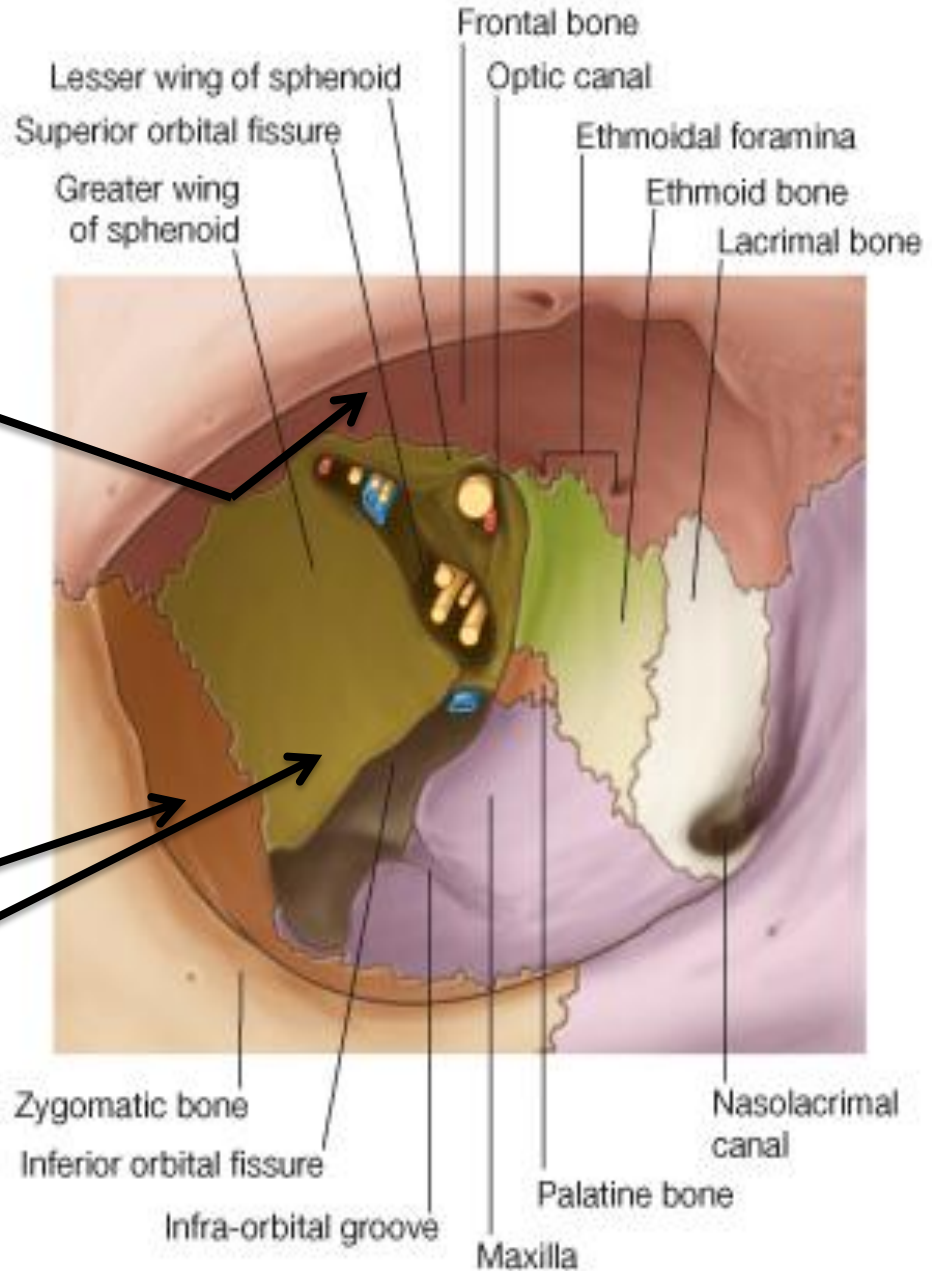
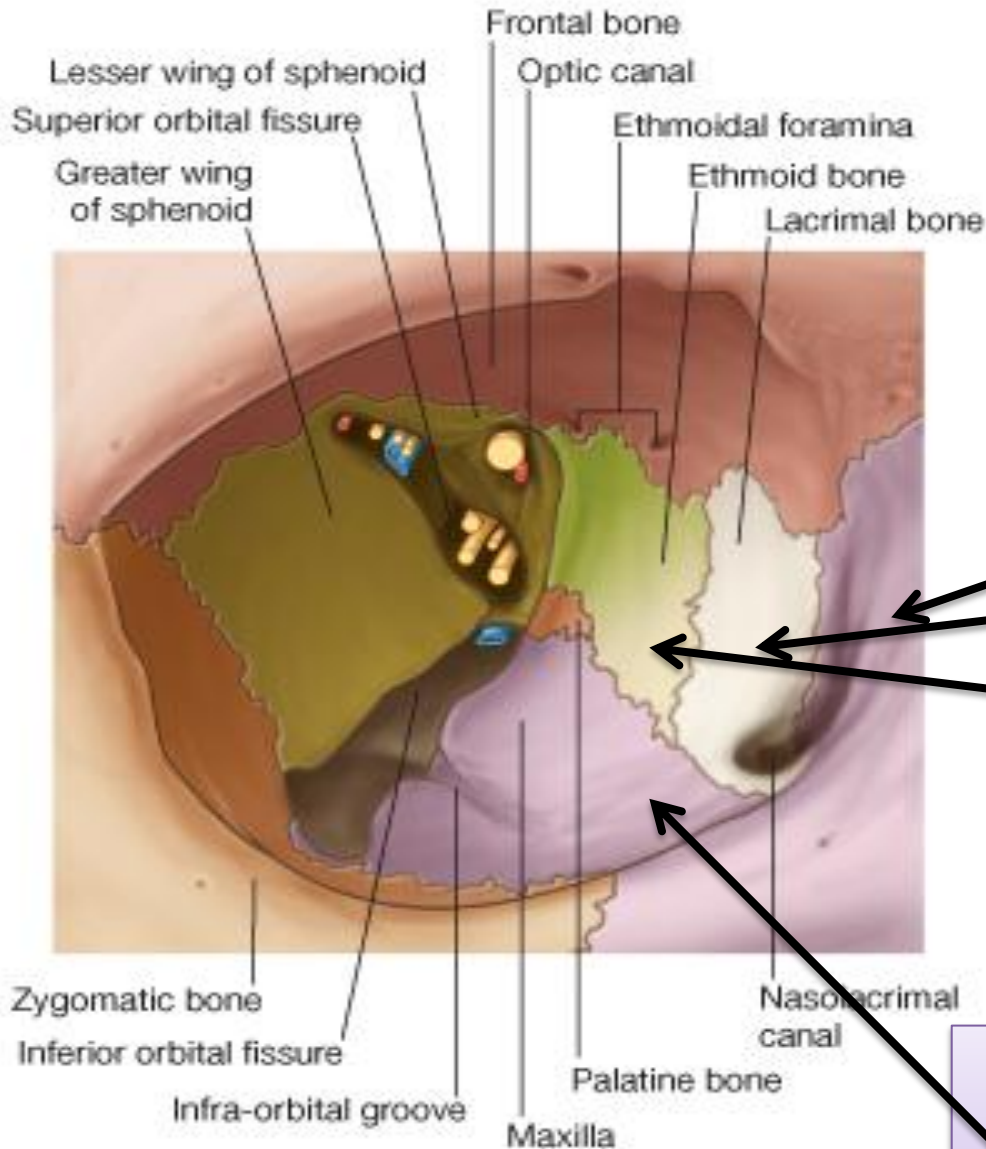


# Bony orbit

**Roof:** Formed by:  
❖ **The orbital plate of the frontal bone**, which separates the orbital cavity from the anterior cranial fossa and the frontal lobe of the cerebral hemisphere

**Lateral wall:** Formed by :  
❖ **the zygomatic bone and the greater wing of the sphenoid**



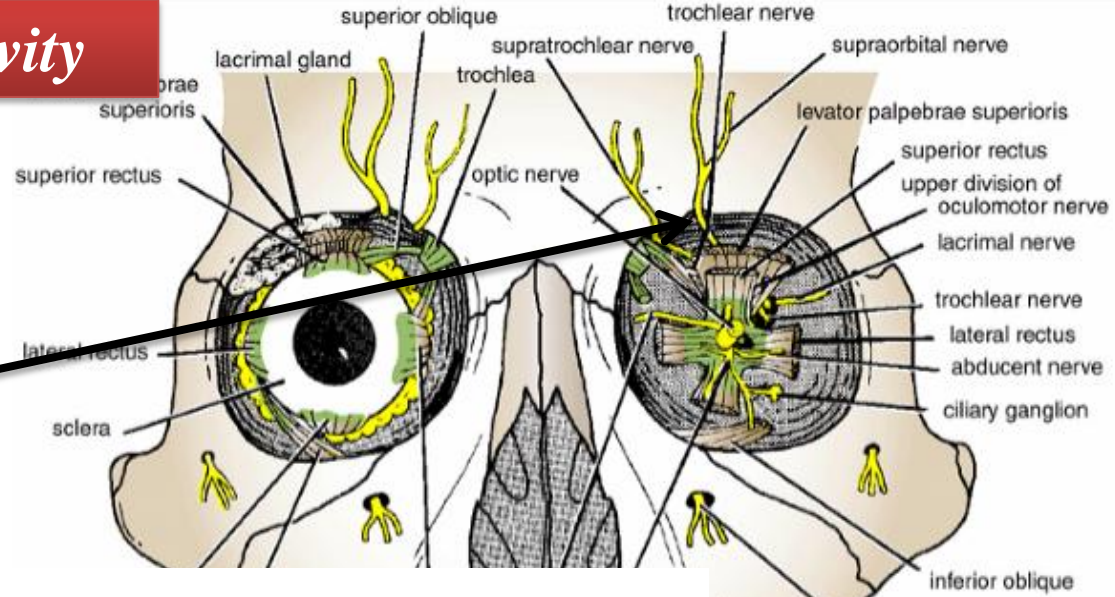


**Medial wall**: Formed from  
 before backward by:  
**The frontal process of the  
 maxilla**  
**The lacrimal bone**  
**The orbital plate of the  
 ethmoid (which separates the  
 orbital cavity from the  
 ethmoid sinuses)**  
**The body of the sphenoid**

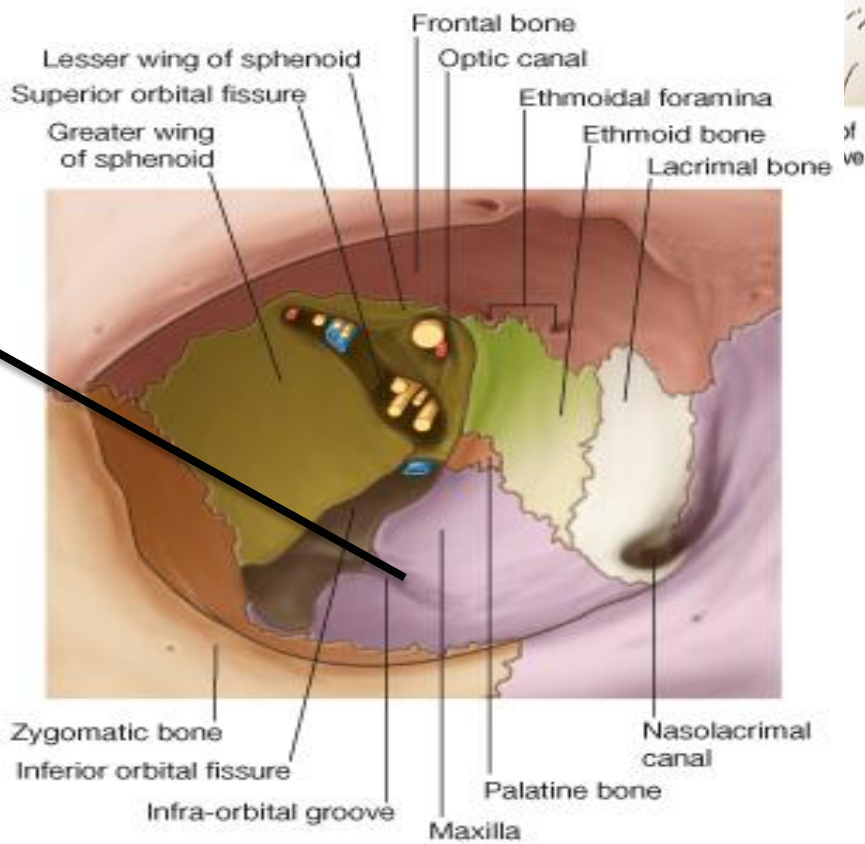
**Floor** :Formed by:  
**the orbital plate of the maxilla**, which  
 separates the orbital cavity from the  
 maxillary sinus

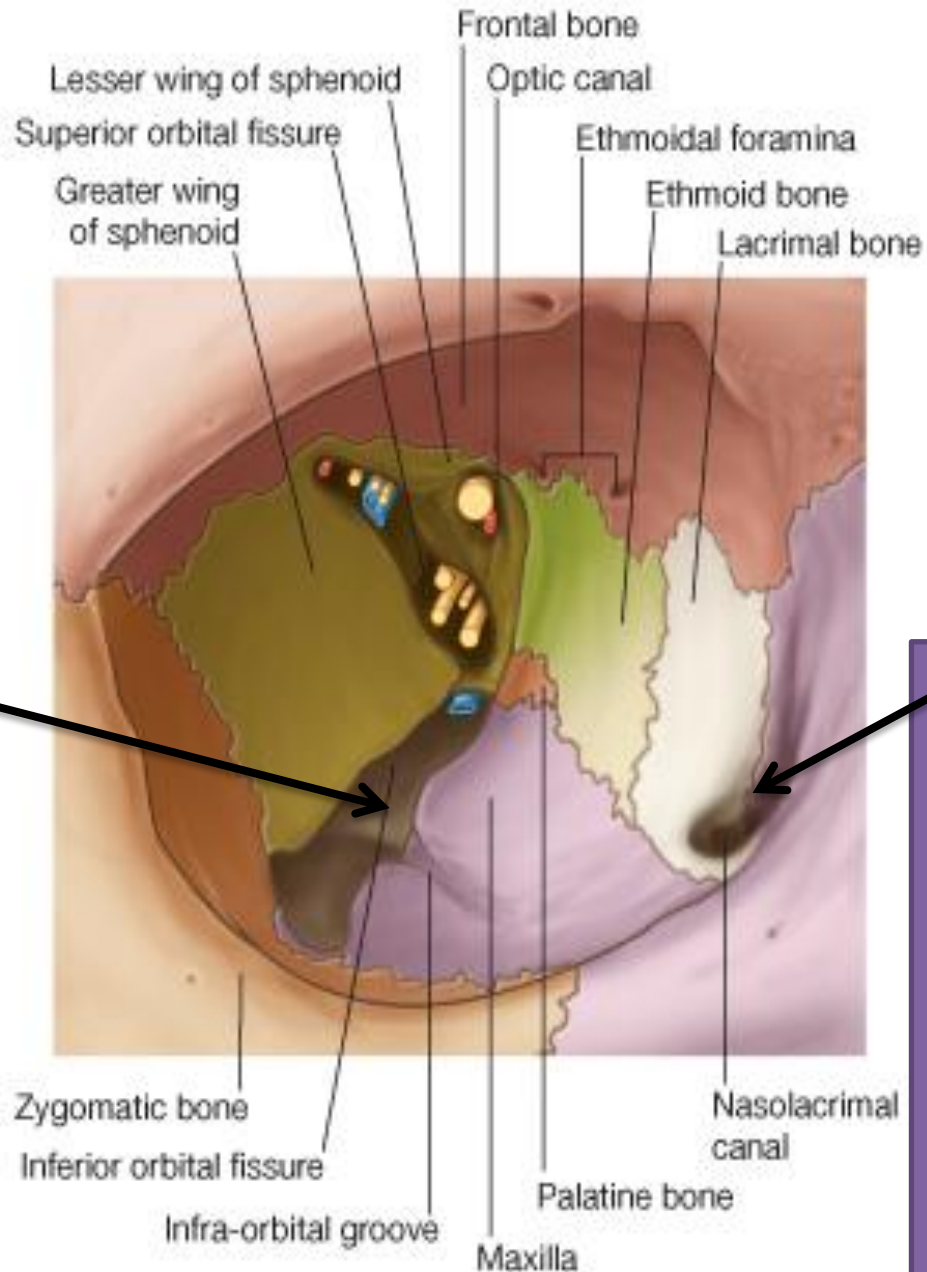
# Openings Into the Orbital Cavity

**1-Supraorbital notch**  
**(Foramen):**  
 It transmits the supraorbital nerve and blood vessels



**2-Infraorbital groove and canal:** Situated they transmit the infraorbital nerve (a continuation of the maxillary nerve) and blood vessels.





**3-Inferior orbital fissure:**

Located posteriorly between the maxilla and the greater wing of the sphenoid it communicates with the pterygopalatine fossa.

It transmits

- 1-the maxillary nerve and its zygomatic branch
- 2-the inferior ophthalmic vein and sympathetic nerves.

**4-Nasolacrimal canal:**

Located anteriorly on the medial wall; it communicates with the inferior meatus of the

nose

It transmits the nasolacrimal duct.



**5-Superior orbital fissure:** Located posteriorly between the greater and lesser wings of the sphenoid

it communicates with the middle cranial fossa.

It transmits

*the lacrimal nerve*

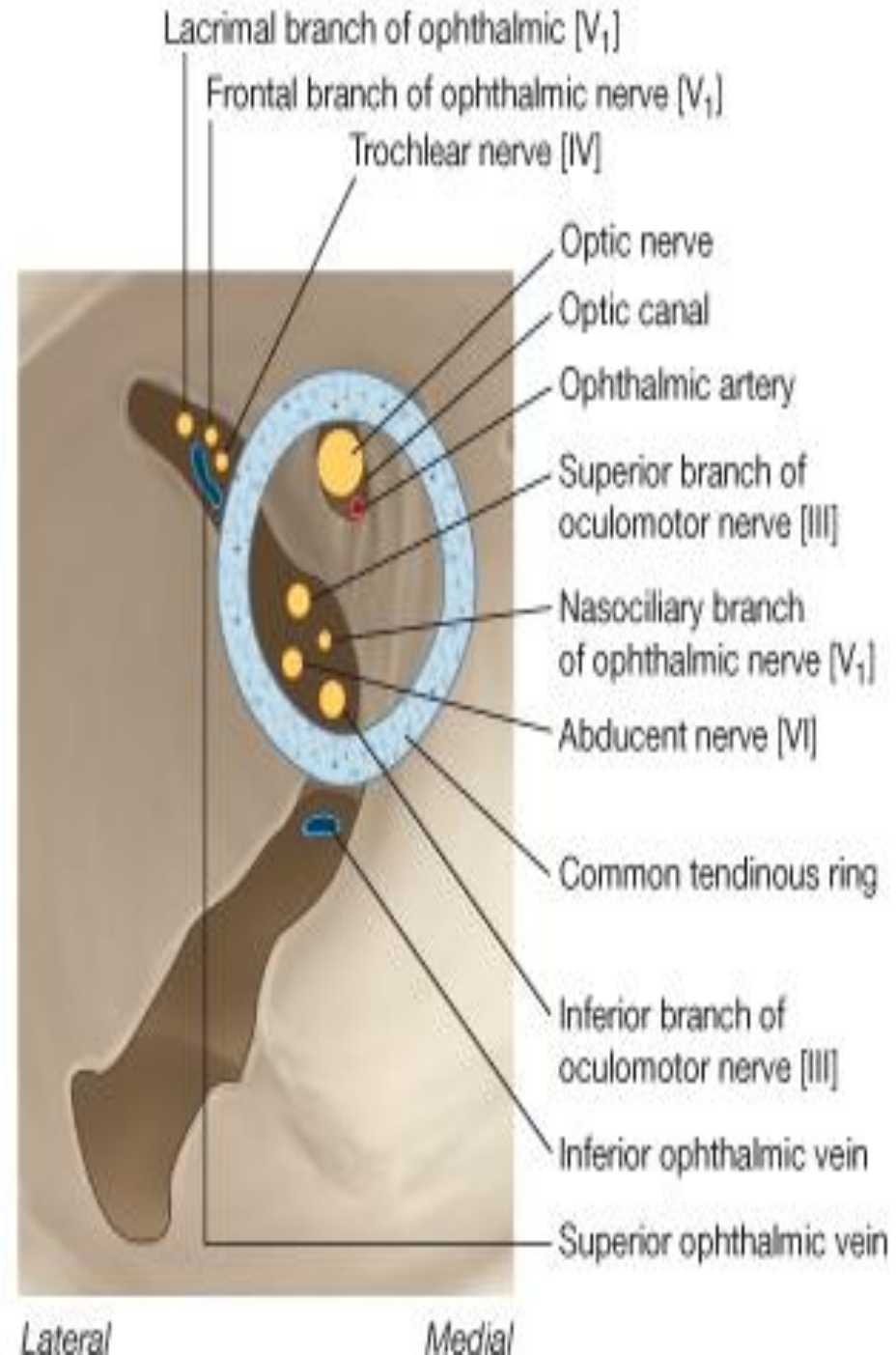
*the frontal nerve*

*the trochlear nerve*

*the oculomotor nerve (upper and lower divisions)*

*the abducent nerve, the nasociliary nerve  
the superior ophthalmic vein.*

***6-Optic canal:*** Located posteriorly in the lesser wing of the sphenoid it communicates with the middle cranial fossa. It transmits the optic nerve and the ophthalmic artery

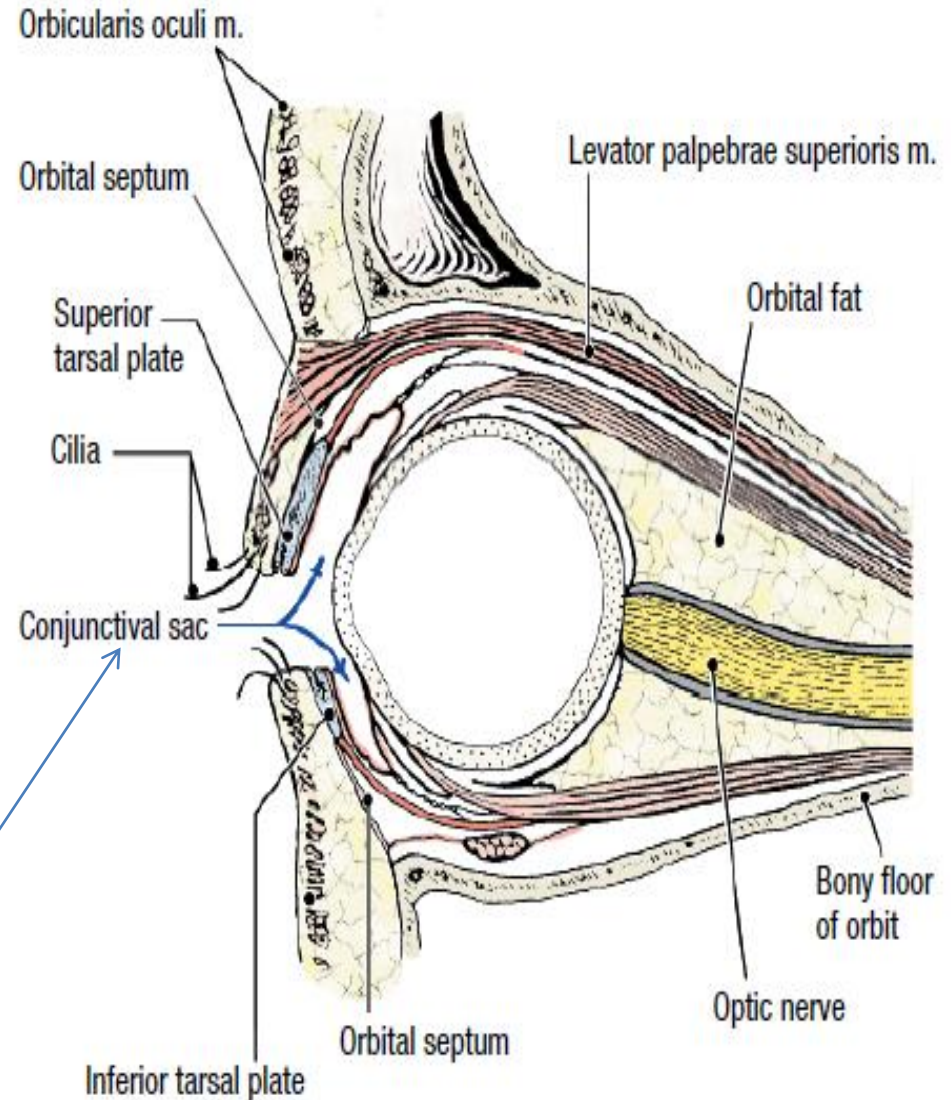


## The Orbital Region

The orbits are a pair of bony cavities that contain the eyeballs

## Eyelids

- ❖ The eyelids (they act like the curtains) protect the eye from injury and ***excessive light*** by their closure
- ❖ The upper eyelid ***is larger and more mobile*** than the lower because of its attachment to the ***levator palpebrae superioris***
- ❖ The upper and lower eyelids meet each other at ***the medial and lateral angles***.
- ❖ **The palpebral fissure** is the elliptical opening between the eyelids
- ❖ **The palpebral fissure** is the entrance into the **conjunctival sac**



## structure of the eye lids

**1-skin:** thin and can be easily become oedematous (with fluid or blood)

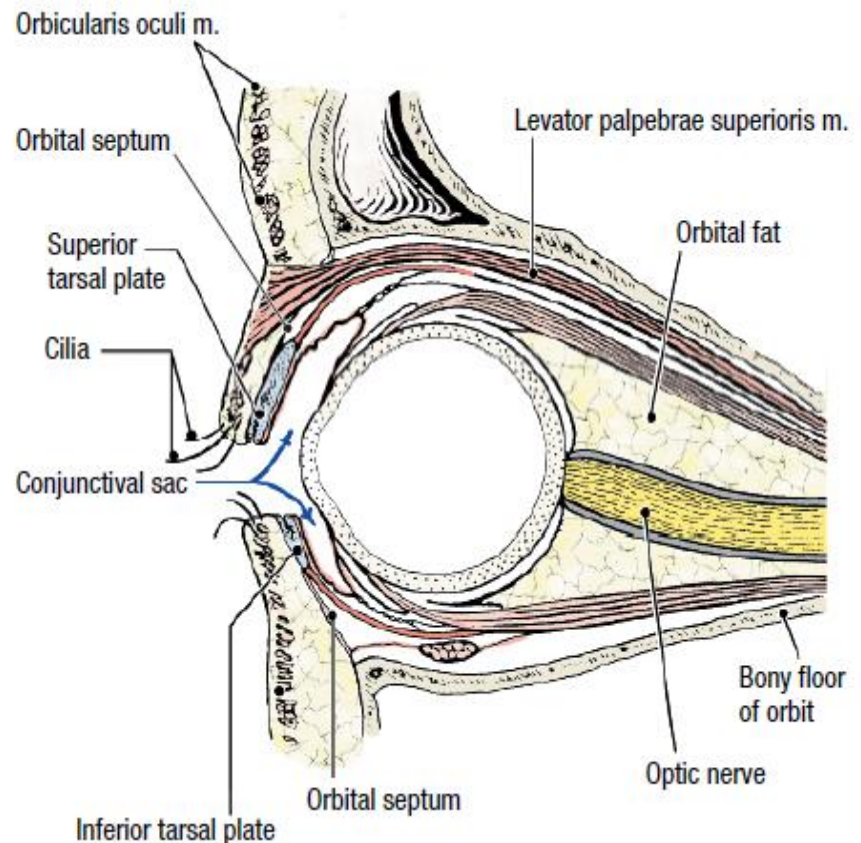
➤ Contains The sebaceous glands (**glands of Zeis**) open directly into the eyelash follicles.

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

## 2- Superficial fascia:

❖ (remember we said earlier No fat)

❖ Contains the palpebral part of orbicularis occuli





### 3- Palpebral fascia

The framework of the eyelids is formed by a **fibrous sheet, the orbital septum**

#### The orbital septum

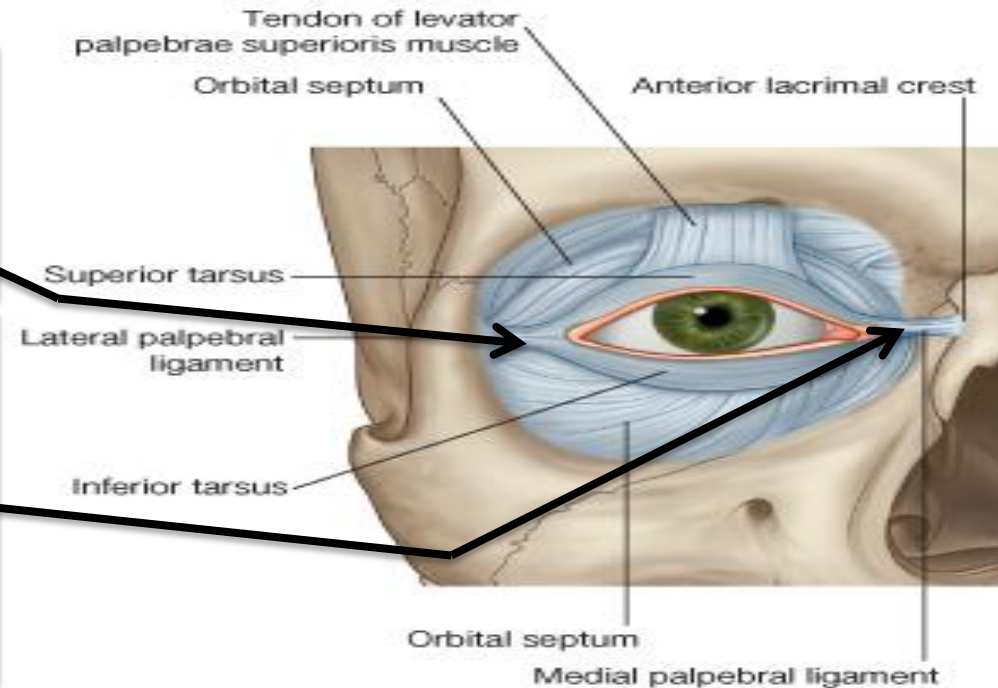
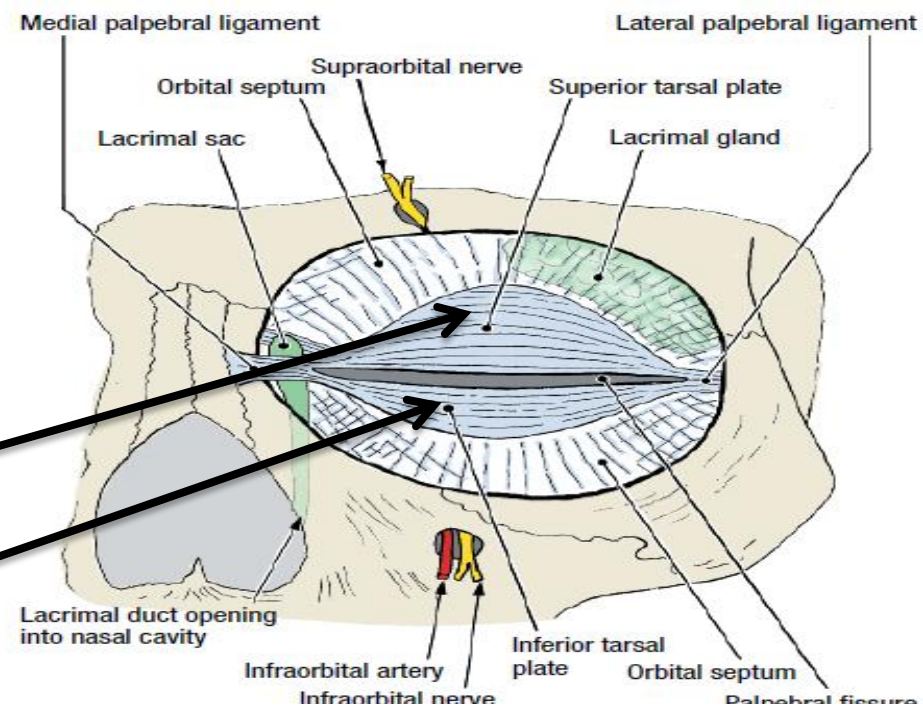
- is attached to the periosteum at the orbital margins.
- The orbital septum is thickened at the margins of the lids to form the superior and inferior

### TARSAL PLATES

The lateral ends of the tarsal plates are attached by a band, the lateral palpebral ligament, the orbital margin.

The medial ends of the plates are attached by a band, the medial palpebral ligament, to the lacrimal bone

The tarsal glands are embedded in the posterior surface of the tarsal plates

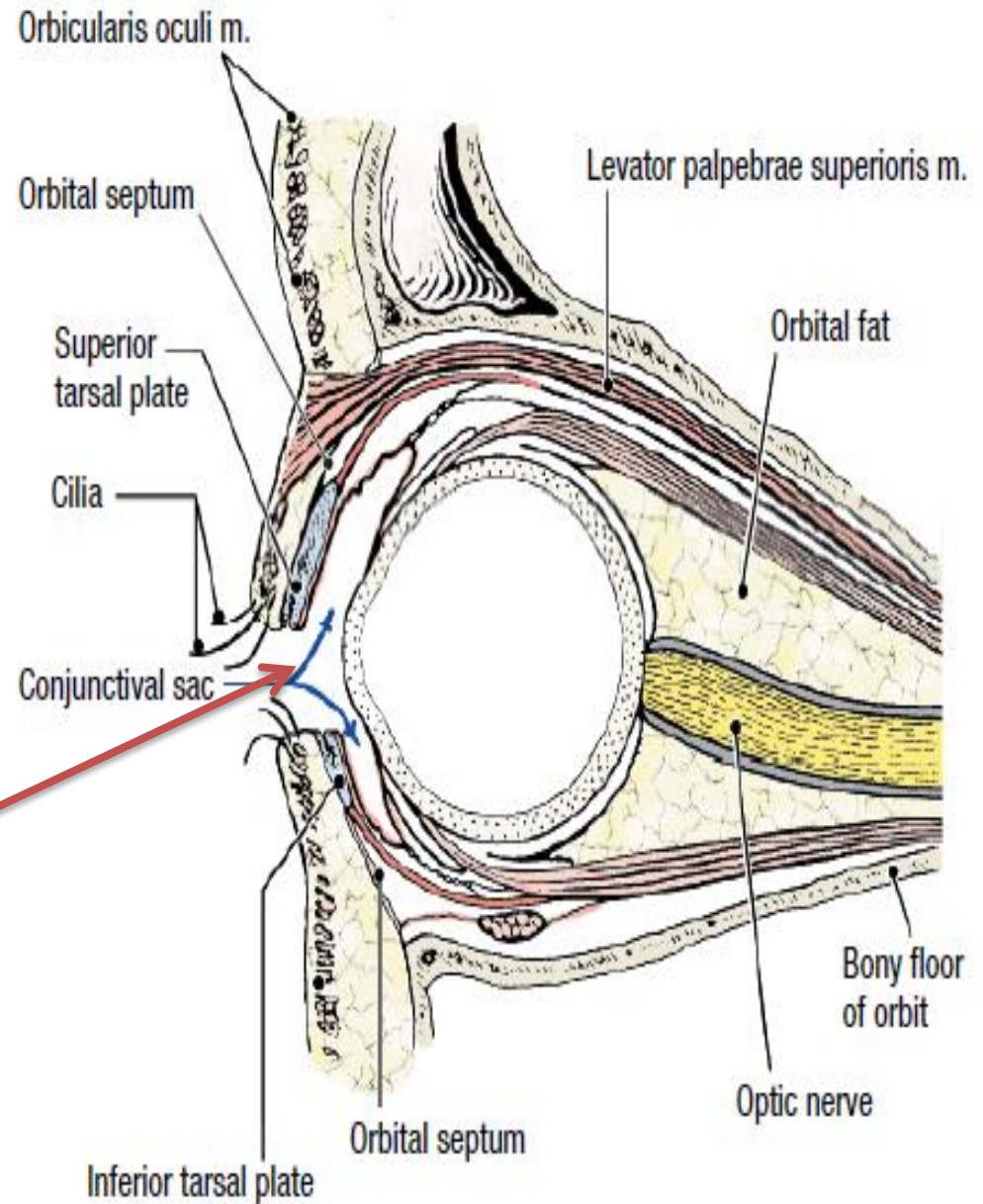


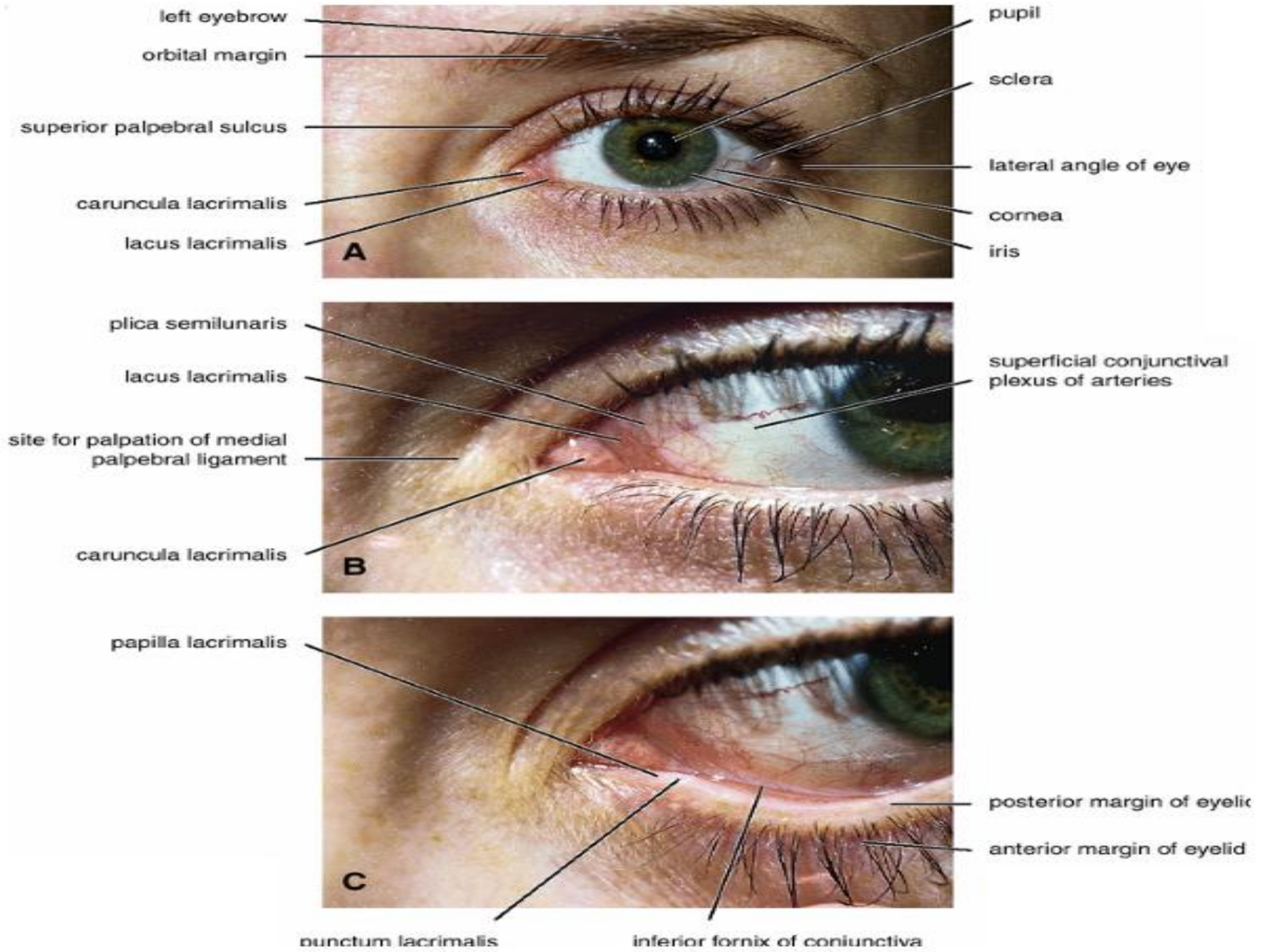


#### 4-The conjunctiva

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

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.





## Movements of the Eyelids

The position of the eyelids at rest depends on the tone of :

- 1-The orbicularis oculi
- 2-The levator palpebrae superioris muscles and the position of the eyeball.

The eyelids are closed by :

- 1-The contraction of the orbicularis oculi and
- 2-The relaxation of the levator palpebrae superioris muscles

The eye is opened by:

**THE LEVATOR PALPEBRAE SUPERIORIS**  
Raising the upper lid

the ***superior tarsal muscle*** which is part of the levator palpebrae superioris, helps maintain eyelid elevation and are innervated by postganglionic sympathetic fibers from **the superior cervical ganglion**

Loss of oculomotor nerve [III] function results in **complete ptosis or drooping of the superior eyelid,** whereas loss of sympathetic innervation to the **superior tarsal muscle results in partial ptosis**

# Horner's syndrome

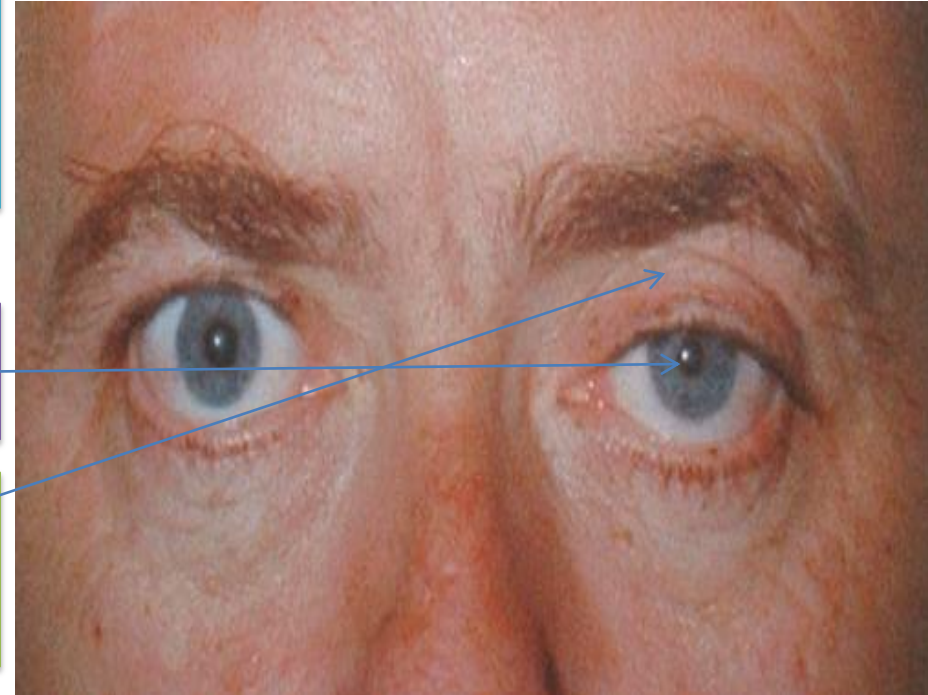
Horner's syndrome is caused by a lesion in the **sympathetic trunk** in the neck that results in sympathetic dysfunction.

It is characterized by three typical features:

1-Pupillary constriction due to paralysis of the dilator pupillae muscle;

2-Partial ptosis (drooping of the upper eyelid) due to paralysis of the superior tarsal muscle of the levator palpebrae superioris;

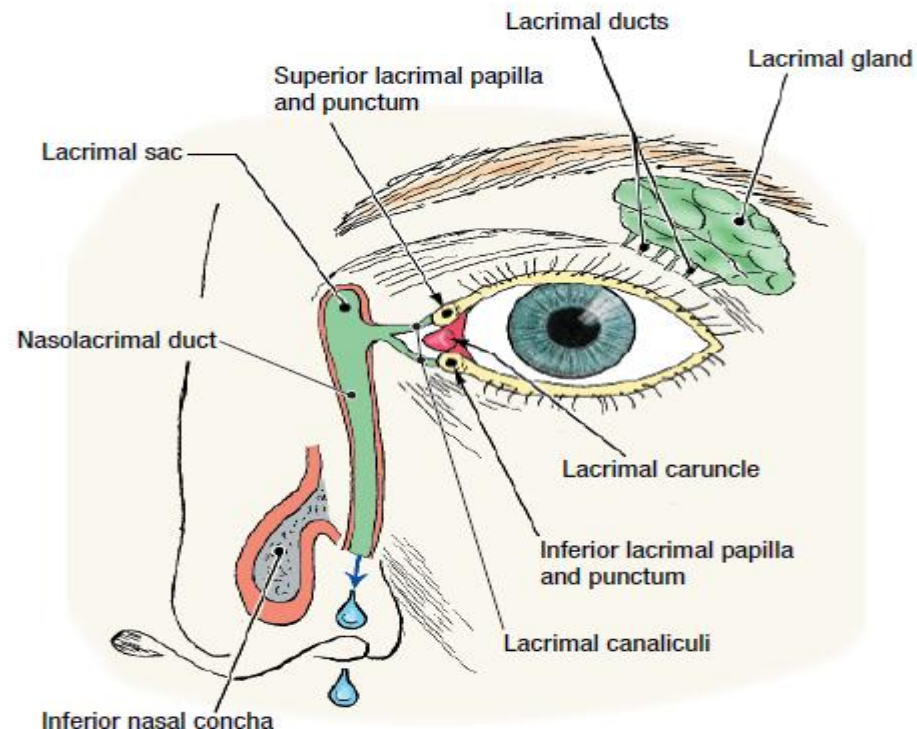
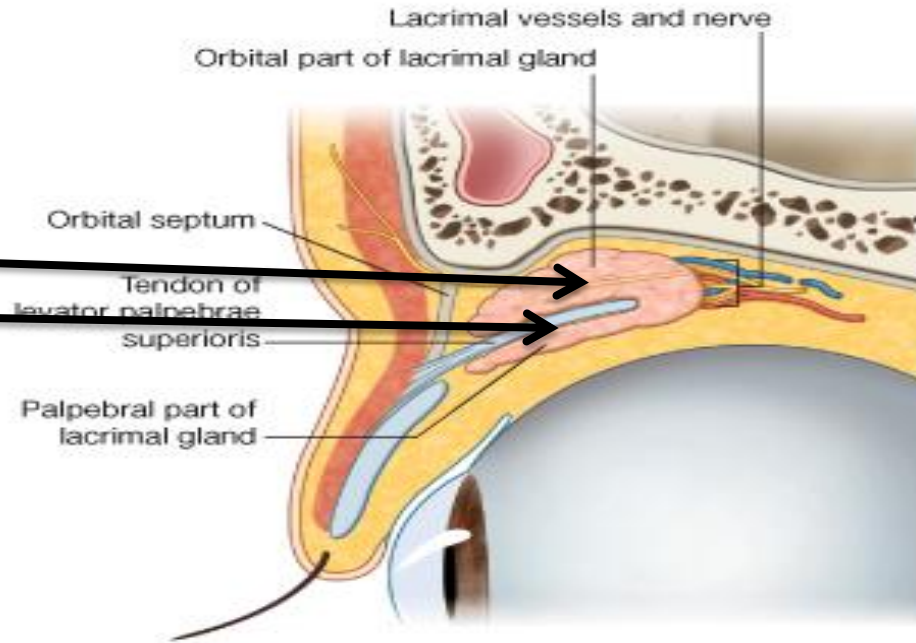
3-Absence of sweating on the ipsilateral side of the face and the neck due to absence of innervation of the sweat glands.





# Lacrimal Gland

- The lacrimal gland consists of:
  - 1- a large *orbital part*
  - 2- a *small palpebral part*which are continuous with each other around the *lateral edge of the aponeurosis of the levator palpebrae superioris*.
- 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.



Superior palpebral conjunctiva:  
tarsal (meibomian) glands  
shining through

Superior lacrimal  
papilla and punctum

Plica semilunaris

Pupil (seen through transparent cornea)

Lacrimal caruncle  
in lacrimal lake  
(lacus lacrimalis)

Iris (seen through transparent cornea)

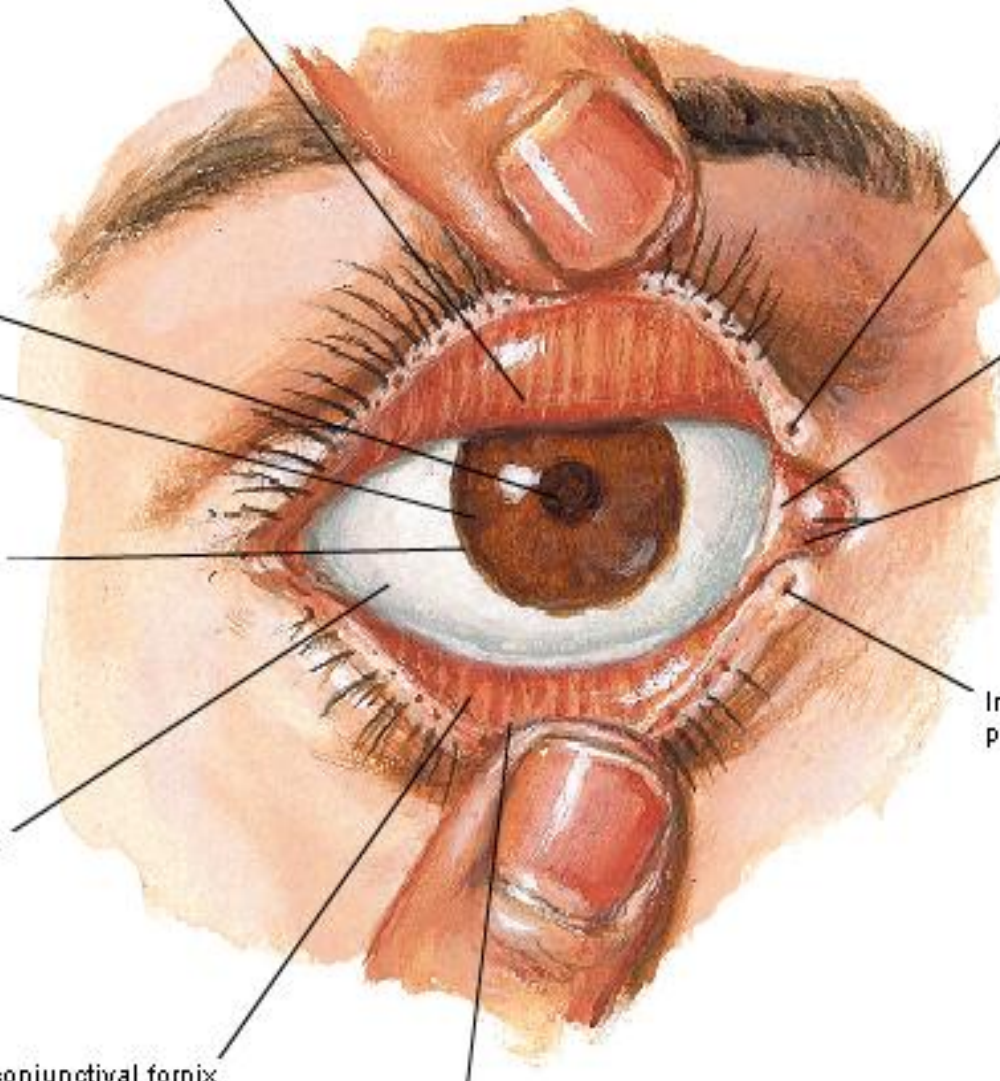
Corneoscleral junction (corneal limbus)

Inferior lacrimal  
papilla and punctum

Bulbar conjunctiva over sclera

Inferior conjunctival fornix

Inferior palpebral conjunctiva:  
tarsal glands shining through



## Lacrimal Ducts

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

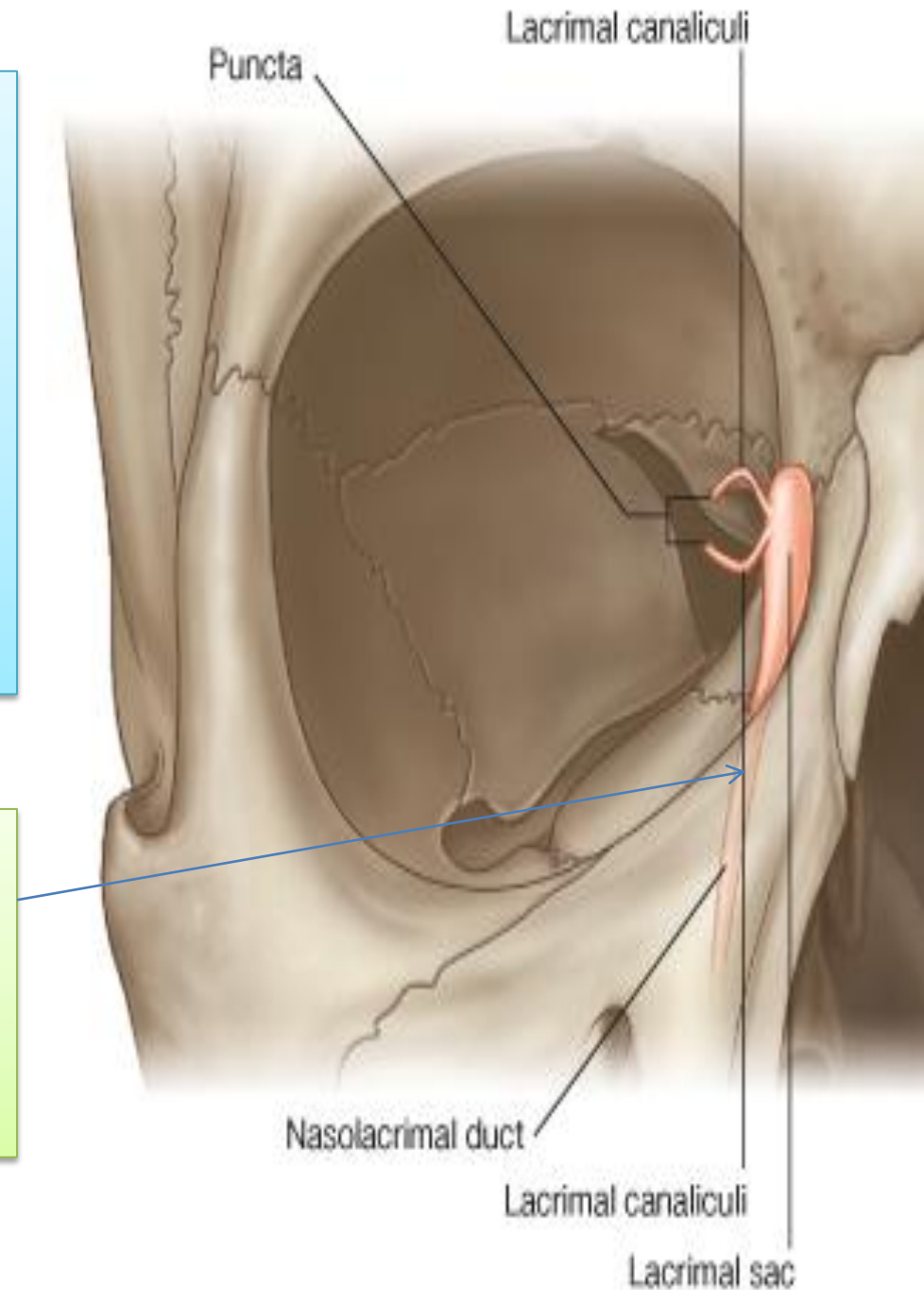
From here

the tears enter the canaliculi lacrimales through the puncta lacrimalis.

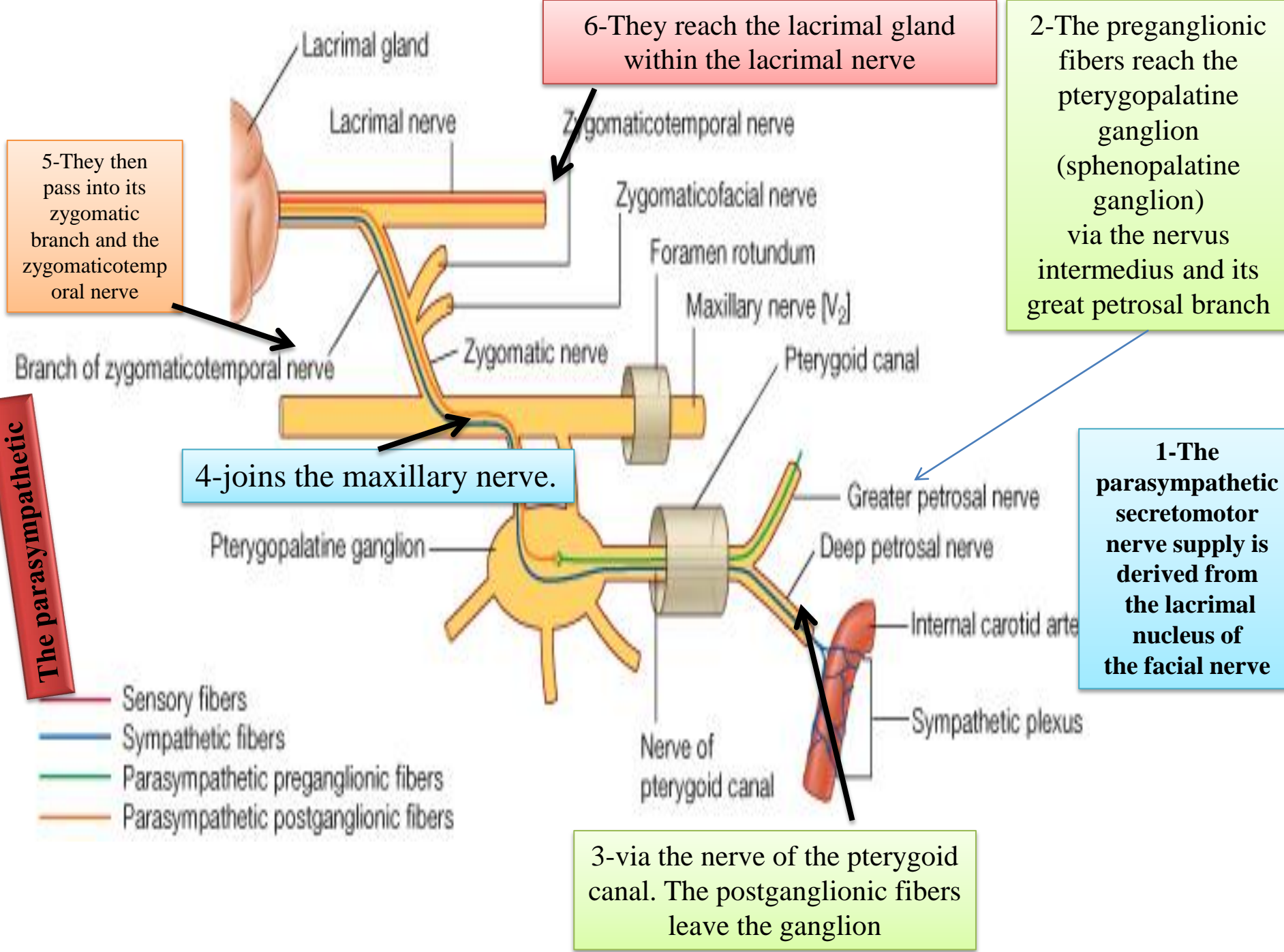
The canaliculi lacrimales pass medially and open into the lacrimal sac which lies in the lacrimal groove behind the medial palpebral ligament and is the upper blind end of the nasolacrimal duct.

The nasolacrimal duct is about 0.5 in. (1.3 cm) long and emerges from the lower end of the lacrimal sac

The duct descends downward, backward, and laterally in a bony canal and opens into the inferior meatus of the nose.









sympathetic nerve supply

5-finally the lacrimal nerve

4- via the zygomatic nerve, the zygomaticotemporal nerve

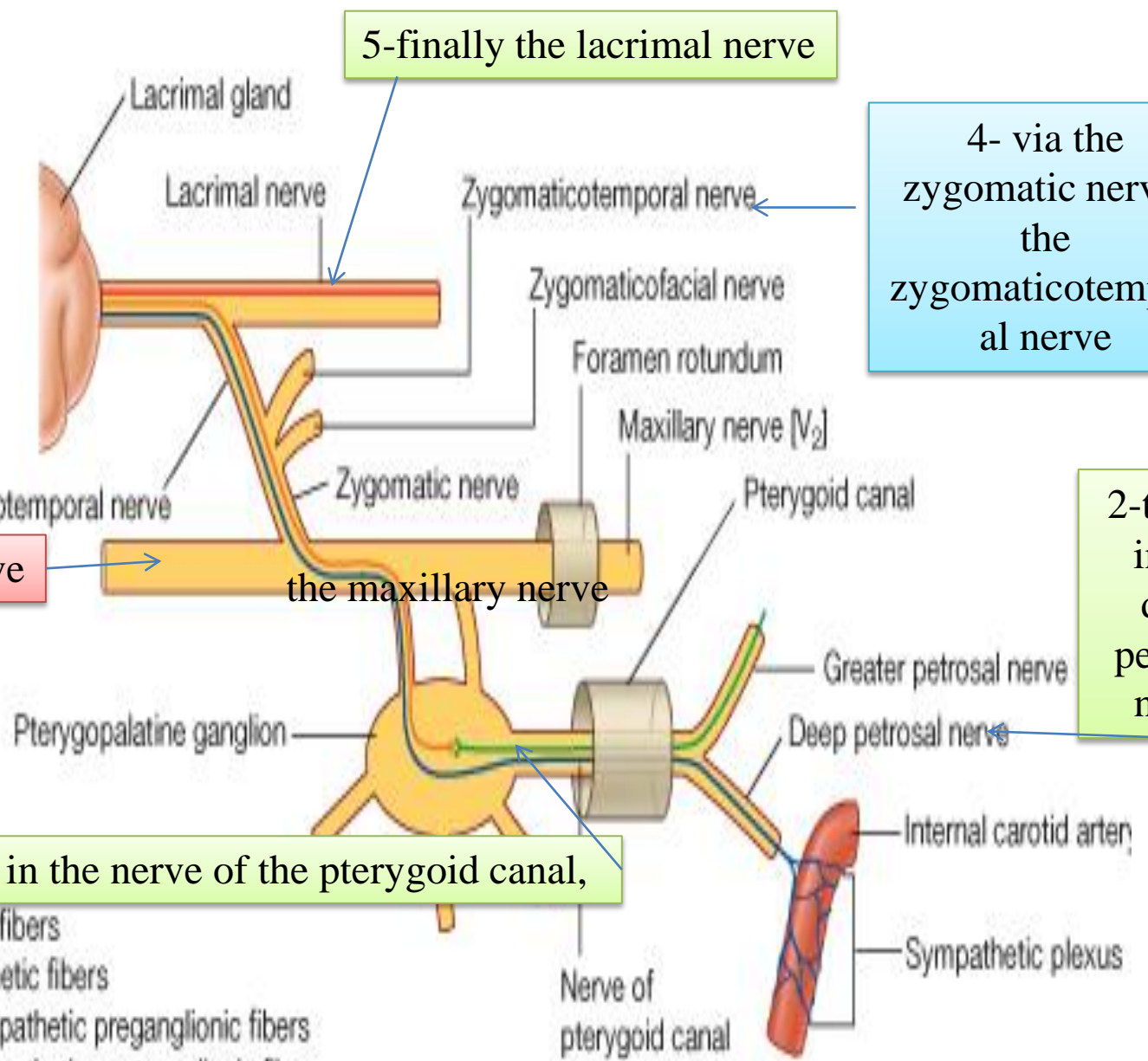
2-travels in the deep petrosal nerve

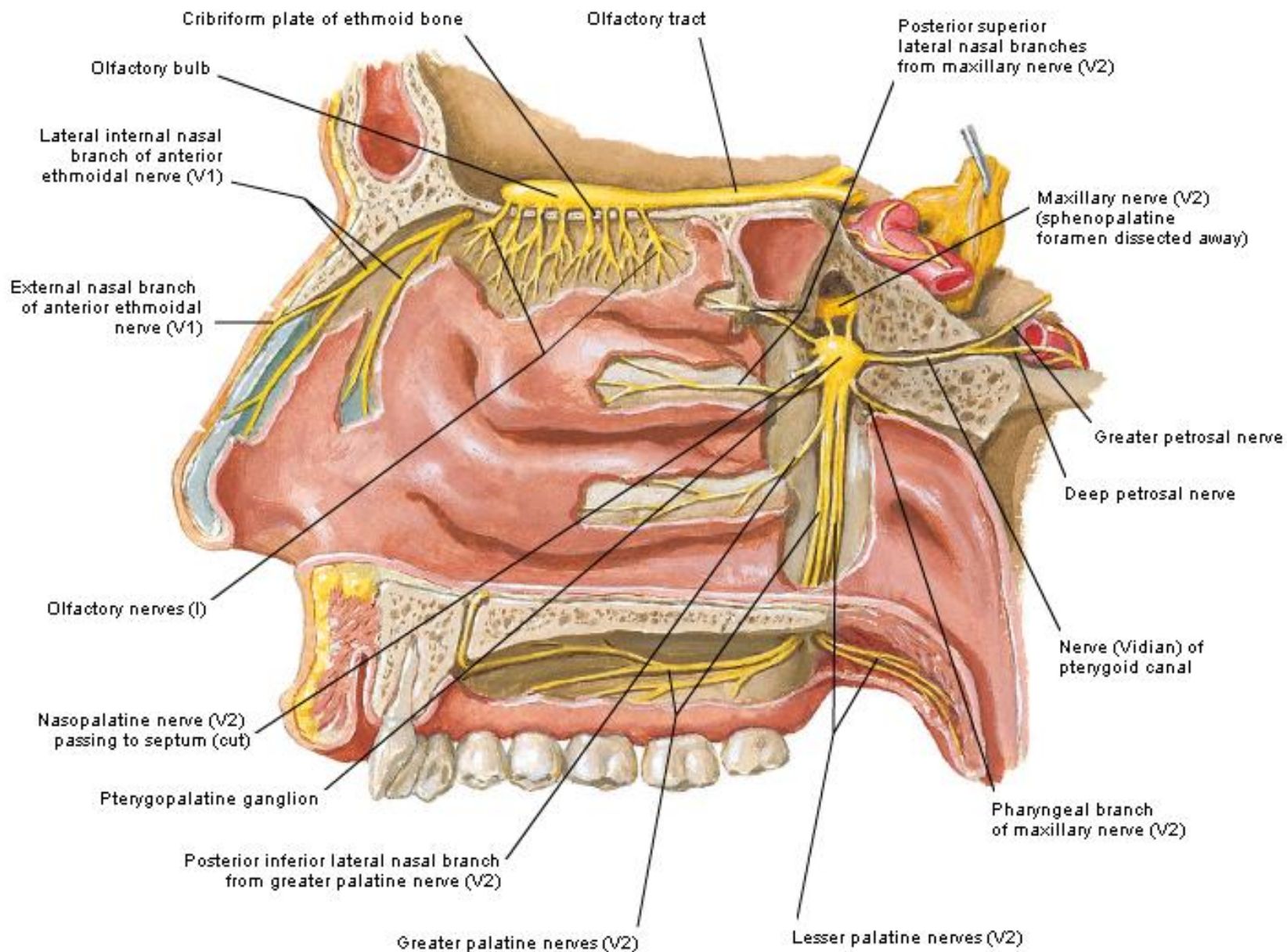
4-the maxillary nerve

3-then in the nerve of the pterygoid canal,

1-The sympathetic postganglionic nerve supply is from the internal carotid plexus

- Sensory fibers
- Sympathetic fibers
- Parasympathetic preganglionic fibers
- Parasympathetic postganglionic fibers



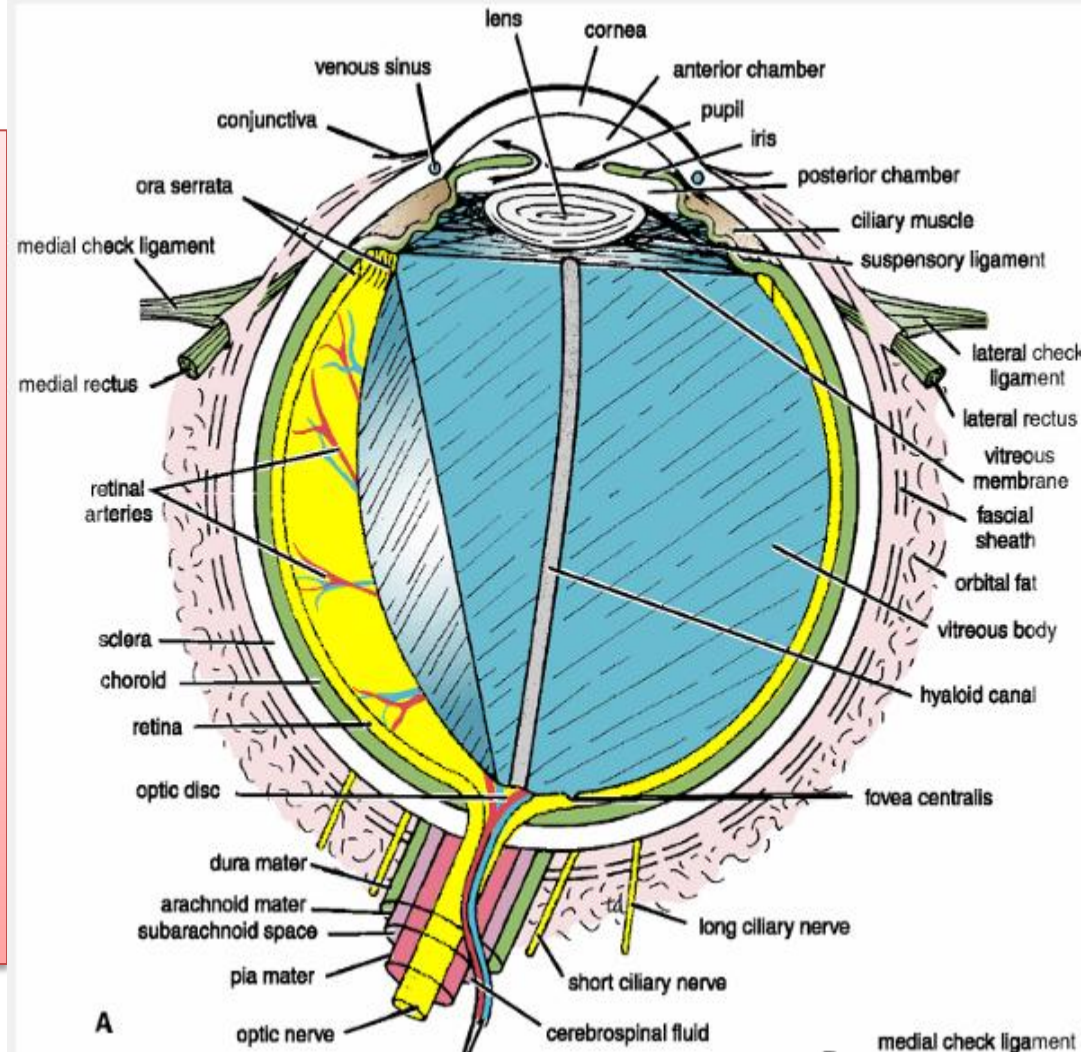




# Nerves of the Orbit

## Optic Nerve

- ❖ The optic nerve enters the orbit from the middle cranial fossa by passing **through the optic canal**
- ❖ It is accompanied by the **ophthalmic artery**, which lies on its lower lateral side.
- ❖ The nerve is surrounded by sheaths of pia mater, arachnoid mater, and dura mater
- ❖ It runs forward and laterally within the cone of the recti muscles and pierces the sclera at a point medial to the posterior pole of the eyeball



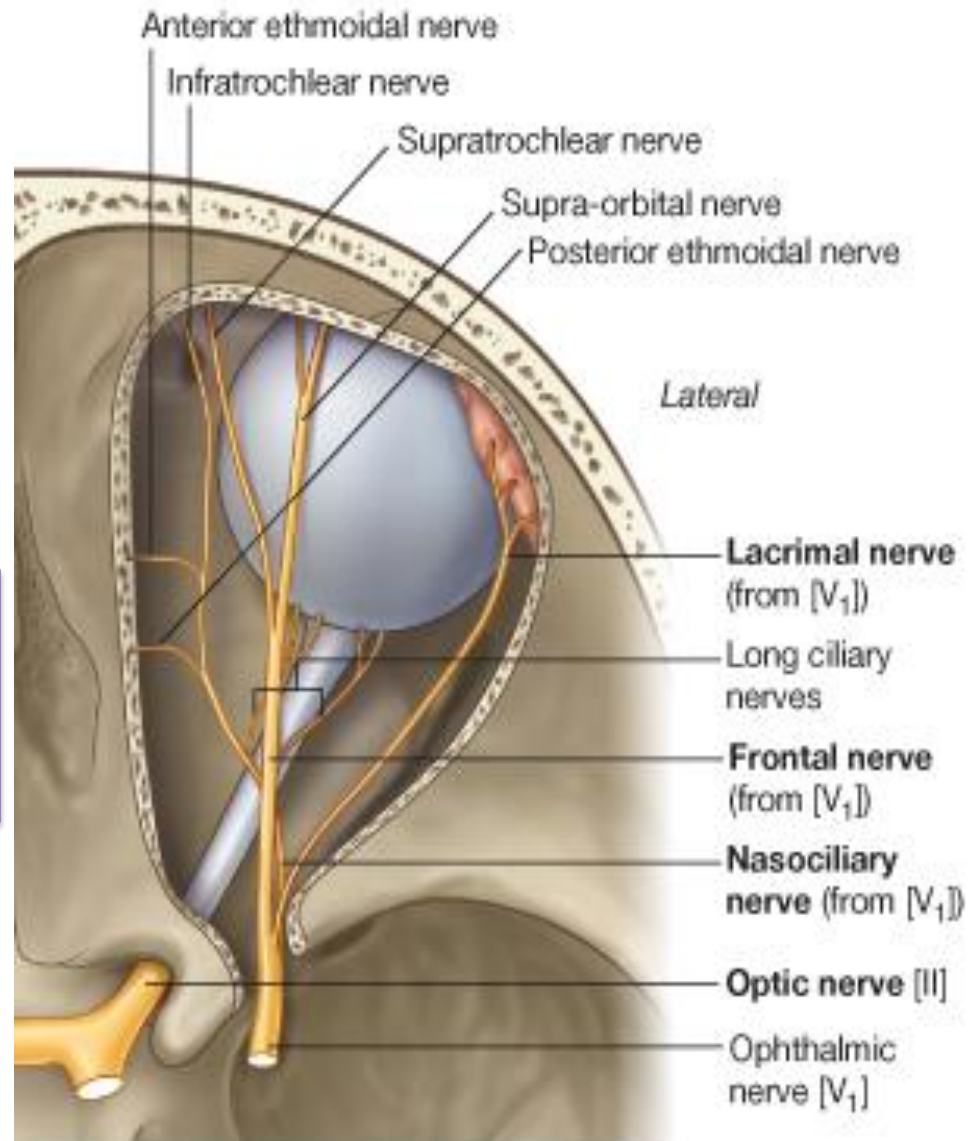
Remember that the meninges fuse with the sclera so that the subarachnoid space with its contained cerebrospinal fluid extends forward from the middle cranial fossa, around the optic nerve, and through the optic canal, as far as the eyeball. A rise in pressure of the cerebrospinal fluid within the cranial cavity therefore is transmitted to the back of the eyeball.

# Lacrimal Nerve

arises from  
*the ophthalmic division of the  
trigeminal nerve*

It enters the orbit through the  
*upper part of the superior orbital fissure*  
passes forward along the upper border of the  
lateral rectus muscle

➤ It is joined by a branch of the  
zygomaticotemporal nerve, which later  
leaves it to enter the lacrimal gland



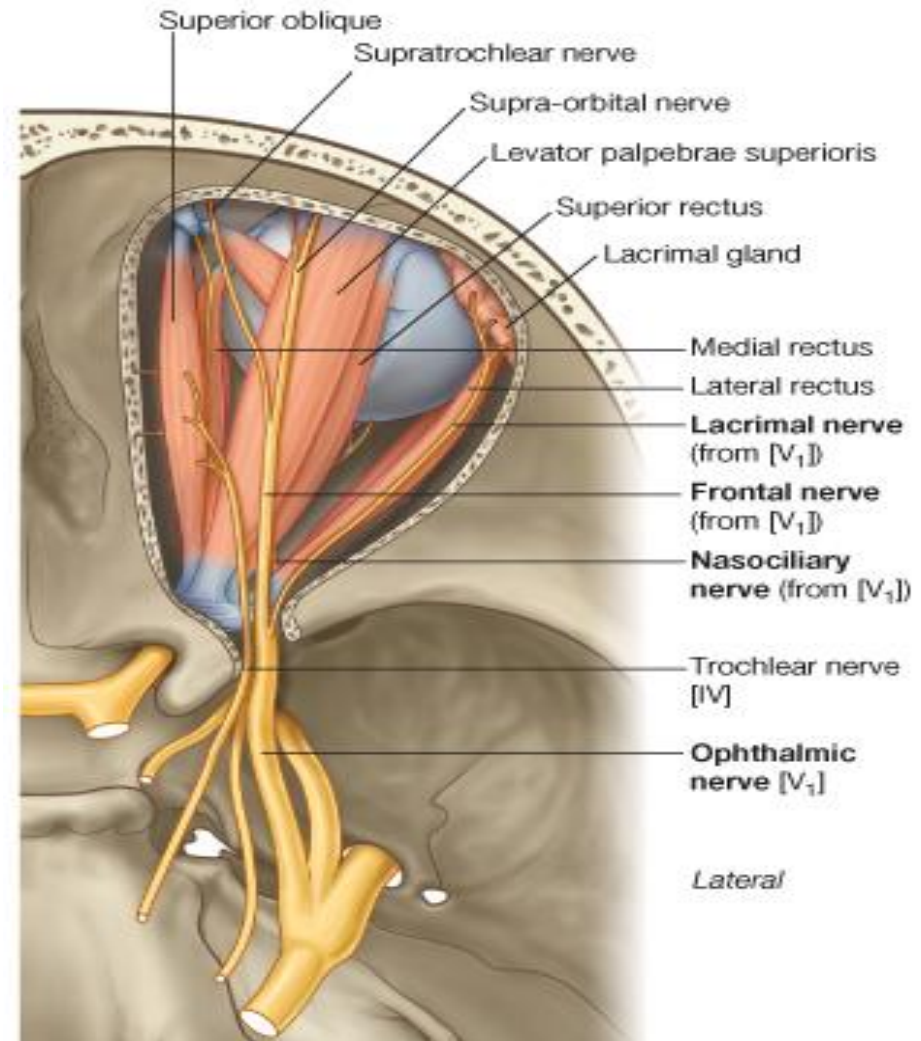


# Frontal Nerve

➤ The frontal nerve arises from the ophthalmic division of the trigeminal nerve

It enters the orbit through the upper part of the superior orbital fissure and passes forward on the upper surface of the levator palpebrae superioris beneath the roof of the orbit

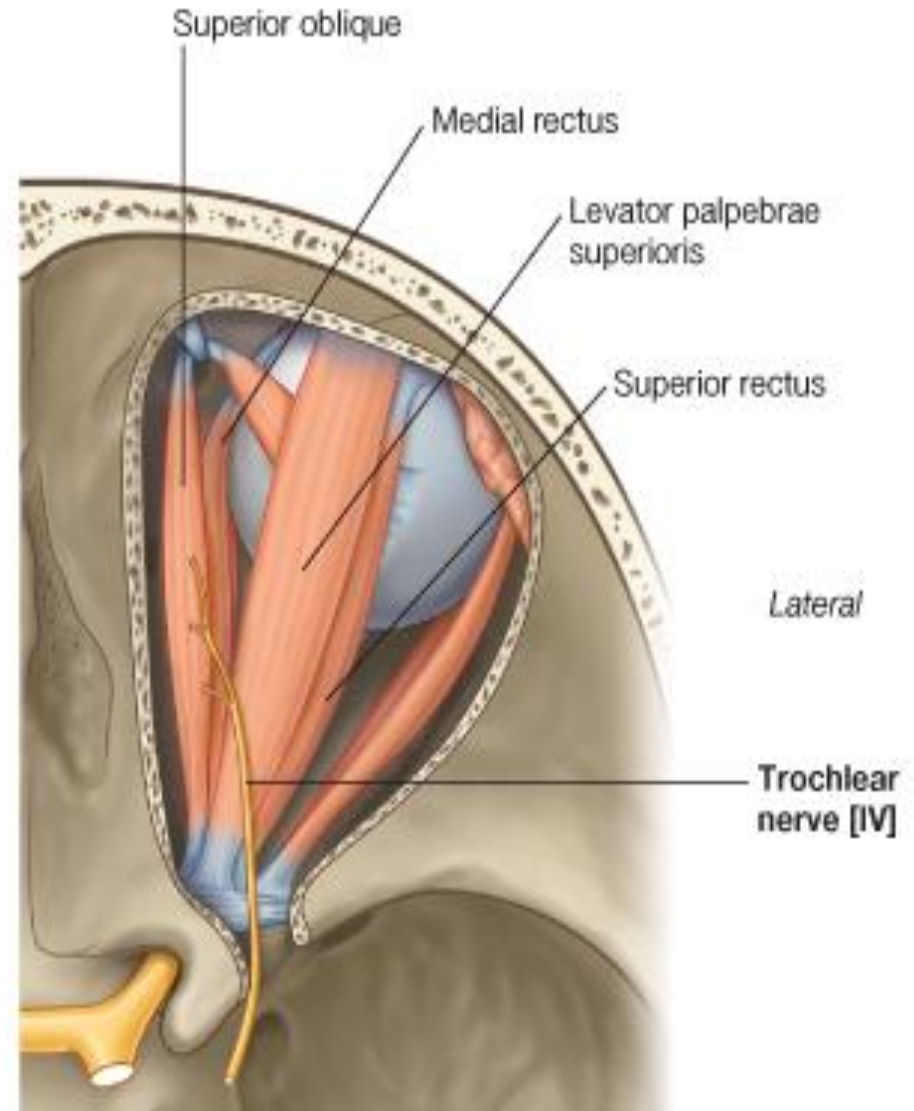
It divides into the supratrochlear and supraorbital nerves that wind around the upper margin of the orbital cavity to supply the skin of the forehead; the supraorbital nerve also supplies the mucous membrane of the frontal air sinus.



# Trochlear Nerve

The trochlear nerve enters the orbit through the upper part of the superior orbital fissure

It runs forward and supplies *the superior oblique muscle*







# Nasociliary Nerve

- The nasociliary nerve arises from the ophthalmic division of the trigeminal nerve.
- It enters the orbit through the **lower part of the superior orbital fissure**
- It crosses above the optic nerve, runs forward along the upper margin of the medial rectus muscle, and ends by dividing into **the anterior ethmoidal and infratrochlear nerves**

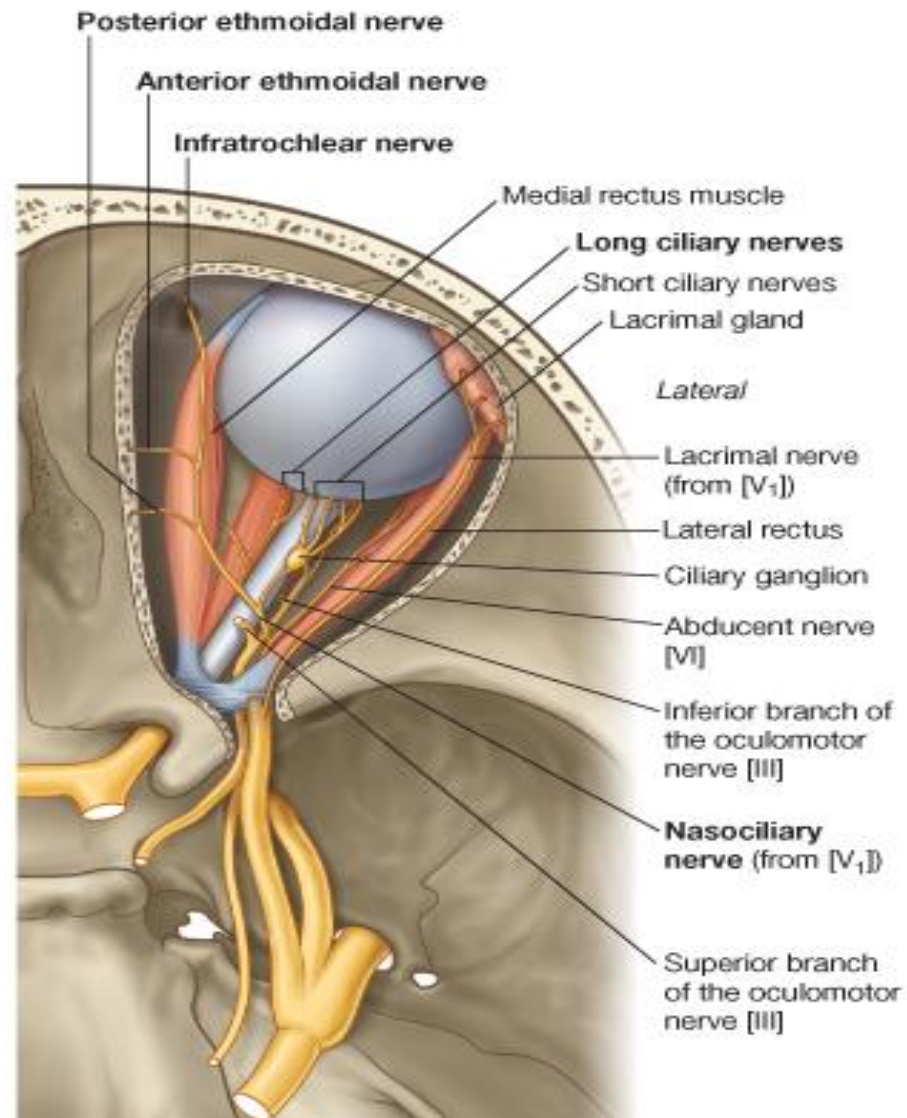
## Branches of the Nasociliary Nerve

**1-The communicating branch to the ciliary ganglion** is a sensory nerve.

The sensory fibers **from the eyeball** pass to the ciliary ganglion via the short ciliary nerves without **interruption**, and then join the **nasociliary nerve** by means of the communicating branch.

**2-The long ciliary nerves**, two or three in number, arise from the nasociliary nerve as it crosses the optic nerve. **They contain sympathetic fibers for the dilator pupillae muscle.**

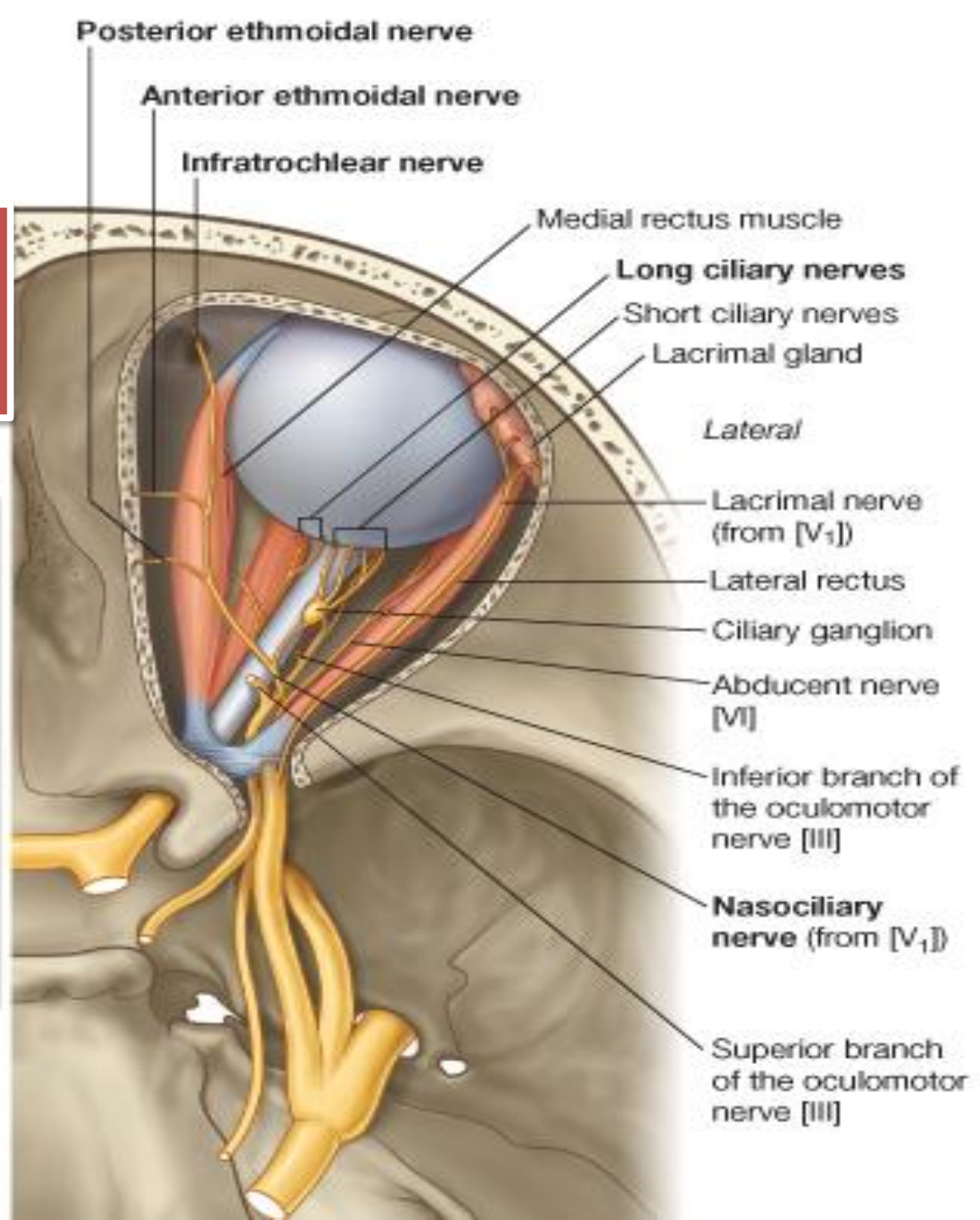
The nerves pass forward with the short ciliary nerves and pierce the sclera of the eyeball. They continue forward between the sclera and the choroid to reach the iris.



**3-The posterior ethmoidal nerve** supplies the ethmoidal and sphenoidal air sinuses

**4-The infratrochlear nerve** supplies the skin of the medial part of the upper eyelid and the adjacent part of the nose

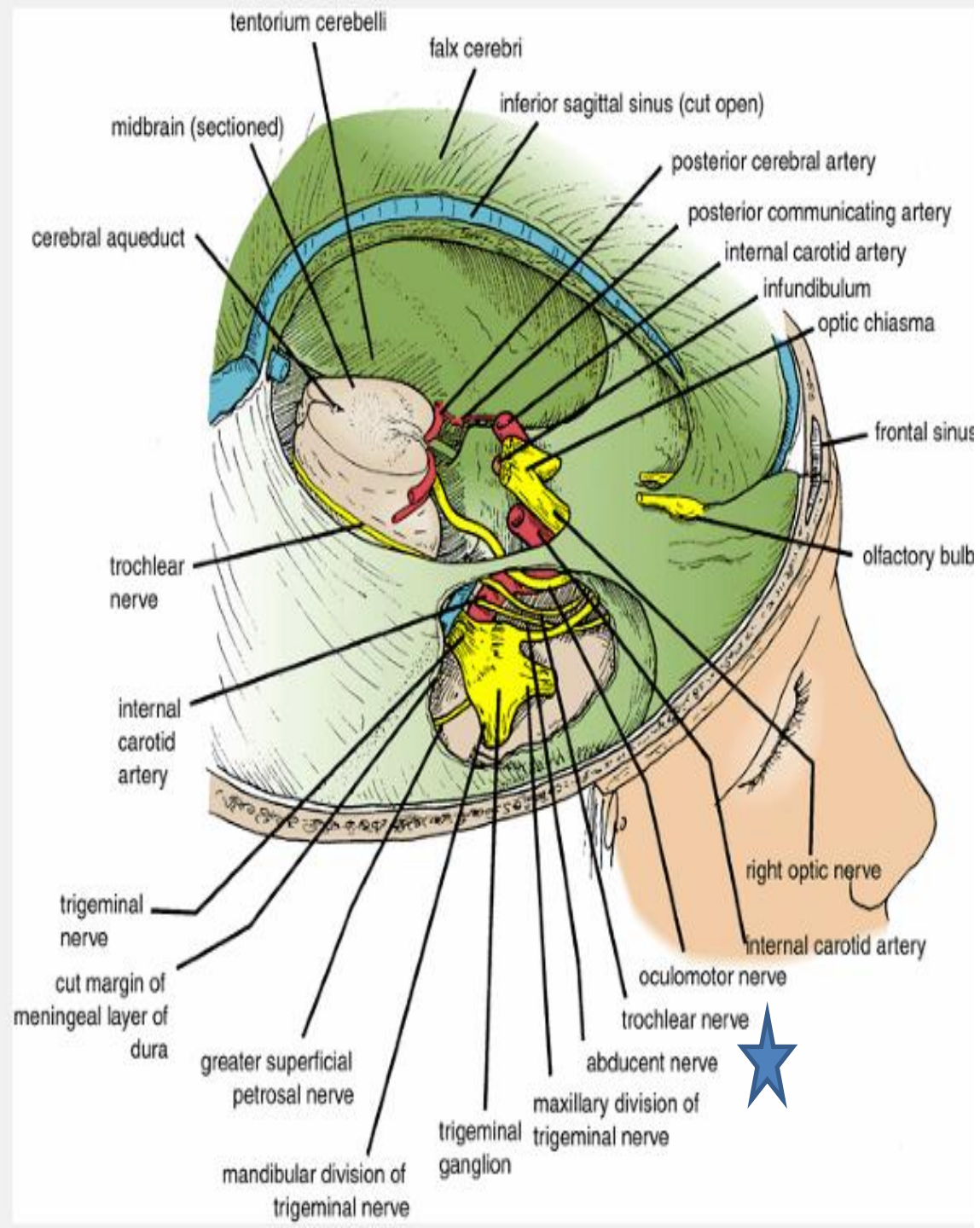
**5-The anterior ethmoidal nerve** passes through the **anterior ethmoidal foramen**  
➤ After supplying an area of mucous membrane in the nasal cavity, it appears on the face as **the external nasal nerve at the lower border of the nasal bone**, and supplies the skin of the nose down as far as the tip



## The Sixth Cranial nerve

# ABDUCENT NERVE

The abducent nerve enters the orbit through the lower part of the superior orbital fissure  
**It supplies the lateral rectus muscle**





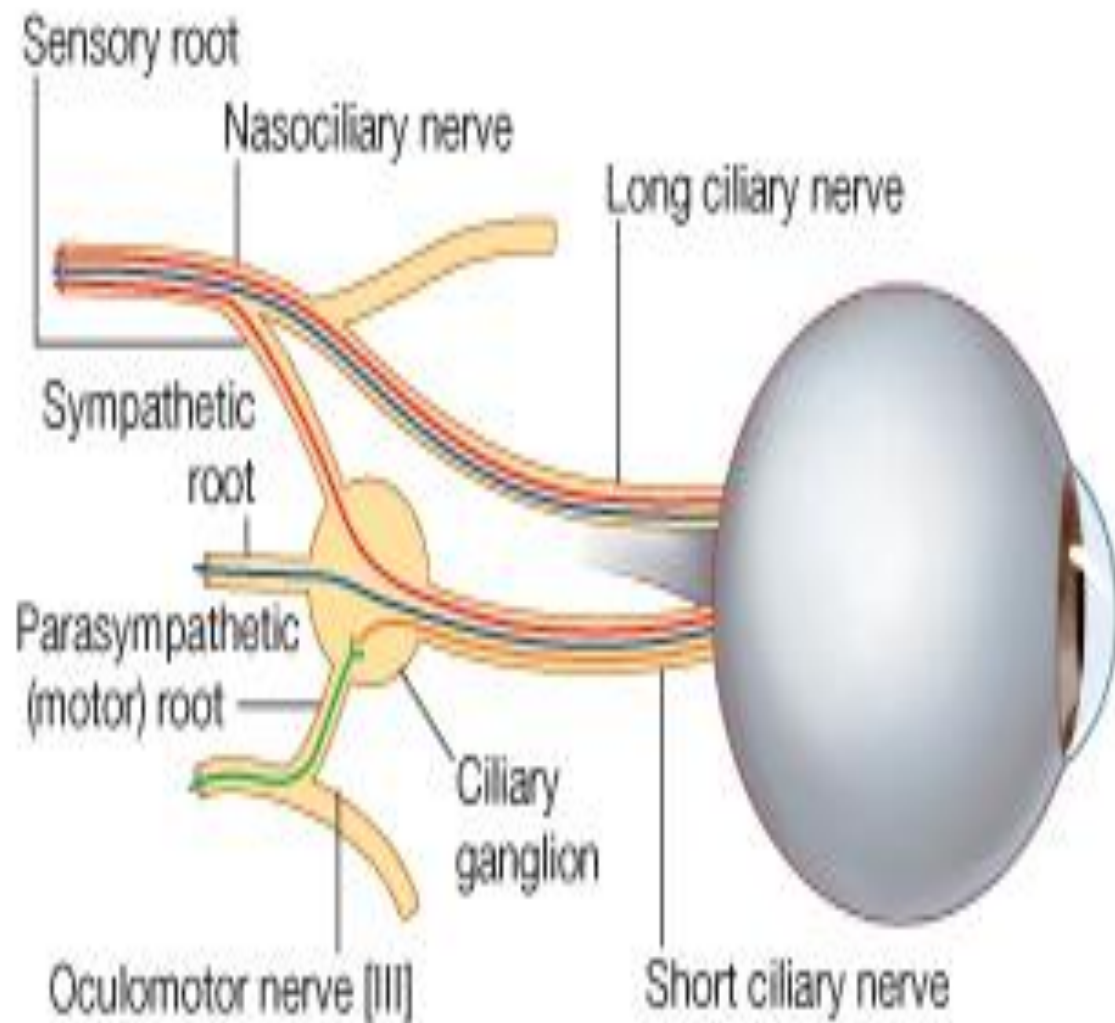
# Ciliary Ganglion

➤ Is a parasympathetic ganglion  
➤ About the size of a pinhead and 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 muscle*

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*.

It receives its *sympathetic fibers* from the internal carotid sympathetic plexus in the orbit and run through the ganglion without interruption.



- Sensory fibers
- Sympathetic fibers
- Parasympathetic preganglionic fibers
- Parasympathetic postganglionic fibers

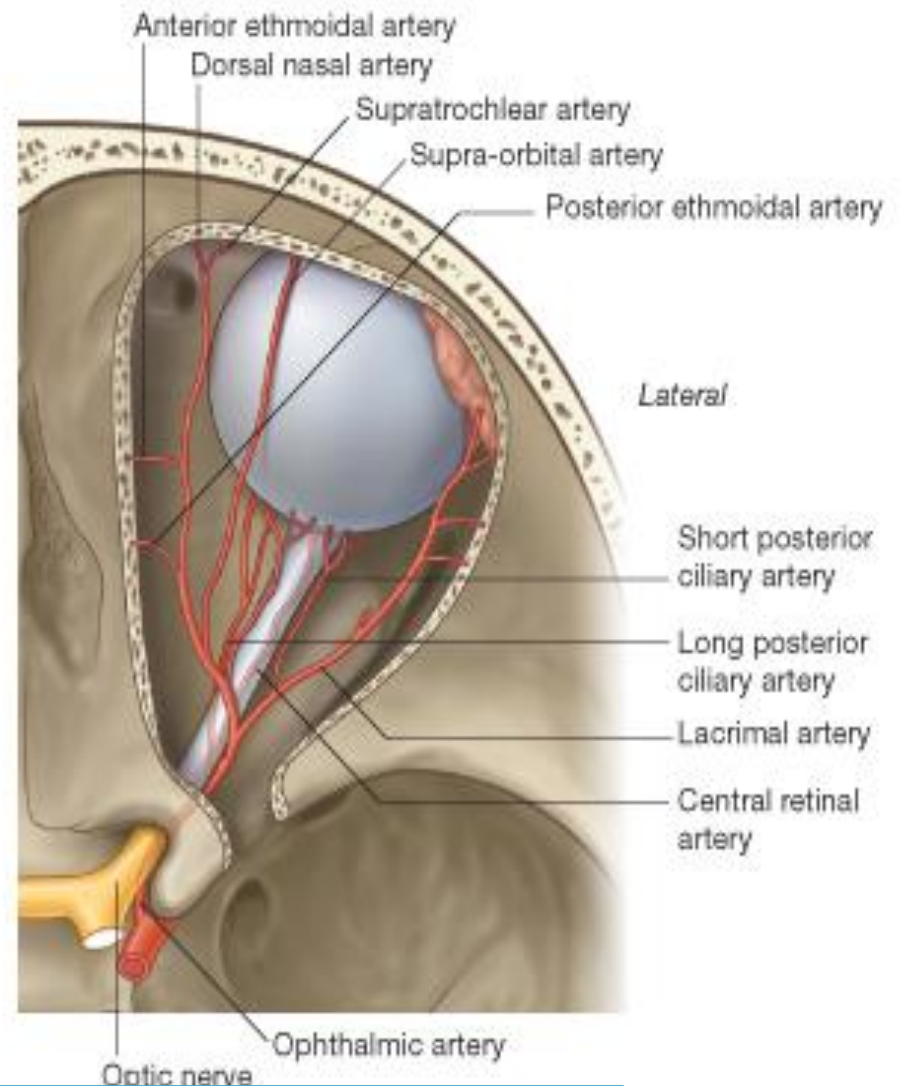
# Ophthalmic Artery

- is a branch of the *internal carotid artery*
- 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

- *It runs in the substance of the optic nerve* and enters the eyeball at the center of the optic disc. Here, it divides into branches, which may be studied in a patient through an *ophthalmoscope*



The muscular branches (of the ophthalmic artery)

*The ciliary arteries*

*The lacrimal artery to the lacrimal gland*

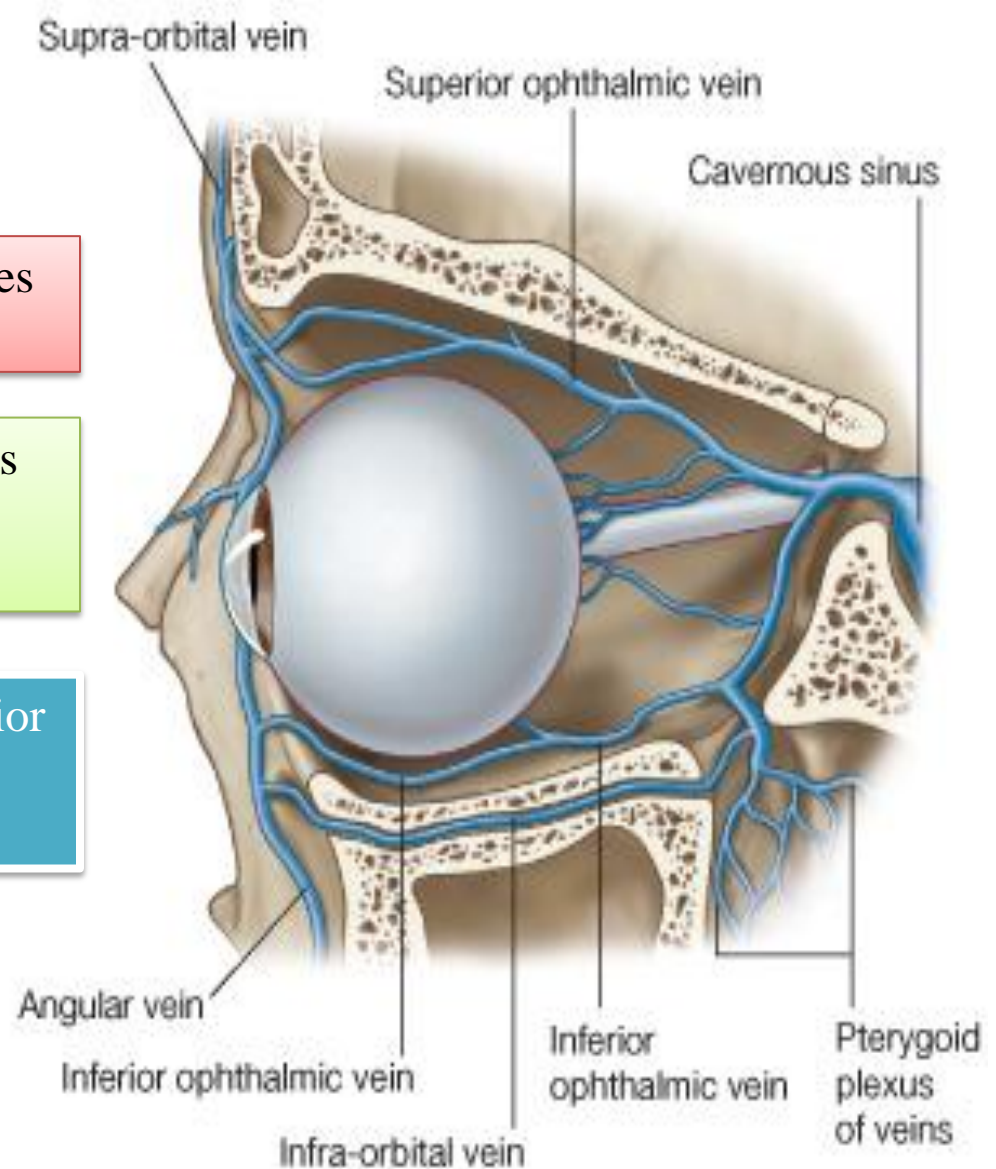
*The supratrochlear and supraorbital arteries* are distributed to the skin of the forehead

## 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**.





# MUSCLES OF THE EYE

There are two groups of muscles within the orbit:  
*1-extrinsic muscles of eyeball* (extra-ocular muscles) involved *in movements of the eyeball or raising upper eyelids*;  
*2-intrinsic muscles* within the eyeball, which control the shape of the lens and size of the pupil.

The extrinsic muscles include

**THE LEVATOR PALPEBRAE SUPERIORIS**

**SUPERIOR RECTUS**

**INFERIOR RECTUS**

**MEDIAL RECTUS**

**LATERAL RECTUS**

**SUPERIOR OBLIQUE**

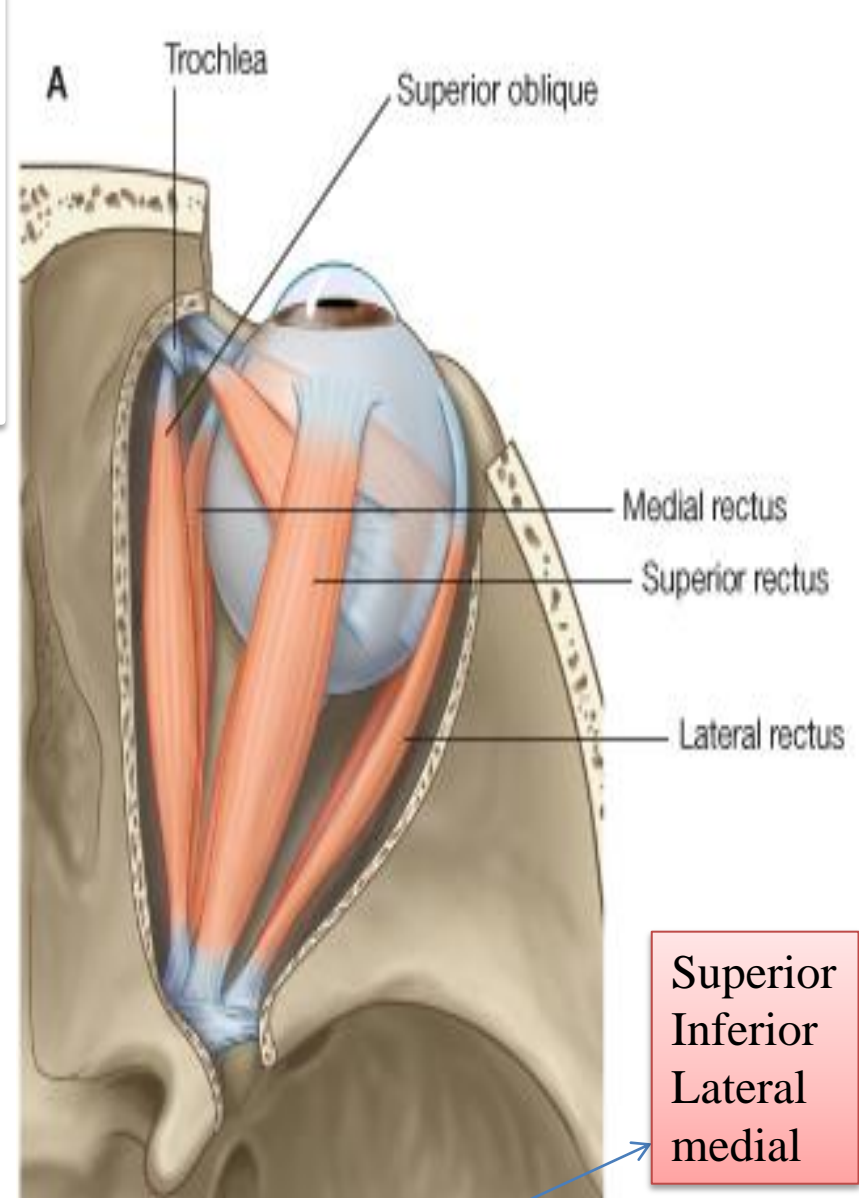
**INFERIOR OBLIQUE**

*The intrinsic* muscles include

**THE CILIARY MUSCLE**

**THE SPHINCTER PUPILLAE**

**THE DILATOR PUPILLAE**



Superior  
Inferior  
Lateral  
medial

7 muscles

6 muscles

4 recti muscles  
2 oblique muscles

Superior  
inferior

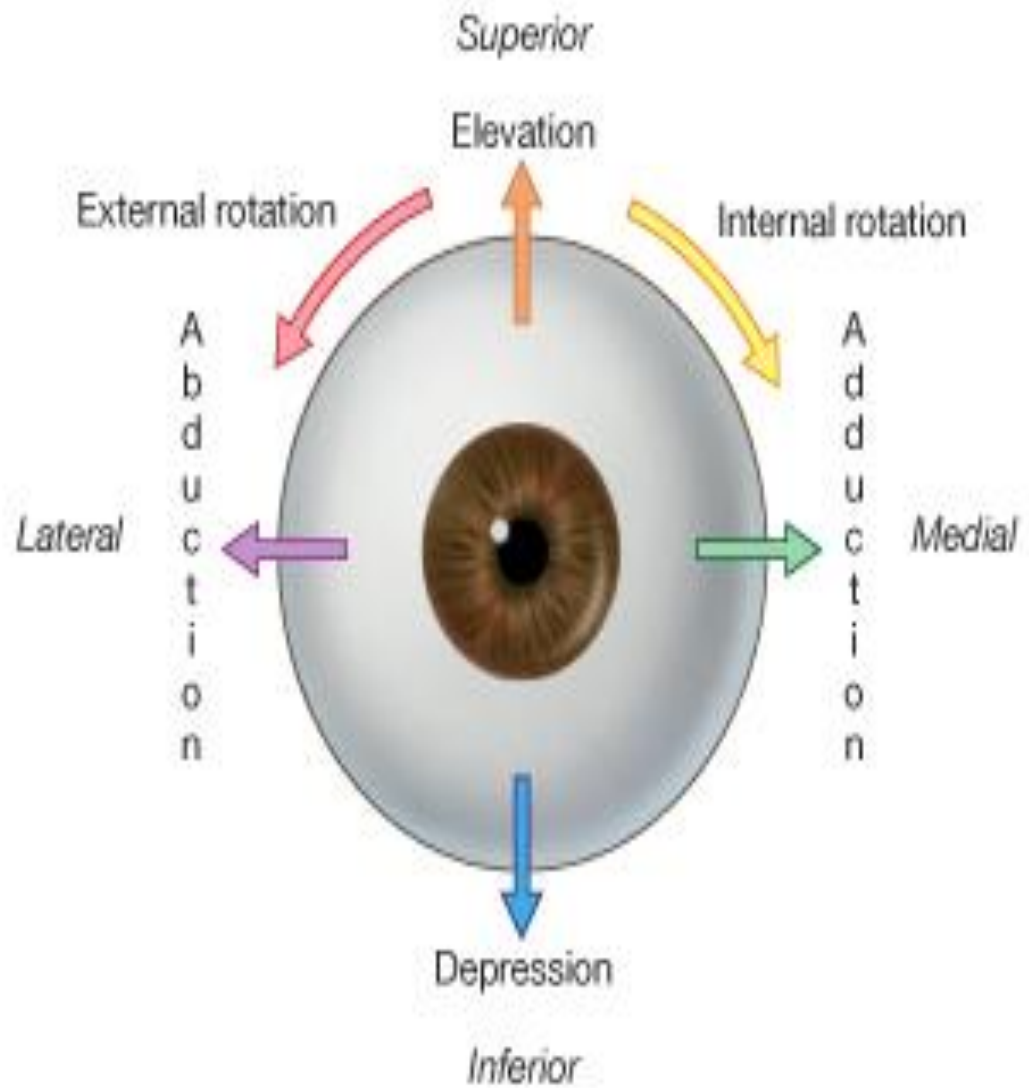
+ 1 levator palpebrae superioris

**Extrinsic muscles**  
Of the seven muscles in the extrinsic group of muscles, one raises the eyelids, while the other six move the eyeball itself  
The movements of the eyeball, in three dimensions are:

**elevation**-moving the pupil superiorly  
**depression**-moving the pupil inferiorly  
**abduction**-moving the pupil laterally  
**adduction**-moving the pupil medially  
**internal rotation**-rotating the upper part of the pupil medially (or towards the nose)  
**external rotation**-rotating the upper part of the pupil laterally (or towards the temple)

the oculomotor nerve [III].

levator palpebrae superioris raises the upper eyelid.



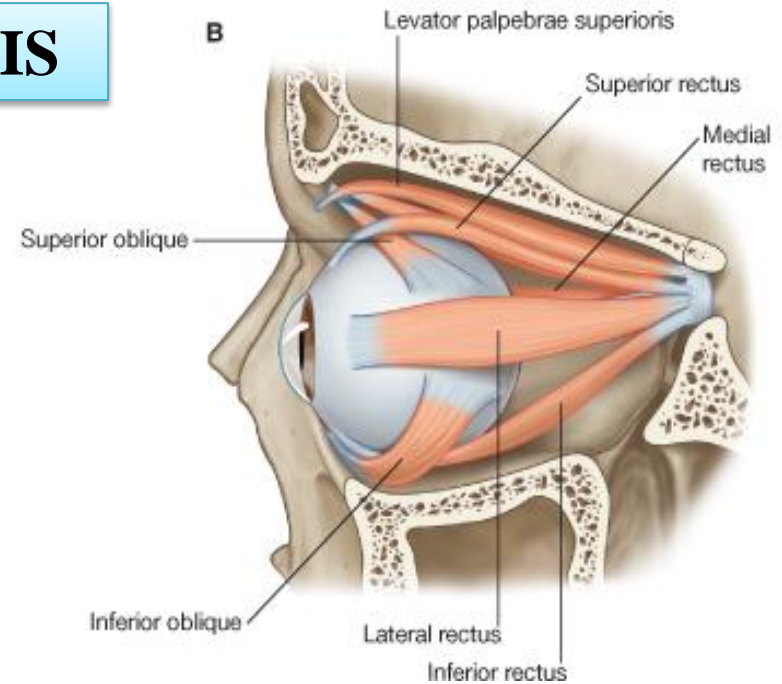
# 1-LEVATOR PALPEBRAE SUPERIORIS

**Origin:** Lesser wing of sphenoid anterior to optic canal

**Insertion:** Anterior surface of tarsal plate; a few fibers to skin and superior conjunctival fornix

**Nerve supply:** Oculomotor nerve /superior branch

**Actions:** Elevation of upper eyelid



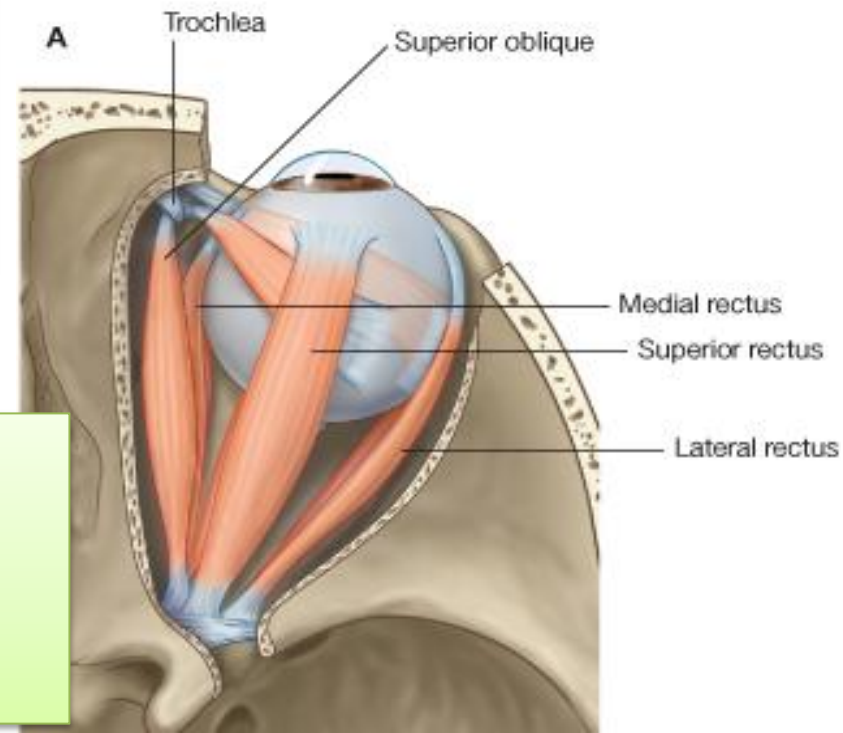
## 2-SUPERIOR RECTUS

**Origin:** Superior part of common tendinous ring

**Insertion:** Anterior half of eyeball superiorly

**Nerve supply:** Oculomotor nerve /superior branch

**Function:** Elevation, adduction, medial rotation of eyeball



## 3-INFERIOR RECTUS

**Origin:** Inferior part of common tendinous ring

**Insertion:** Anterior half of eyeball inferiorly

**Nerve supply:** Oculomotor nerve /inferior branch

**ACTION:** Depression, adduction, lateral rotation of eyeball



## 4-MEDIAL RECTUS

**Origin:** Medial part of common tendinous ring

**Insertion:** Anterior half of eyeball medially

**Nerve supply:** Oculomotor nerve /inferior branch

**Action:** Adduction of eyeball

## 5-Lateral rectus

**Origin:** Lateral part of common tendinous ring

**Insertion:** Anterior half of eyeball laterally

**Nerve supply:** Abducent nerve [VI]

**Action:** Abduction of eyeball

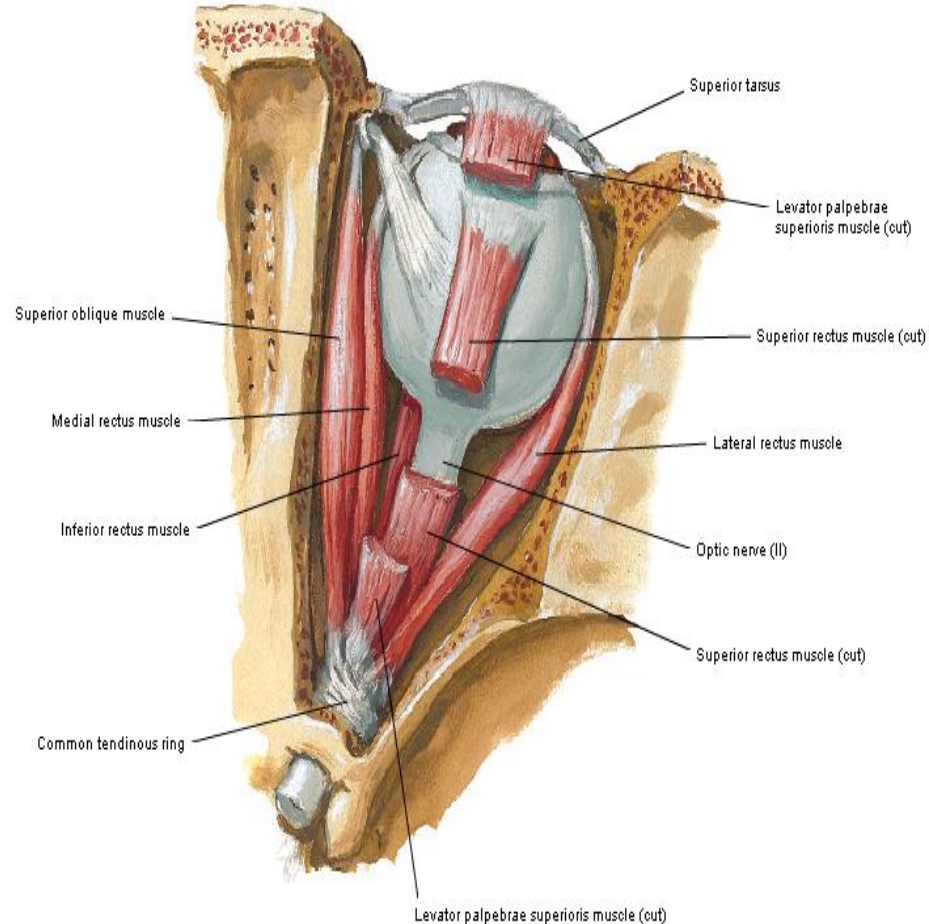
## 6-Superior oblique

**Origin:** Body of sphenoid, superior and medial to optic canal

**Insertion:** Outer posterior quadrant of eyeball

**Nerve supply:** Trochlear nerve

**Action:** Depression, abduction, medial rotation of eyeball



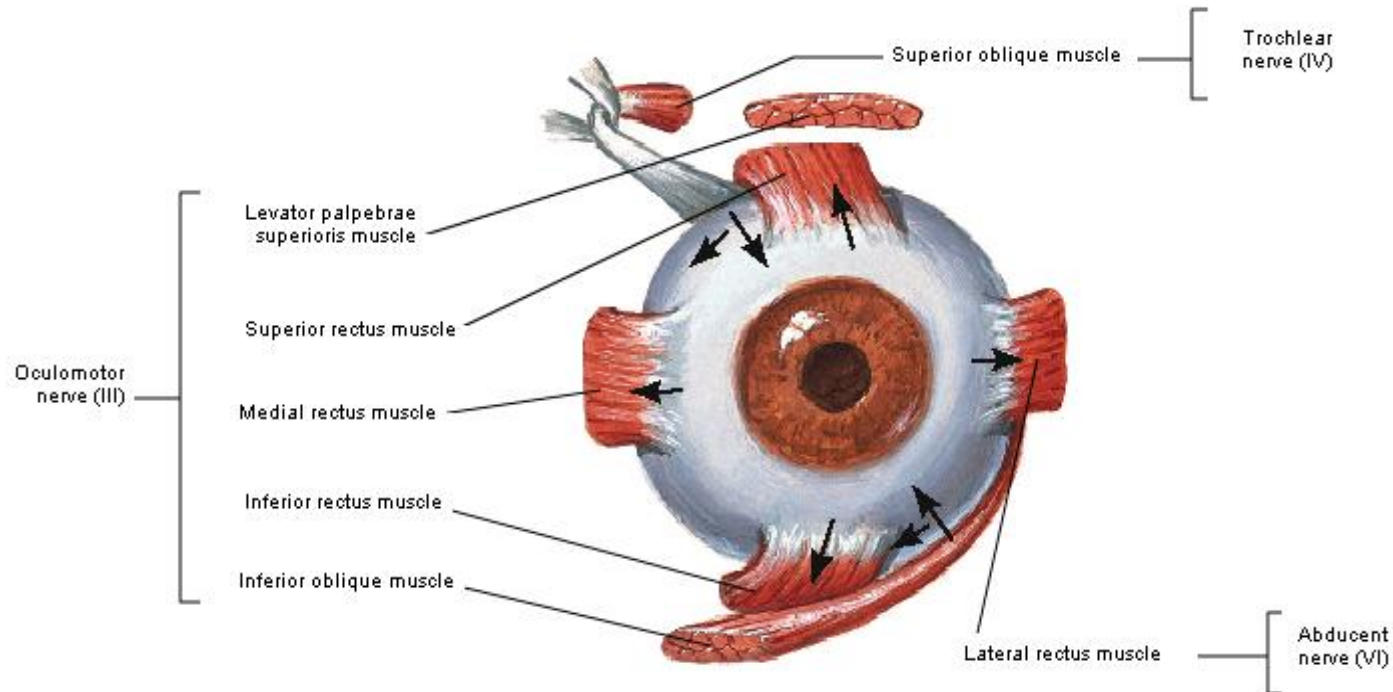
# 7-INFERIOR OBLIQUE

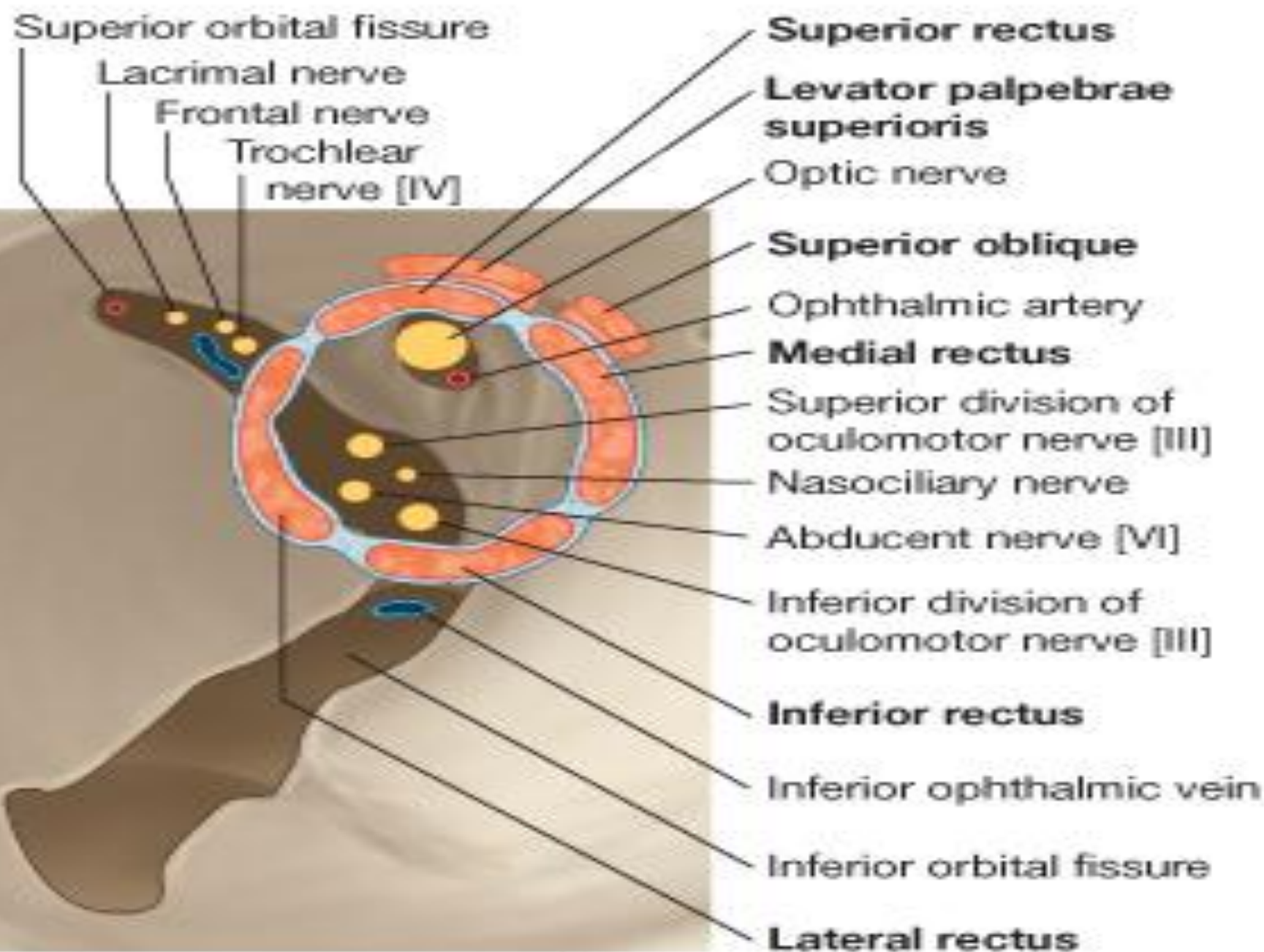
**Origin:** Medial floor of orbit posterior to rim;  
**maxilla lateral** to nasolacrimal groove

**Insertion:** Outer posterior quadrant of eyeball

**Nerve supply:** Oculomotor nerve /inferior  
branch

**Action:** *Elevation, abduction, lateral rotation  
of eyeball*





*Lateral*

*Medial*



Lacrimal branch of ophthalmic [V<sub>1</sub>]

Frontal branch of ophthalmic nerve [V<sub>1</sub>]

Trochlear nerve [IV]

Optic nerve

Optic canal

Ophthalmic artery

Superior branch of oculomotor nerve [III]

Nasociliary branch of ophthalmic nerve [V<sub>1</sub>]

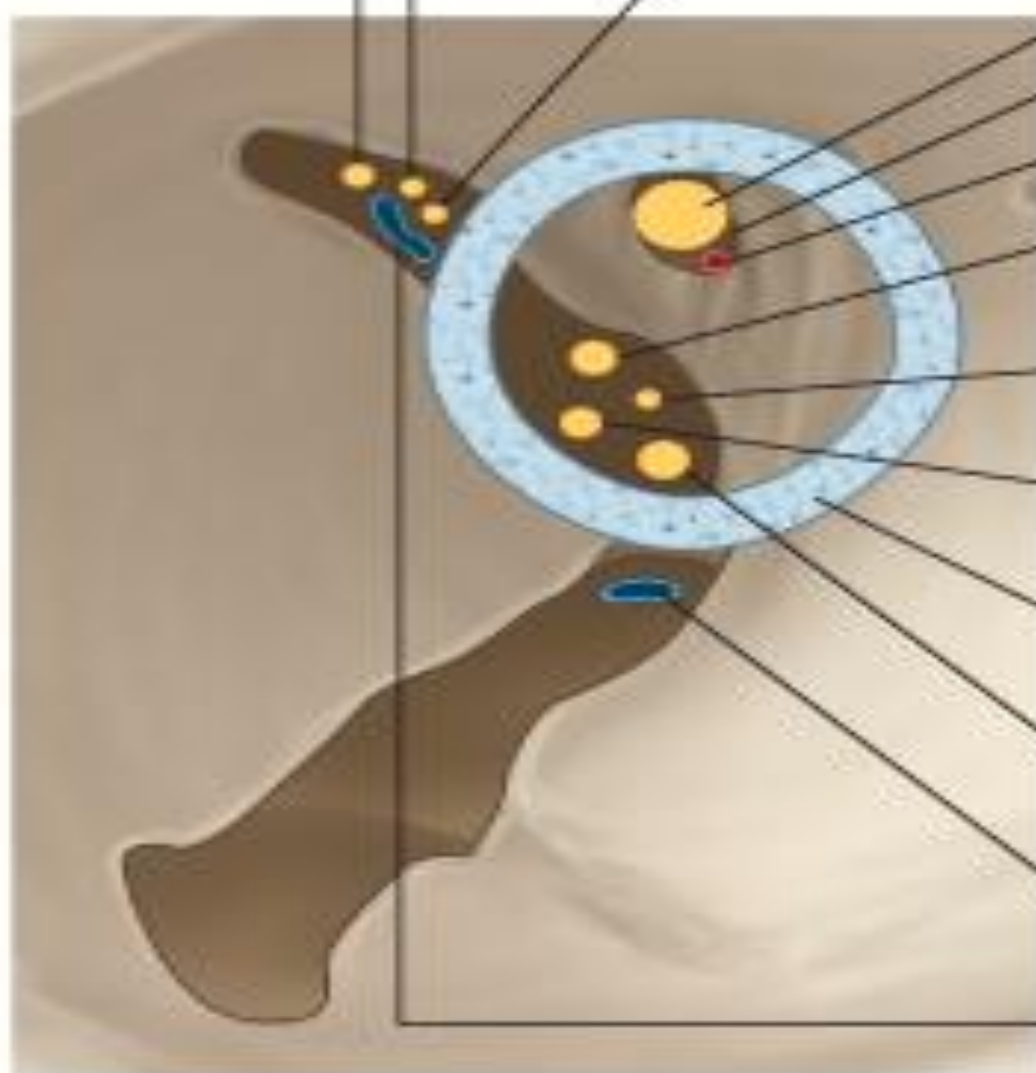
Abducent nerve [VI]

Common tendinous ring

Inferior branch of oculomotor nerve [III]

Inferior ophthalmic vein

Superior ophthalmic vein



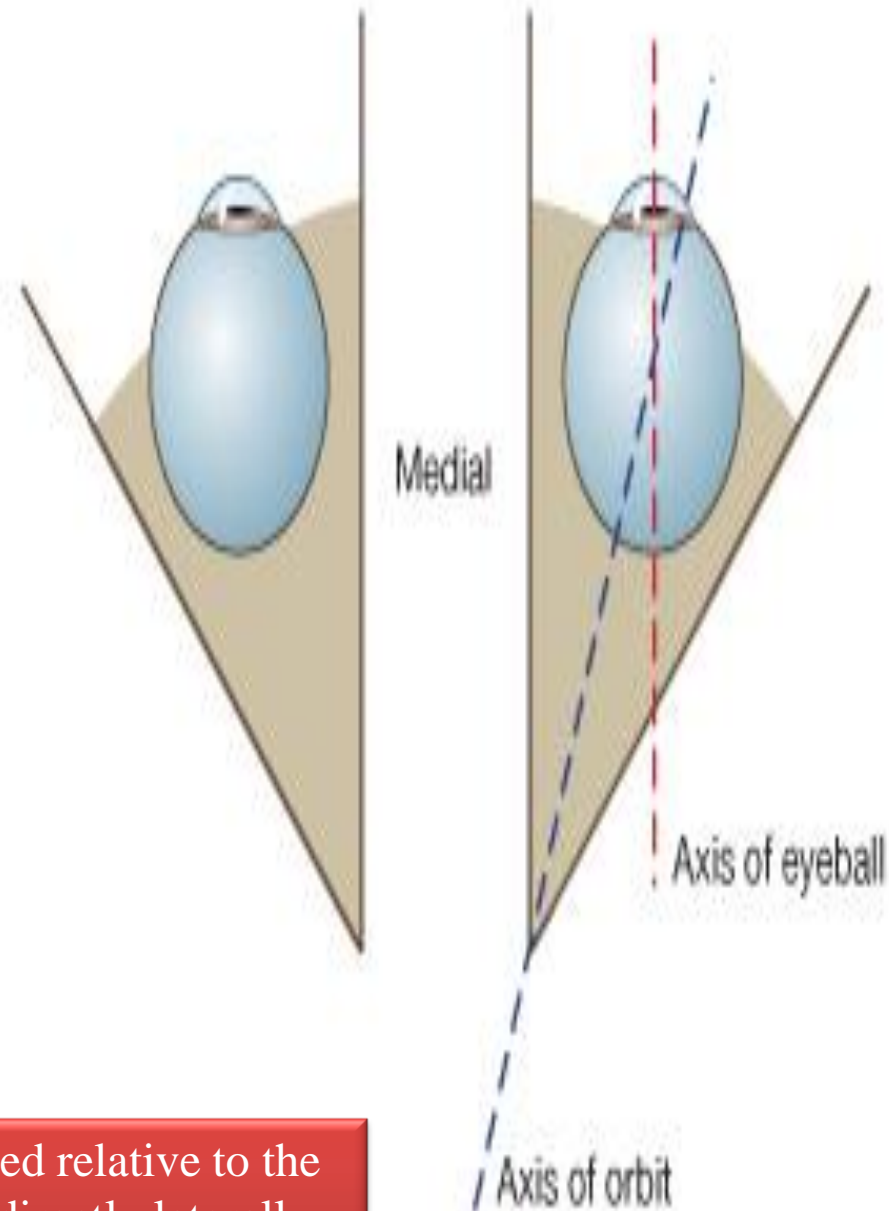
*Lateral*

*Medial*

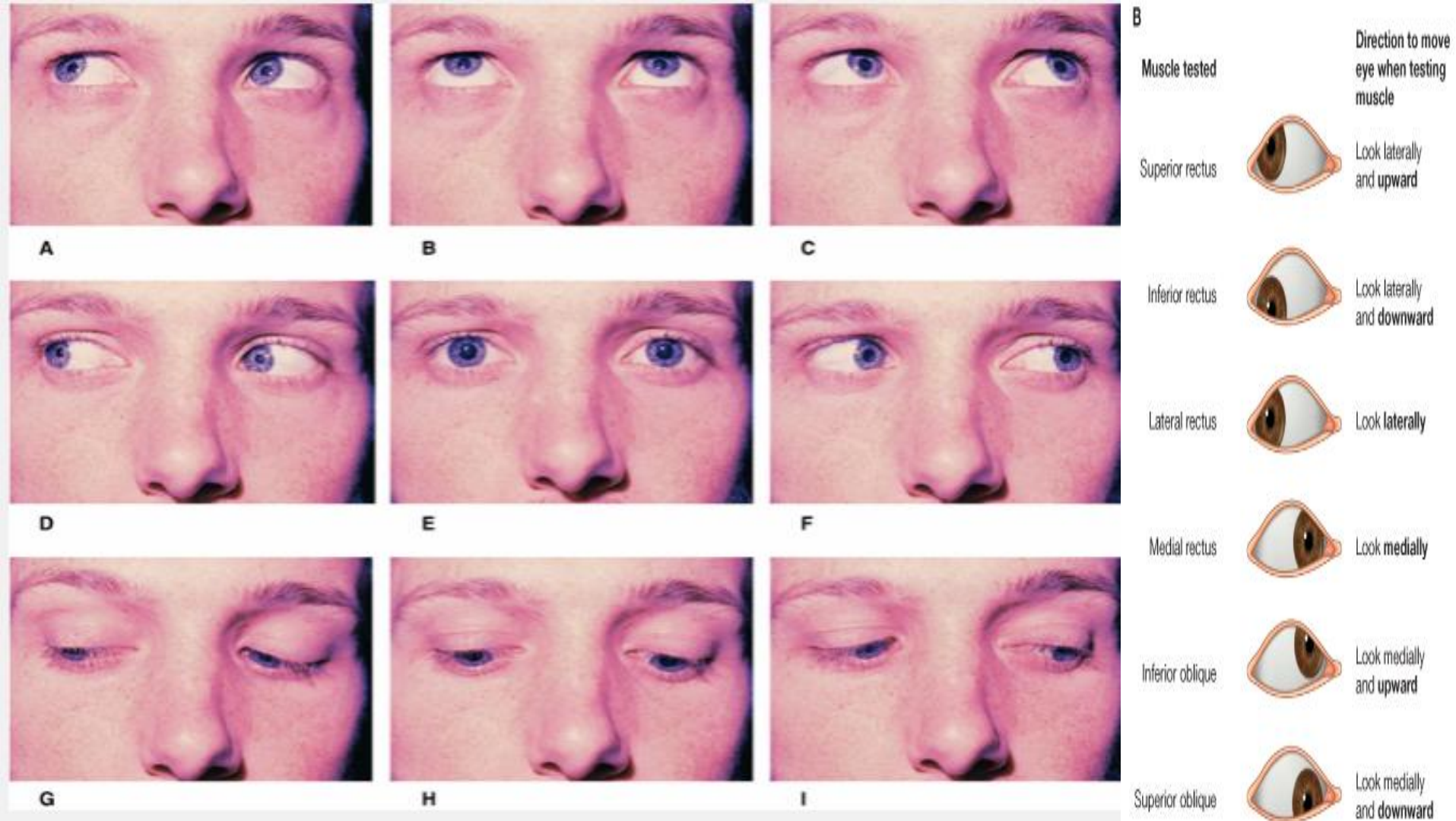
The origins of the superior and inferior recti are situated about  $23^\circ$  medial to their insertions, and, therefore, when the patient is asked to turn the cornea laterally, these muscles are placed in the optimum position to raise (superior rectus) or lower (inferior rectus) the cornea

the superior and inferior oblique muscles can be tested. The pulley of the superior oblique and the origin of the inferior oblique muscles lie medial and anterior to their insertions. The physician tests the action of these muscles by asking the patient first to look medially, thus placing these muscles in the optimum position to lower (superior oblique) or raise (inferior oblique) the cornea.

Because the lateral and medial recti are simply placed relative to the eyeball, asking the patient to turn his or her cornea directly laterally tests the lateral rectus and turning the cornea directly medially tests the medial rectus







**Figure 11-24** The cardinal positions of the right and left eyes and the actions of the recti and oblique muscles principally responsible for the movements of the eyes. **A.** Right eye, superior rectus muscle; left eye, inferior oblique muscle. **B.** Both eyes, superior recti and inferior oblique muscles. **C.** Right eye, inferior oblique muscle; left eye, superior rectus muscle. **D.** Right eye, lateral rectus muscle; left eye, medial rectus muscle. **E.** Primary position, with the eyes fixed on a distant fixation point. **F.** Right eye, medial rectus muscle; left eye, lateral rectus muscle. **G.** Right eye, inferior rectus muscle; left eye, superior oblique muscle. **H.** Both eyes, inferior recti and superior oblique muscles. **I.** Right eye, superior oblique muscle; left eye, inferior rectus muscle.



# Coats of the Eyeball

## 1- OUTER FIBROUS COAT

is made up of :

- 1-Posterior opaque part
- 2-THE SCLERA** ★

the dense white part

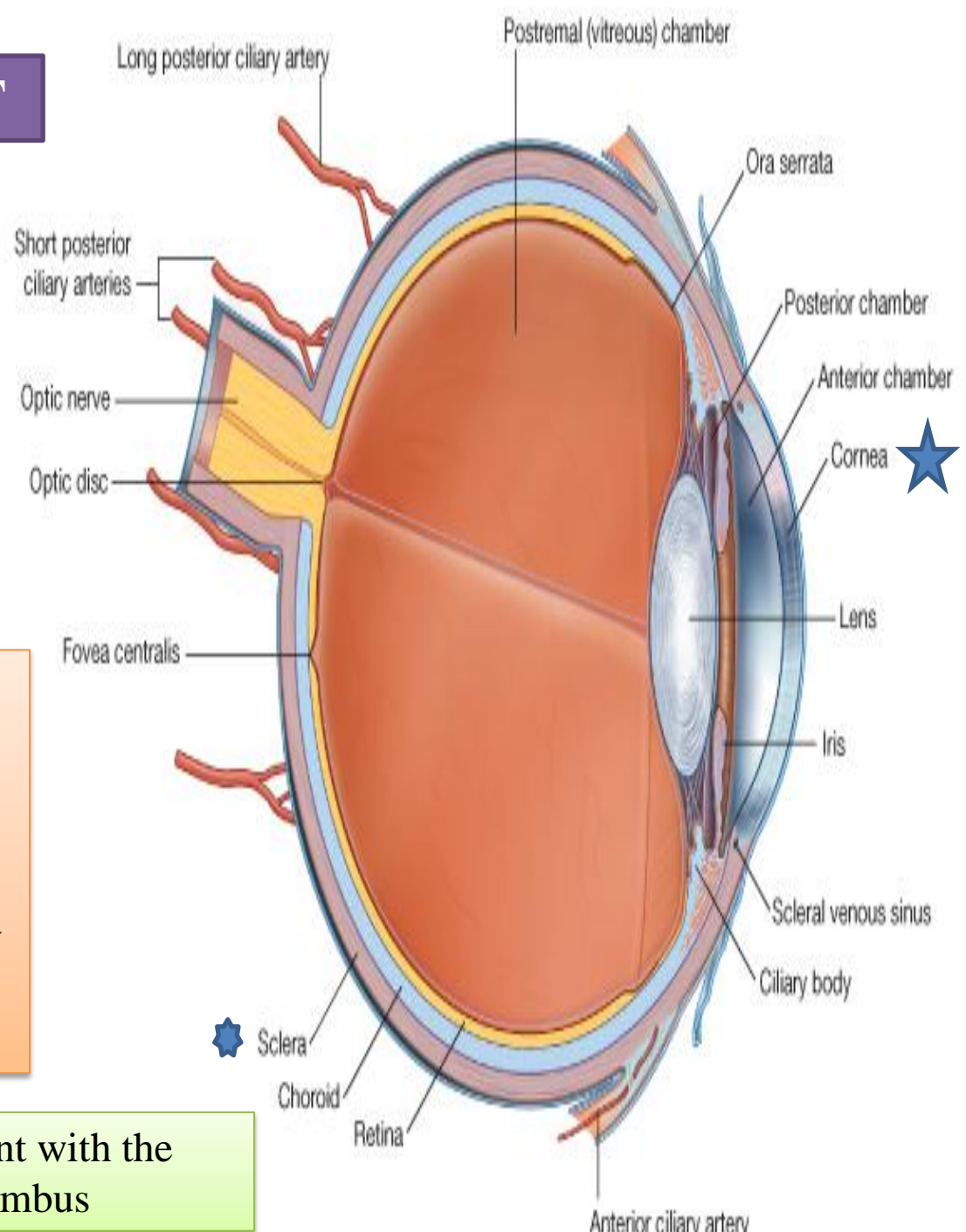
- 1- THE CORNEA** ★

the anterior transparent part

## The Sclera

- The sclera is composed of dense fibrous tissue and is white.
- Posteriorly, it is pierced by the optic nerve and is fused with the dural sheath of that nerve
- The sclera is also pierced by the ciliary arteries and nerves and their associated veins.

- The sclera is directly continuous in front with the cornea at the corneoscleral junction, or limbus



# The Cornea

- ❖ The transparent cornea is largely responsible for the refraction of the light entering the eye
- ❖ It is in contact posteriorly with the aqueous humor.

## Blood Supply

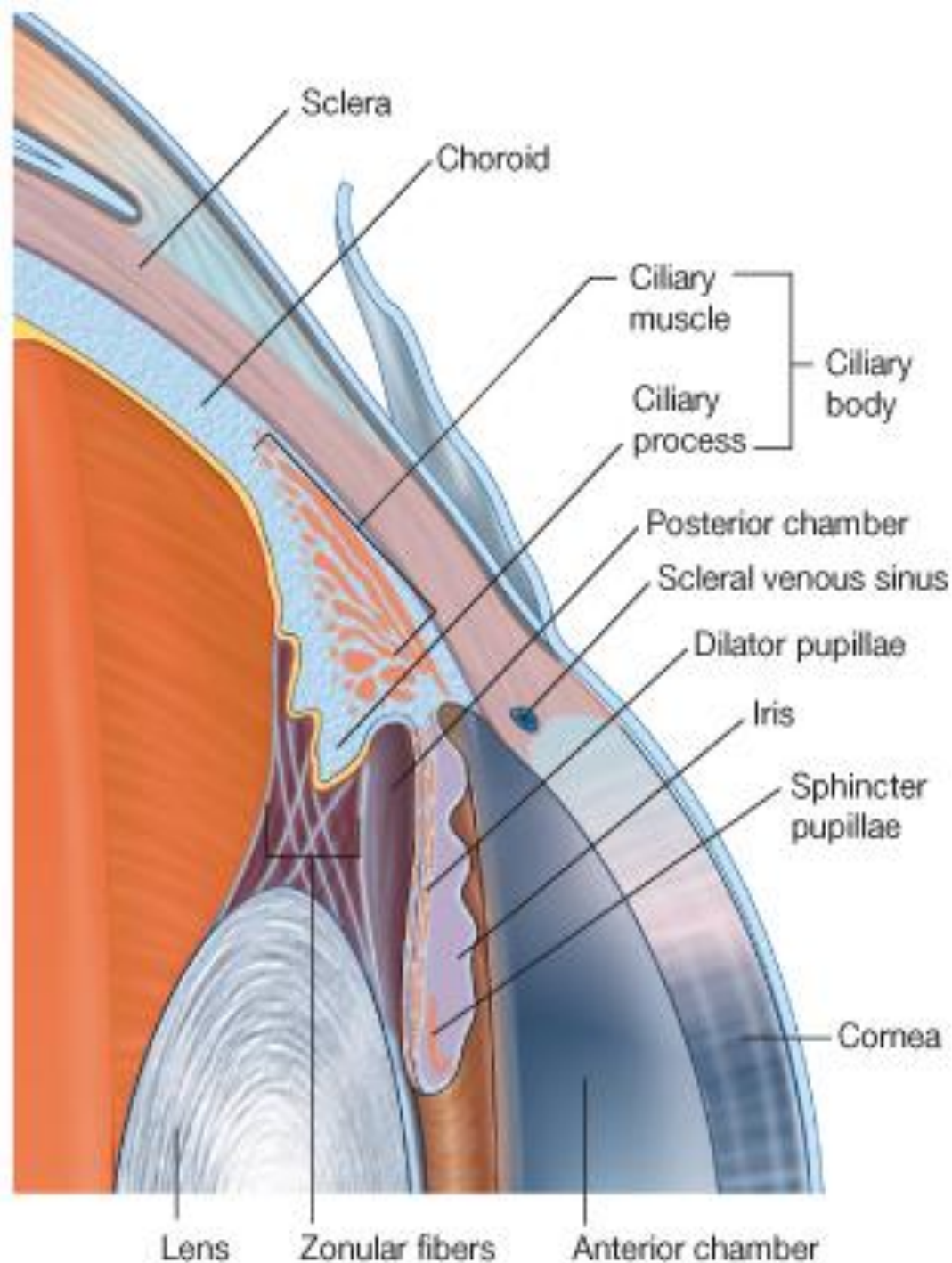
- The cornea is avascular and devoid of lymphatic drainage
- It is nourished by diffusion from the aqueous humor and from the capillaries at its edge.

## Nerve Supply

Long ciliary nerves from the ophthalmic division of the trigeminal nerve

## Function of the Cornea

The cornea is the most important refractive medium of the eye.



# 2-MIDDLE VASCULAR COAT

THE VASCULAR COAT  
CONSISTS OF:  
FROM BEHIND FORWARD

- 1- THE CHOROID
- 2-THE CILIARY BODY
- 3-THE IRIS.

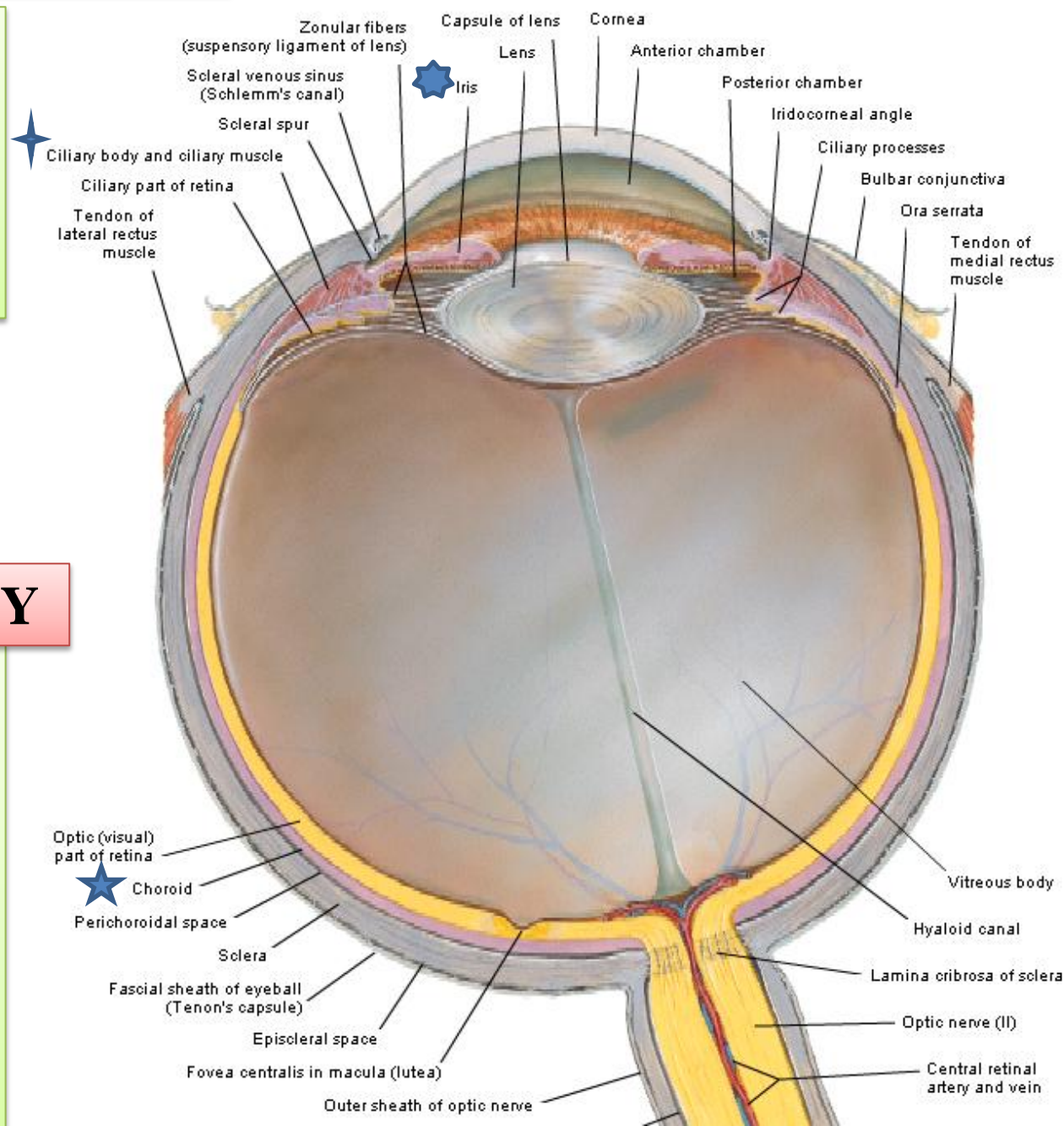
## 1-THE CHOROID

The choroid is a black vascular membrane deep to the sclera

## 2-THE CILIARY BODY

The ciliary body is continuous posteriorly with the choroid, and anteriorly it lies behind the peripheral margin of the iris  
Contains **the ciliary muscle (the main muscle of accommodation) which is connected to the suspensory ligaments of the lens**

Eyeball  
Cross Section





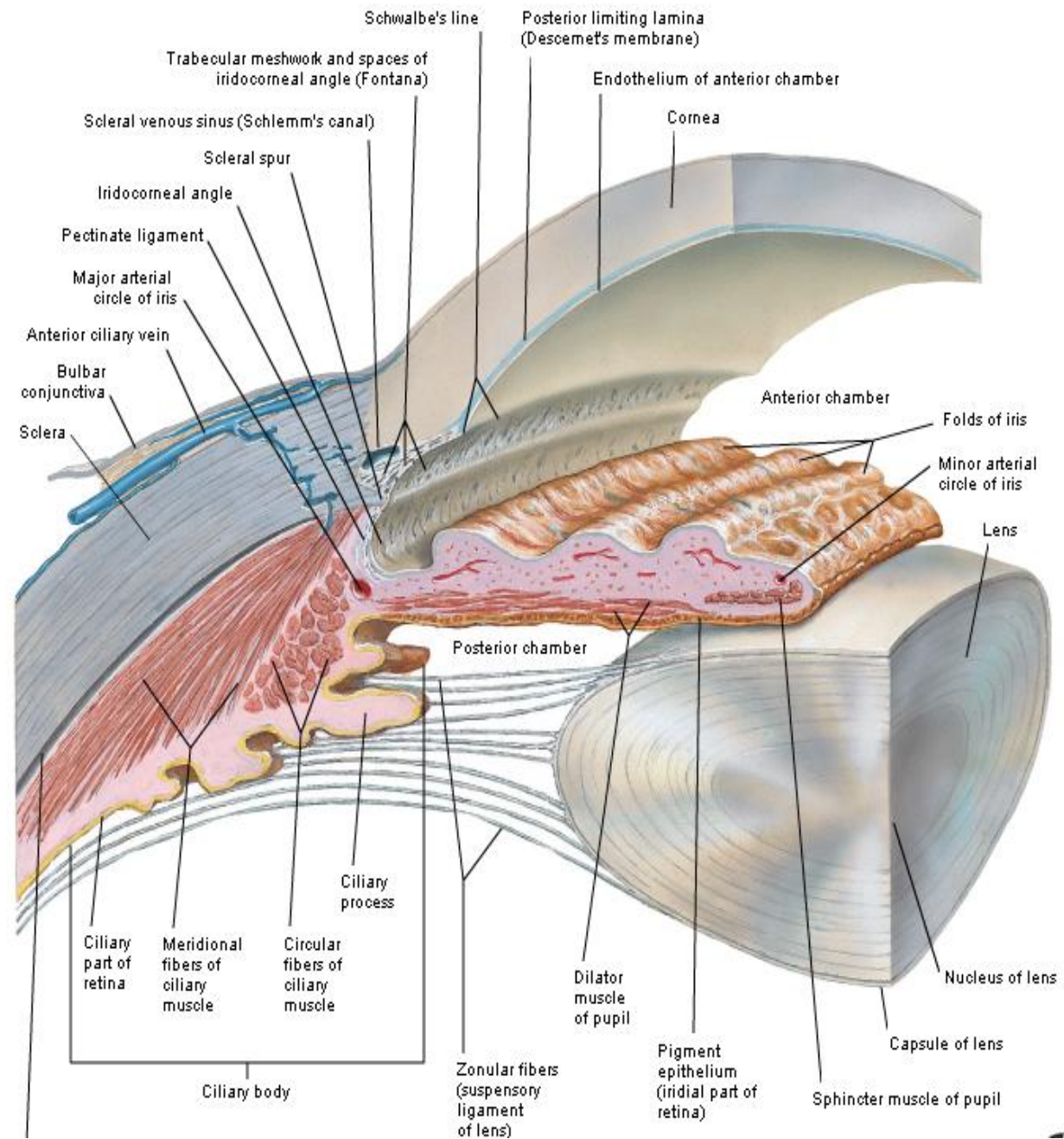
# The ciliary muscle

## Nerve supply:

The ciliary muscle is supplied by the parasympathetic fibers from the oculomotor nerve. After synapsing in the ciliary ganglion, the postganglionic fibers pass forward to the eyeball in the short ciliary nerves.

Action: Contraction of the ciliary muscle, This relieves the tension in the suspensory ligament, and the elastic lens becomes more convex. This increases the refractive power of the lens.

# Anterior and Posterior Chambers of Eye



# The Iris and Pupil

is a thin, contractile, pigmented diaphragm with a central aperture **The pupil**



- It is suspended in the aqueous humor between the cornea and the lens.
- The periphery of the iris is attached to the anterior surface of the ciliary body.
- It divides the space between the lens and the cornea into an anterior and a posterior chamber.

➤ The muscle fibers of the iris are ***involuntary*** and consist of circular and radiating fibers.

➤ ***The circular fibers*** form the **sphincter pupillae**

Nerve supply: The sphincter pupillae is supplied by **parasympathetic** fibers from the oculomotor nerve. After synapsing in the ciliary ganglion, the postganglionic fibers pass forward to the eyeball in the short ciliary nerves.

➤ ***The radial fibers*** form the **dilator pupillae** is supplied by **sympathetic** fibers, which pass forward to the eyeball in the long ciliary nerves.

## Action:

The sphincter pupillae constricts the pupil in the presence of bright light and during accommodation.

The dilator pupillae dilates the pupil in the presence of light of low intensity or in the presence of excessive sympathetic activity such as occurs in fright

### 3-Nervous Coat: The Retina

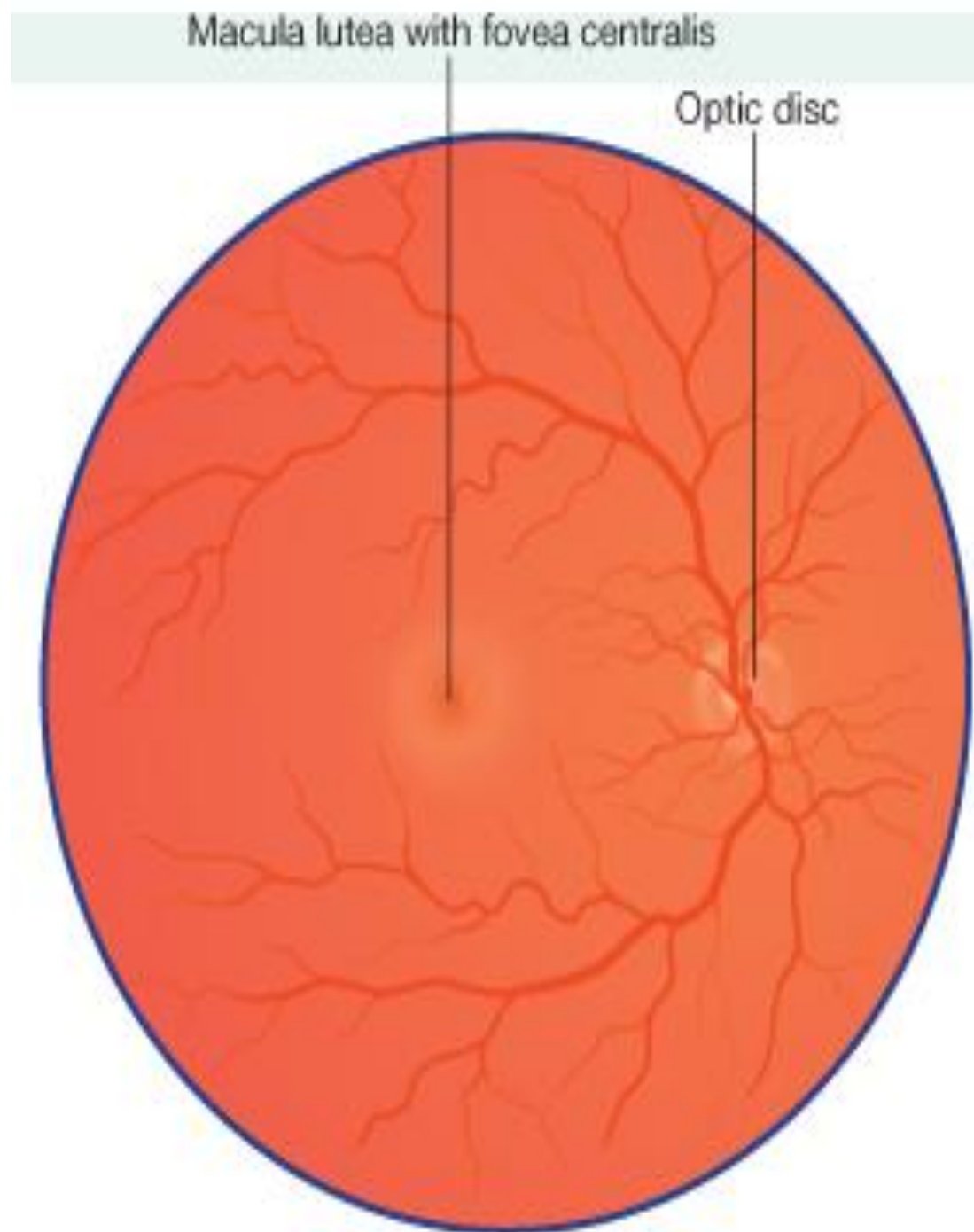
The retina consists of :

**1-AN OUTER PIGMENTED LAYER**

**2-AN INNER NERVOUS LAYER.**

➤ Its outer surface is in contact with the choroid, and its inner surface is in contact with the vitreous body

At the center of the posterior part of the retina is an oval, yellowish area, the macula lutea, which is the area of the retina for the most distinct vision. It has a central depression, the fovea centralis





## Contents of the Eyeball

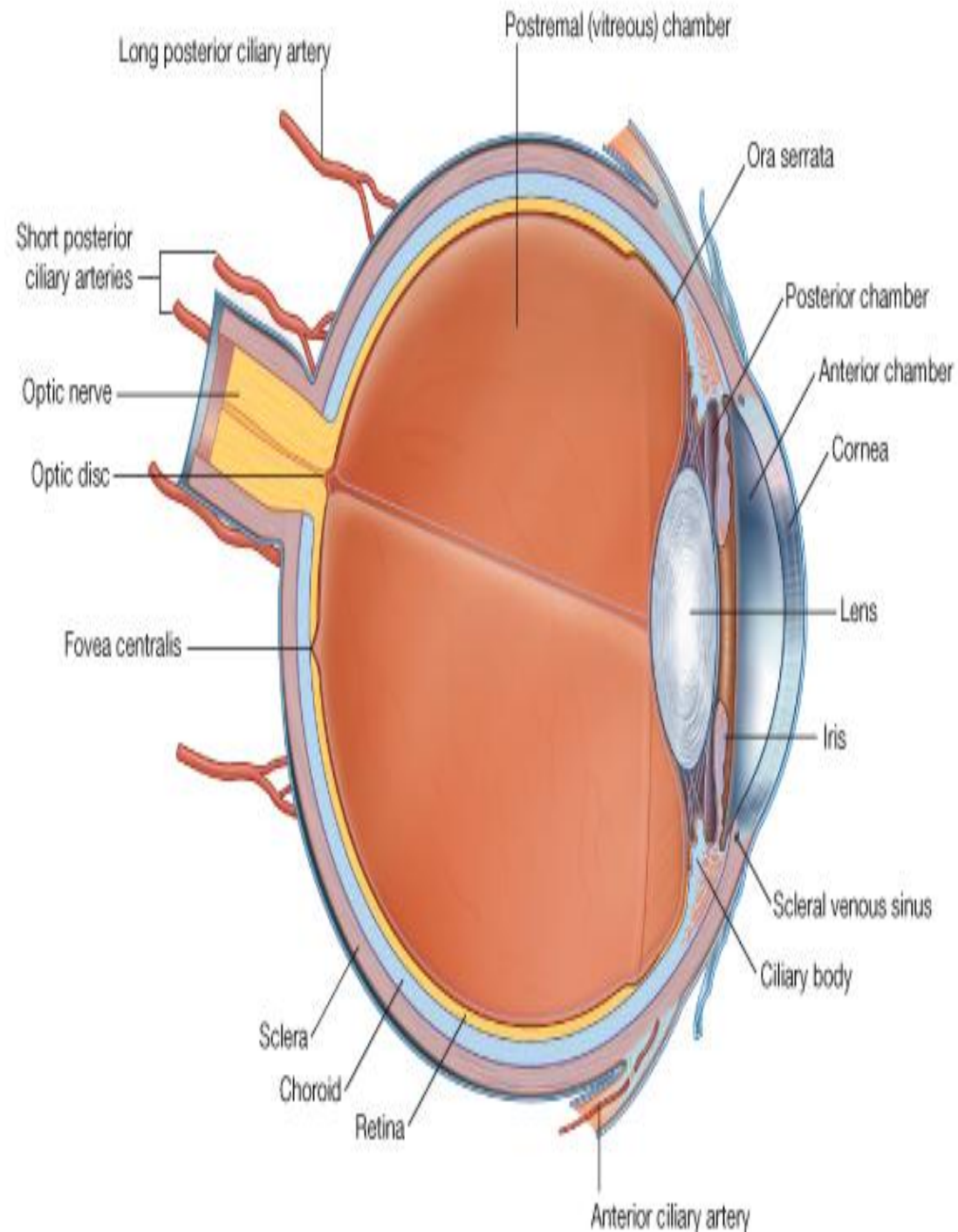
The contents of the eyeball consist of:

- 1-THE AQUEOUS HUMOR
- 2-THE VITREOUS BODY
- 3-THE LENS

### **Aqueous Humor**

is a clear fluid that fills the anterior and posterior chambers of the eyeball

Obstruction to the draining of the aqueous humor results in a rise in intraocular pressure called glaucoma.

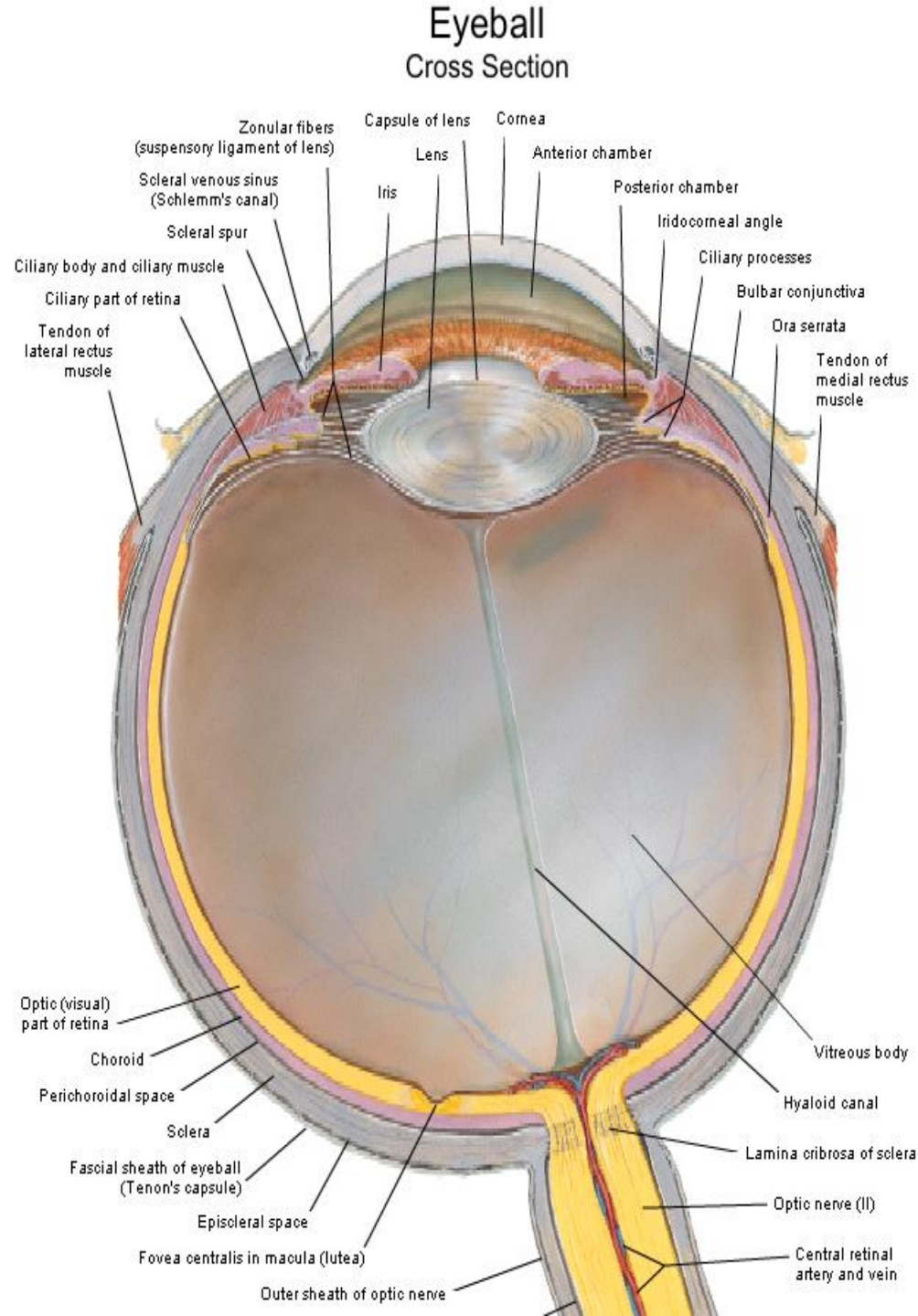


## Vitreous Body

The vitreous body fills the eyeball behind the lens and is a transparent gel.

The hyaloid canal is a narrow channel that runs through the vitreous body from the optic disc to the posterior surface of the lens; in the fetus, it is filled by the hyaloid artery, which disappears before birth.

The function of the vitreous body is to contribute slightly to the magnifying power of the eye. It supports the posterior surface of the lens and assists in holding the neural part of the retina against the pigmented part of the retina.



# The Lens

The lens is a transparent, biconvex structure enclosed in a transparent capsule.

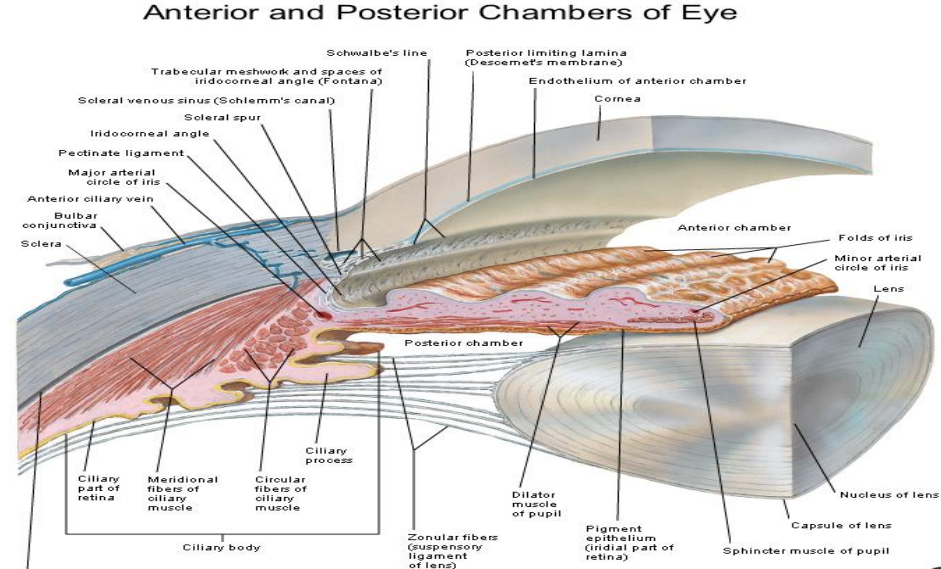
It is situated behind the iris and in front of the vitreous body and is encircled by the ciliary processes.

## Accommodation of the Eye

To accommodate the eye for close objects, the ciliary muscle contracts and pulls the ciliary body forward and inward so that the radiating fibers of the suspensory ligament are relaxed. This allows the elastic lens to assume a more globular shape.

With advancing age, the lens becomes denser and less elastic, and, as a result, the ability to accommodate is lessened (presbyopia). This disability can be overcome by the use of an additional lens in the form of glasses to assist the eye in focusing on nearby objects.

Constriction of the Pupil During Accommodation of the Eye



To ensure that the light rays pass through the central part of the lens so spherical aberration is diminished during accommodation for near objects, the sphincter pupillae muscle contracts so the pupil becomes smaller

## Convergence of the Eyes During Accommodation of the Lens

In humans, the retinae of both eyes focus on only one set of objects (single binocular vision). When an object moves from a distance toward an individual, the eyes converge so that a single object, not two, is seen. Convergence of the eyes results from the coordinated contraction of the medial rectus muscles