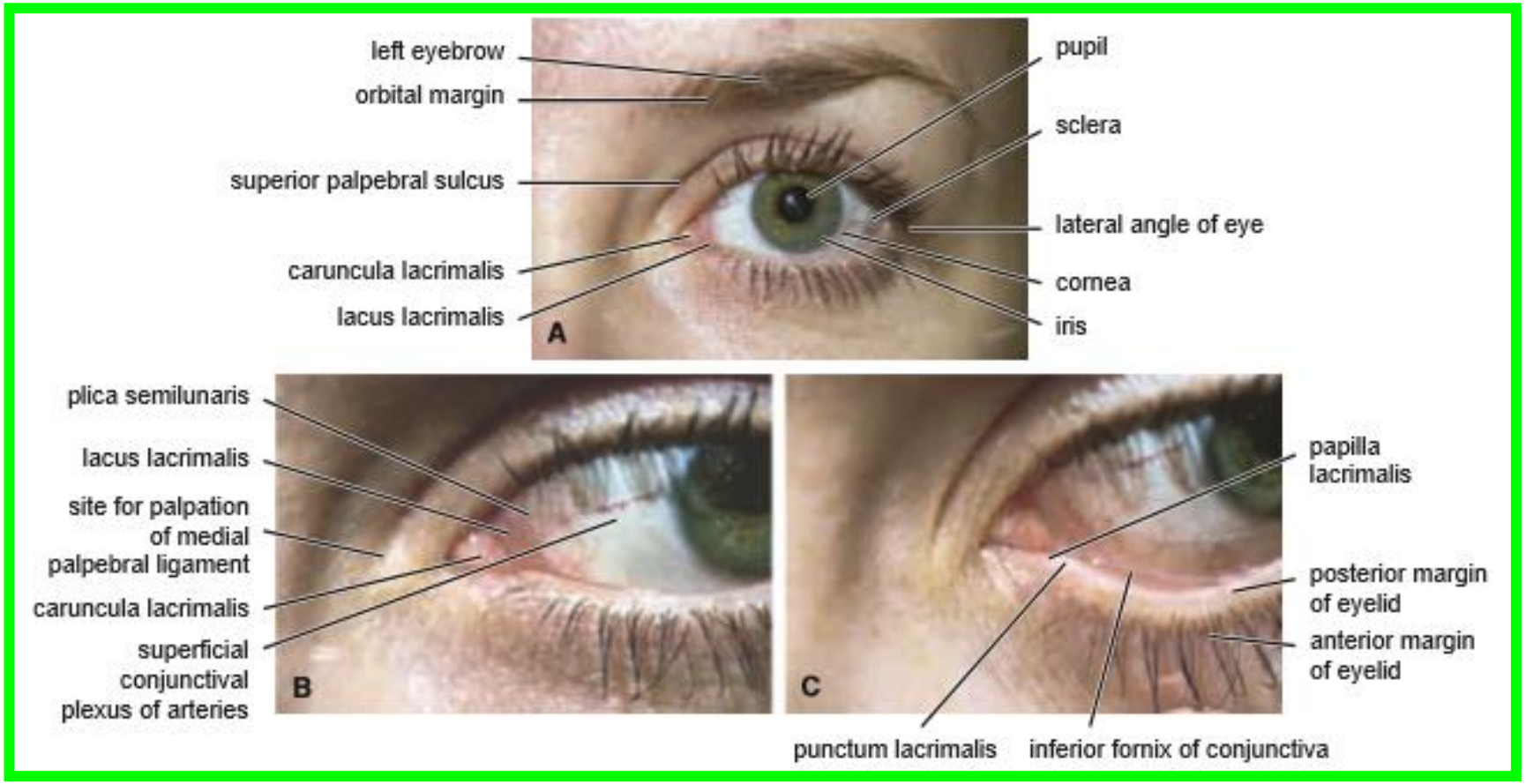
✓The tarsal glands are long, modified sebaceous glands that pour their oily secretion onto the margin of the lid; their openings lie behind the eyelashes



Eyelids

✓*The more rounded medial angle is separated from the eyeball by a small space, the lacus lacrimalis, in the center of which is a small, reddish yellow elevation, the caruncula lacrimalis*

✓*A reddish semilunar fold, called the plica semilunaris, lies on the lateral side of the caruncle.*

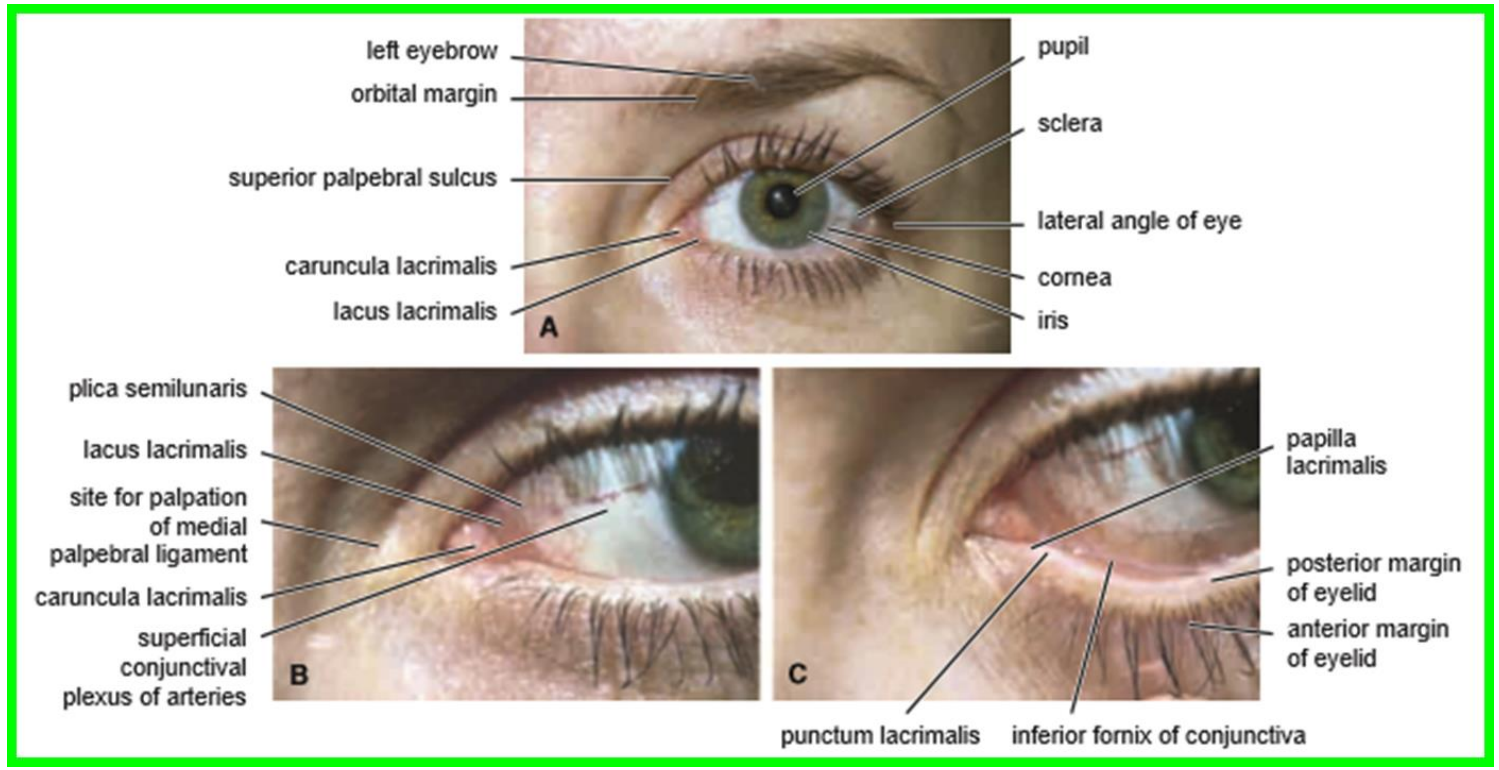


Eyelids

✓Near the medial angle of the eye a small elevation, the papilla lacrimalis, is present.

✓On the summit of the papilla is a small hole, the punctum lacrimale, which leads into the canaliculus lacrimalis

✓The papilla lacrimalis projects into the lacus, and the punctum and canaliculus carry tears down into the nose



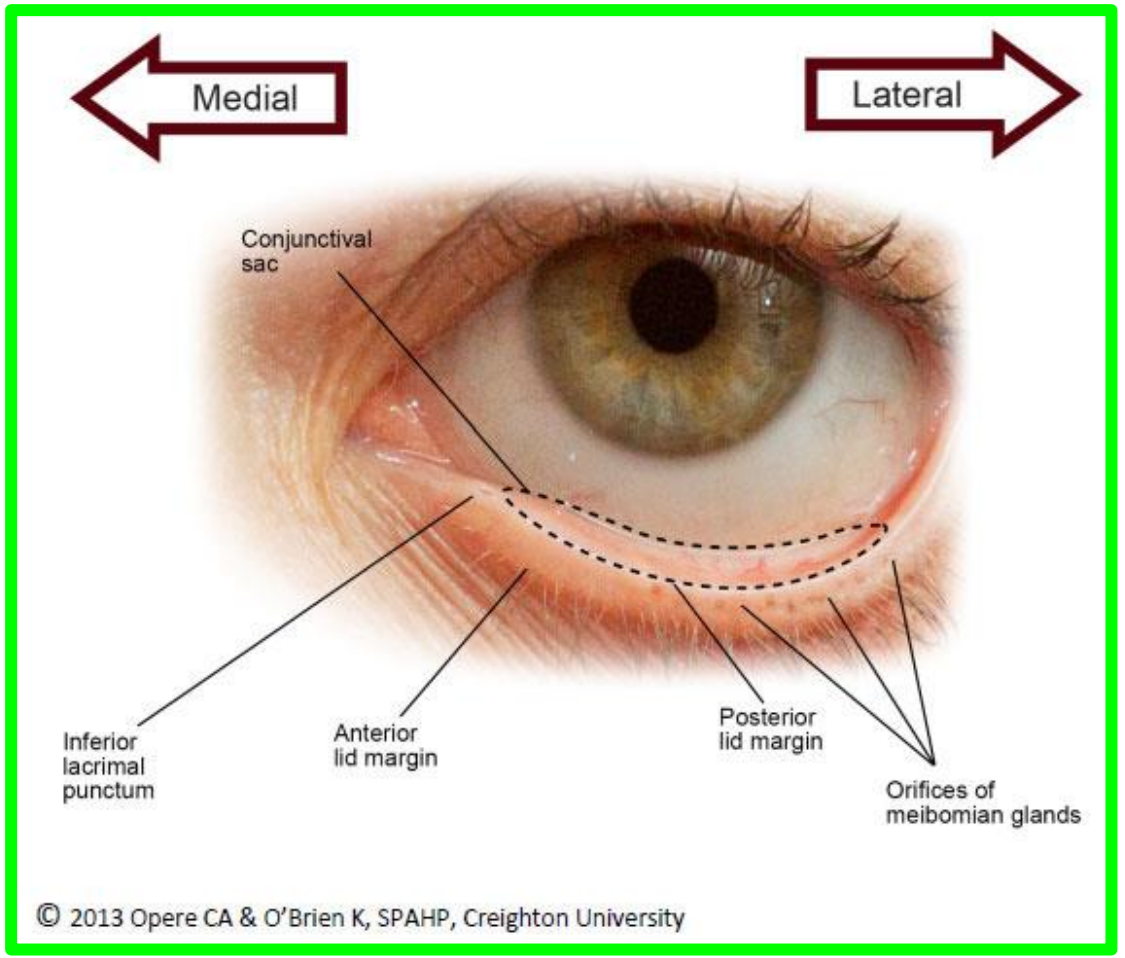
Eyelids

The conjunctiva

✓*is a thin mucous membrane that lines the eyelids and is reflected at the superior and inferior fornices onto the anterior surface of the eyeball*

✓*Its epithelium is continuous with that of the cornea.*

✓*The upper lateral part of the superior fornix is pierced by the ducts of the lacrimal gland*

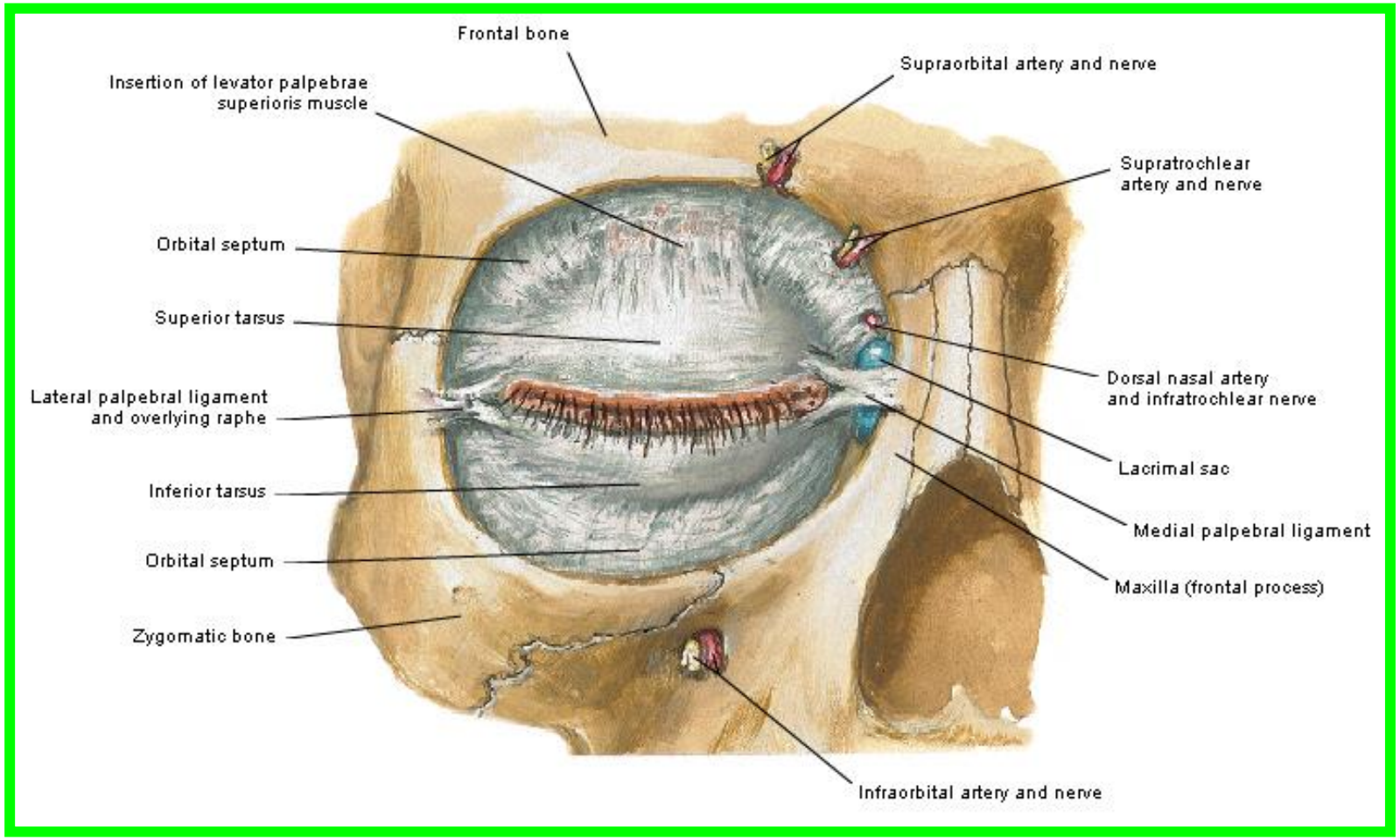


✓*The conjunctiva thus forms a potential space, the conjunctival sac, which is open at the palpebral fissure.*

Eyelids

- ✓The framework of the eyelids is formed by a fibrous sheet, the orbital septum
- ✓This is attached to the periosteum at the orbital margins.
- ✓The orbital septum is thickened at the margins of the lids to form the superior and inferior tarsal plates.

- ✓The tarsal glands are embedded in the posterior surface of the tarsal plates.



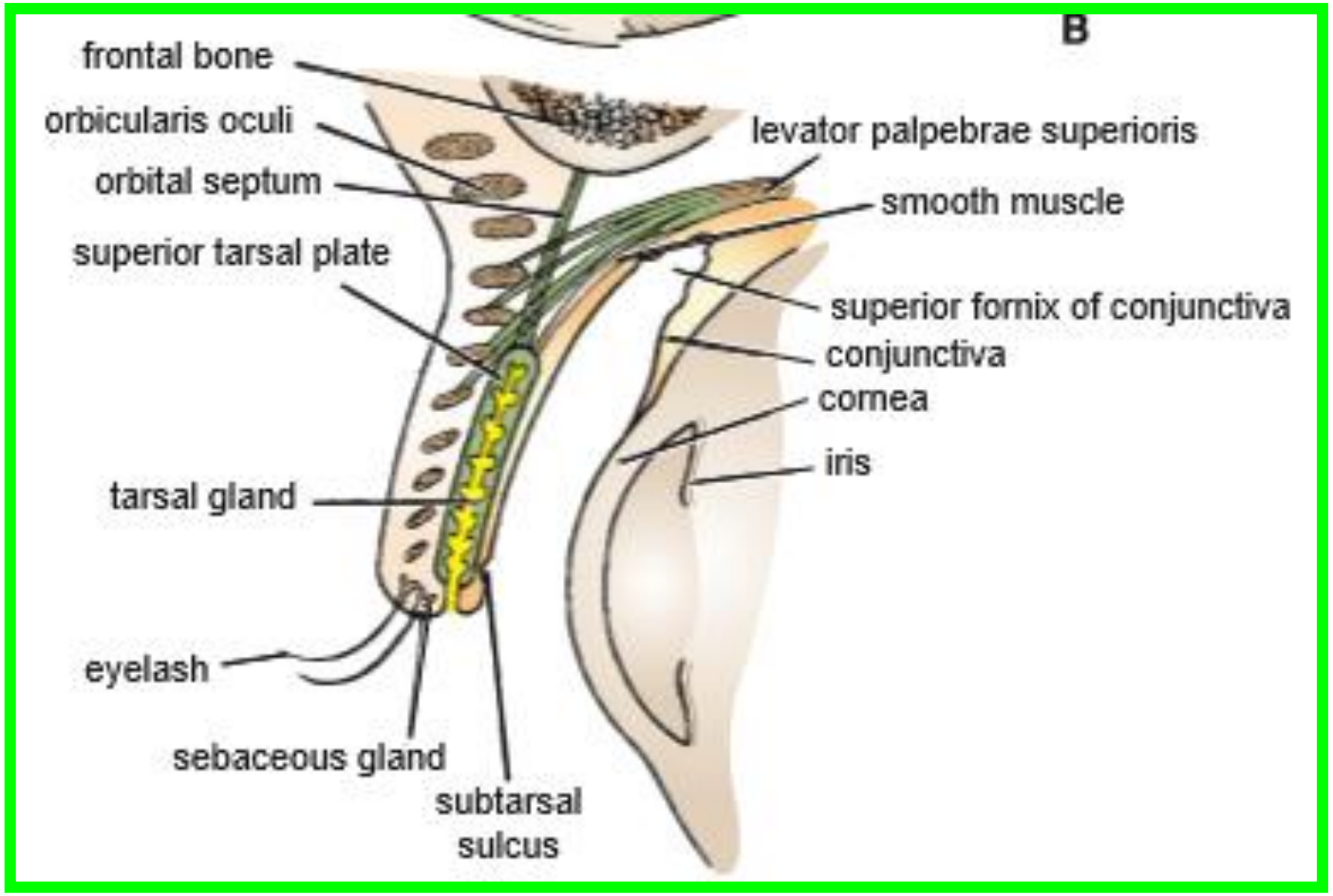
Eyelids

✓Beneath the eyelid is a groove, the subtarsal sulcus, which runs close to and parallel with the margin of the lid.

✓The sulcus tends to trap small foreign particles introduced into the conjunctival sac and is thus clinically important.

✓The superficial surface of the tarsal plates and the orbital septum are covered by the palpebral fibers of the orbicularis oculi muscle

✓ The aponeurosis of insertion of the levator palpebrae superioris muscle pierces the orbital septum to reach the anterior surface of the superior tarsal plate and the skin



Lacrimal Apparatus

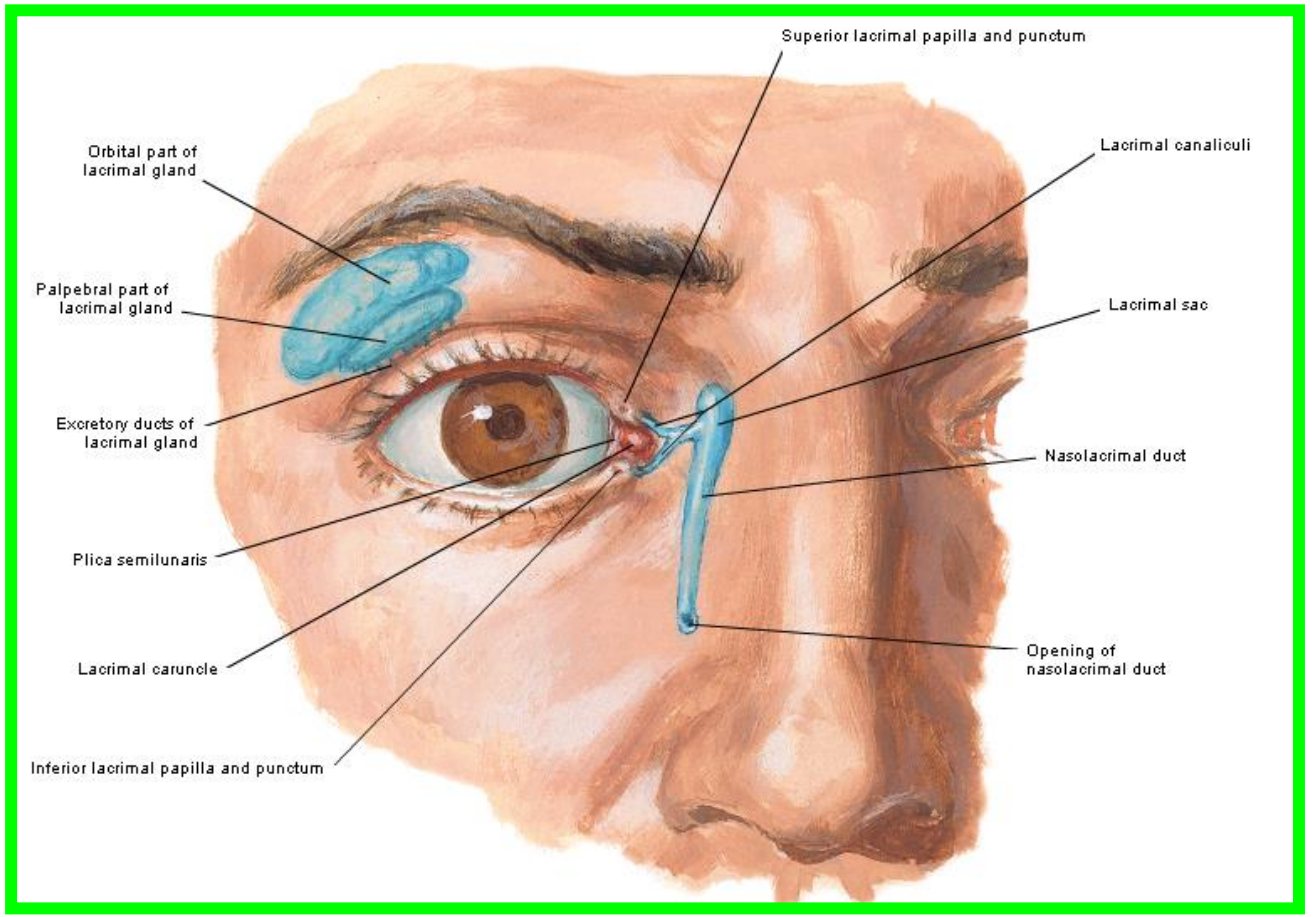
Lacrimal Gland

The gland is consist of

- Large orbital part
- Small palpebral part

✓It is situated above the eyeball in the anterior and upper part of the orbit posterior to the orbital septum

✓The gland opens into the lateral part of the superior fornix of the conjunctiva by 12 ducts.

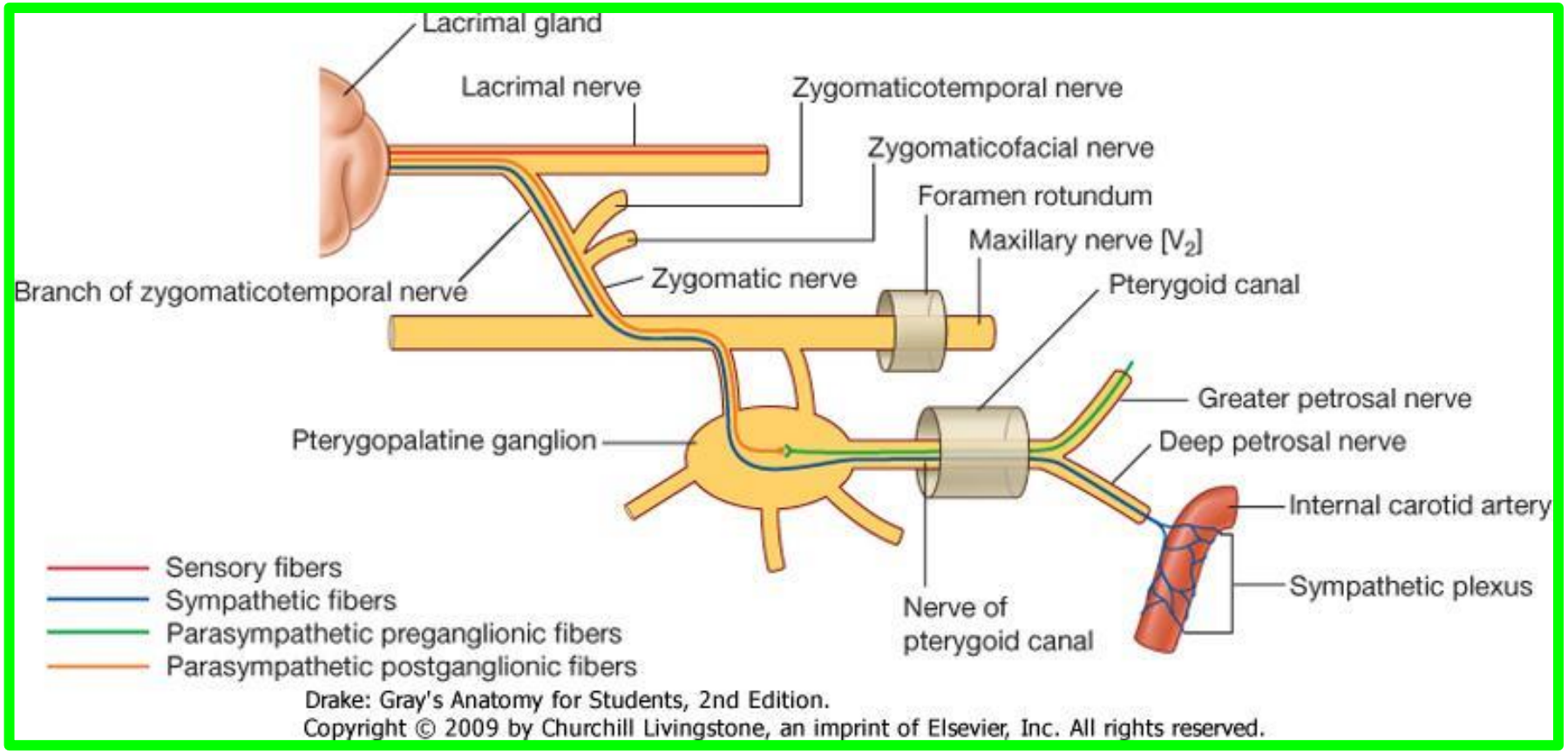


Lacrimal Gland

Dr. Aiman AL Maathidy
Tuesday 7 March 2023

The parasympathetic secretomotor nerve supply is derived from the lacrimal nucleus of the facial nerve

The sympathetic postganglionic nerve supply is from the internal carotid plexus and travels in the deep petrosal nerve,

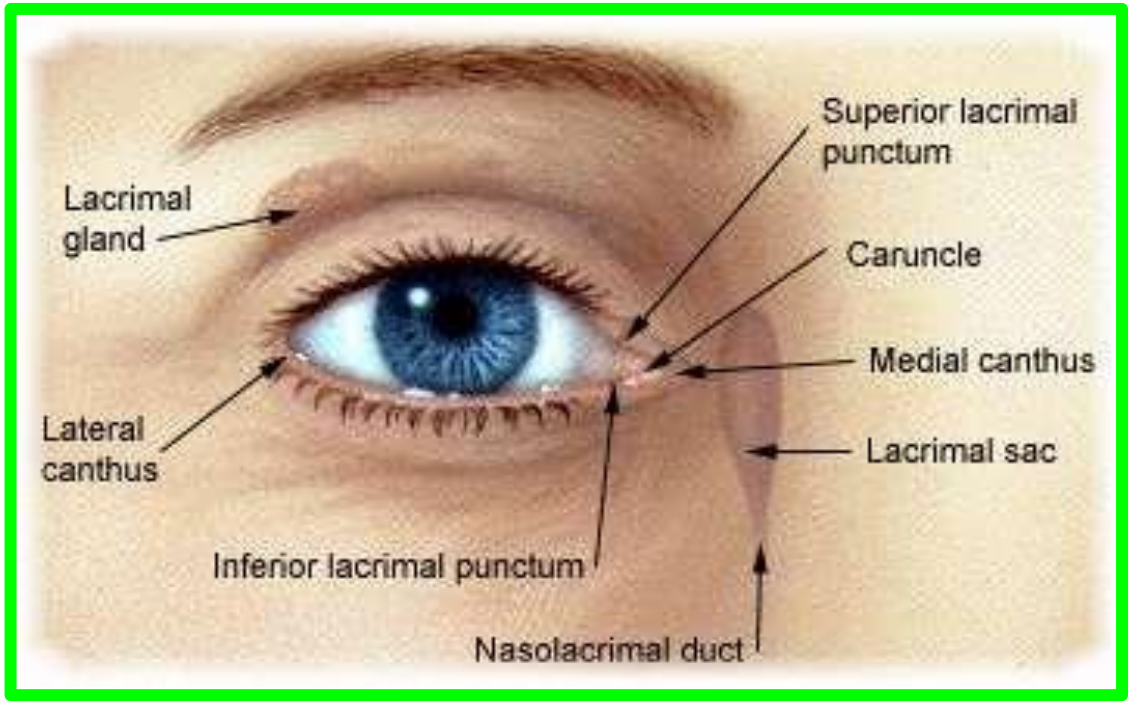


Drake: Gray's Anatomy for Students, 2nd Edition.

Lacrimal Ducts

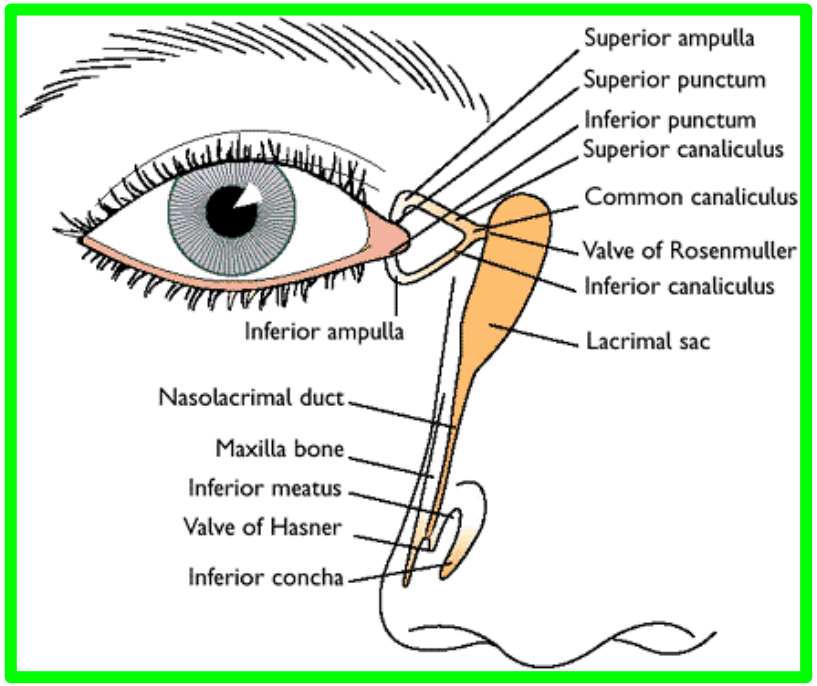
- The tears circulate across the cornea and accumulate in the lacus lacrimalis.

then enter the canaliculi lacrimales through the puncta lacrimalis.



- The canaliculi lacrimales open into the lacrimal sac Then to the nasolacrimal duct.

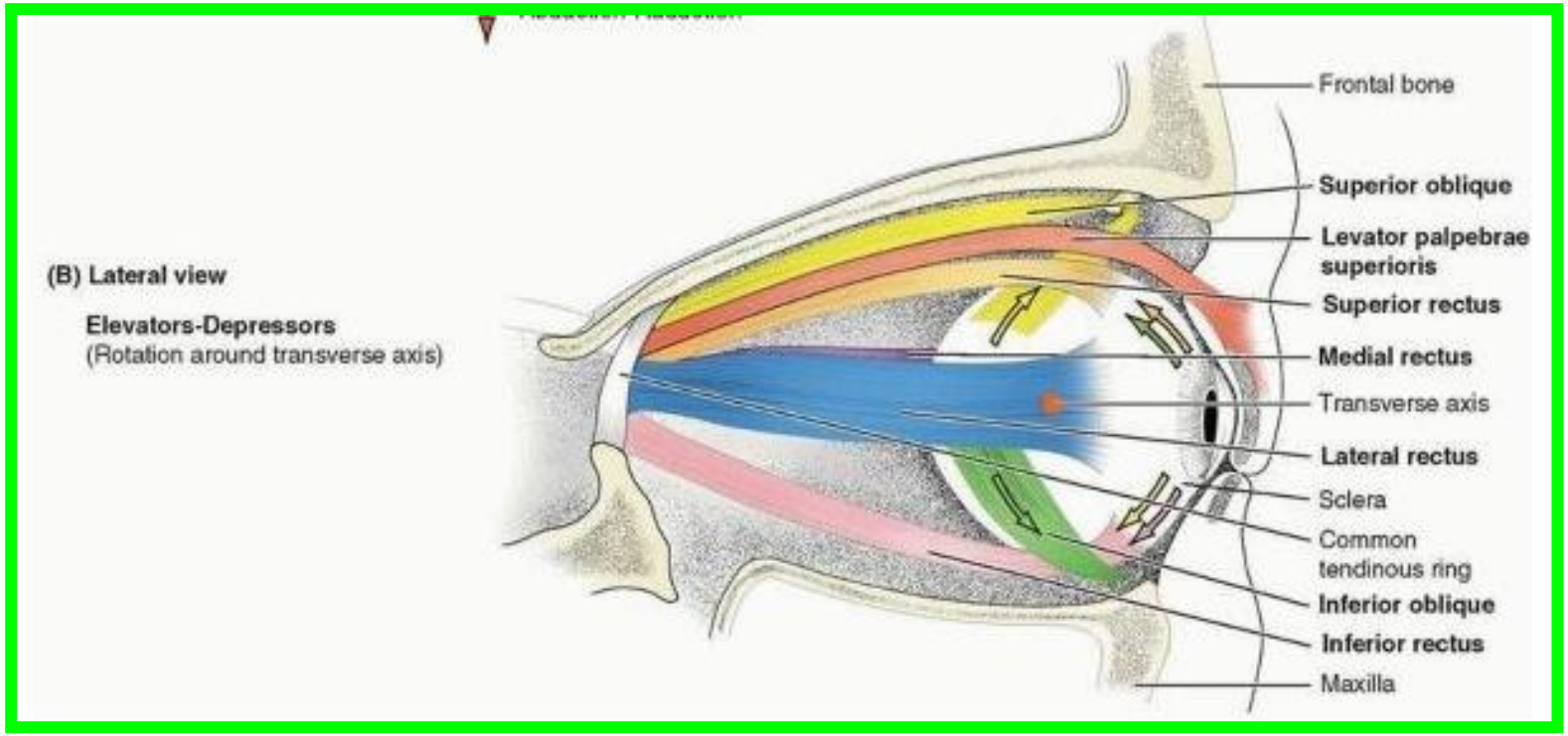
- The nasolacrimal duct is about 0.5 in. (1.3 cm) long descends and opens into the inferior meatus of the nose.



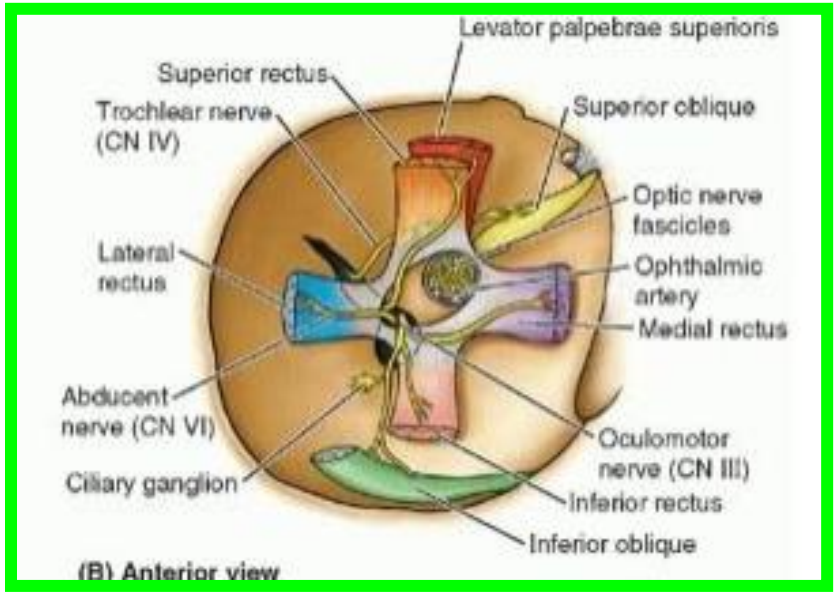
EXTRAOCULAR MUSCLES OF ORBIT

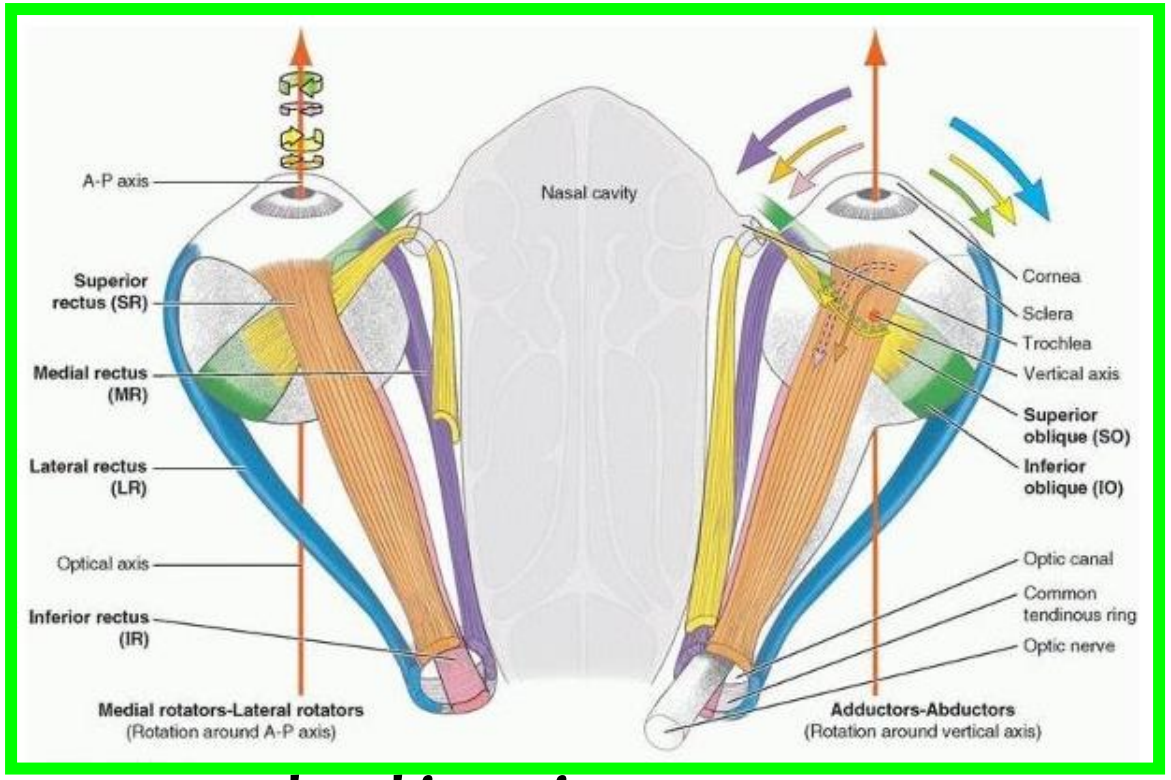
Muscle: Superior rectus
Origin: common tendinous ring
Insertion: Superior surface of eyeball just posterior to corneoscleral junction
N. Supply: Oculomotor nerve **Action:** Raises cornea upward and medially

Muscle: Inferior rectus
Origin: common tendinous ring
Insertion: Inferior surface of eyeball just posterior to corneoscleral junction
N Supply: Oculomotor nerve (3rd cranial nerve)
Action: Depresses cornea downward and medially



Muscle: Medial rectus
Origin: Common tendinous ring
Insertion: Medial surface of eyeball just posterior to corneoscleral junction
N. Supply: Oculomotor nerve (3rd cranial nerve)
Action: Rotates eyeball so that cornea looks medially

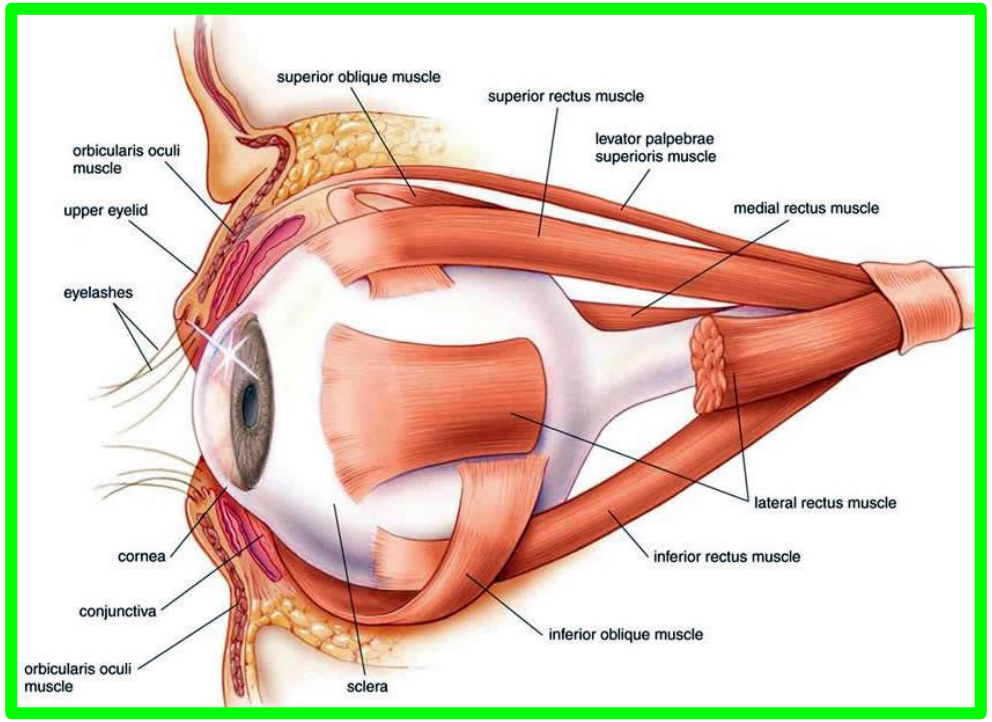




Muscle: Lateral rectus
Origin: Common tendinous ring
Insertion: Lateral surface of eyeball just posterior to corneoscleral junction
N. Supply: Abducent nerve (6th cranial nerve)
Action: Rotates eyeball so that cornea looks laterally

Dr. Aiman AL Maathidy
Tuesday 7 March 2023

Muscle: Superior oblique
Origin: Posterior wall of orbital cavity
Insertion: Passes through pulley and is attached to superior surface of eyeball beneath superior rectus
N. Supply: Trochlear nerve (4th cranial nerve)
Action: Rotates eyeball so that cornea looks downward and laterally



Muscle: Inferior oblique
Origin: Floor of orbital cavity
Insertion: Lateral surface of eyeball deep to lateral rectus
N. Supply: Oculomotor nerve (3rd cranial nerve)
Action: Rotates eyeball so that cornea looks upward and laterally

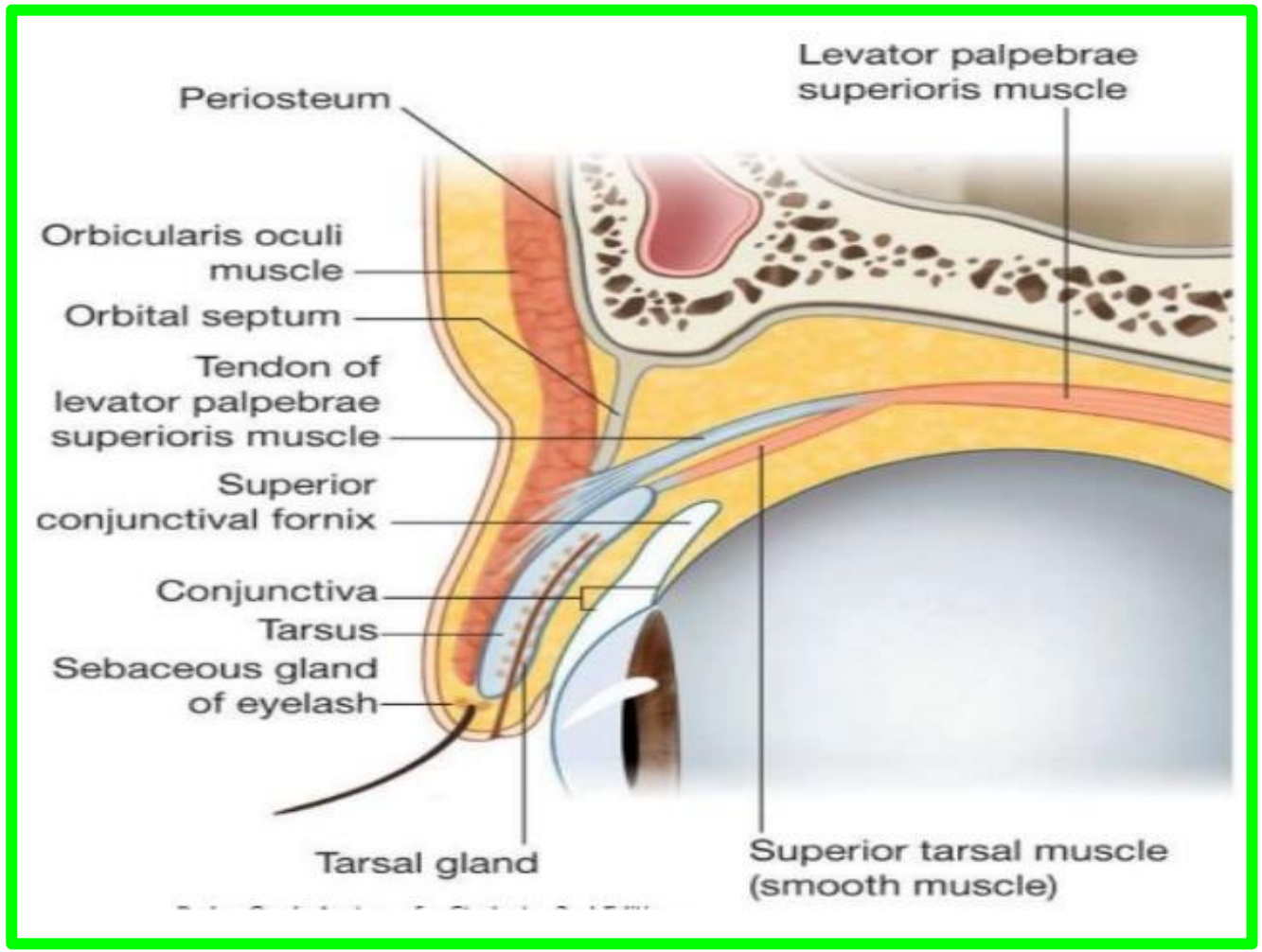
Muscle: *Levator palpebrae superioris*

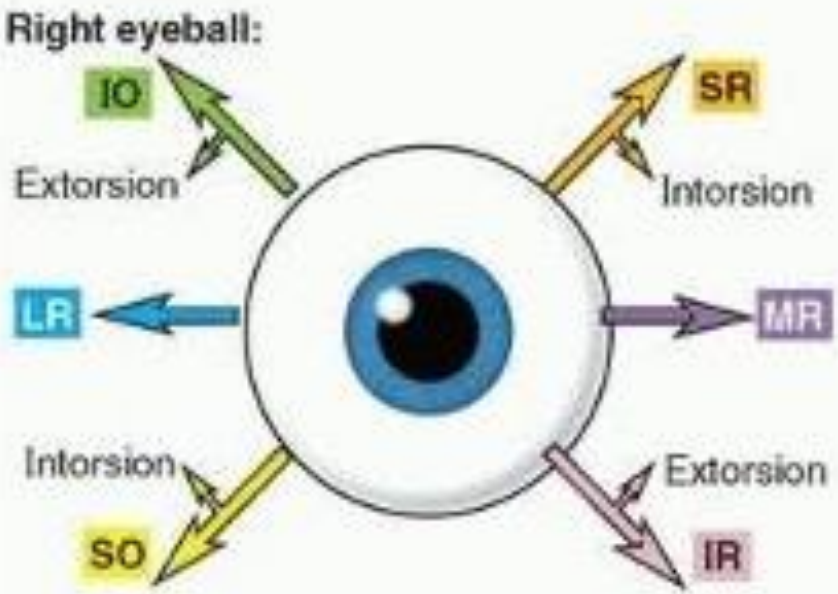
Origin: *Back of orbital cavity*

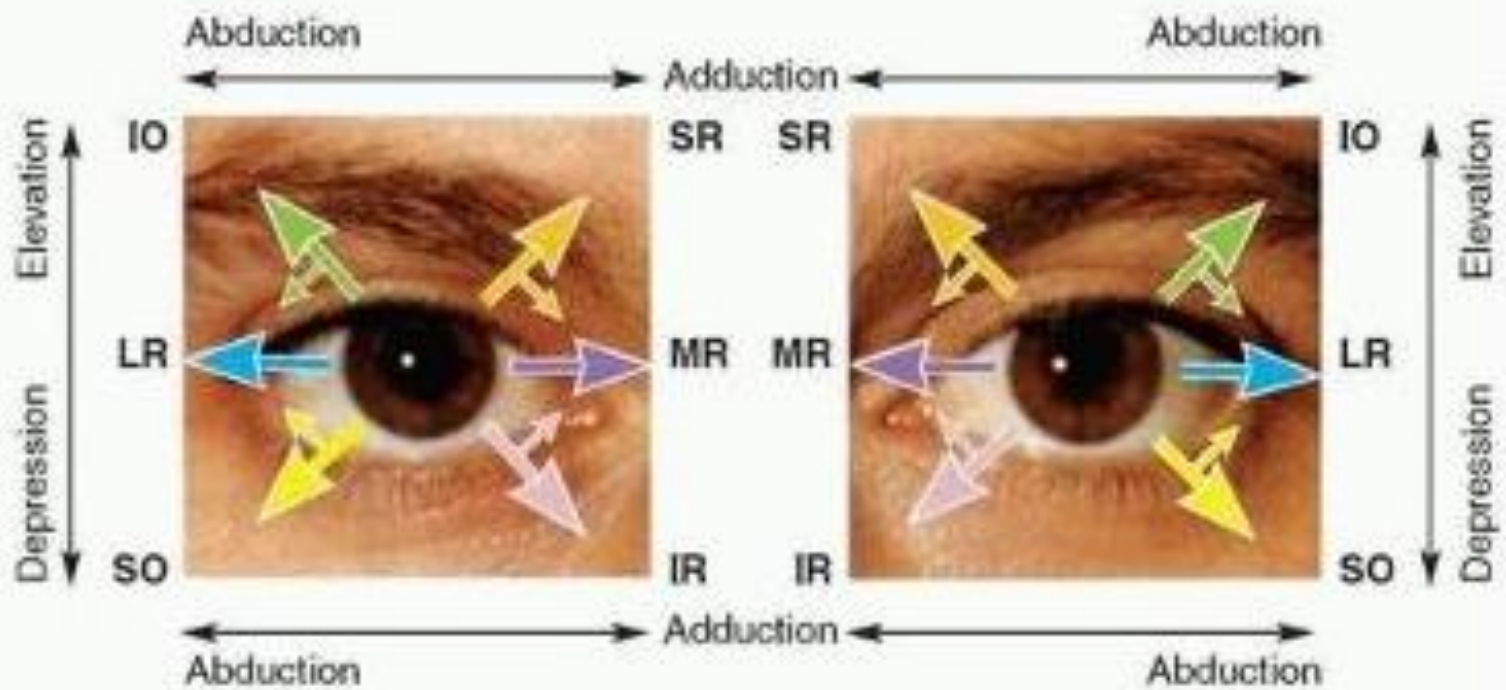
Insertion: *Anterior surface and upper margin of superior tarsal plate*

N. Supply: *Striated muscle oculomotor nerve, smooth muscle sympathetic*

Action: *Raises upper lid*




Right eyeball:
IO
Extorsion
SR
Intorsion
LR
MR
Intorsion
SO
Extorsion
IR


Abduction
Adduction
Abduction
Elevation
IO
SR
SR
IO
LR
MR
MR
LR
Depression
SO
IR
IR
SO
Elevation
Depression
Adduction
Abduction
Abduction


Dr. Aiman Qais Afar
Tuesday 7 March 2023