



The orbit-2.

Edited by: Alia Abbadi

Dr. Heba Kalbouneh
Associate Professor of Anatomy and Histology

Eyelids

❖ The eyelids (act like the curtains) protect the eye from injury and **excessive light** by their closure

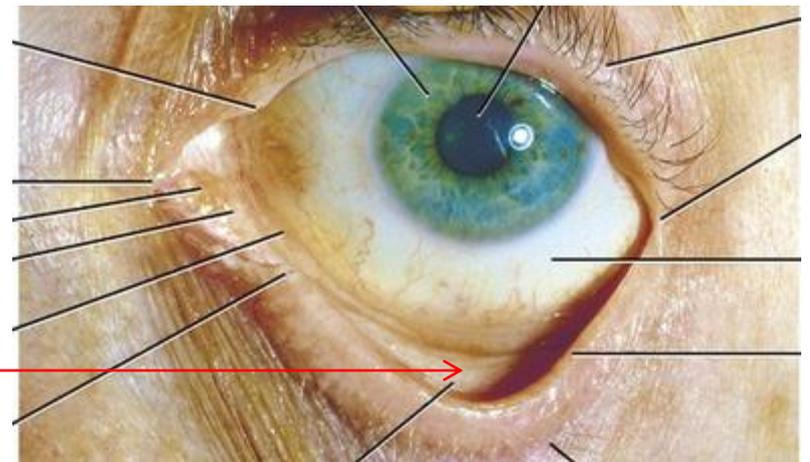
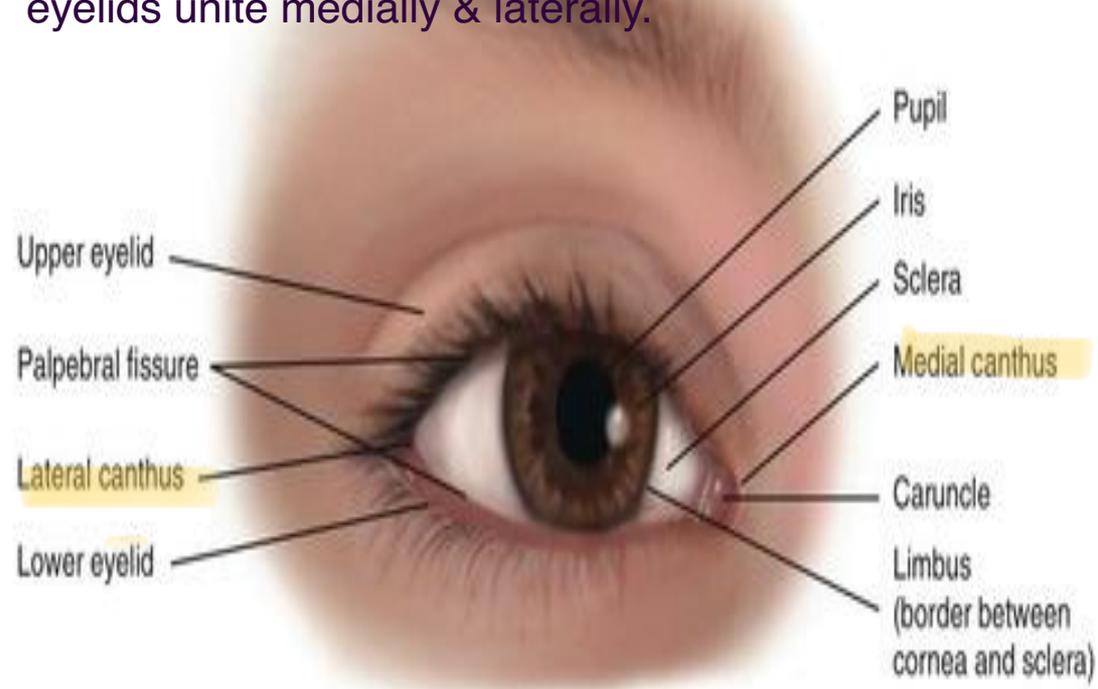
❖ The upper eyelid is **larger** and **more mobile** than the lower because of its attachment to the **levator palpebrae superioris**

❖ The upper and lower eyelids meet each other at **the medial and lateral angles.**

❖ The **palpebral fissure** is the space between the eyelids when they are open

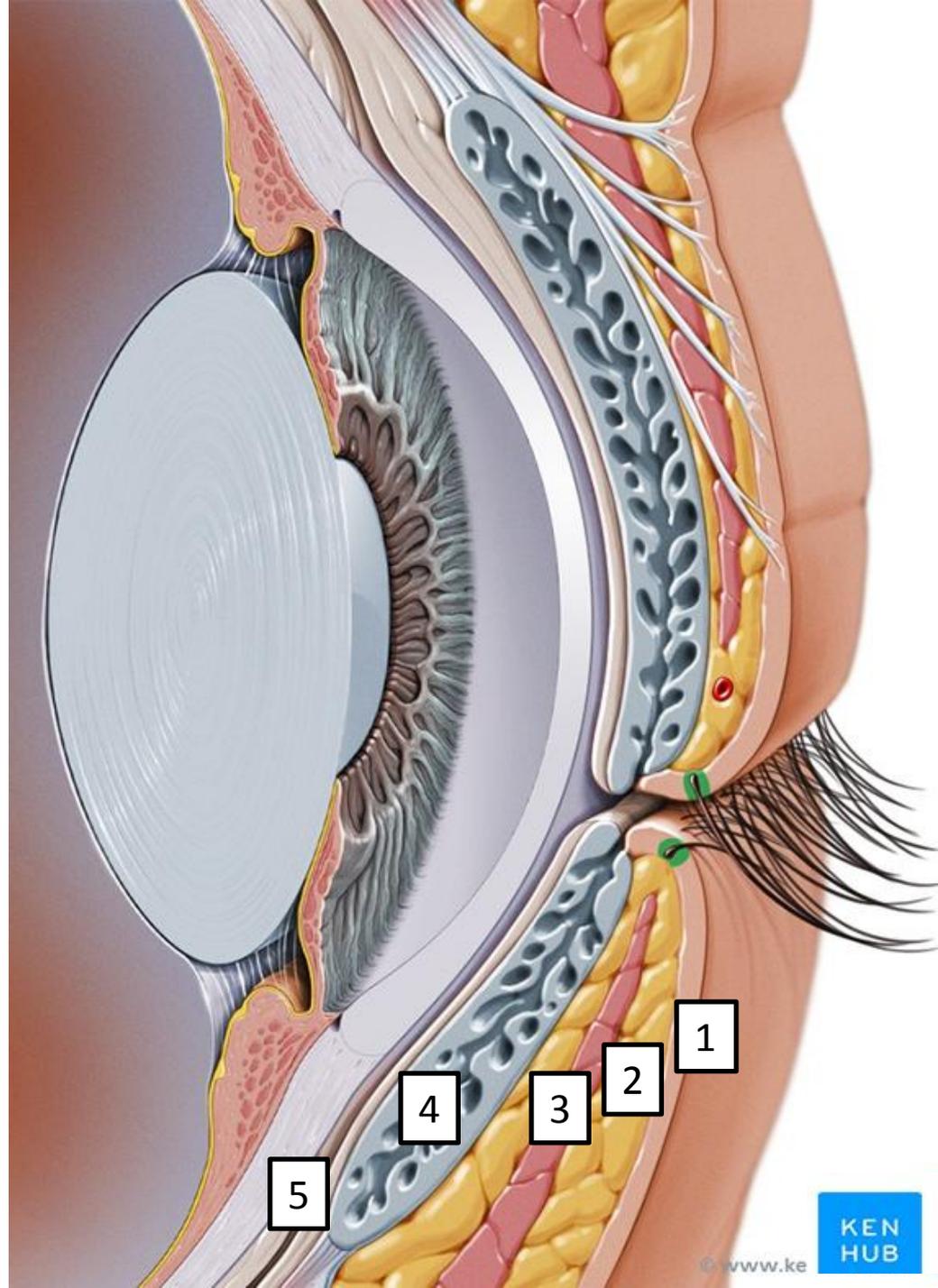
❖ The **palpebral fissure** is the entrance into the **conjunctival sac**
Where eye drops are put

Medial canthus & lateral canthus: (medial & lateral angles) Where the upper & lower eyelids unite medially & laterally.



The layers of the eyelids:
(from anterior to posterior)

- Superficial fascia
1. Skin
 2. Subcutaneous tissue
 3. Voluntary muscle
 4. The orbital septum (tarsus)
 5. Conjunctiva



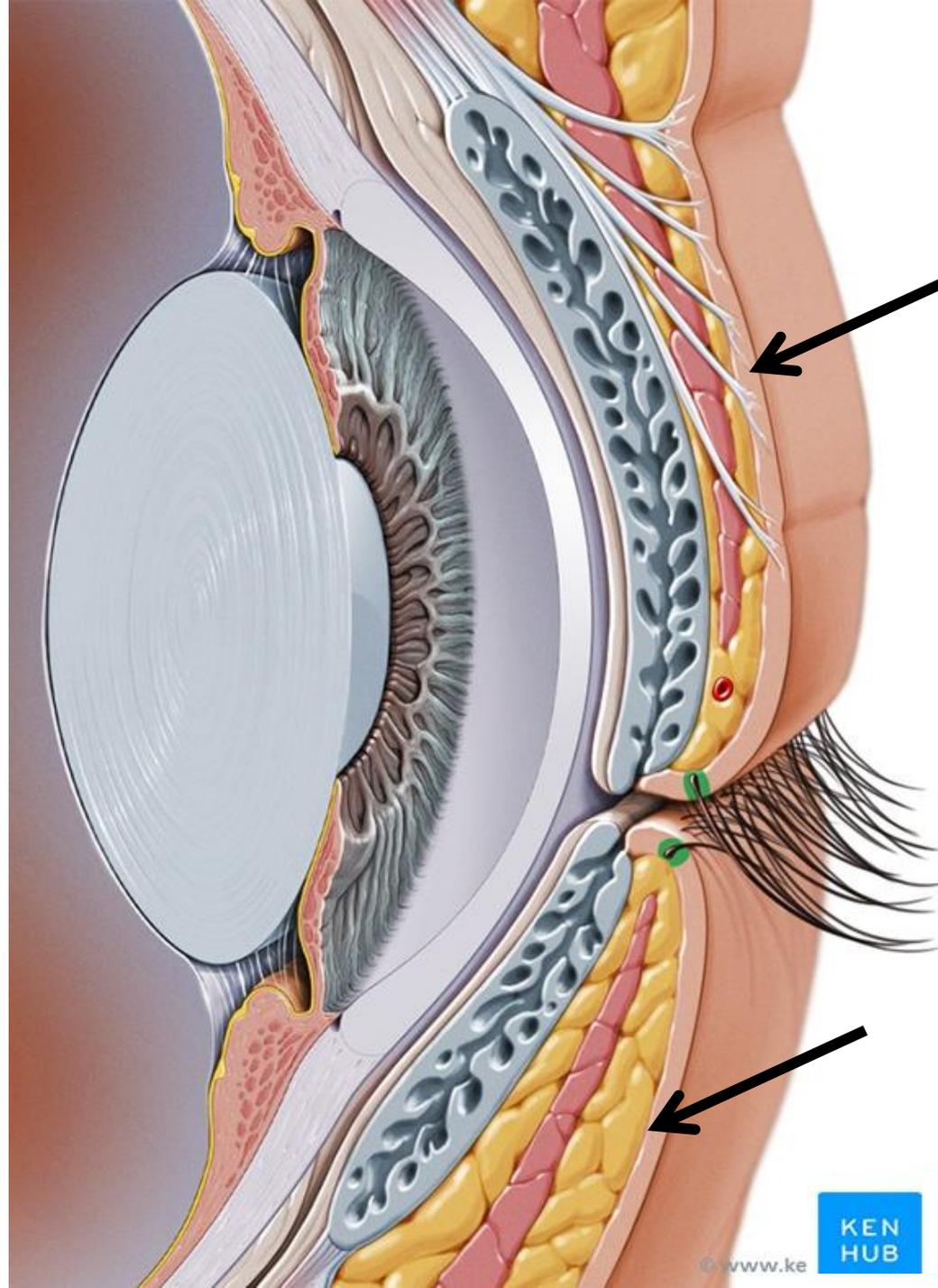
Structure of the eyelids

1 & 2: Skin and subcutaneous tissue:

- Thin
- Only a thin layer of connective tissue (can be easily become oedematous (with fluid or blood))

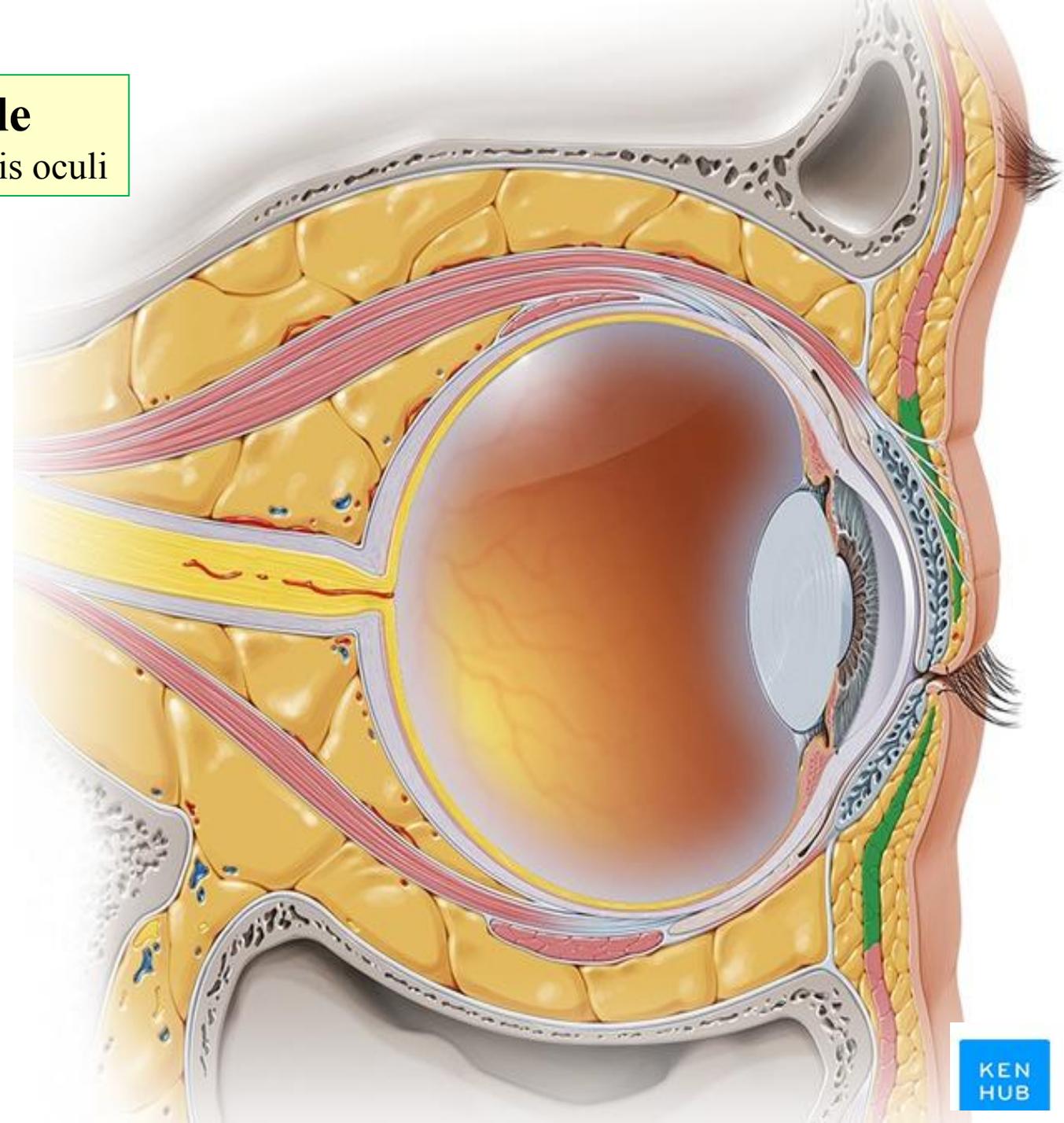
Contains:

- 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 (Cooling effect)



3- Voluntary muscle

Palpebral part of orbicularis oculi



4- Orbital septum (Palpebral fascia)

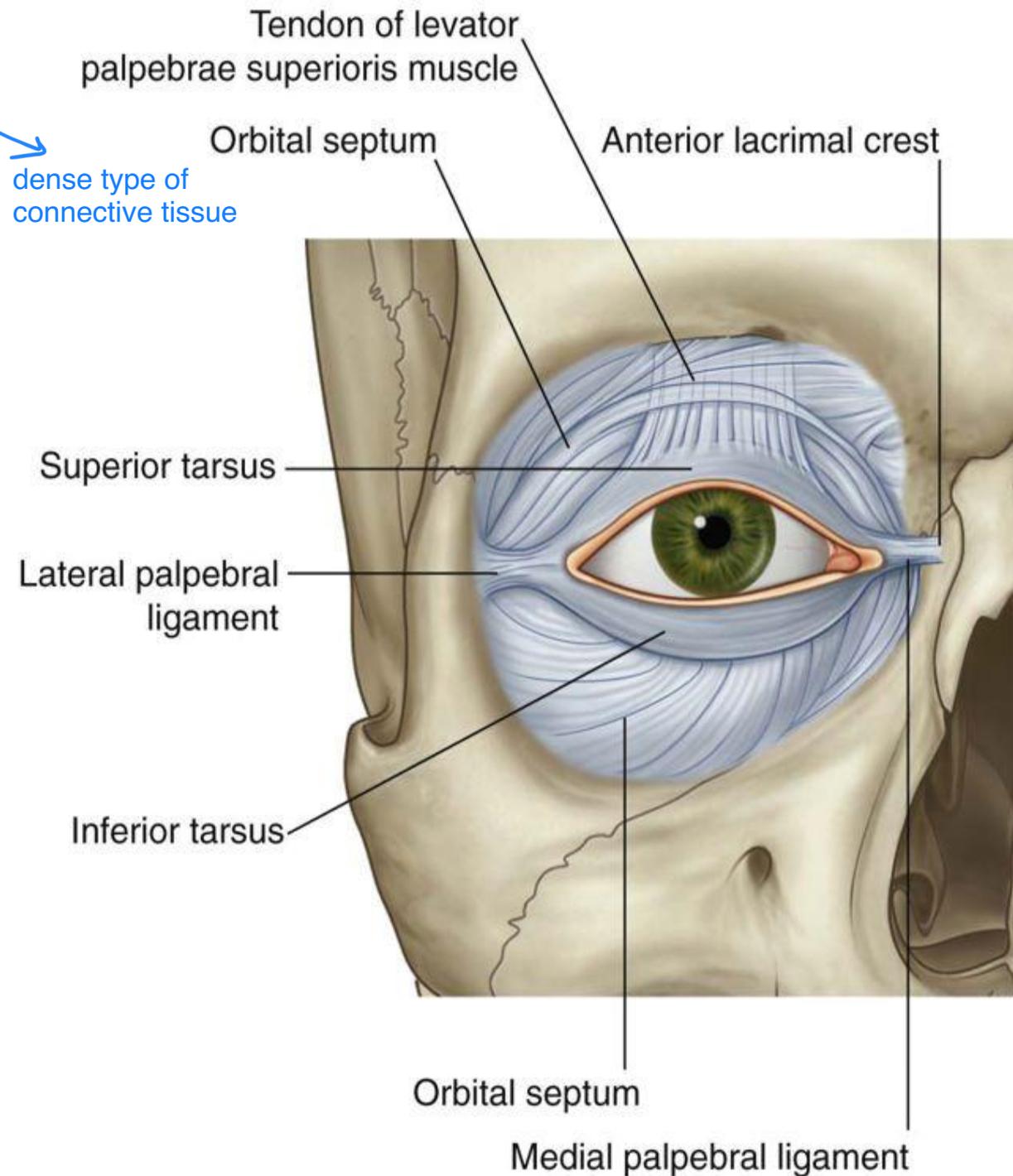
An extension of periosteum into both the upper and lower eyelids from the orbital margin

➤ 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**, to the orbital margin

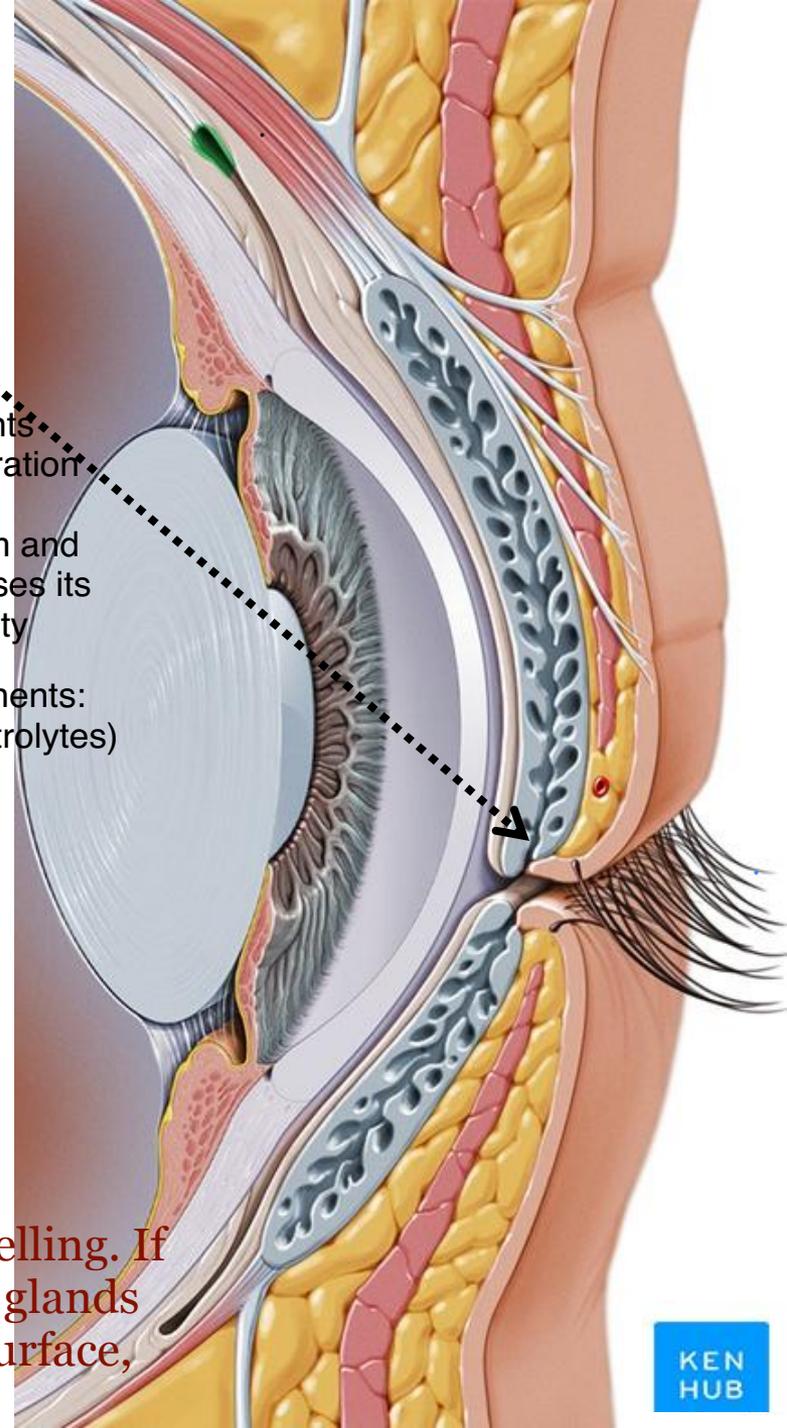
The medial ends of the plates are attached by a band, **the medial palpebral ligament**, to the orbital margin.

Tarsus provides major support for each eyelid



- The **tarsal glands** are long, modified sebaceous glands that pour their oily secretion onto the free margin of the lid; their openings lie behind the eyelashes
- This oily material prevents the overflow of tears and helps make the closed eyelids airtight.
(Meibomian glands)

Prevents evaporation of the tearfilm and increases its viscosity



Tearfilm that covers the anterior surface of the eyeball has many components:

- 1- aqueous part that is produced in the lacrimal gland (water+some electrolytes)
- 2- mucus from the conjunctiva that contains goblet cells
- 3- lipid material from tarsal glands



Sebaceous glands can become obstructed & cause swelling. If the swelling is in the outer surface of the eyelid, then glands of zeis are obstructed. If the swelling is in the inner surface, then tarsal glands are obstructed.

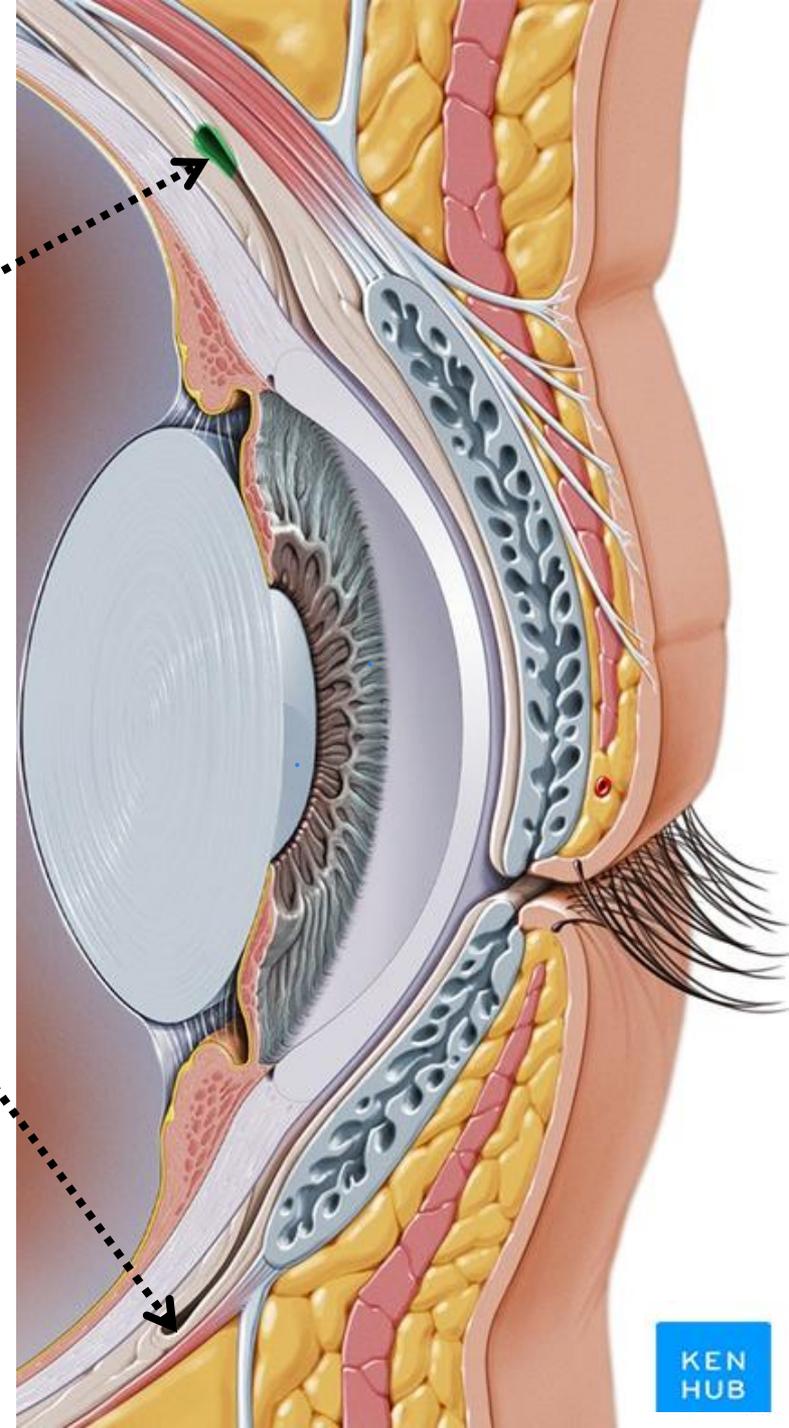
5-The conjunctiva

Is a thin mucous membrane that lines the eyelids .

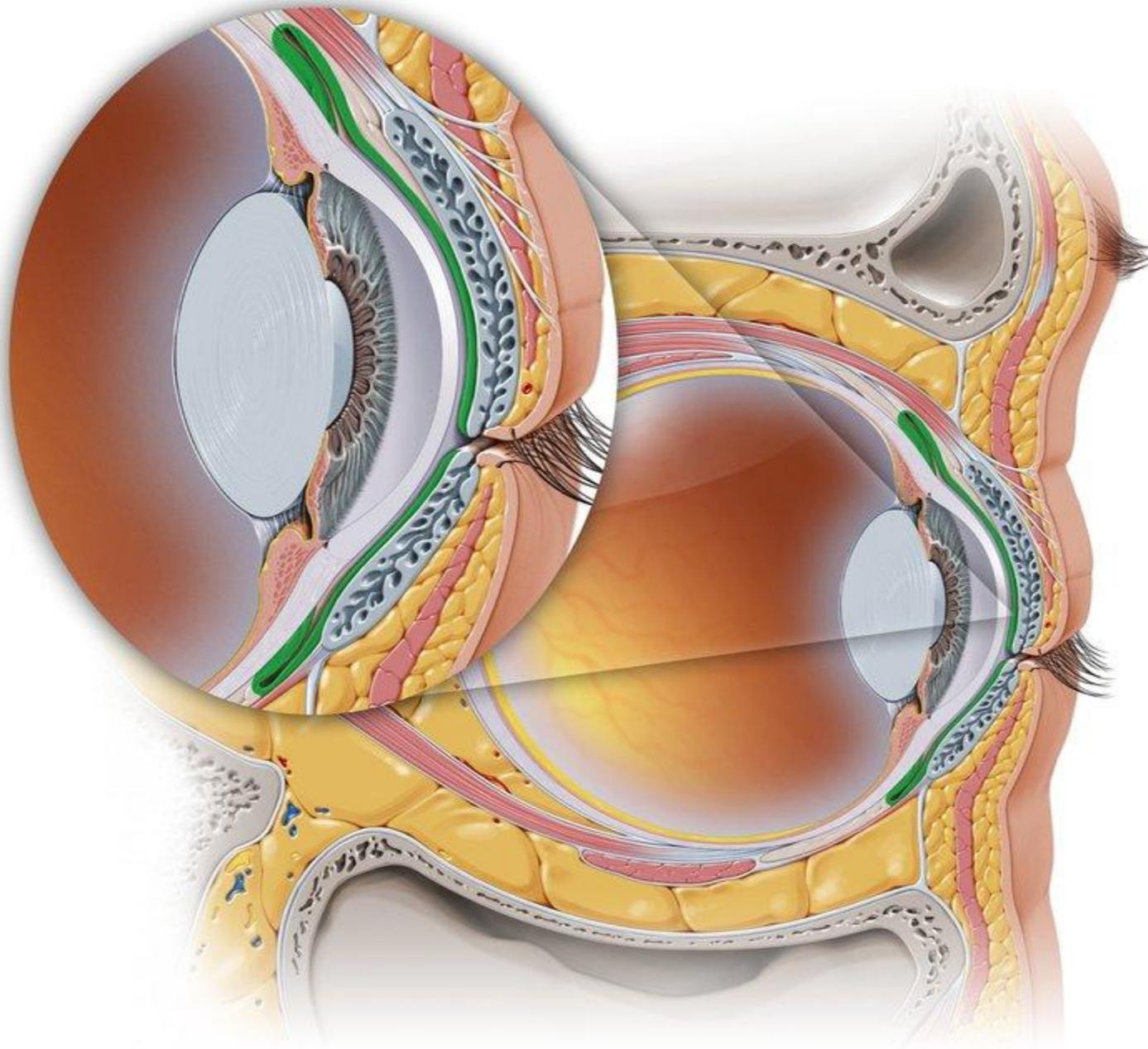
➤ It is reflected at **the superior and inferior fornices** onto the outer surface of the eyeball (sclera)

Mucous membranes consist of epithelium & underlying connective tissue. They line cavities in our bodies which have connection with the outer environment.

Part of the conjunctiva is related to the eyelid and part covers the sclera of the eyeball except where the cornea is.

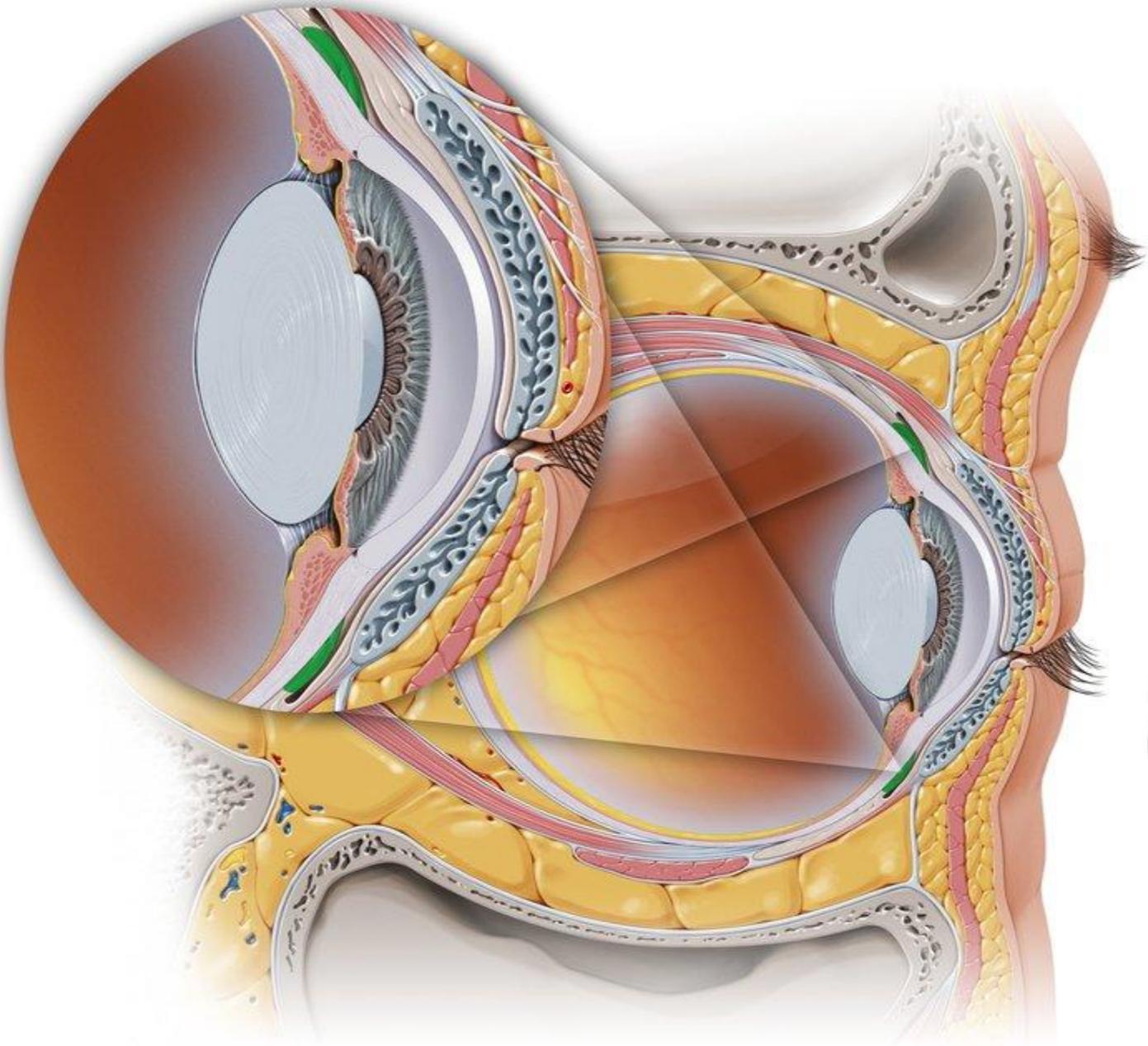


The conjunctiva

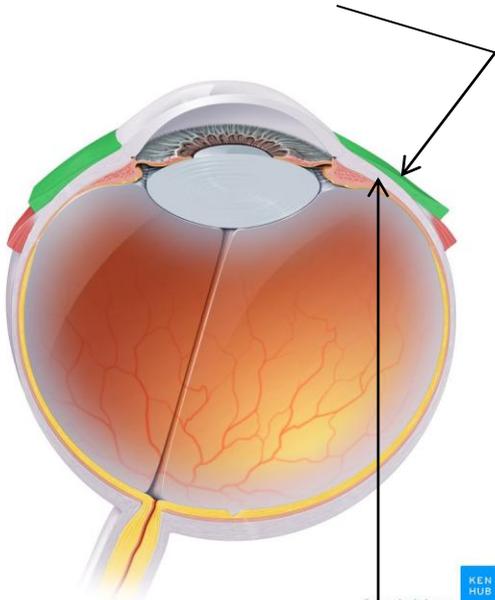


Bulbar conjunctiva

The part that covers the sclera



Bulbar conjunctiva

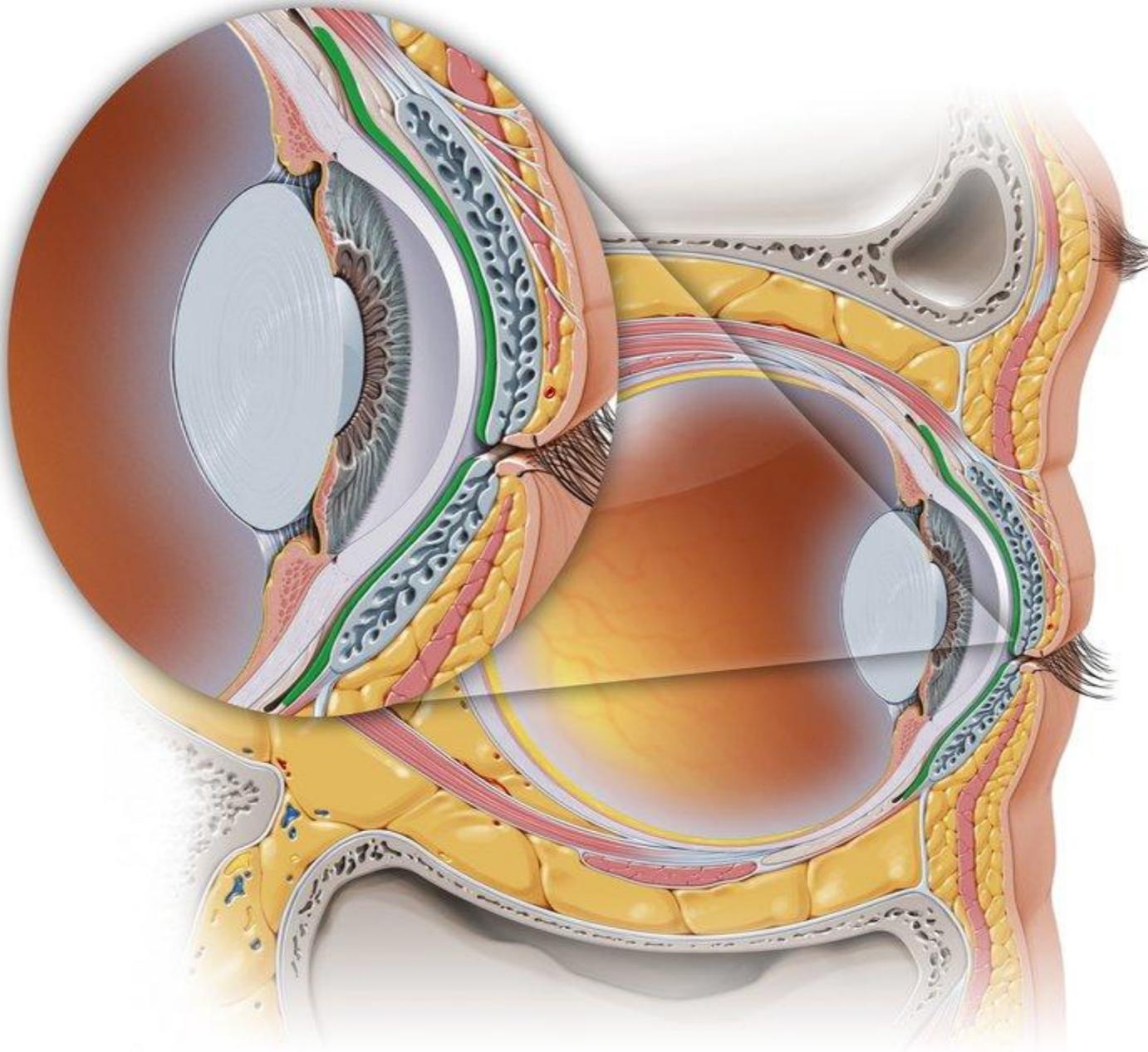


Sclera



Palpebral conjunctiva

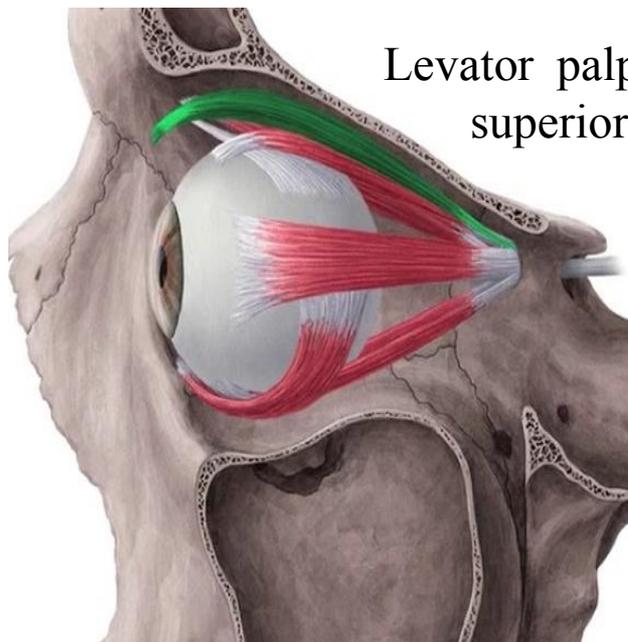
The part that lines the inside of the eyelids



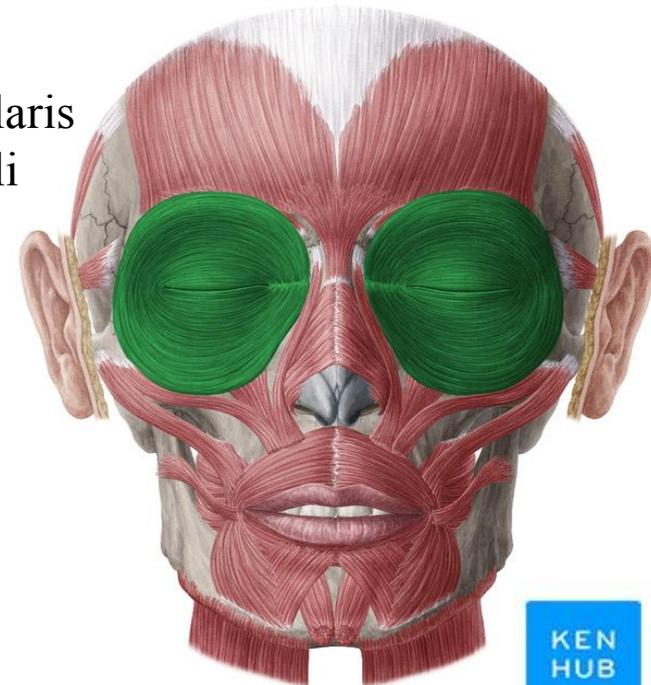
The eyelids are closed by:
1-The contraction of the orbicularis oculi
and

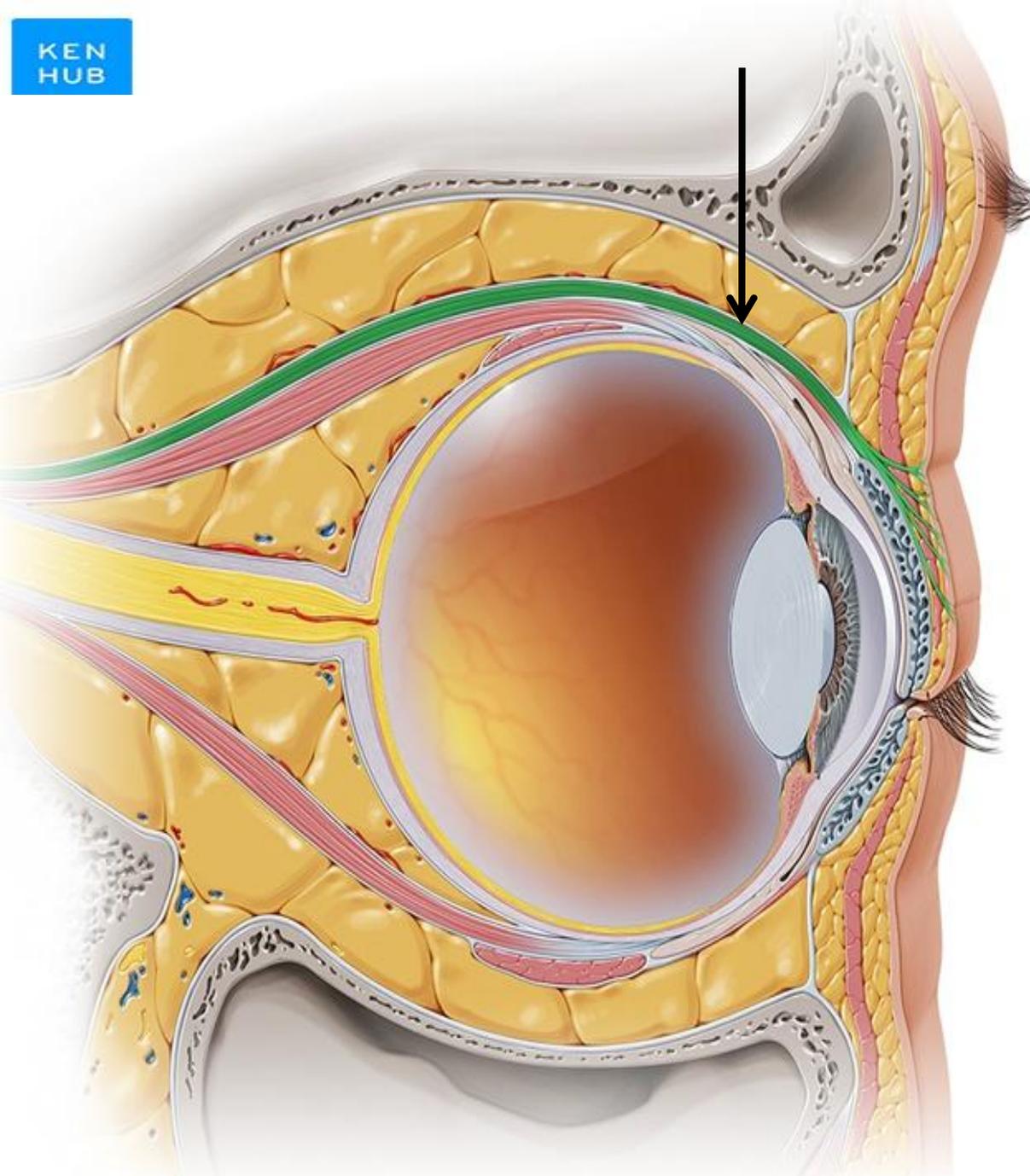
2-The relaxation of the levator palpebrae superioris muscles in the
upper eyelids

The upper eyelid is elevated by:
THE LEVATOR PALPEBRAE SUPERIORIS



Orbicularis oculi



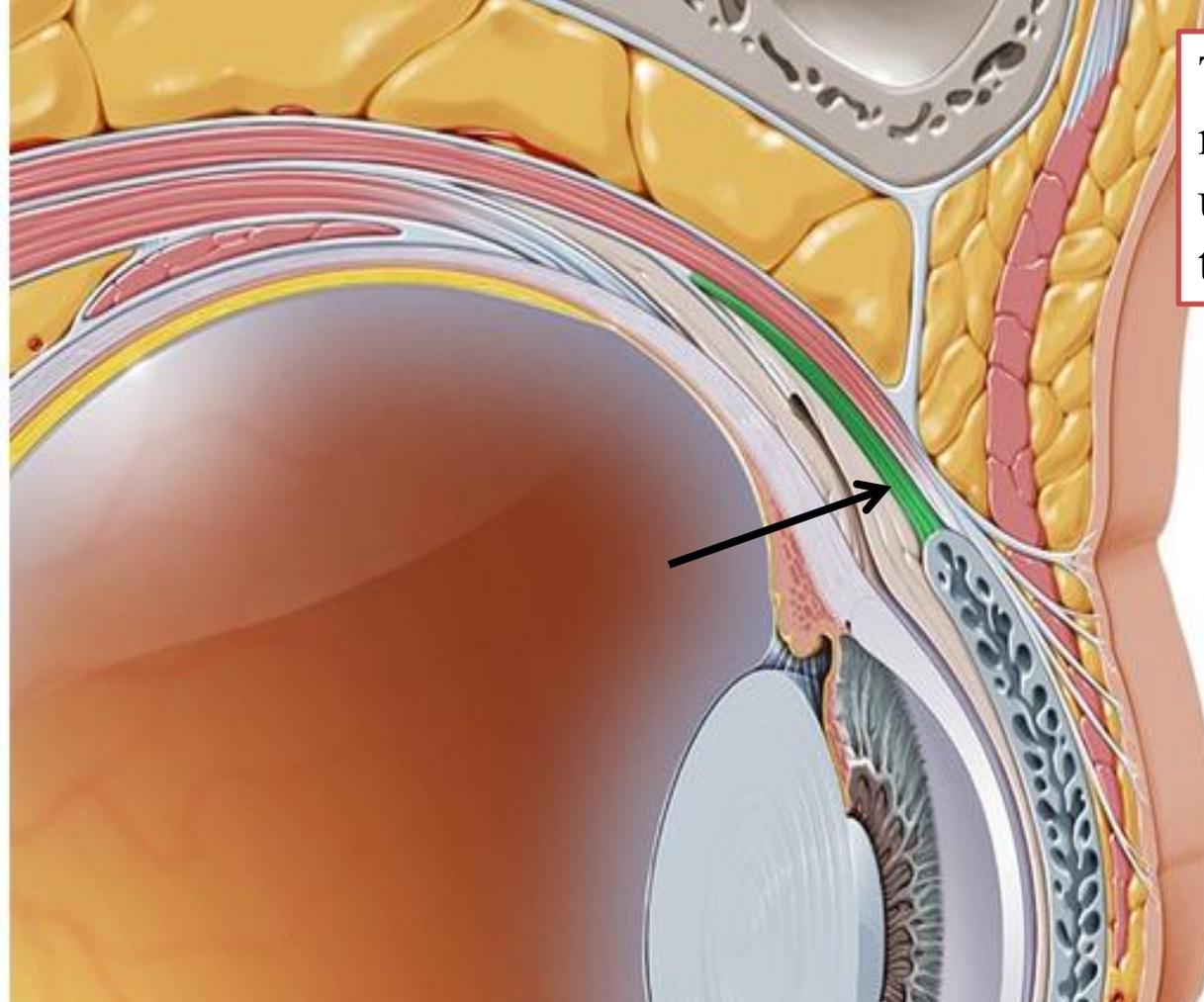


Levator palpebrae superioris

Origin: posterior part of the roof of the orbit

Insertion: anterior surface of superior tarsus with some fibers attaching to the skin of upper eyelid

Nerve supply: oculomotor nerve/ superior division



There is a collection of smooth muscle fibers insert into the upper edge of the superior tarsus (**superior tarsal muscle**)



Terminology
Ptosis: drooping of upper eyelid
Proptosis: bulging of eyeball=
exophthalmous

Dr. Heba Kalbouneh

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

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

Horner's syndrome (Damage to superior cervical ganglion)

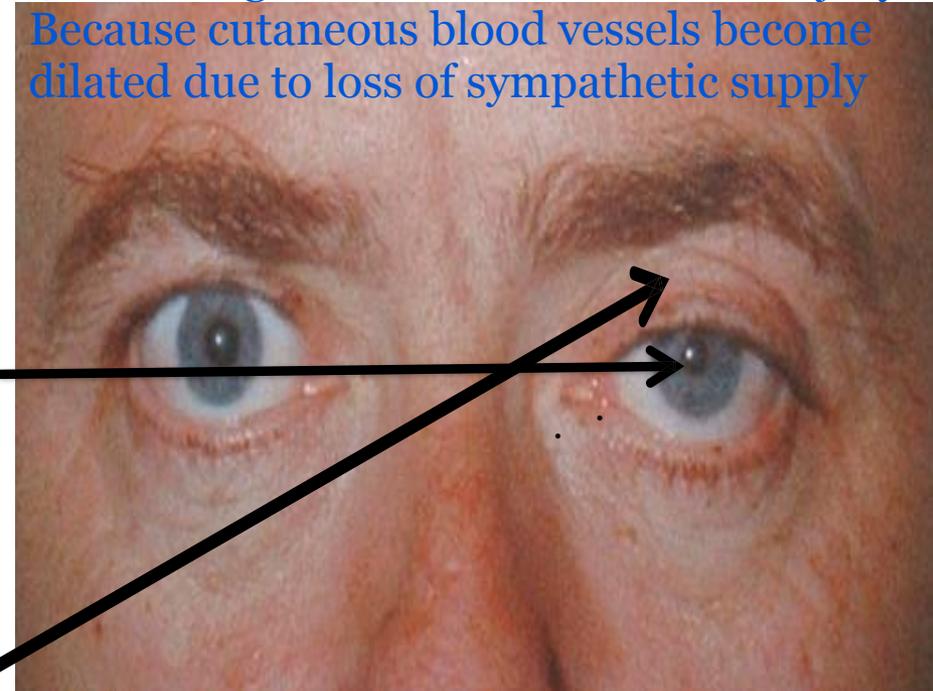
Horner's syndrome is caused by a lesion in the **sympathetic trunk** in the neck that results in sympathetic dysfunction. It is characterized by three typical features:

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 (anhidrosis) on the ipsilateral side of the face and the neck due to absence of innervation of the sweat glands

4- Blushing of the face at the side of injury.
Because cutaneous blood vessels become dilated due to loss of sympathetic supply

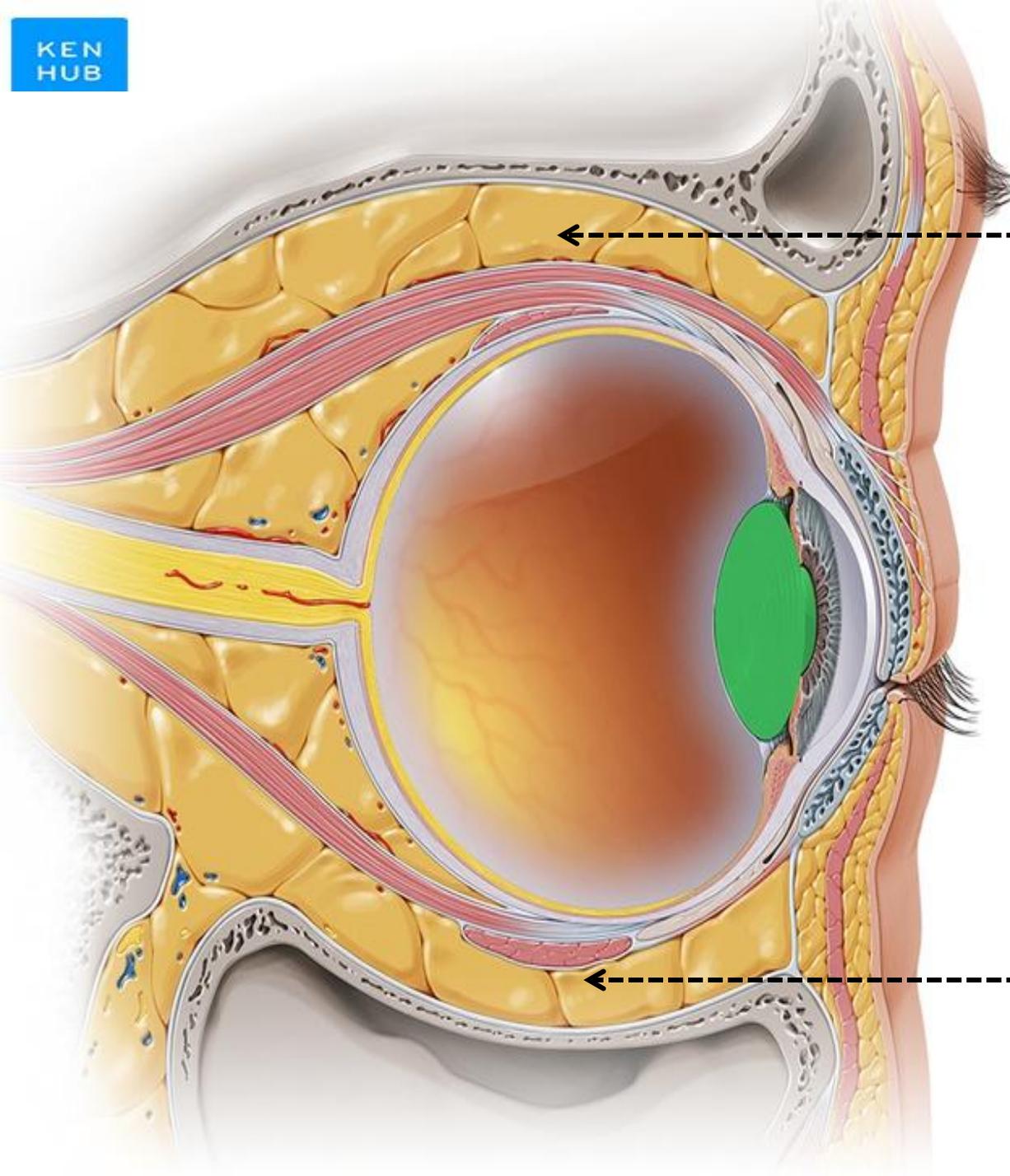


How can damage to the superior cervical ganglion occur?

Trauma/tumor to the neck.

Tumor in chest.

Why chest? Because preganglionic sympathetic fibers originate from spinal cord at the level of the chest but form ganglions at superior level.



ORBITAL FAT

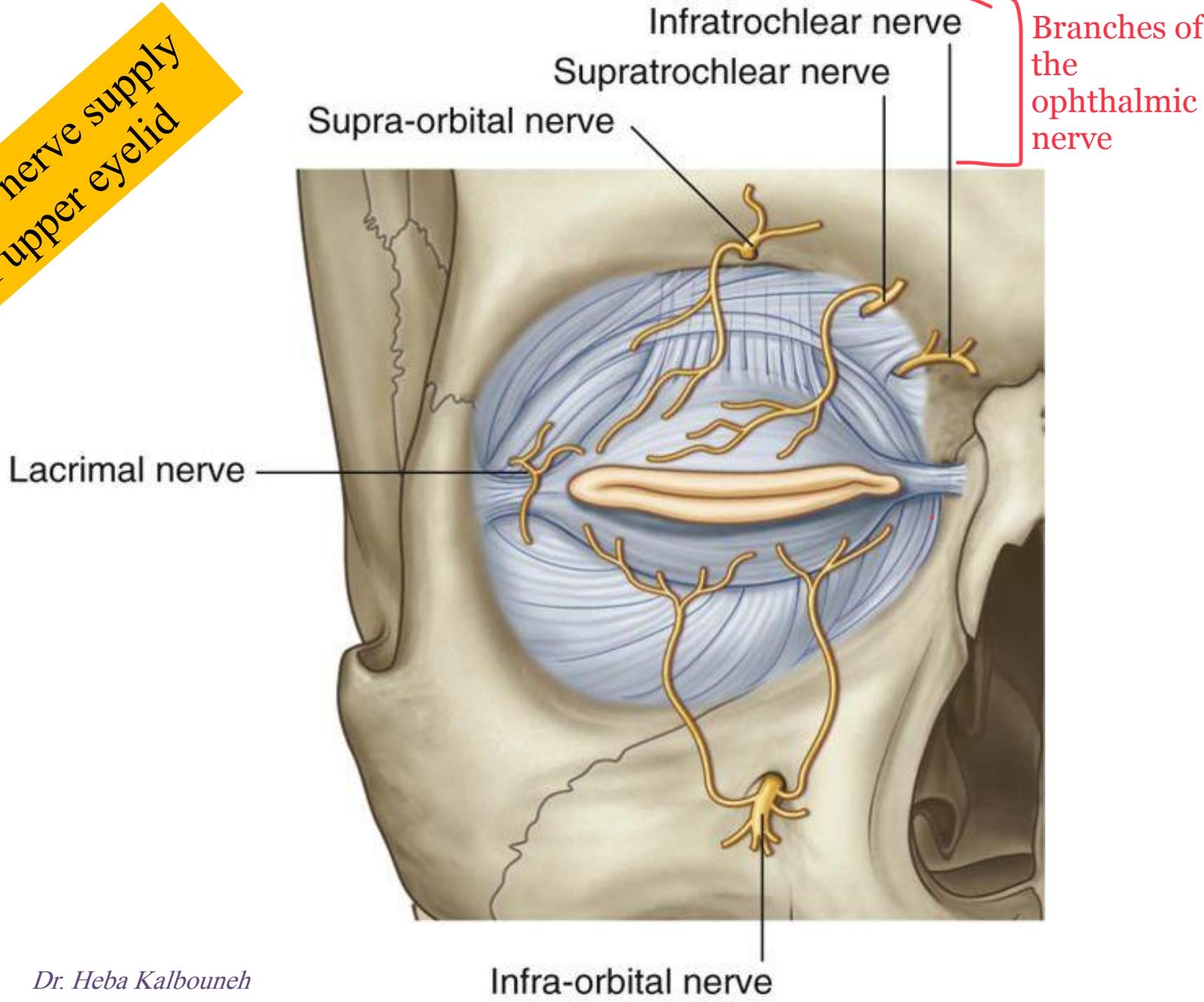
- ✓ The spaces between the main structures of the orbit are occupied by fat
- ✓ The fat helps to stabilize the position of the eyeball and also acts as a socket within which the eye can rotate.

Conditions resulting in an increased overall volume of orbital fat, e.g.

hyperthyroidism (Graves' disease), may lead to forward protrusion of the eyeball
Exophthalmos/ proptosis

Due to increase in orbital fat

Sensory nerve supply
of upper eyelid



Lacrimal apparatus

✓ The lacrimal apparatus is involved in the production, movement, and drainage of fluid from the surface of the eyeball

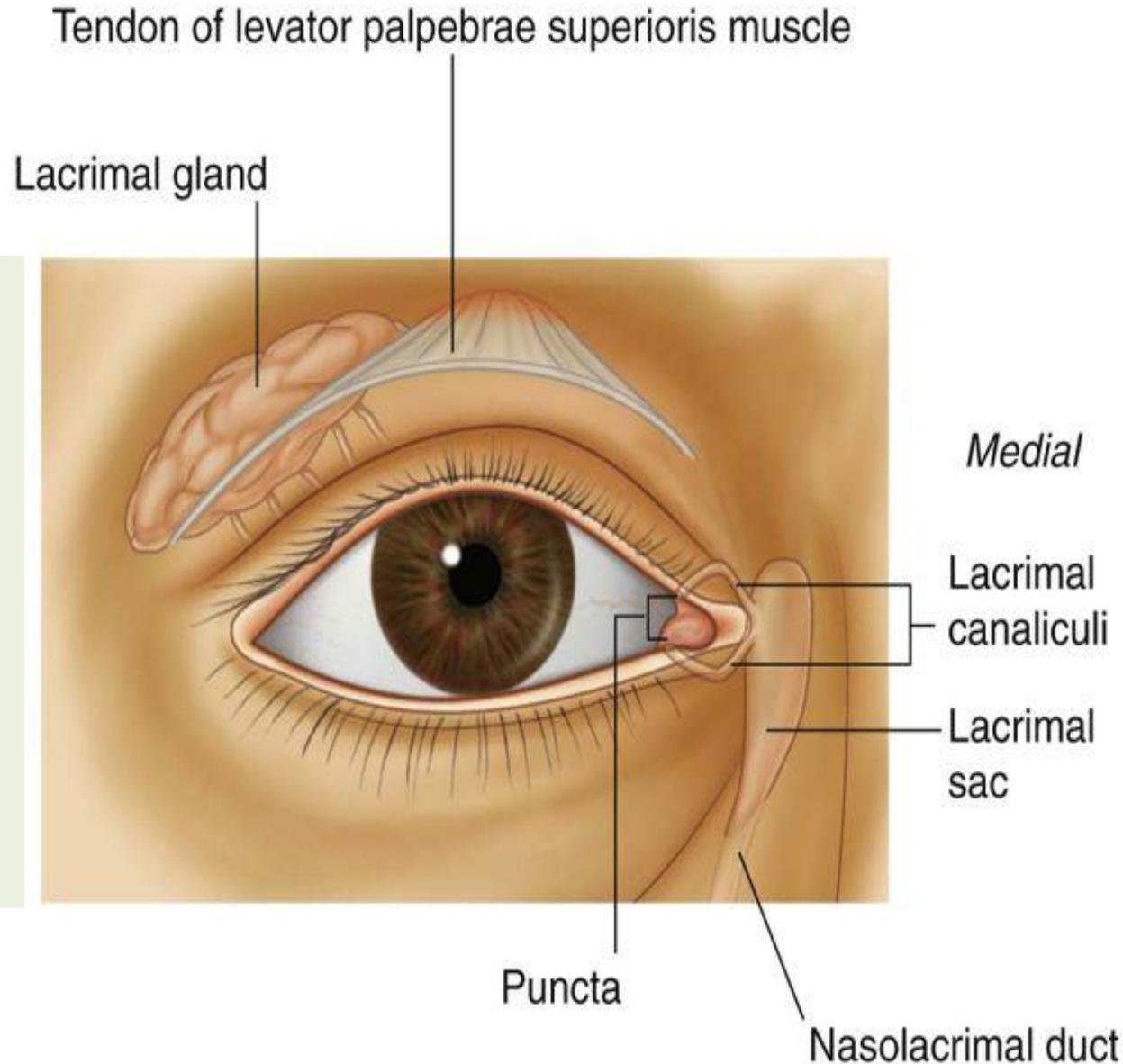
✓ Its made up of:

Lacrimal gland and its ducts

Lacrimal canaliculi

Lacrimal sac

Nasolacrimal duct



Lacrimal Gland

Lacrimal fossa is a depression in frontal bone

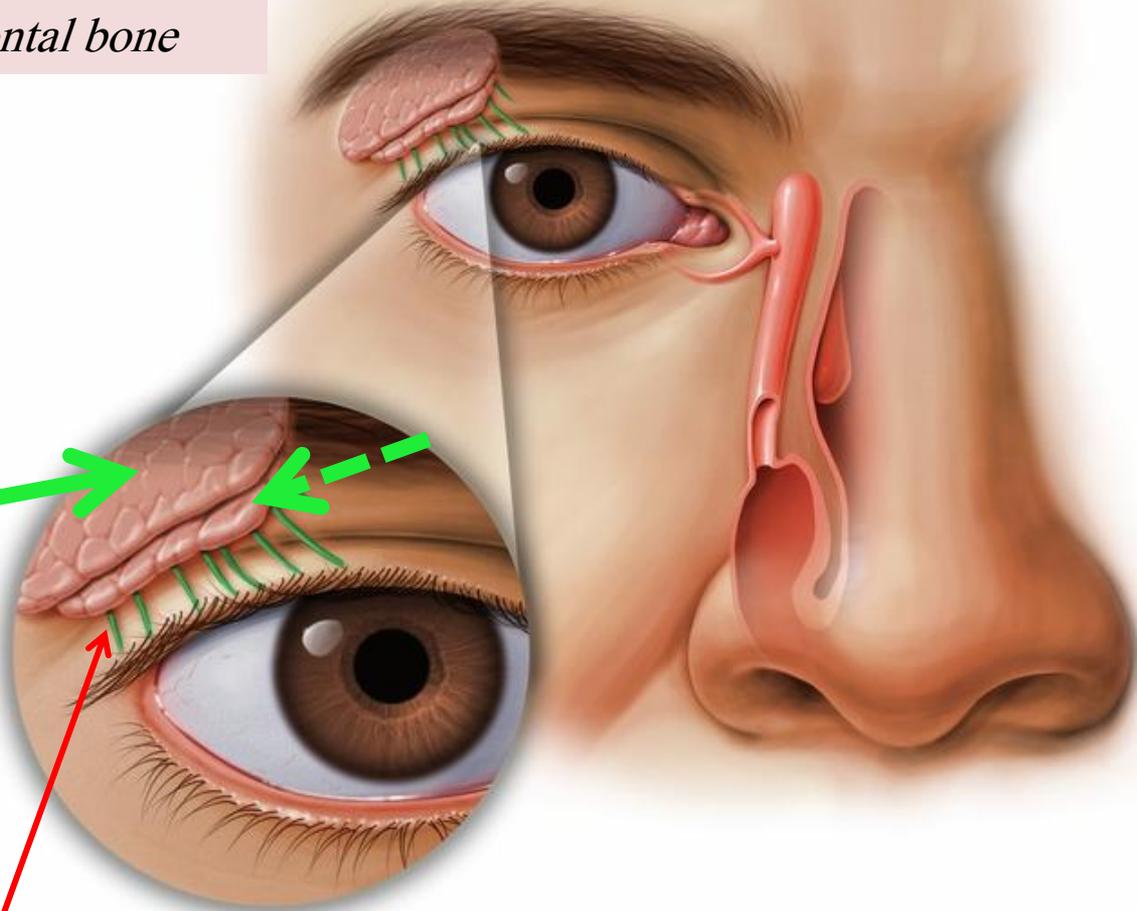
➤ It is anterior in the superolateral region in the orbit (posterior to the orbital septum)

➤ The lacrimal gland consists of:
1- a large **orbital part**
(in the lacrimal fossa)

2- a small **palpebral part**

which are continuous with each other around the **lateral edge of the aponeurosis of the levator palpebrae superioris.**

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

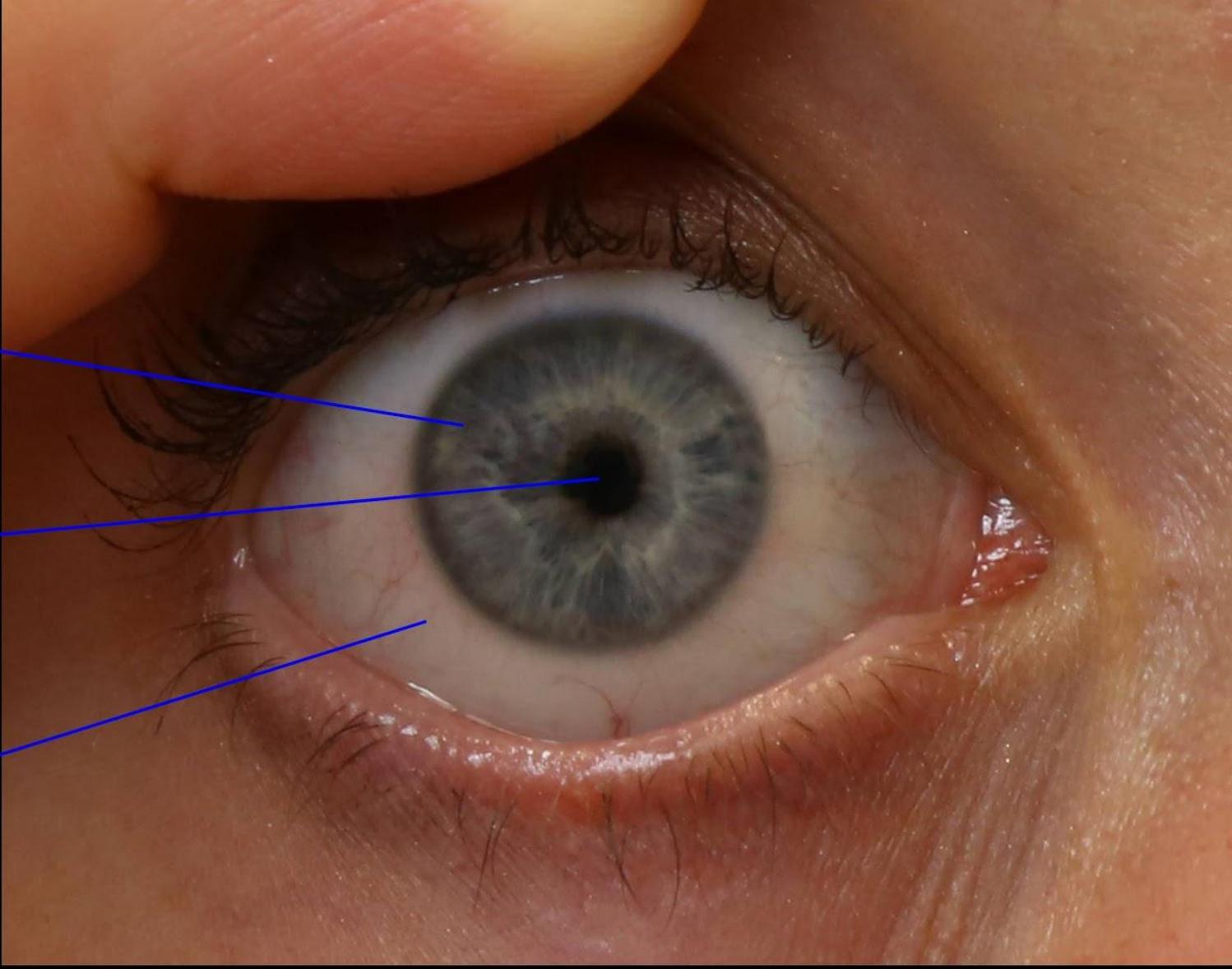


Fluid is continually being secreted by the lacrimal gland and moved across the surface of the eyeball from lateral to medial as the eyelids blink

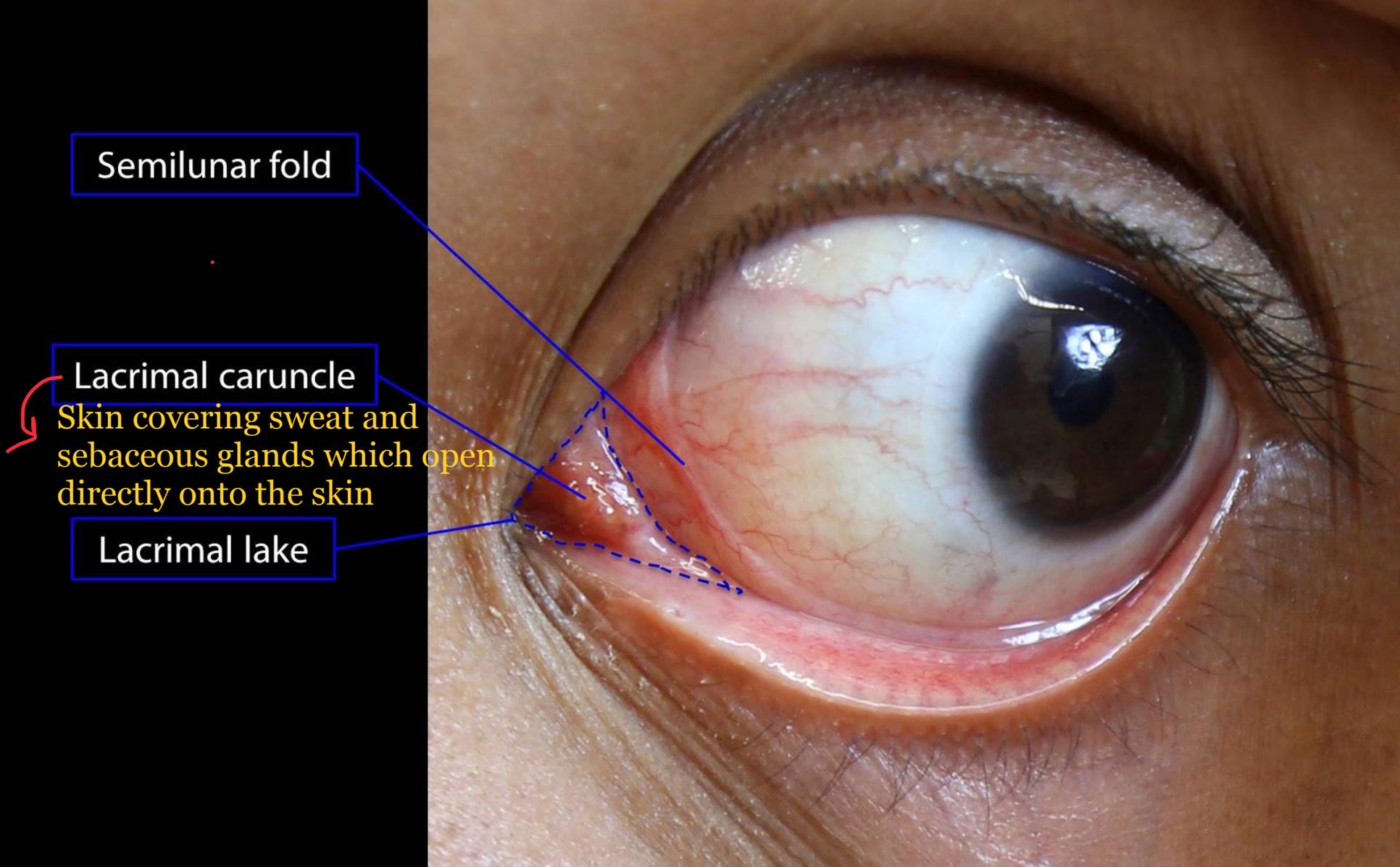
Iris

Pupil

Sclera



Orbital region, anterior

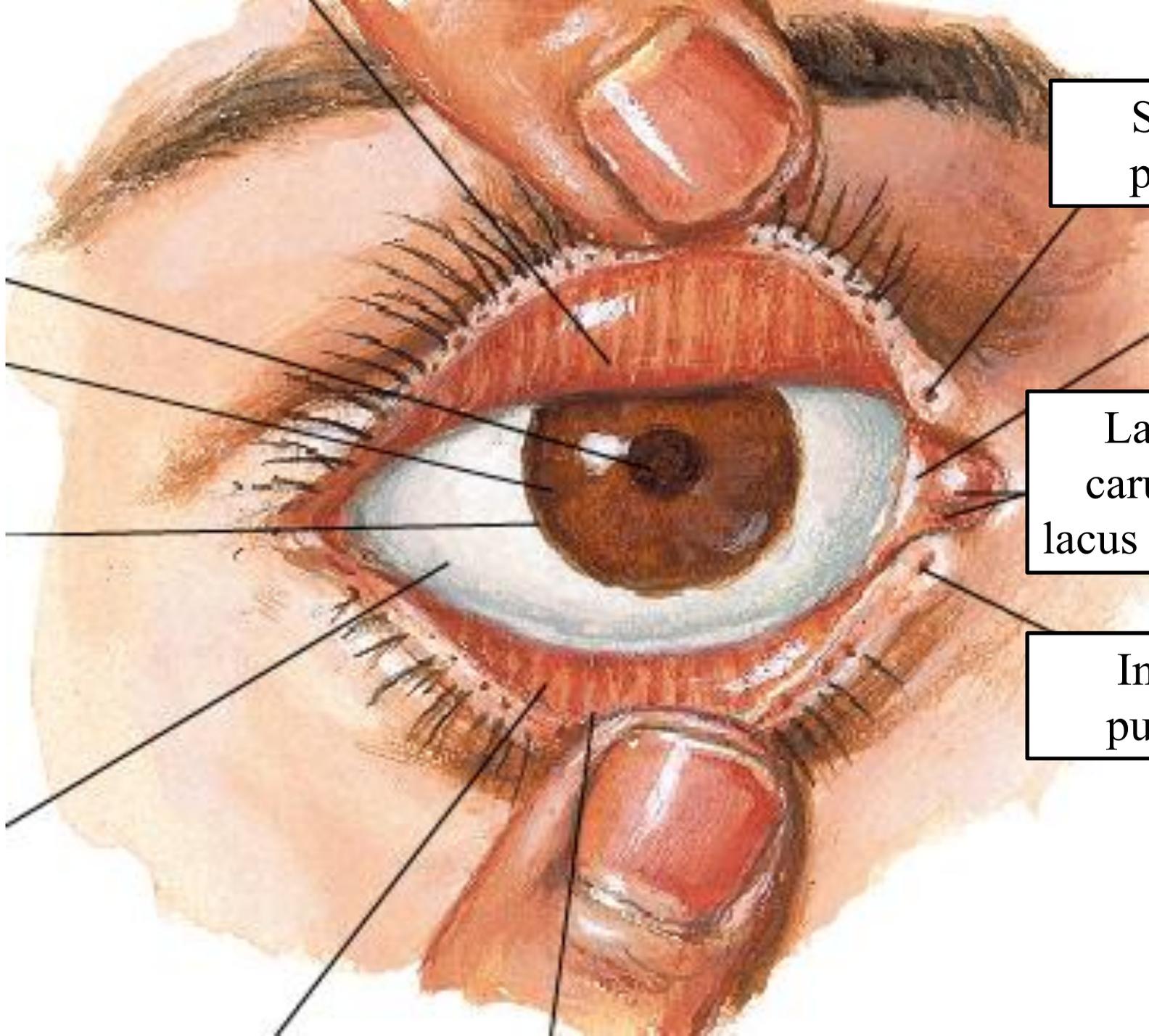


Semilunar fold

Lacrimal caruncle

Skin covering sweat and sebaceous glands which open directly onto the skin

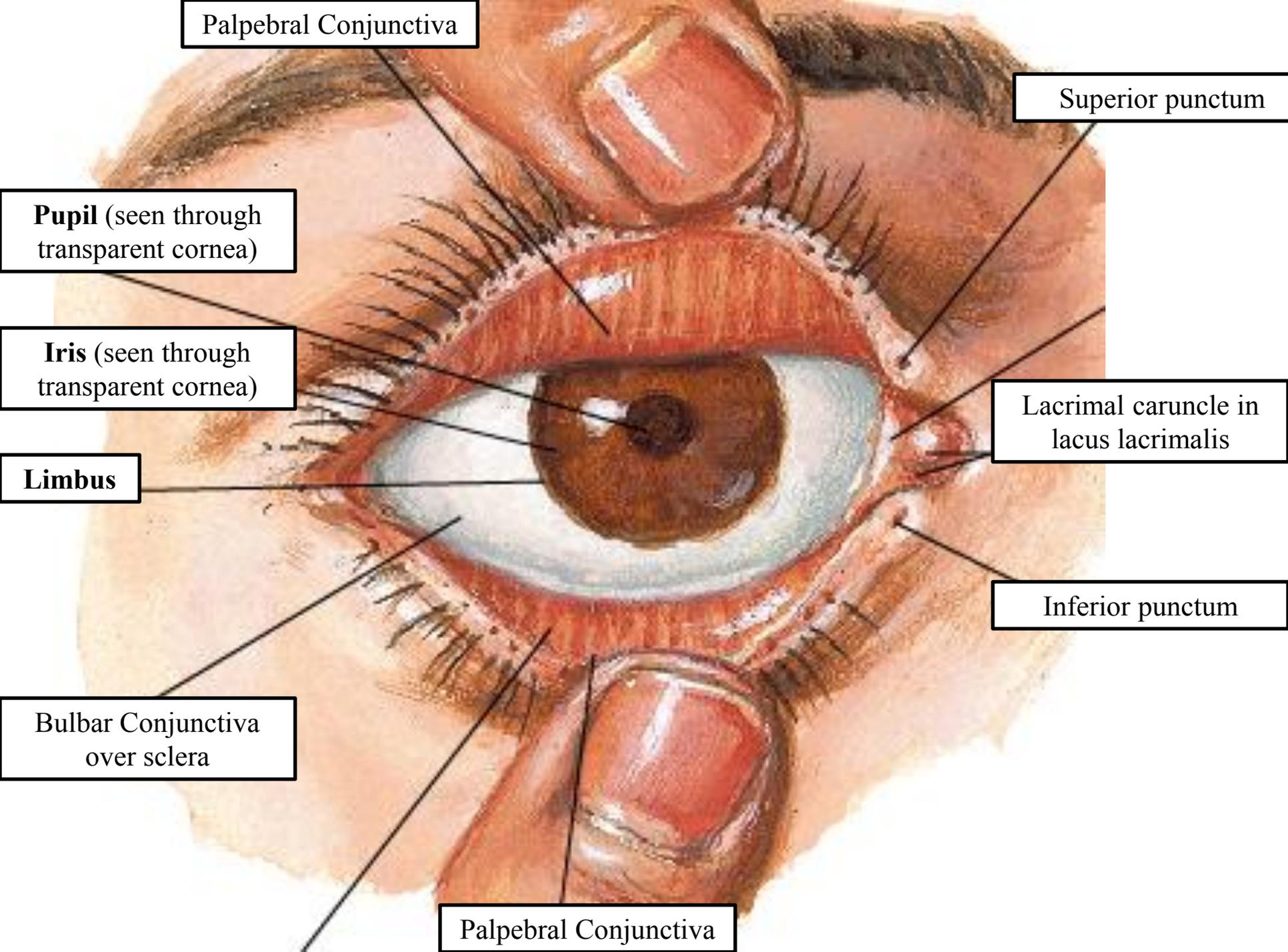
Lacrimal lake



Superior
punctum

Lacrimal
caruncle in
lacus lacrimalis

Inferior
punctum



Palpebral Conjunctiva

Superior punctum

Pupil (seen through transparent cornea)

Iris (seen through transparent cornea)

Limbus

Lacrimal caruncle in lacus lacrimalis

Inferior punctum

Bulbar Conjunctiva over sclera

Palpebral Conjunctiva

Lacrimal Ducts

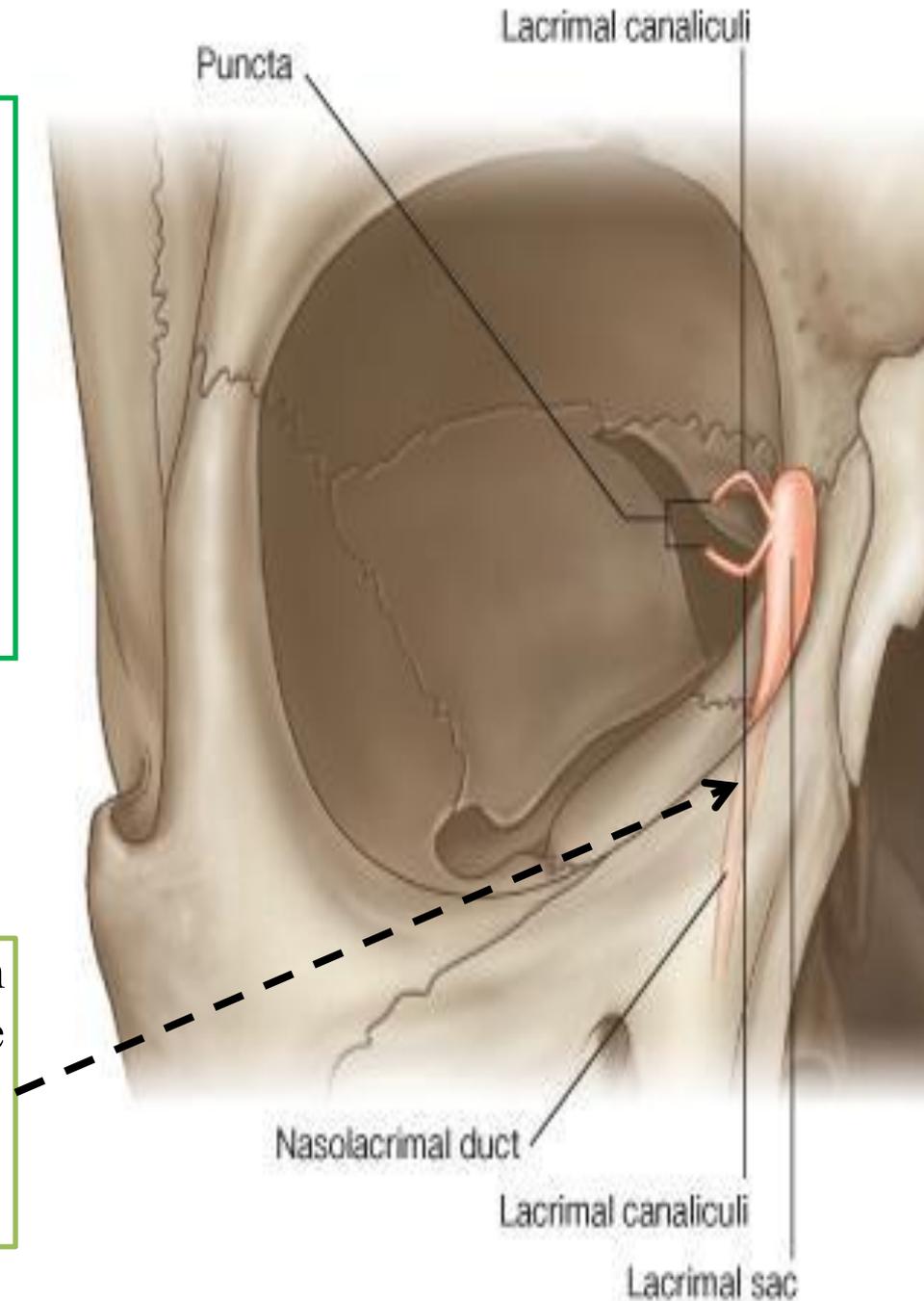
The tears circulate across the cornea and accumulate medially in the lacus lacrimalis (lacrimal lake).

From here the tears enter the lacrimal canaliculi through the lacrimal puncta. The canaliculi lacrimales open into the lacrimal sac which is the upper blind end of the nasolacrimal duct.

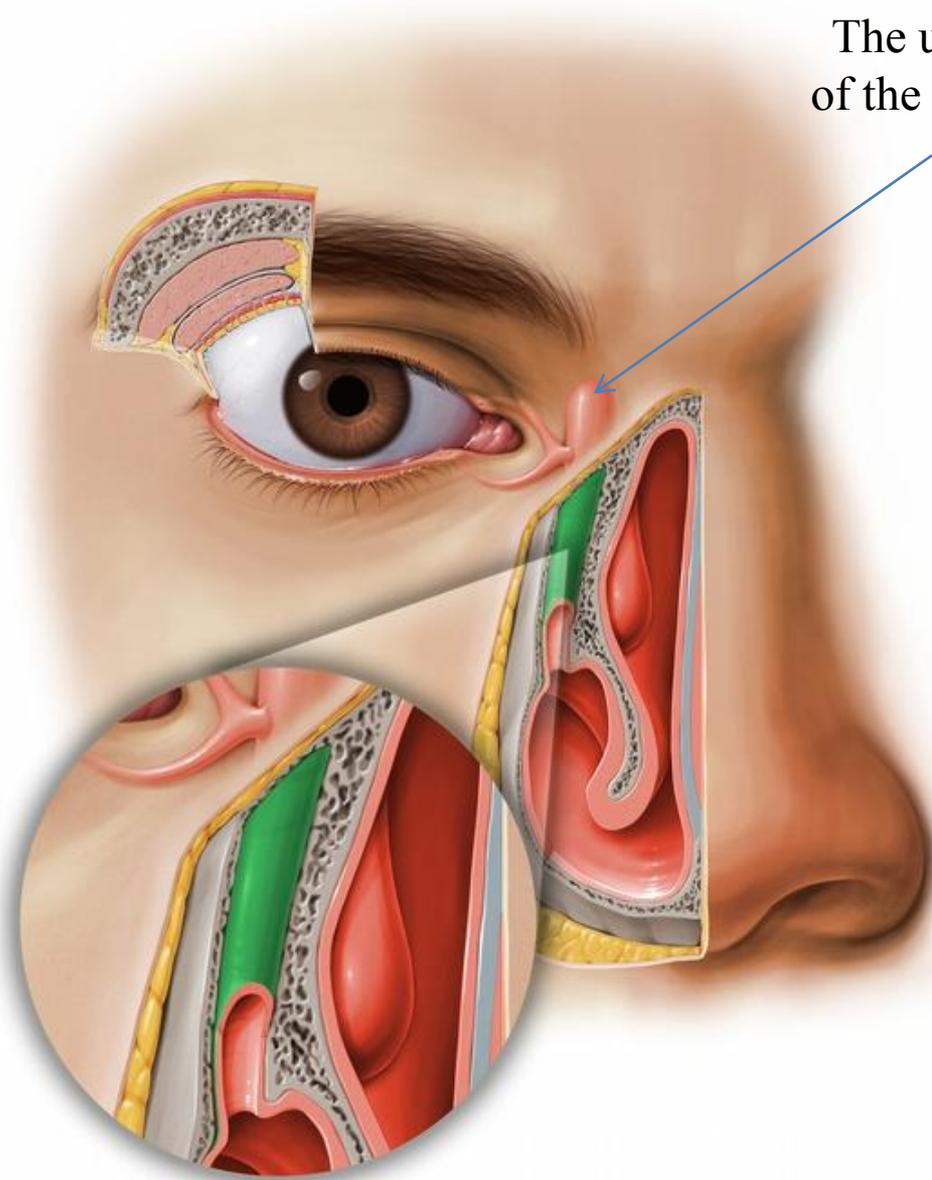
Lacrimal punctum is the opening through which fluid enters each canaliculus

➤ **The nasolacrimal duct** is about 0.5 inch long and emerges from the lower end of the lacrimal sac

➤ The duct descends in a bony canal and opens into the nasal cavity



The upper dilated blind part
of the nasolacrimal duct is the
lacrimal sac



Nasolacrimal canal

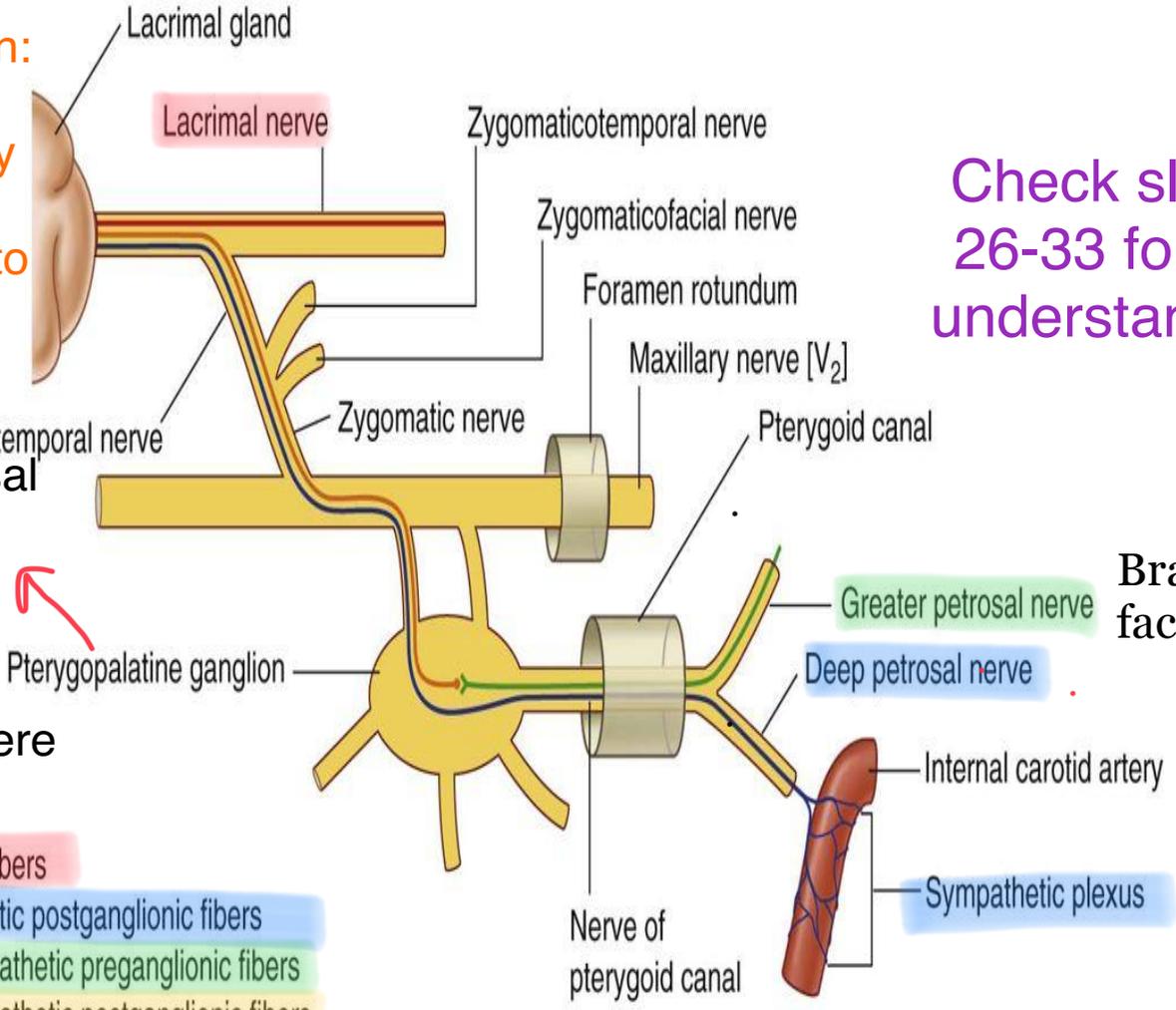
Pterygopalatine ganglion:
Anatomically related &
“carried” by the maxillary nerve
But functionally related to
the facial nerve

Check slides
26-33 for full
understanding

Where the greater petrosal
nerve (preganglionic)
synapses with the post
ganglionic fiber
*Notice: deep petrosal
nerve doesn't synapse here
(sympathetic post
ganglionic fiber)

Branch from
facial nerve

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



Nerve supply of lacrimal gland

Sensory: The lacrimal nerve (ophthalmic nerve)
Parasympathetic: The greater petrosal nerve (facial nerve)
Sympathetic (postganglionic fibers): originate from the superior cervical ganglion

Otic ganglion

Ciliary ganglion

Ptergopalatine ganglion

Submandibular ganglion

3rd, 7th, 9th

Sensory root

Does not relay

Glands in the head

Salivary glands

Paotid, sublingual and submandibular)

Lacrimal glands

Palatine and nasal glands

Postganglionic parasympathetic

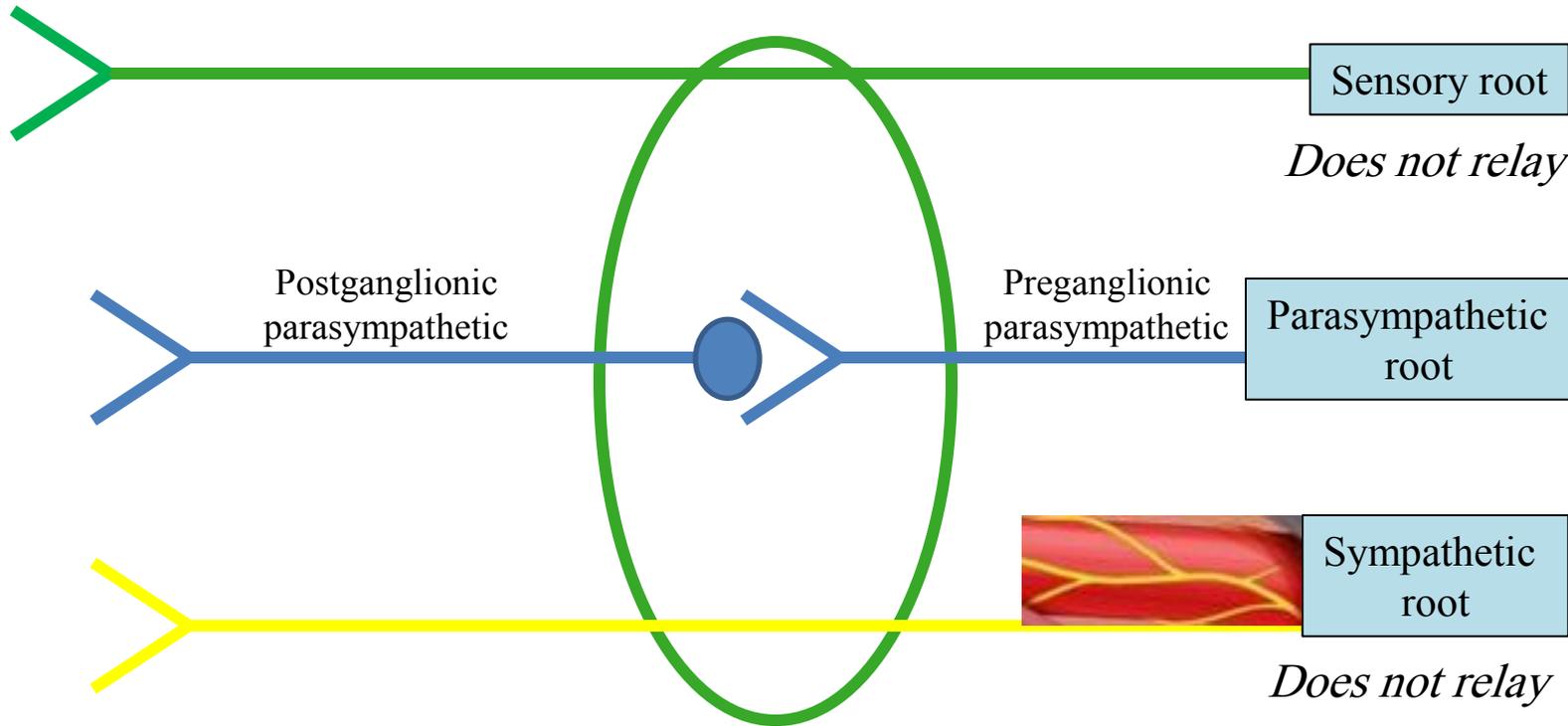
Preganglionic parasympathetic

Parasympathetic root

Smooth muscles in the eye

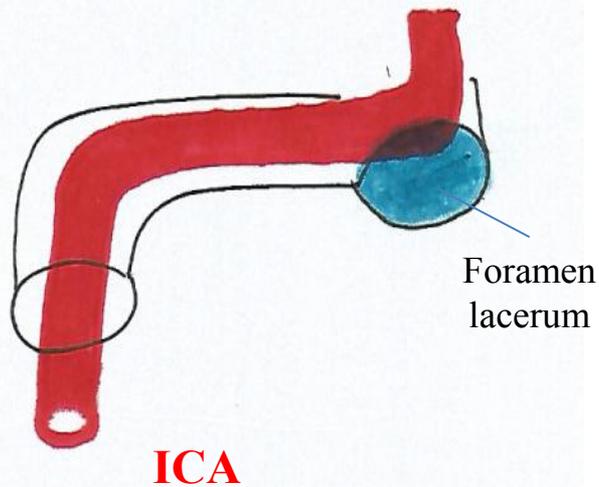
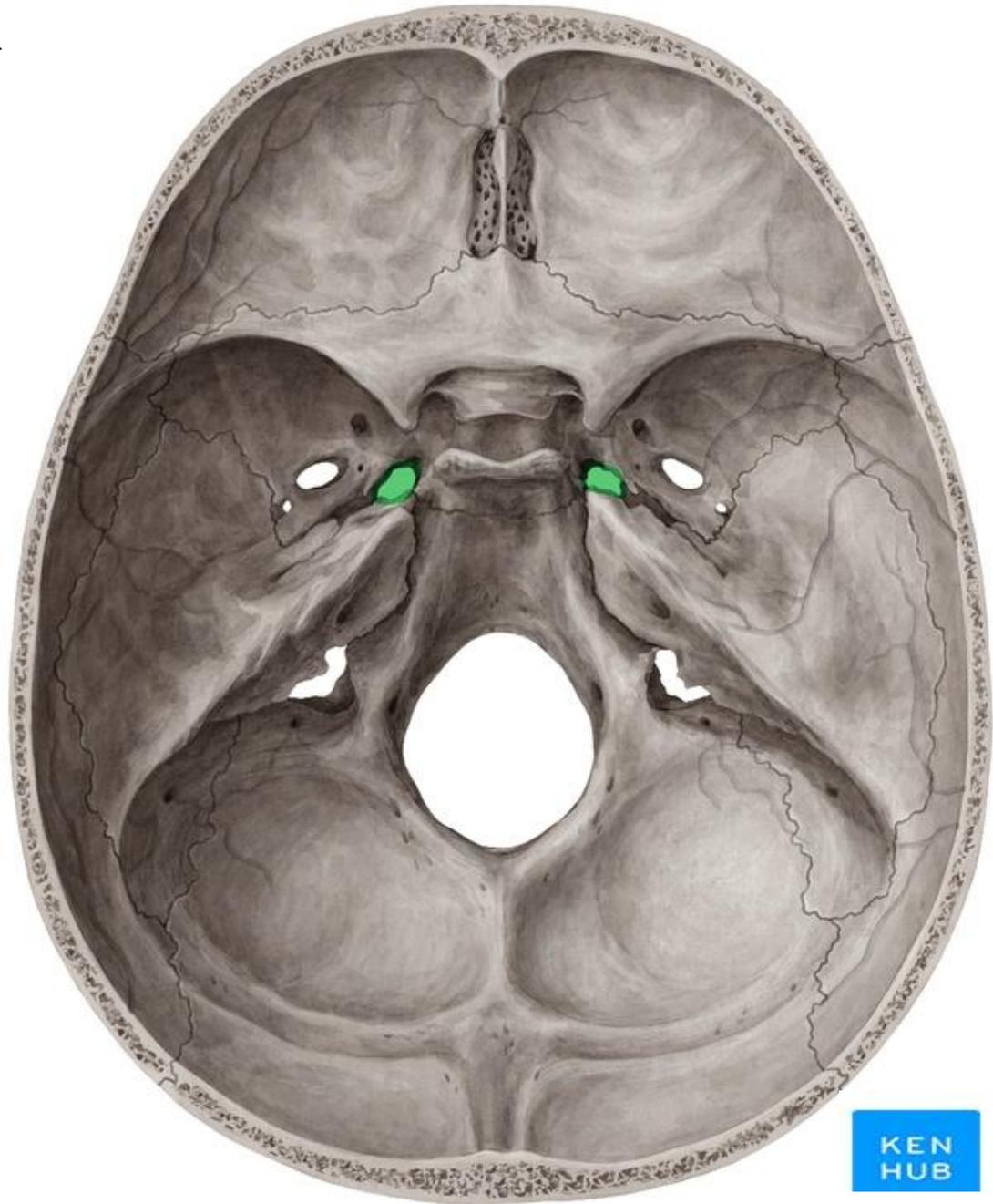
Sympathetic root

Does not relay



Foramen lacerum

Has an anterior opening for
the pterygoid canal
And a posterior opening for
the carotid canal



Sphenopalatine foramen
nasal cavity

Inferior orbital fissure
floor of orbit

Pterygomaxillary fissure
infratemporal fossa

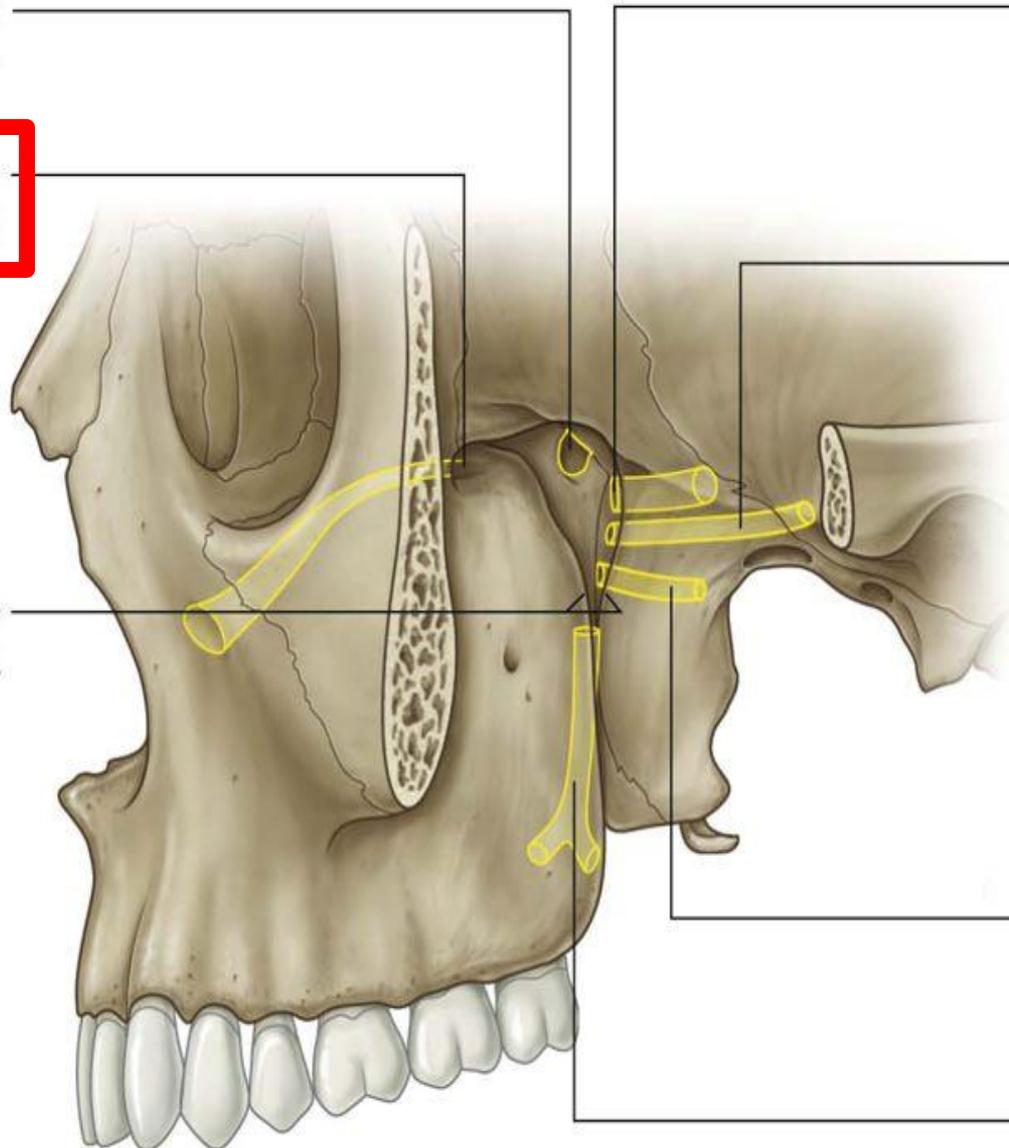
Foramen rotundum
cranial cavity
(middle cranial fossa)

Pterygoid canal
cranial cavity
(middle cranial fossa)

Passes through
pterygoid plate of
sphenoid

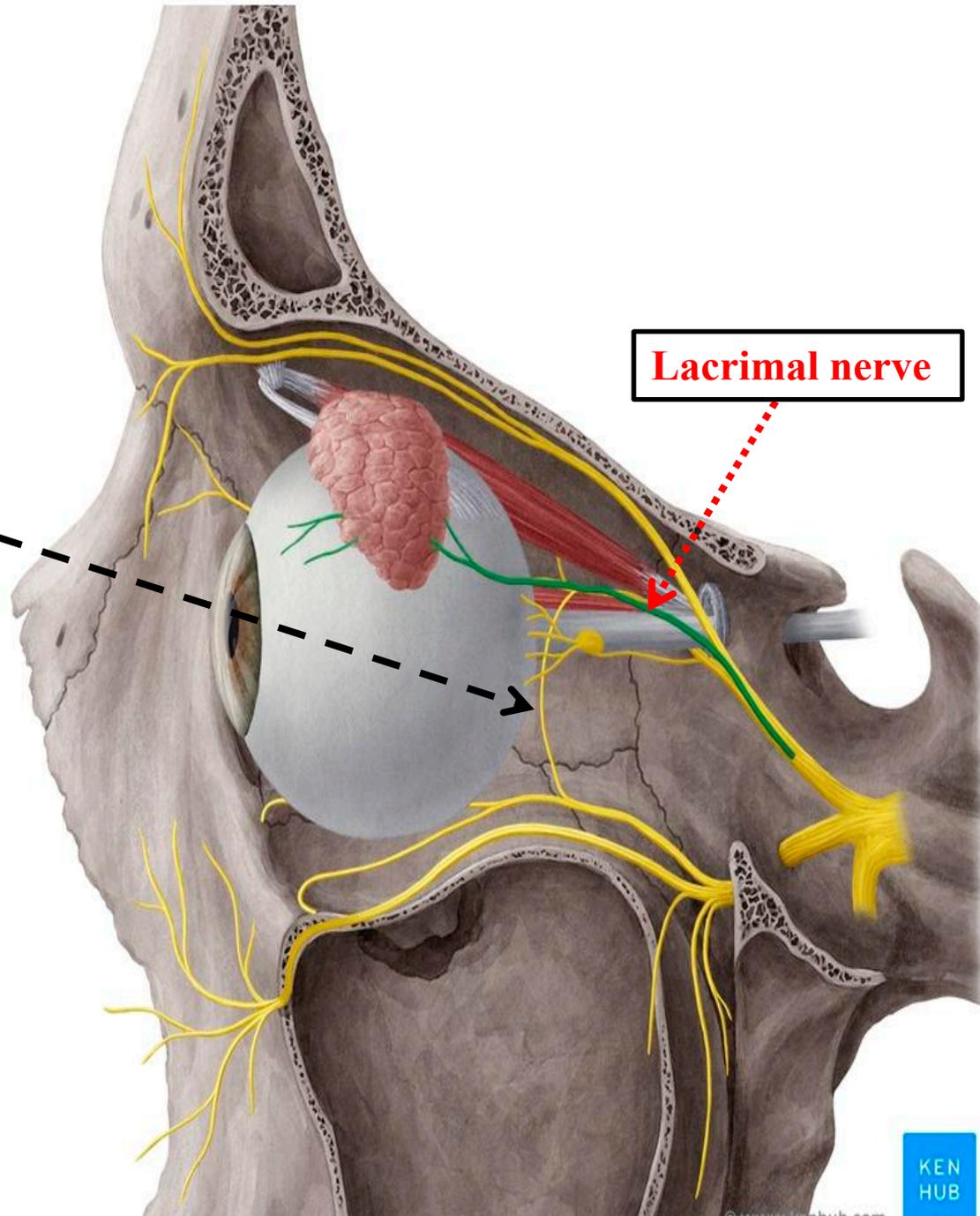
Palatovaginal canal
nasopharynx

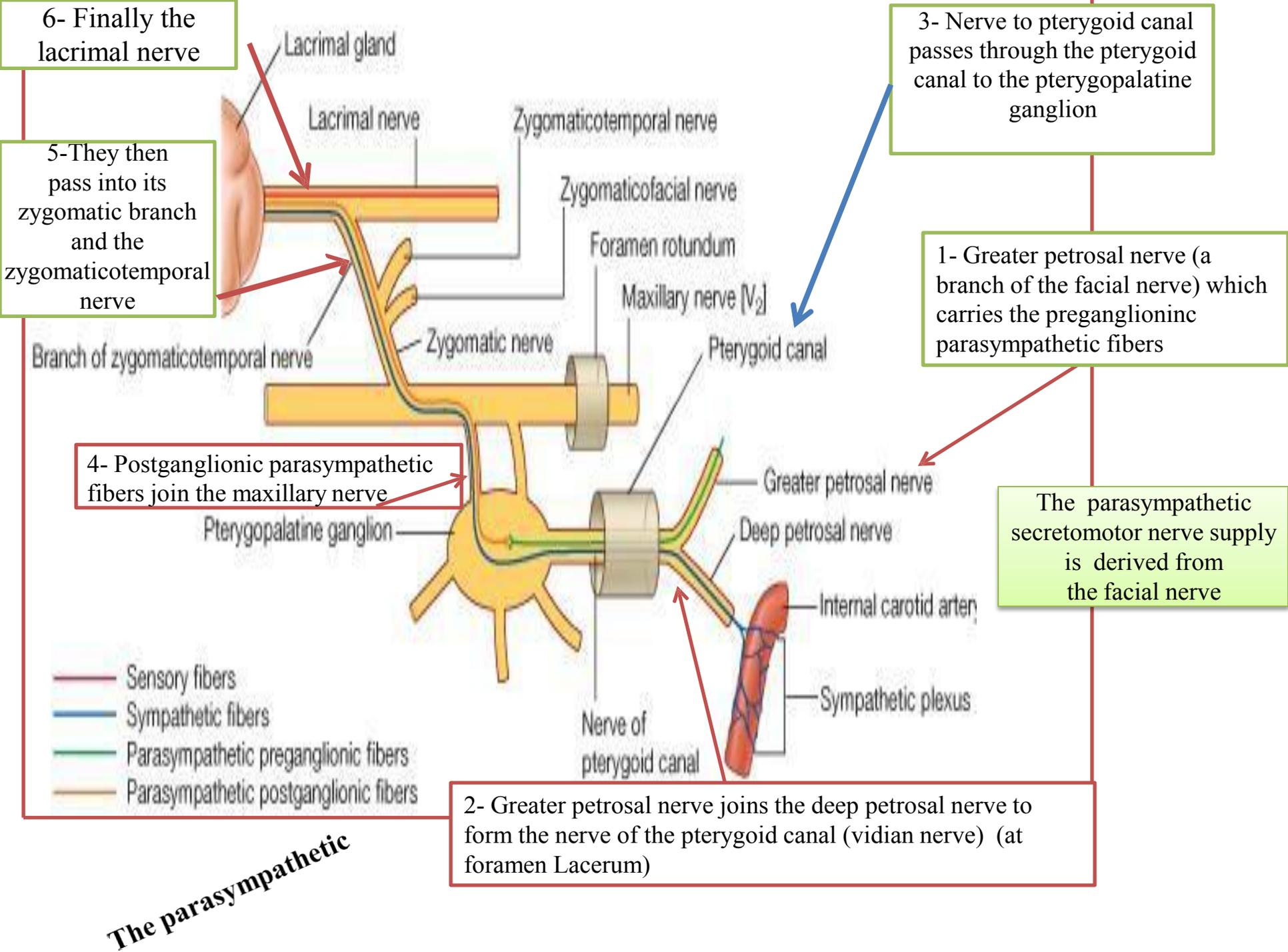
Palatine canal
roof of oral cavity (palate)

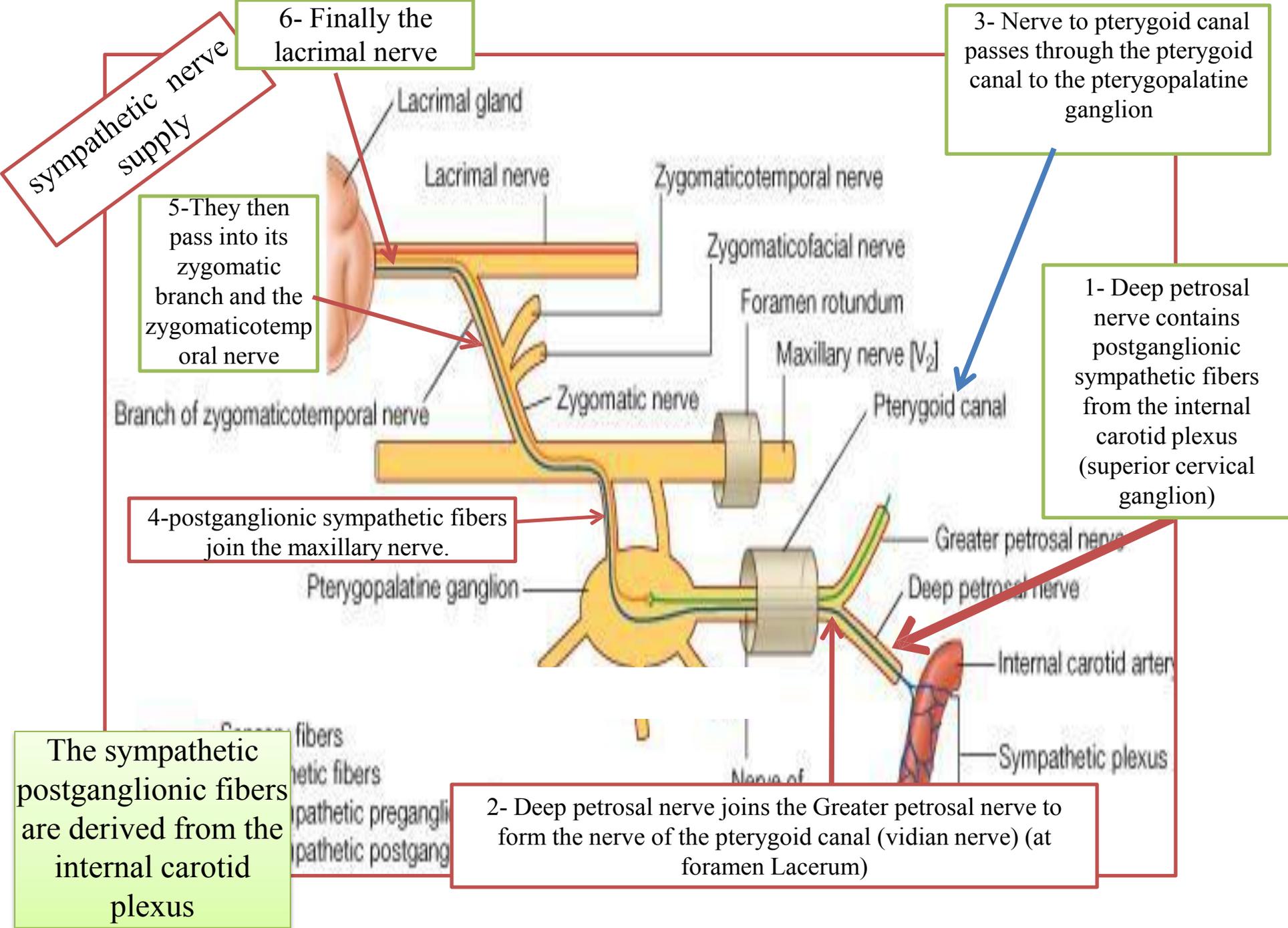


Lacrimal nerve is joined by a branch of the zygomaticotemporal nerve (parasympathetic to lacrimal gland)

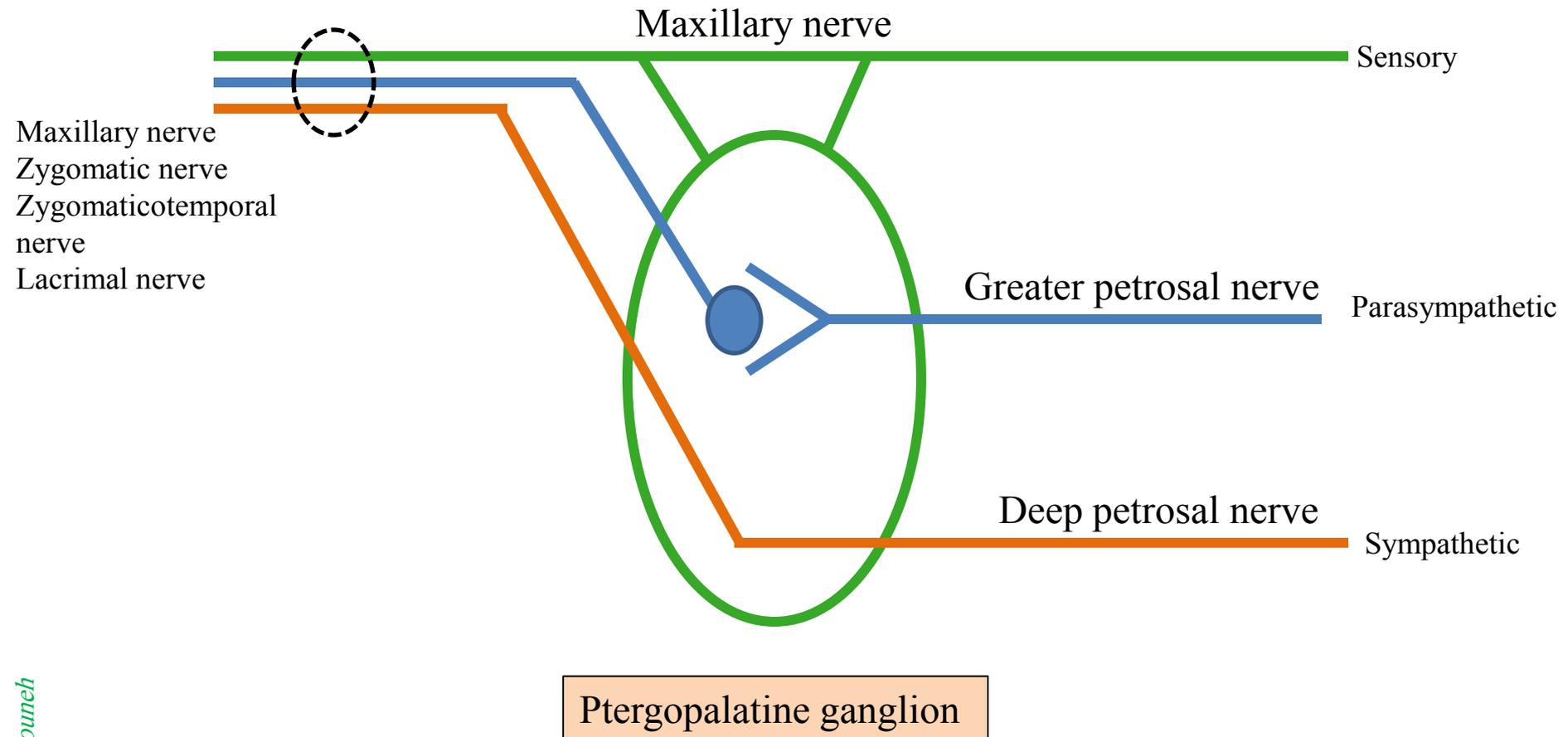
Lacrimal nerve







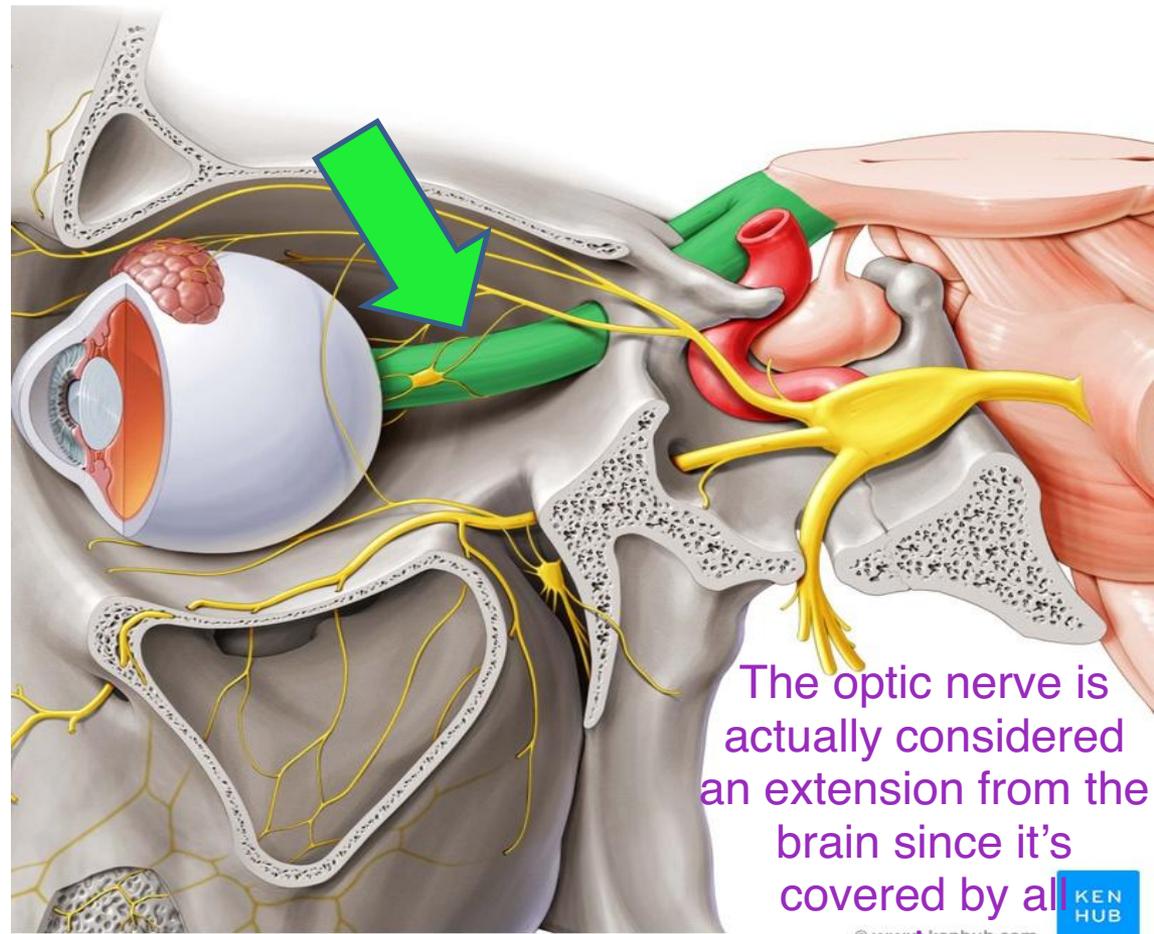
Anatomically its connected to maxillary nerve (through a ganglionic branch)
Functionally its associated with the facial nerve



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**
 - ❖ The nerve is surrounded by sheaths of pia mater, arachnoid mater, and dura mater
 - ❖ It pierces the sclera at the posterior pole of the eyeball (optic disc)

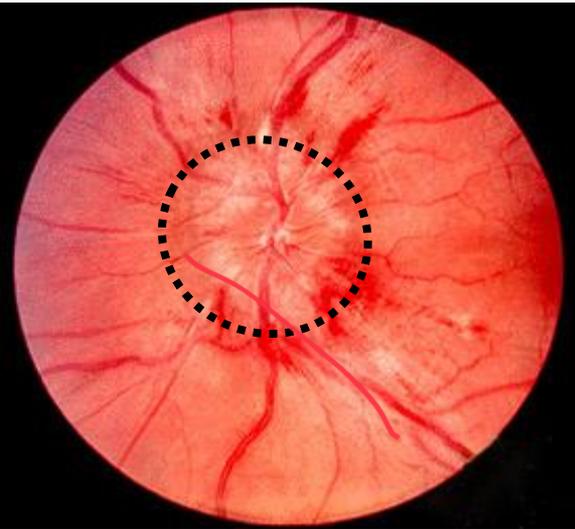


The optic nerve is actually considered an extension from the brain since it's covered by all meninges

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. Thus, the subarachnoid space extends around the optic nerve as far as the eyeball

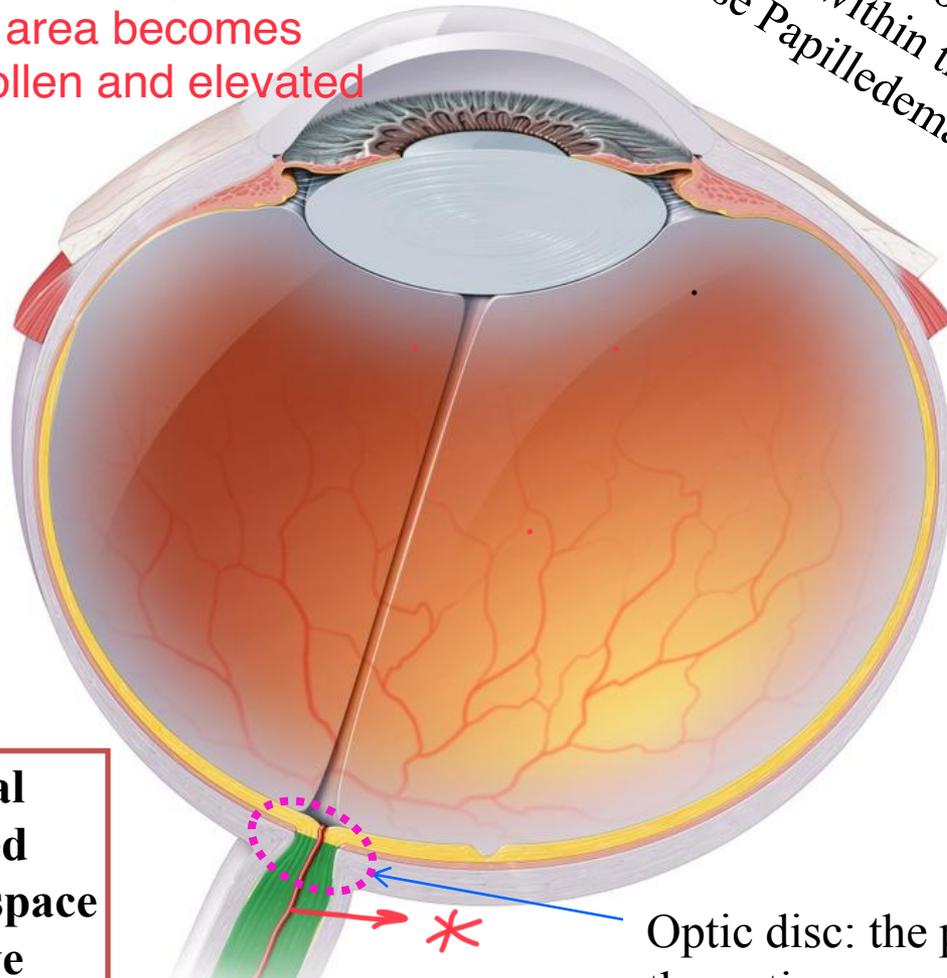
A rise in pressure of the cerebrospinal fluid within the cranial cavity therefore is transmitted to the back of the eyeball.

Papilledema



Normally, there is a shallow depression in the area of the optic disc, but when there is an increase in intracranial pressure the area becomes swollen and elevated

Another cause of papilledema
Example
In cavernous sinus thrombosis, venous congestion within the retina May cause Papilledema



*
Central artery of retina
With central vein of retina in the center of the optic nerve

Optic disc: the point of exit of the optic nerve, lacking visual receptors (blind spot)

A swollen optic disc caused by increased intracranial pressure

Can be seen when retina is examined using an Ophthalmoscope

Any increase in intracranial pressure results in increased pressure in the subarachnoid space surrounding the optic nerve

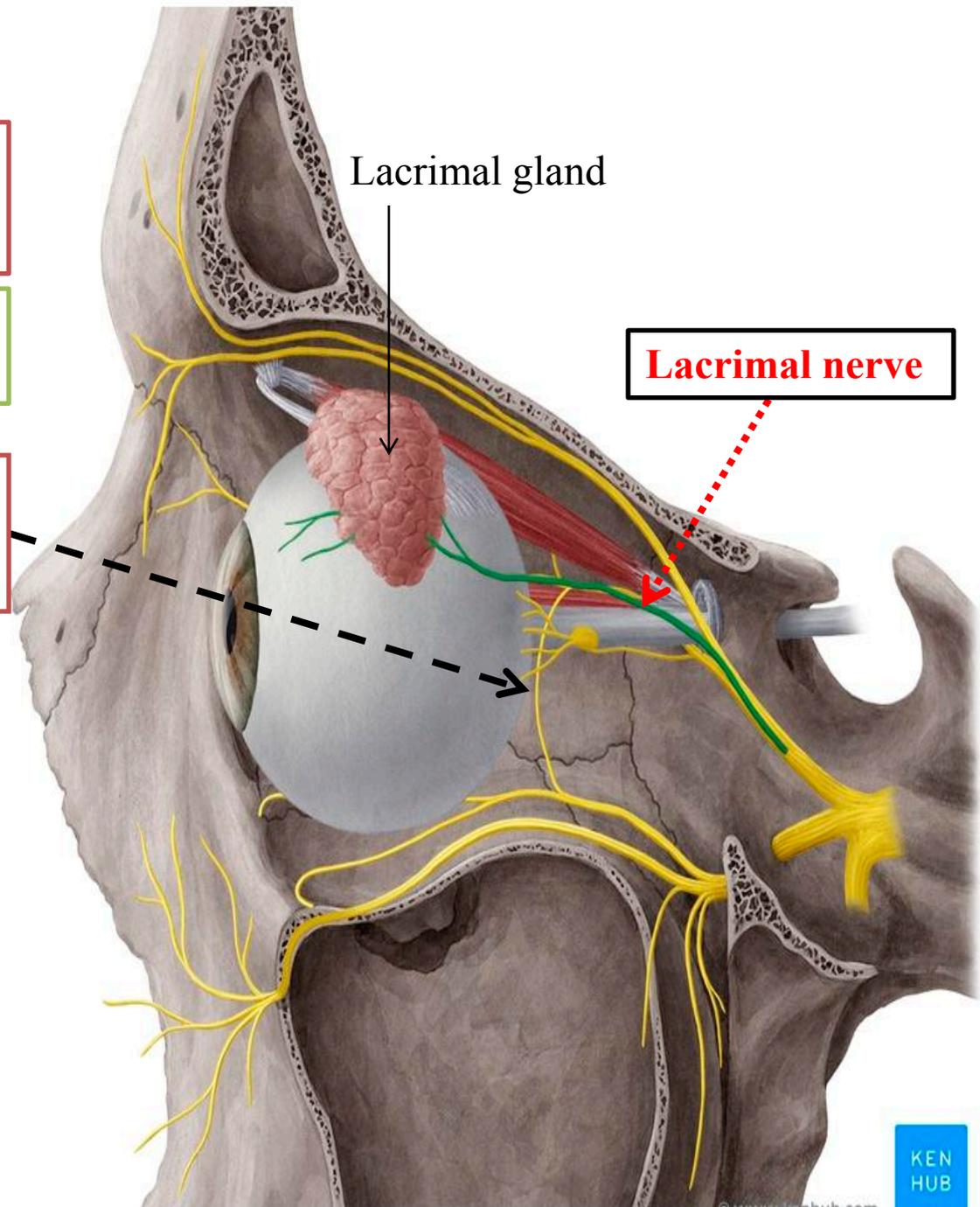
Increase in CSF pressure

Lacrimal Nerve

The lacrimal nerve arises from the ophthalmic division of the trigeminal nerve

It enters the orbit through **the superior orbital fissure**

It is joined by a branch of the zygomaticotemporal nerve (parasympathetic to lacrimal gland)

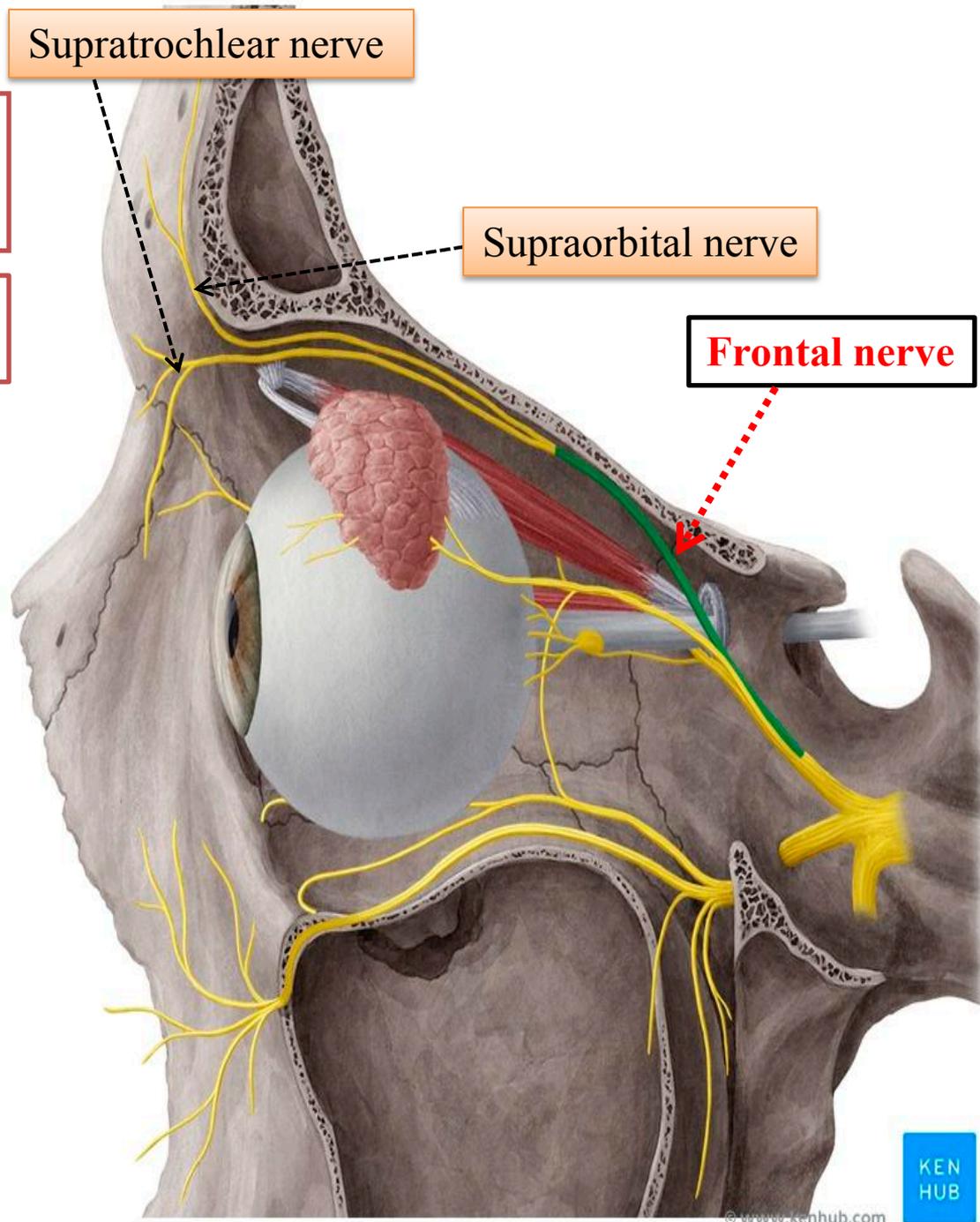


Frontal Nerve

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

It enters the orbit through the **superior orbital fissure**

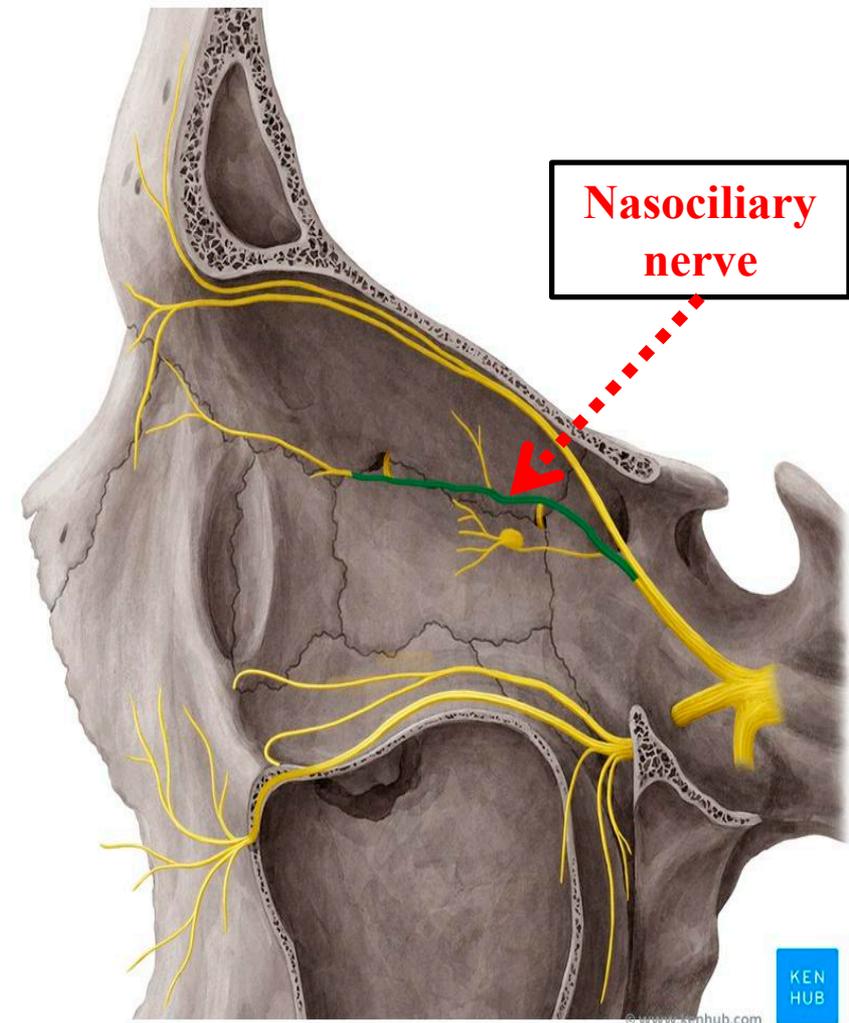
It divides into the supratrochlear and supraorbital nerves that wind around the upper margin of the orbital cavity to supply the skin of the forehead



Nasociliary Nerve

- The nasociliary nerve arises from the ophthalmic division of the trigeminal nerve.
- It enters the orbit through the **superior orbital fissure**

It passes over the (medial) nasal wall of the orbit



Read only

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

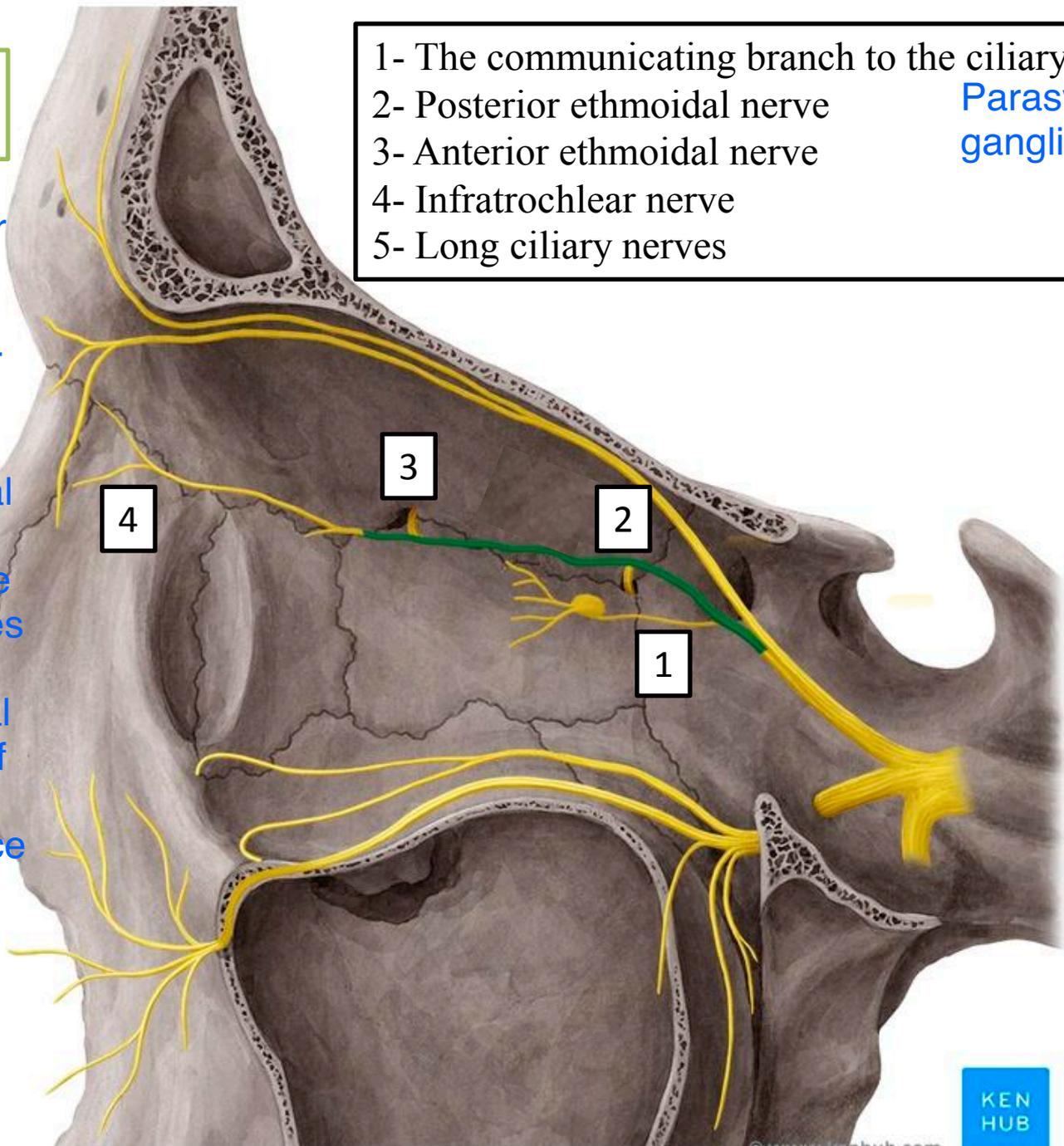
5-**The anterior ethmoidal nerve** passes through the anterior ethmoidal foramen. After supplying an area of mucous membrane in the nasal cavity, it appears on the face as the external nasal nerve at the lower border of the nasal bone, and supplies the skin of the nose down as far as the tip

Branches of the Nasociliary Nerve

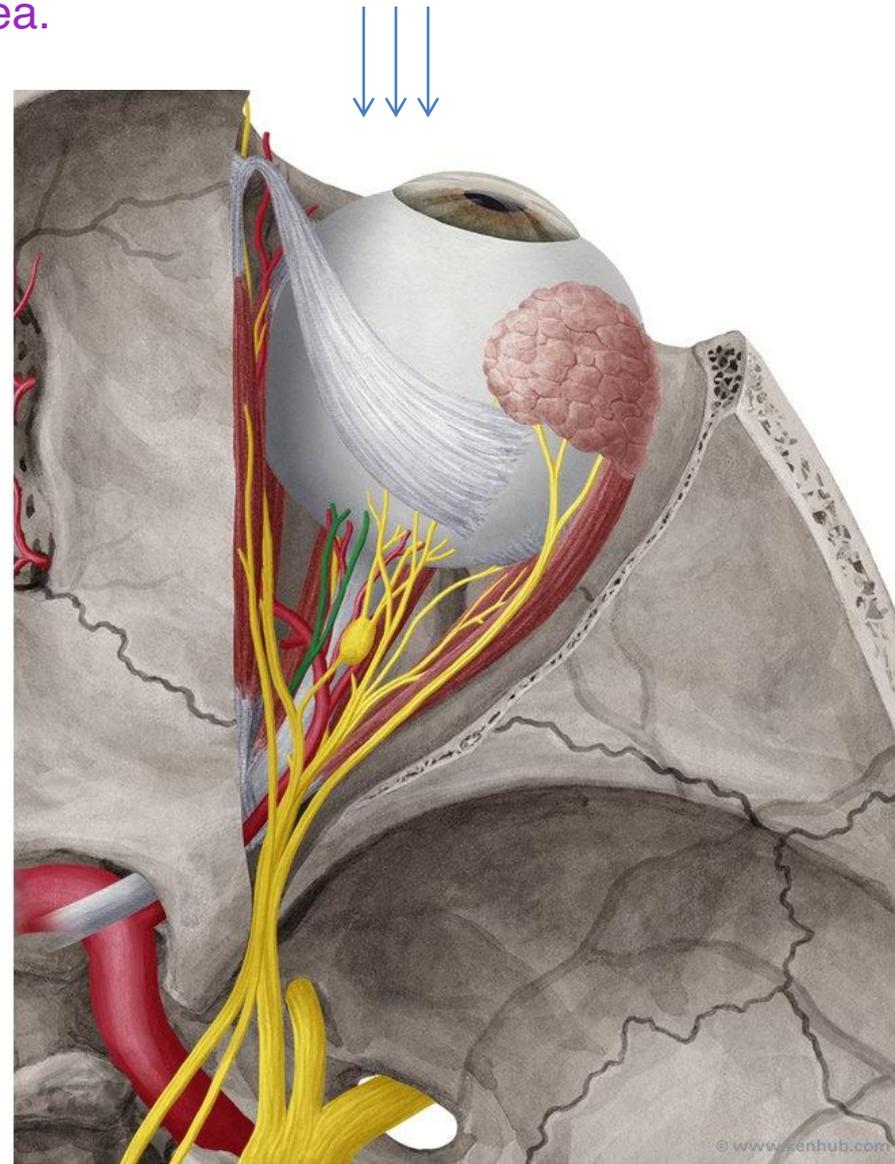
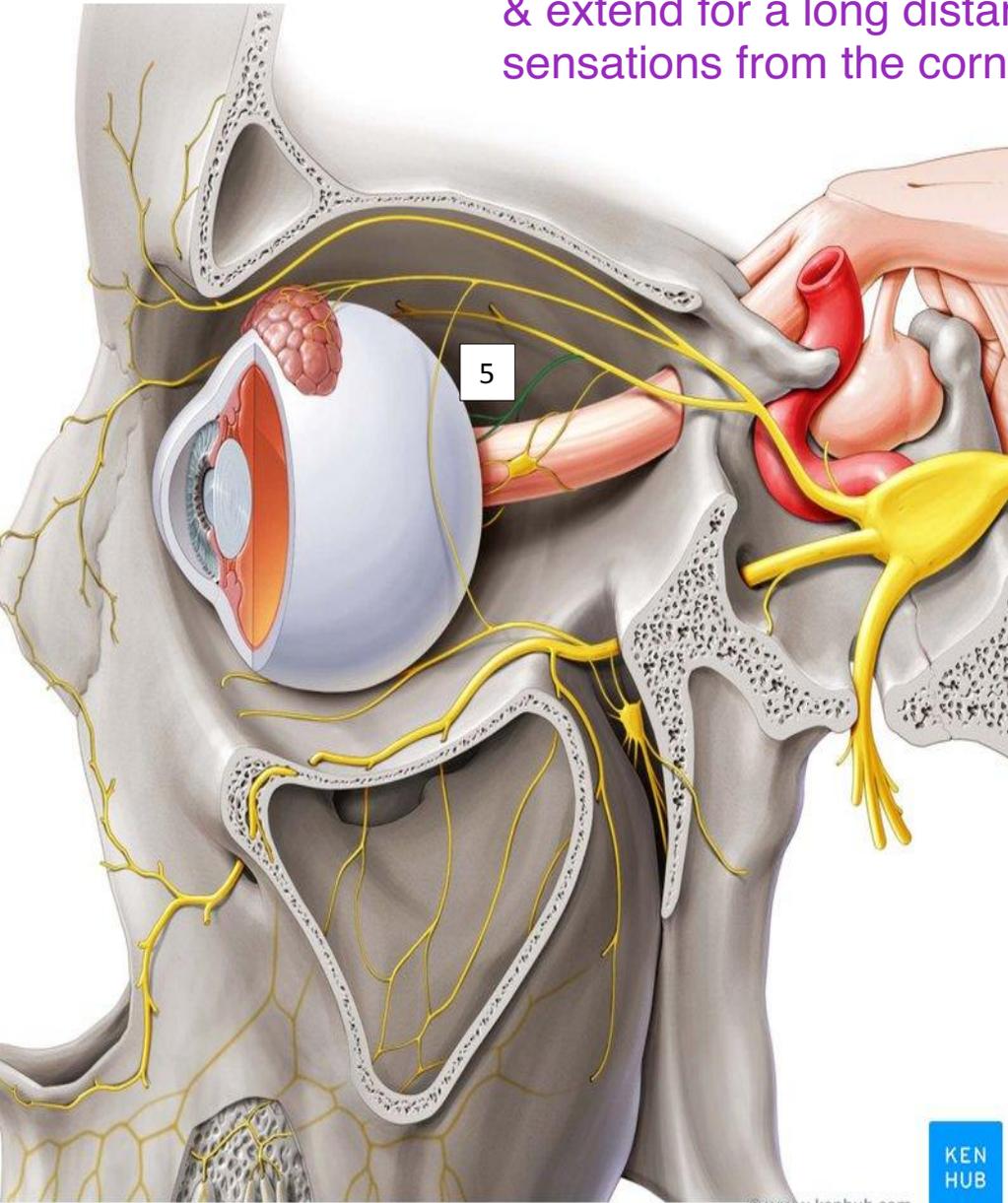
Posterior & anterior ethmoidal nerves pass through posterior & anterior foramina, respectively. Then emerge in the nasal cavity, to bring sensations from the mucous membranes of this cavity.

* Anterior ethmoidal nerve: at the end of its course it emerges on the face as external nasal nerve

- 1- The communicating branch to the ciliary ganglion
 - 2- Posterior ethmoidal nerve
 - 3- Anterior ethmoidal nerve
 - 4- Infratrochlear nerve
 - 5- Long ciliary nerves
- Parasympathetic ganglion



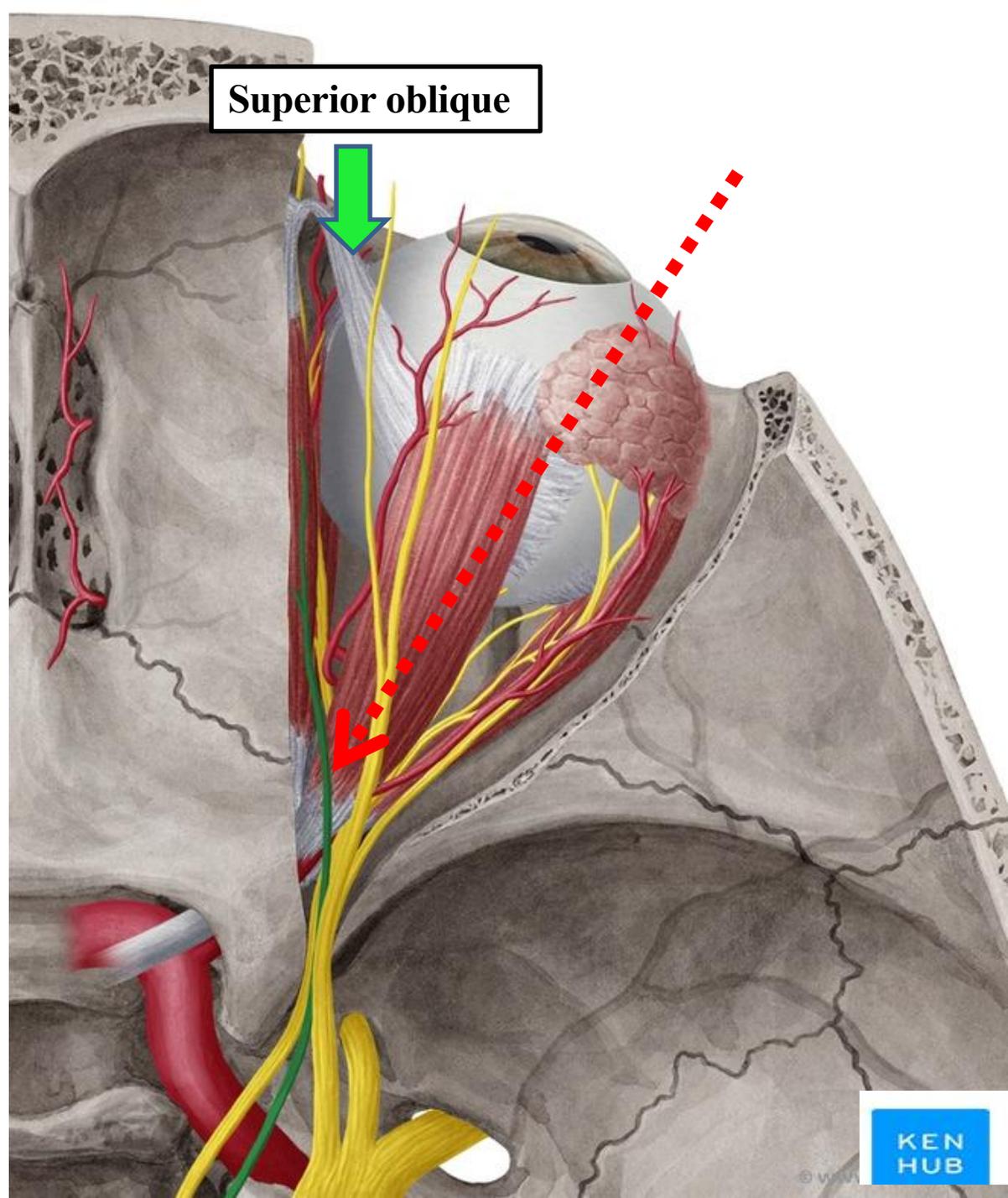
Called “long” because they pierce the sclera & extend for a long distance to bring sensations from the cornea. Long ciliary nerves



Trochlear Nerve

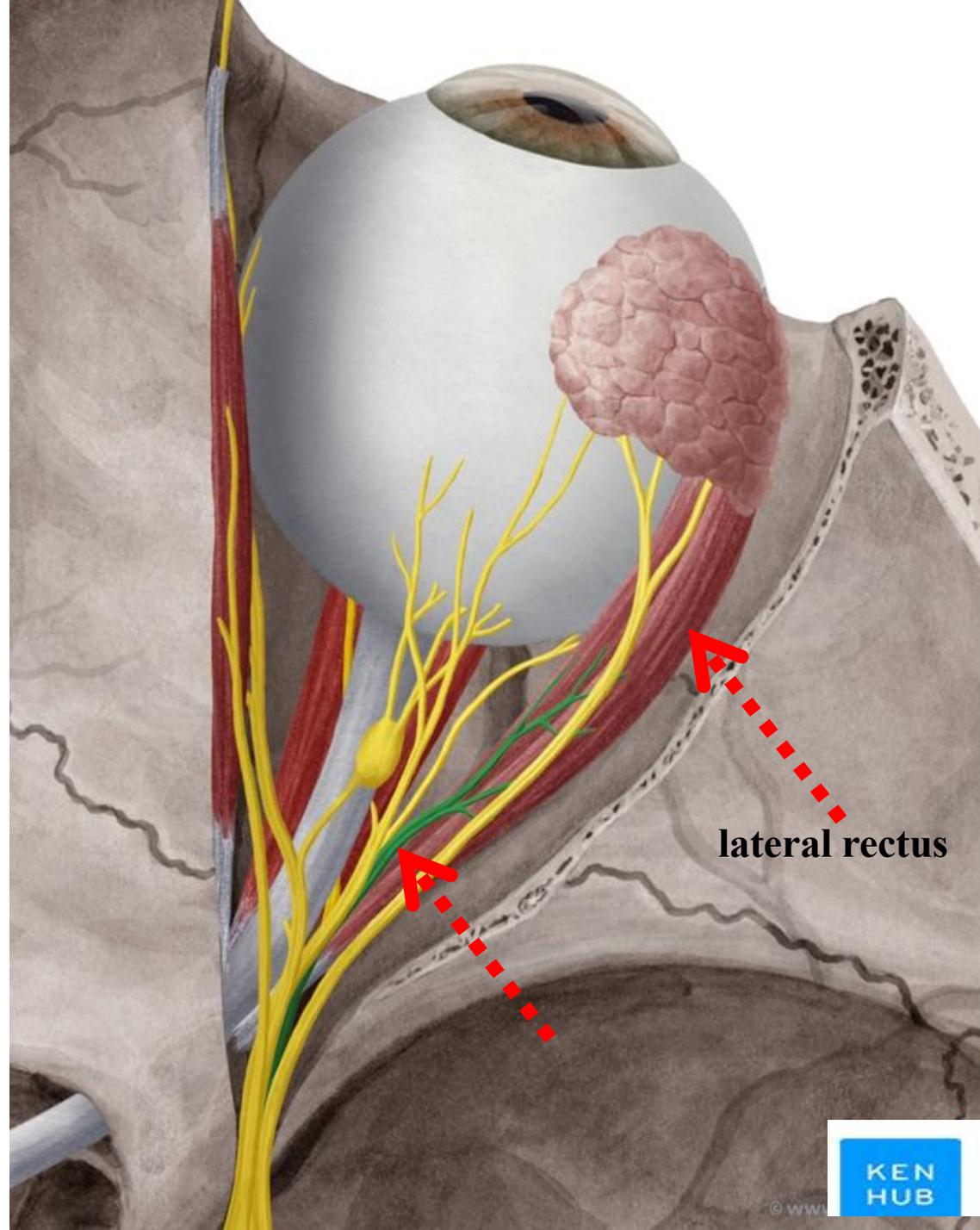
The trochlear nerve enters the orbit through the **superior orbital fissure**

It supplies
the **superior oblique muscle**



Abducent nerve

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



lateral rectus

Oculomotor Nerve

The superior division of the oculomotor nerve enters the orbit through **the superior orbital fissure**

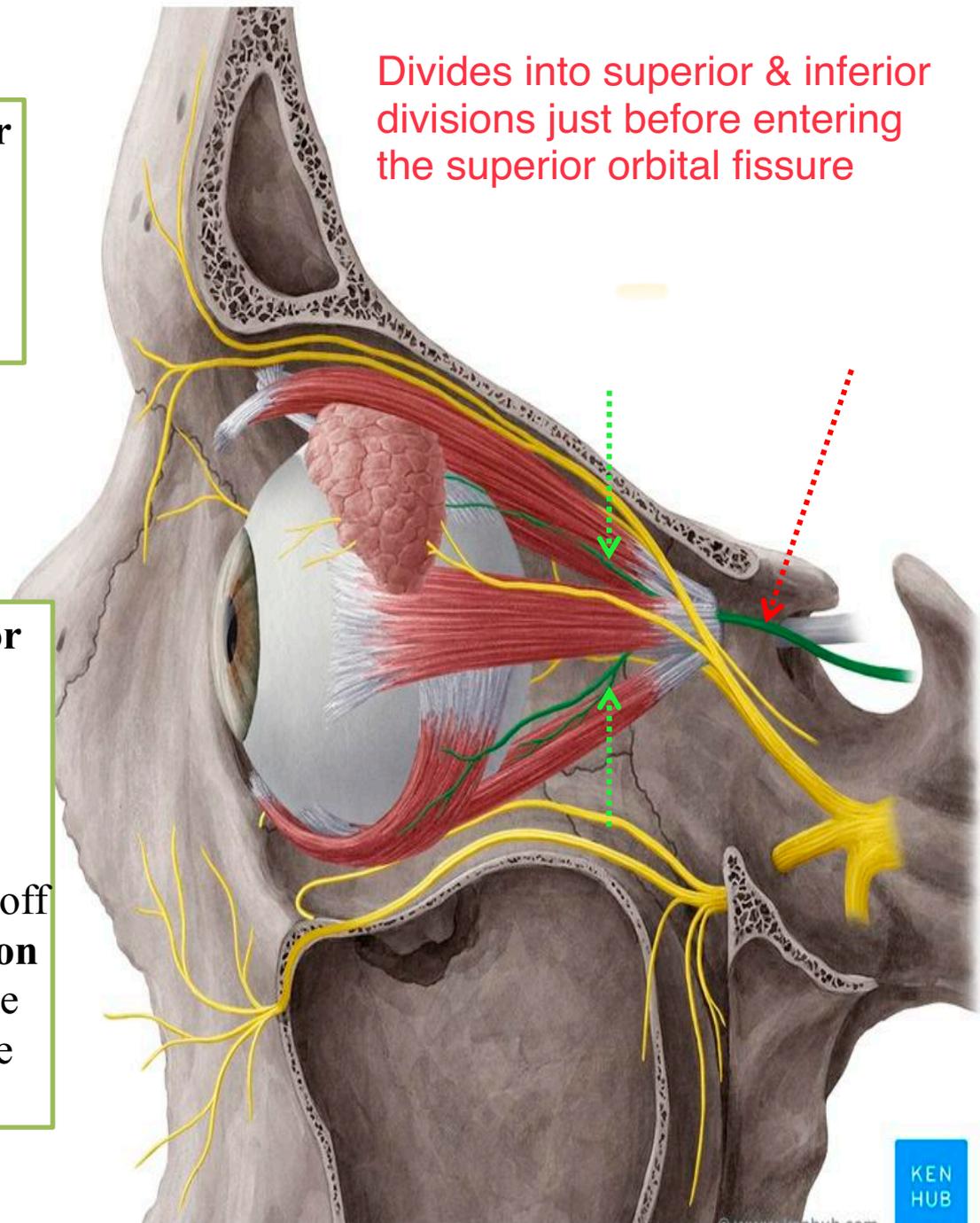
- It supplies **superior rectus** and **levator palpebrae superioris**

SO4 LR6

The inferior division of the oculomotor nerve enters the orbit through **the superior orbital fissure**

- It supplies **inferior rectus, medial rectus, and inferior oblique** muscles.
- The nerve to the inferior oblique gives off a branch that passes to the **ciliary ganglion** and carries parasympathetic fibers to the sphincter pupillae and the ciliary muscle

Divides into superior & inferior divisions just before entering the superior orbital fissure

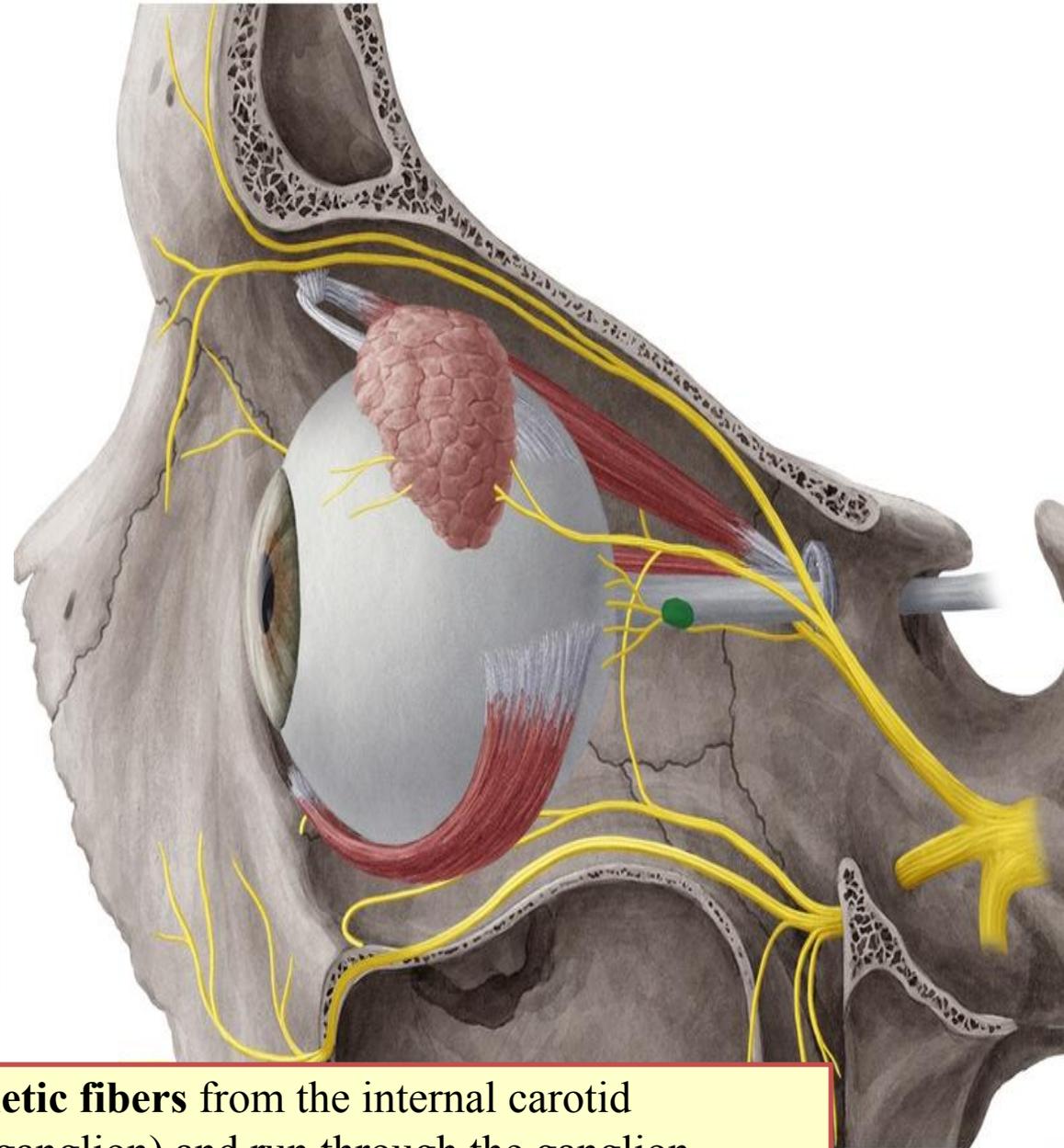


Ciliary Ganglion

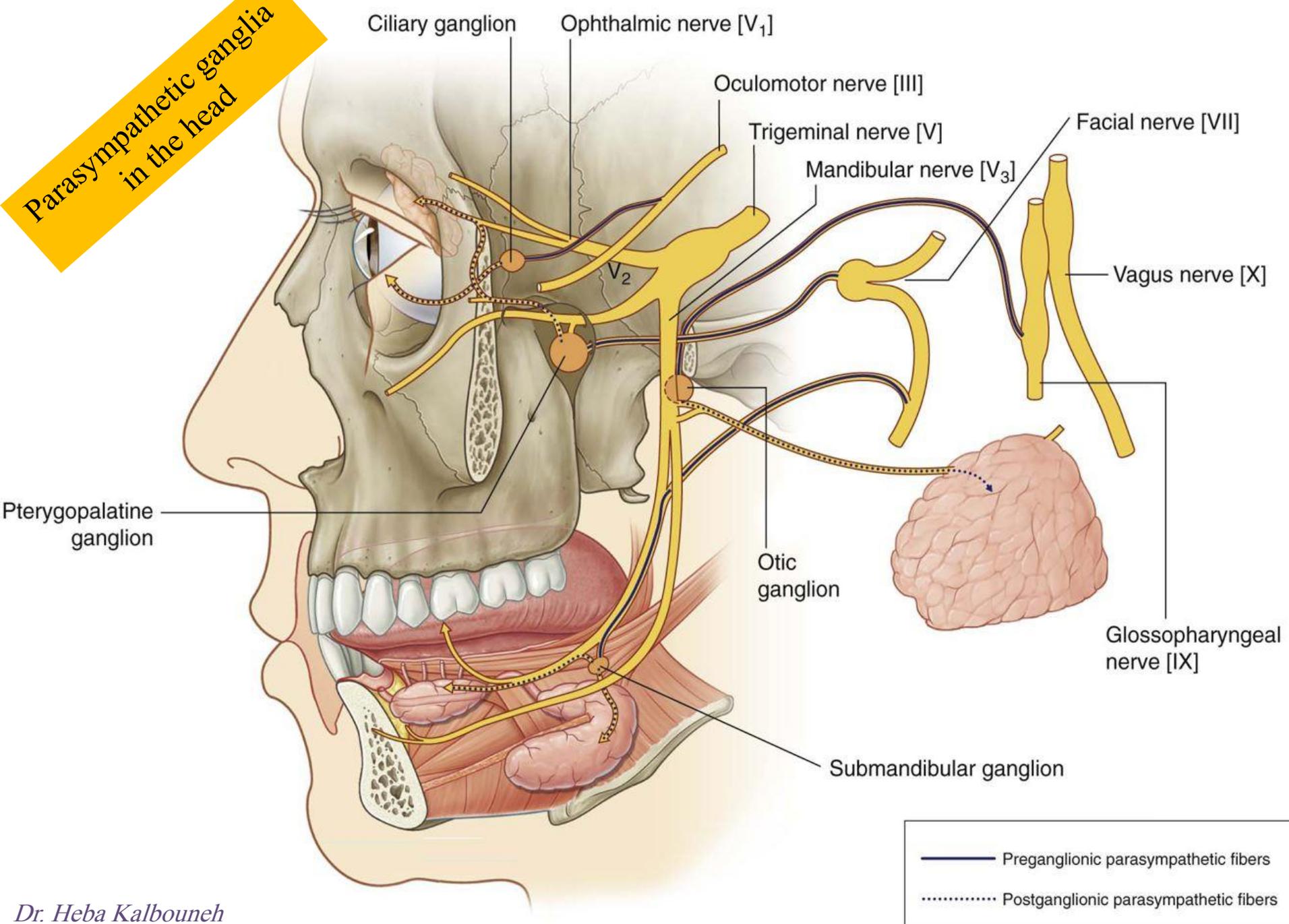
- Is a parasympathetic ganglion
- About the size of a pinhead and situated in the posterior part of the orbit.
- It receives its preganglionic parasympathetic fibers from the **oculomotor nerve via the nerve to the inferior oblique muscle**

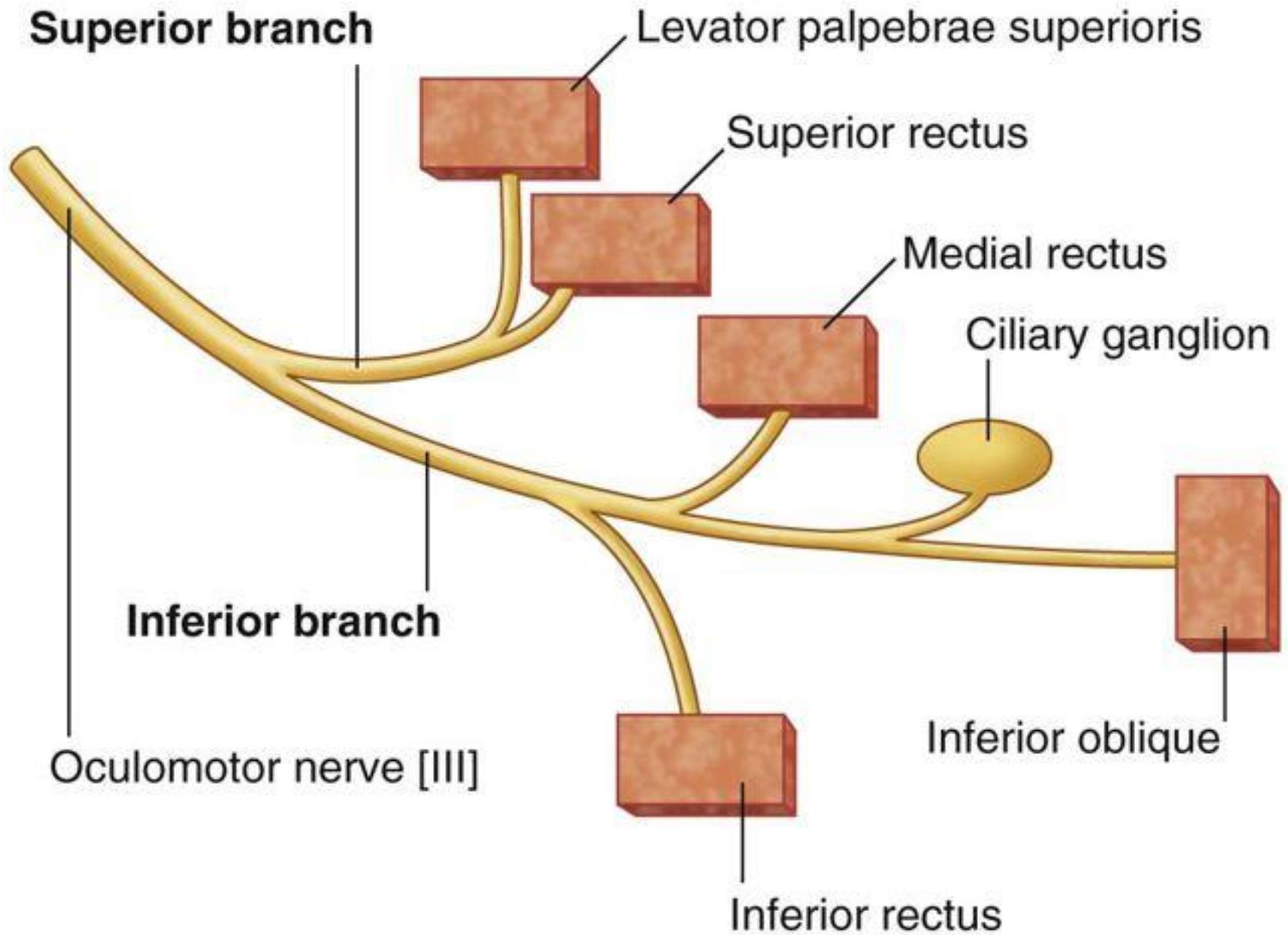
The postganglionic fibers leave the ganglion in the short ciliary nerves, which enter the back of the eyeball and supply the sphincter pupillae and the ciliary muscle.

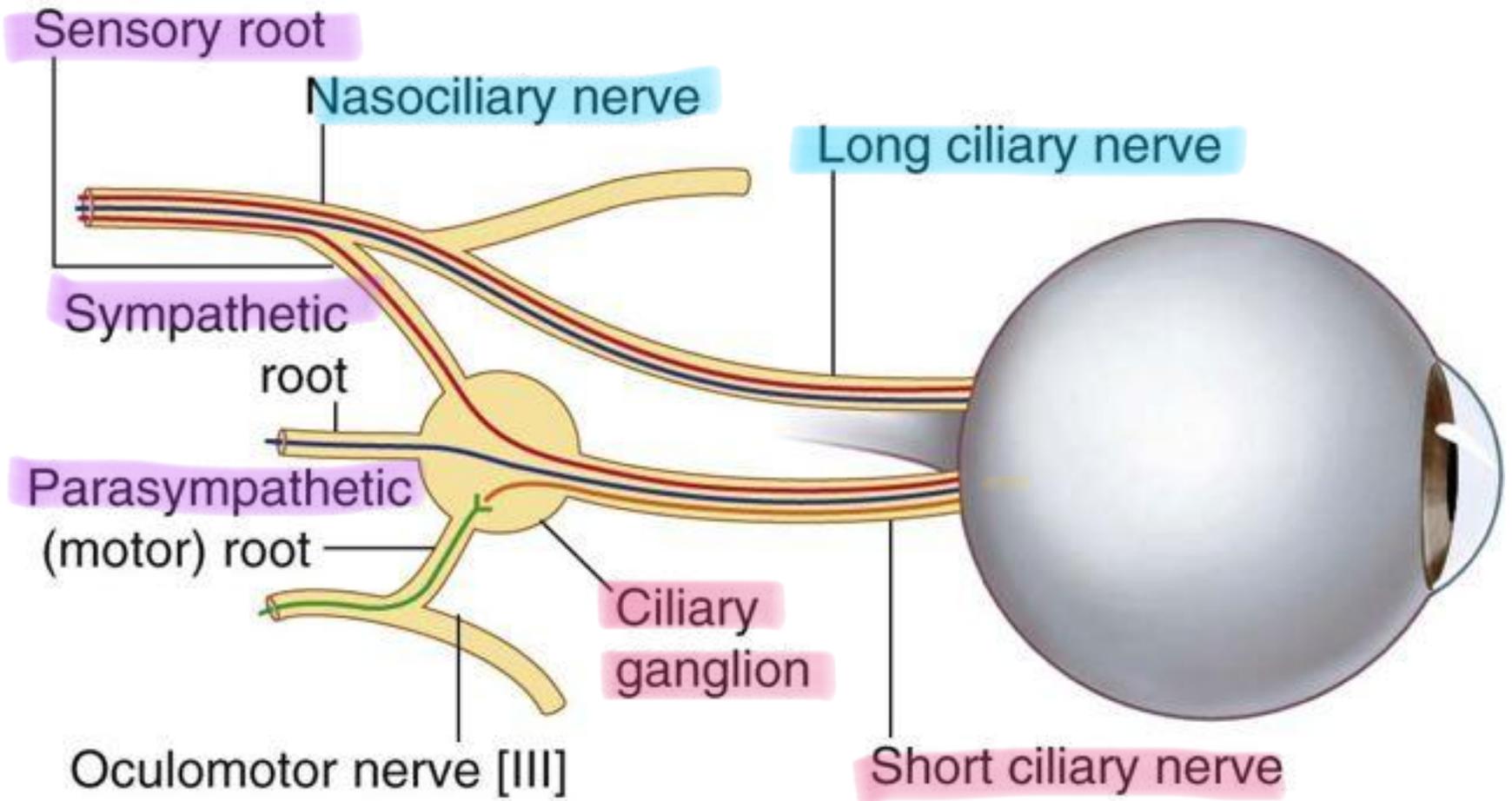
It receives its postganglionic **sympathetic fibers** from the internal carotid sympathetic plexus (superior cervical ganglion) and run through the ganglion without interruption.



Parasympathetic ganglia in the head





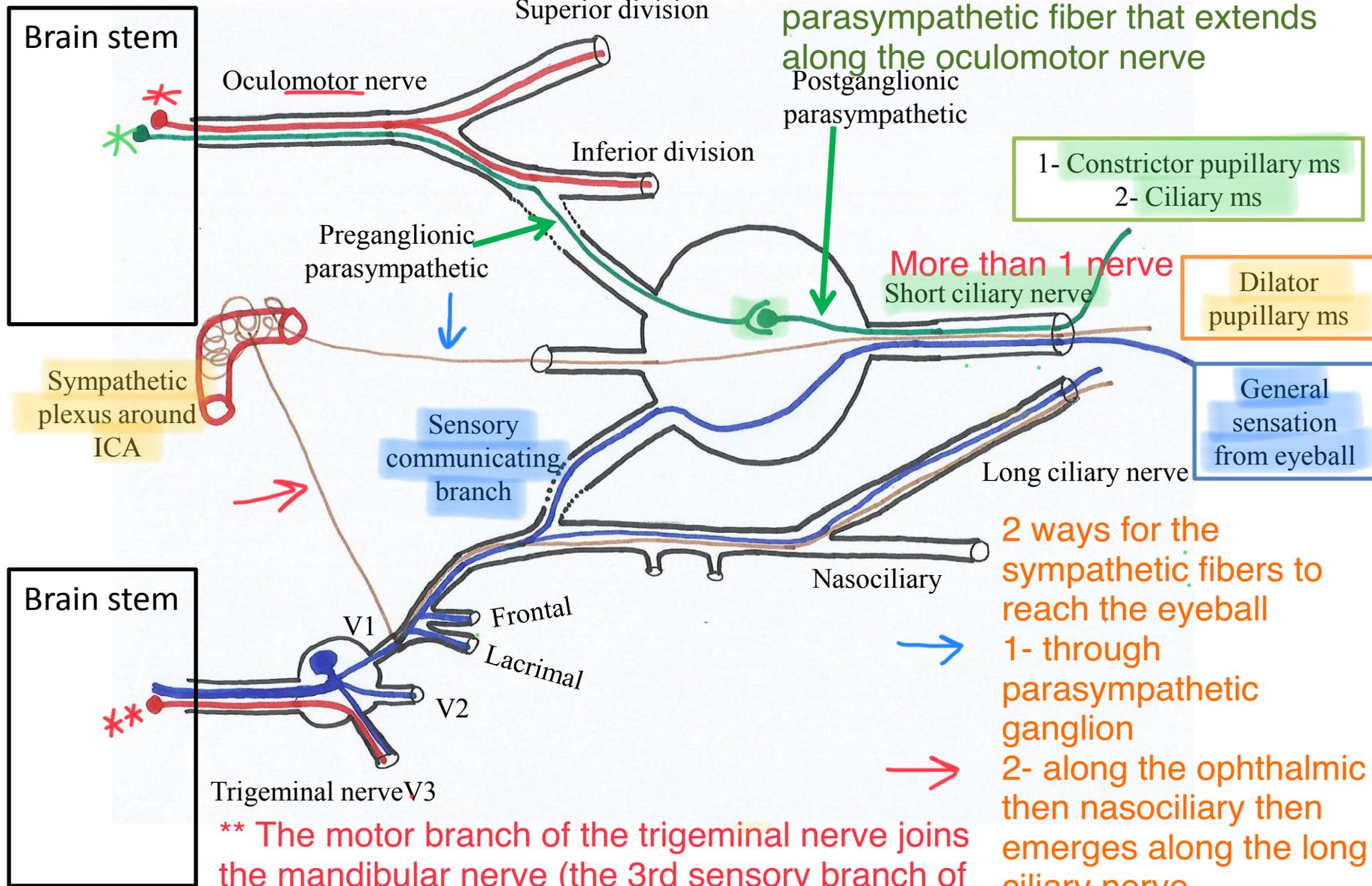


- Sensory fibers
- Sympathetic postganglionic fibers
- Parasympathetic preganglionic fibers
- Parasympathetic postganglionic fibers

Each ganglion must have at least 3 inputs: sensory, parasympathetic and sympathetic

* Cell body of oculomotor is in brain stem

* Cell body of the preganglionic parasympathetic fiber that extends along the oculomotor nerve



1- Constrictor pupillary ms
2- Ciliary ms

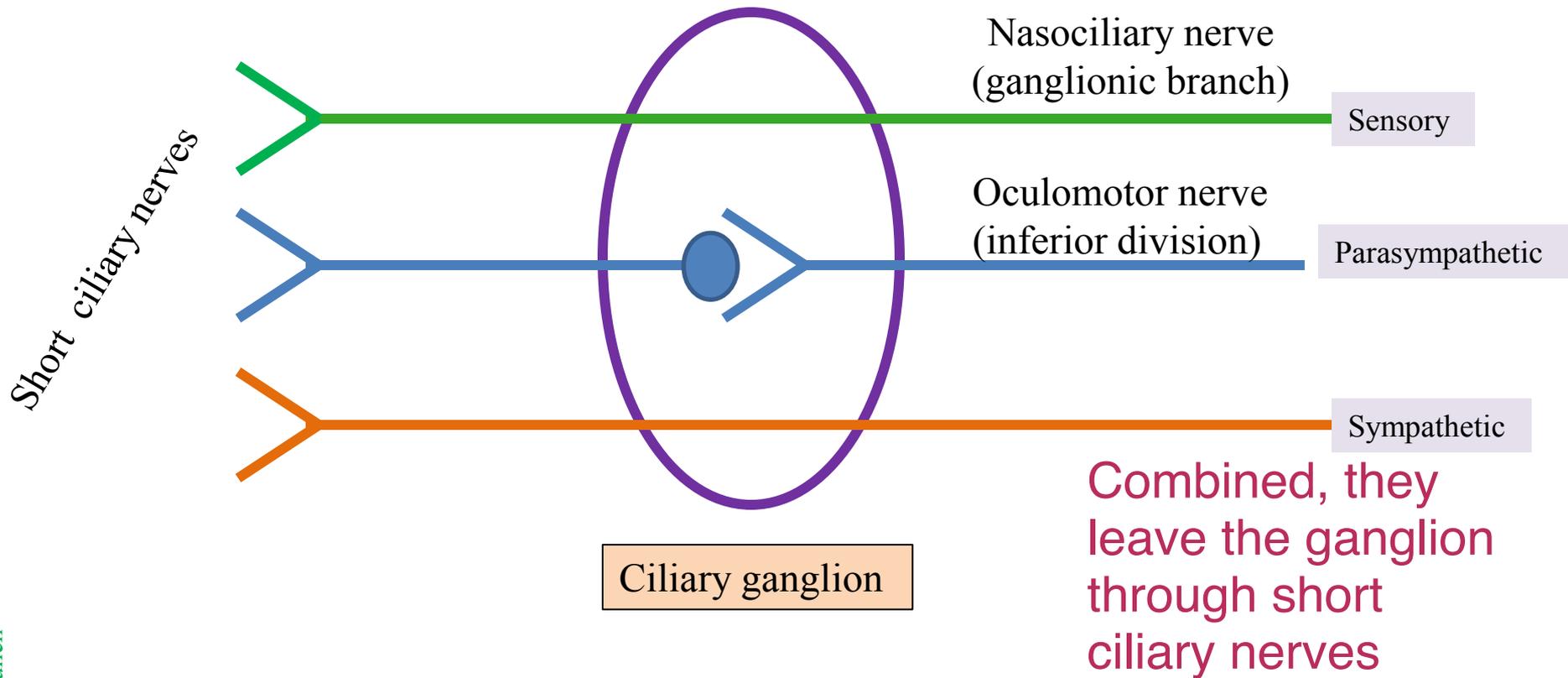
Dilator pupillary ms

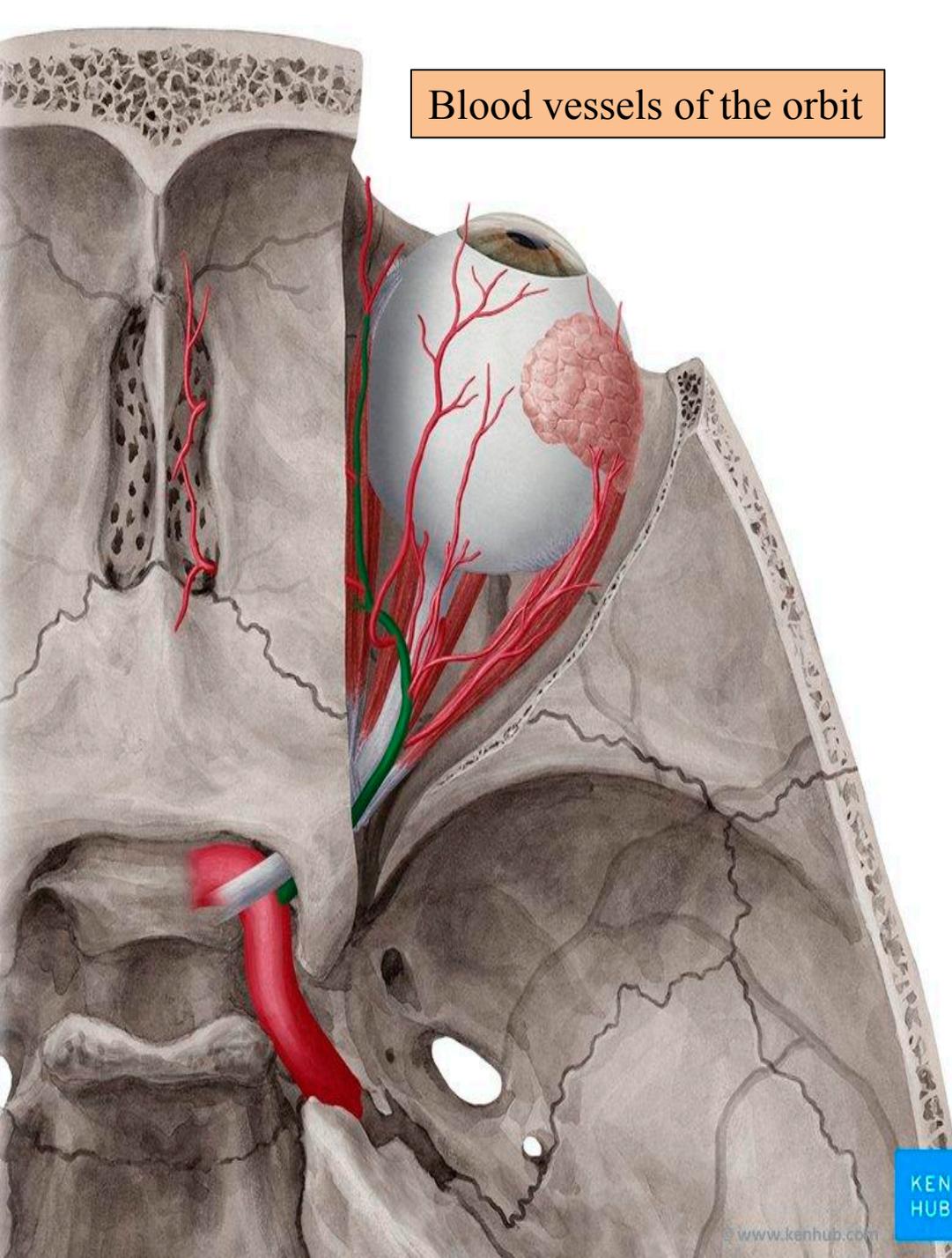
General sensation from eyeball

2 ways for the sympathetic fibers to reach the eyeball
1- through parasympathetic ganglion
2- along the ophthalmic then nasociliary then emerges along the long ciliary nerve

** The motor branch of the trigeminal nerve joins the mandibular nerve (the 3rd sensory branch of the trigeminal nerve).

Anatomically its connected to nasociliary nerve (through a ganglionic branch)
Functionally its associated with the oculomotor nerve





Blood vessels of the orbit

The ophthalmic artery

- ✓ Is the first branch of the internal carotid artery distal to the cavernous sinus
- ✓ Passes through the optic canal with the optic nerve
- ✓ Runs along the medial wall of the orbit. It gives off numerous branches, which accompany the nerves in the orbital cavity

✓ Branches:

Central retinal artery: supplies the inner retinal layers.

Lacrimal artery

Posterior ciliary arteries (long and short)

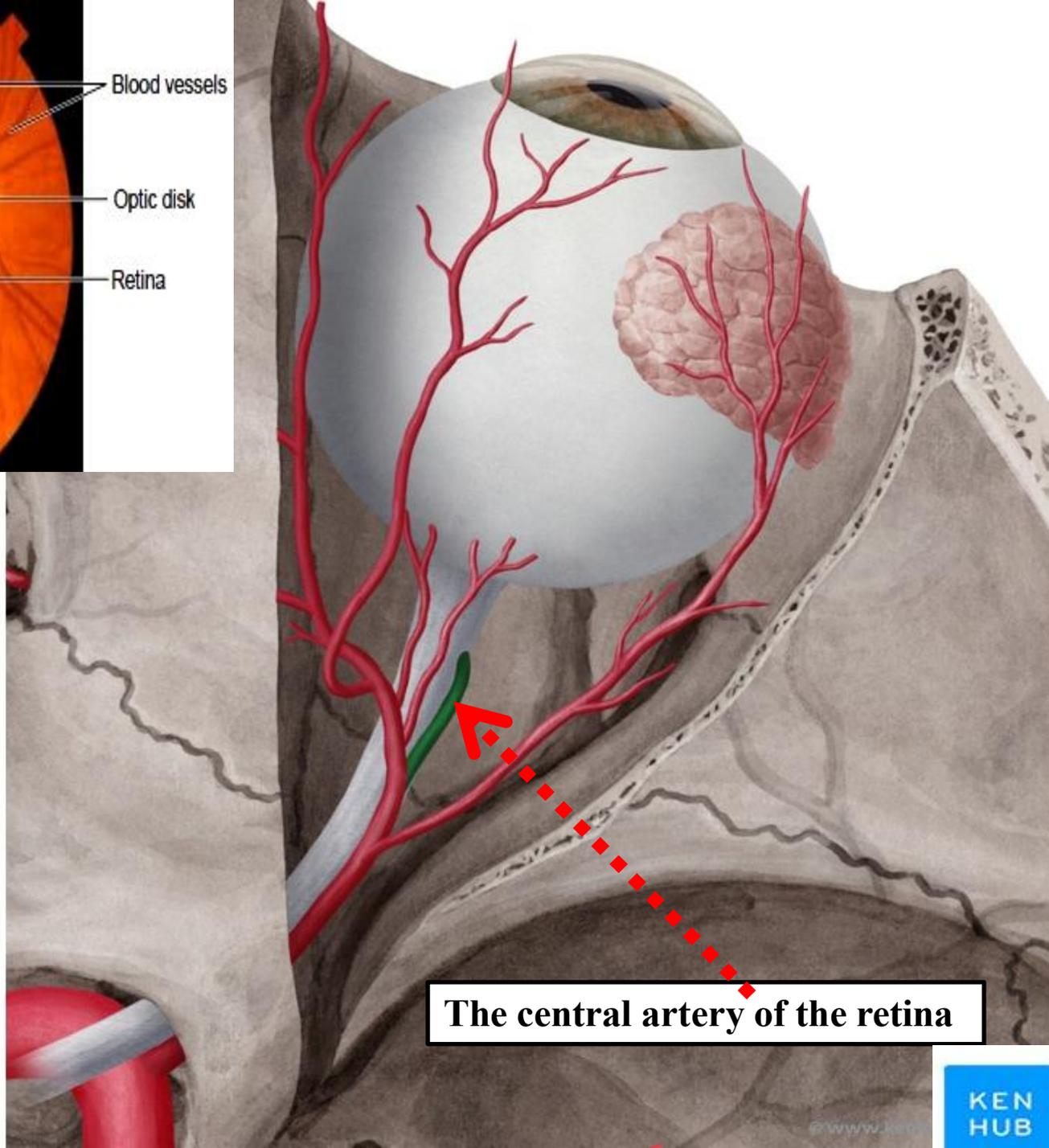
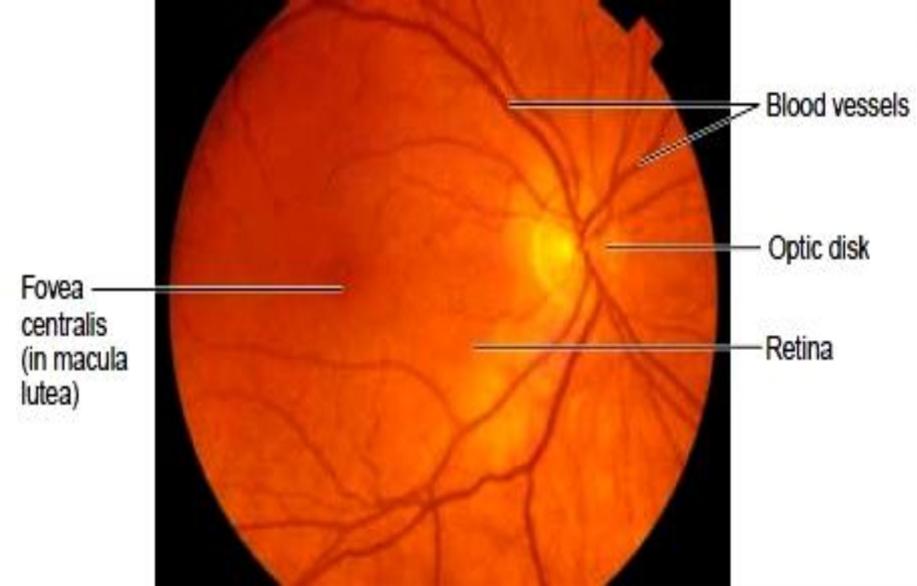
Muscular branches: supplies extra ocular muscles

Anterior and posterior ethmoidal arteries

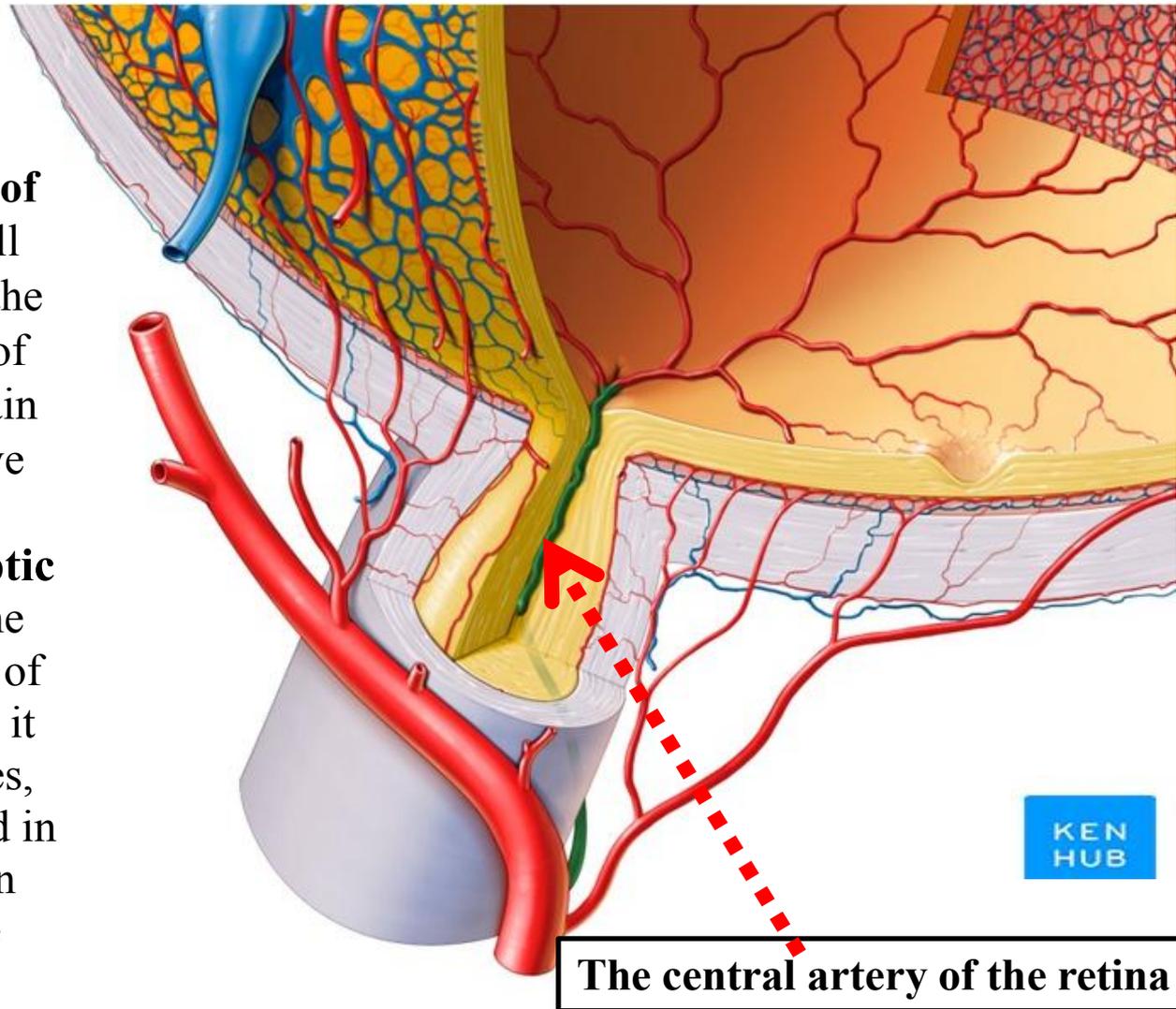
Supraorbital artery

Supratrochlear artery

External nasal 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 central artery of the retina

It's an anatomical end artery. Occlusion of central artery of retina results in blindness
It supplies the retina and doesn't communicate with other branches

Supratrochlear artery

External nasal artery
Passes with external nasal nerve

Supraorbital artery

Long Ciliary artery

Lacrimal artery

Short ciliary arteries

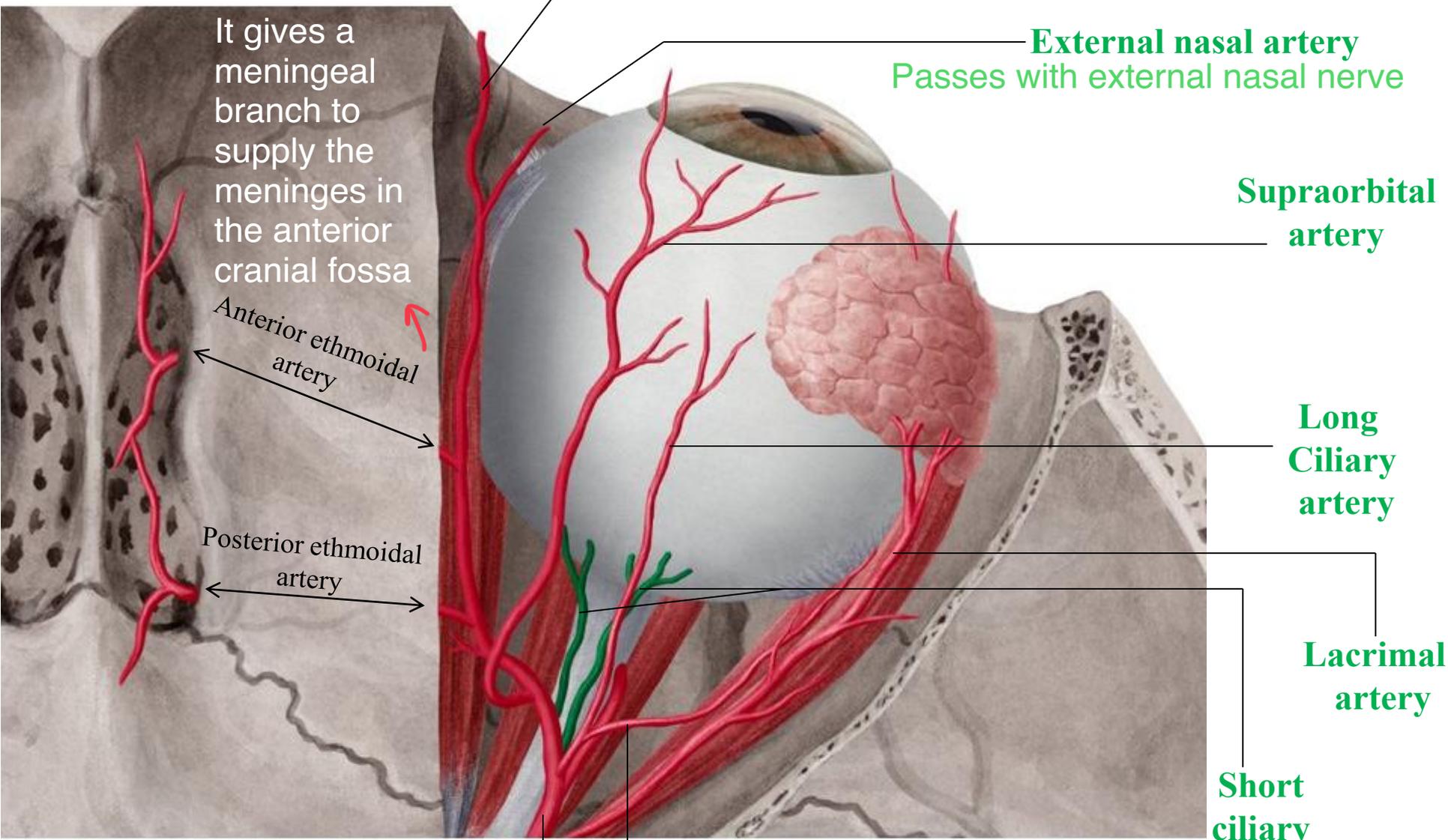
Muscular branch

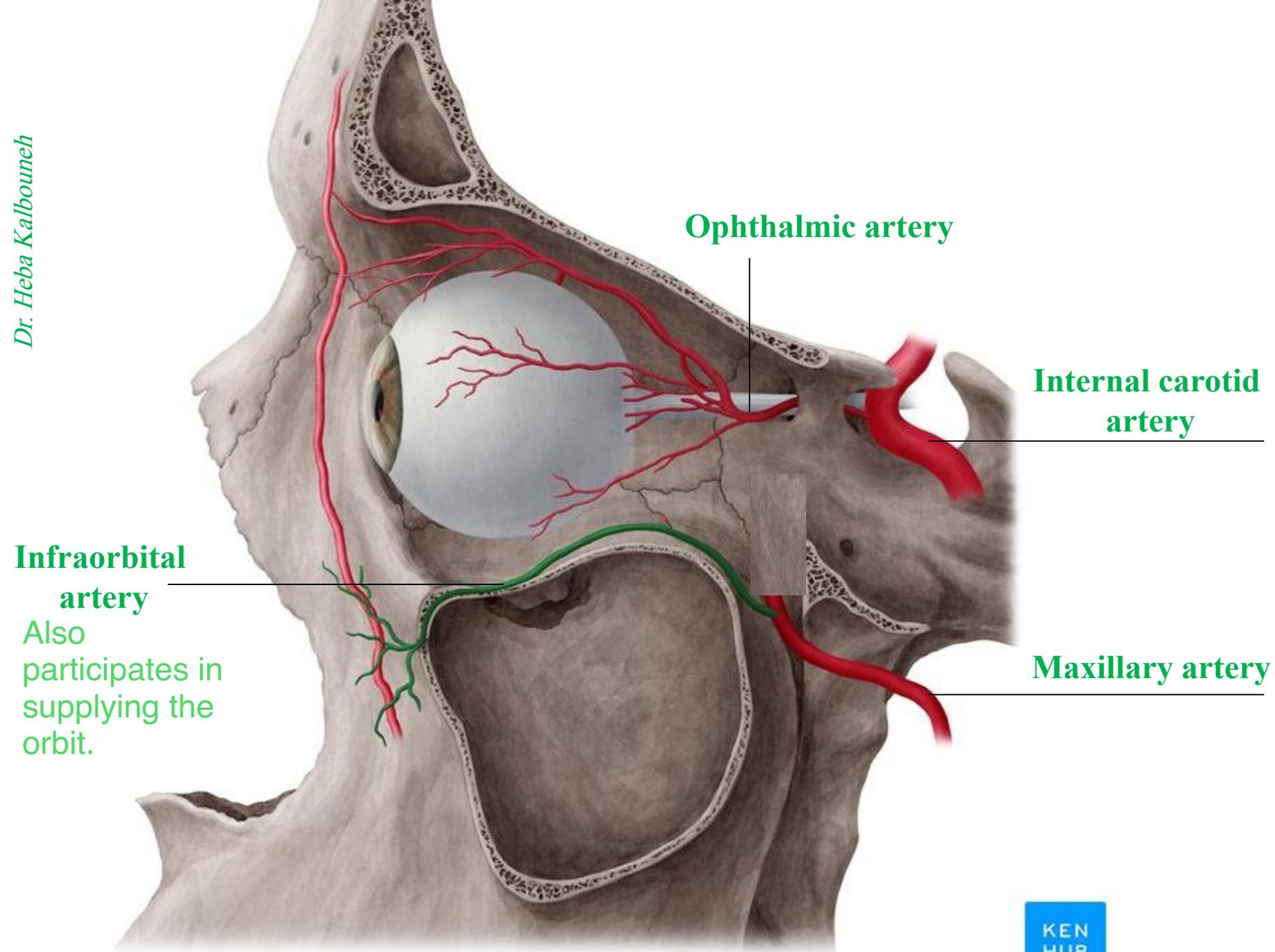
Ophthalmic artery

It gives a meningeal branch to supply the meninges in the anterior cranial fossa

Anterior ethmoidal artery

Posterior ethmoidal artery





Ophthalmic artery

Internal carotid artery

Maxillary artery

Infraorbital artery

Also participates in supplying the orbit.

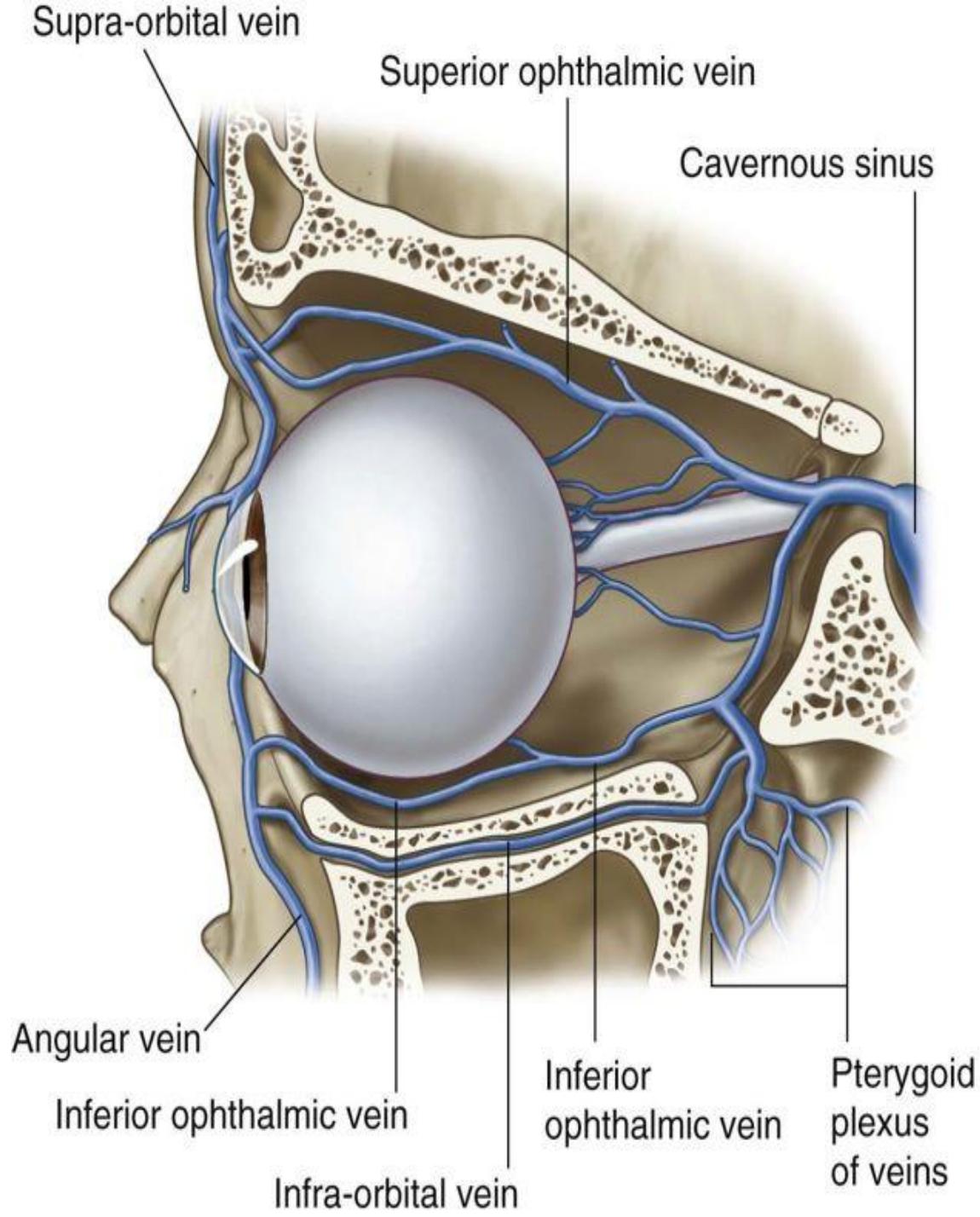
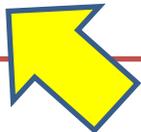
Ophthalmic Veins

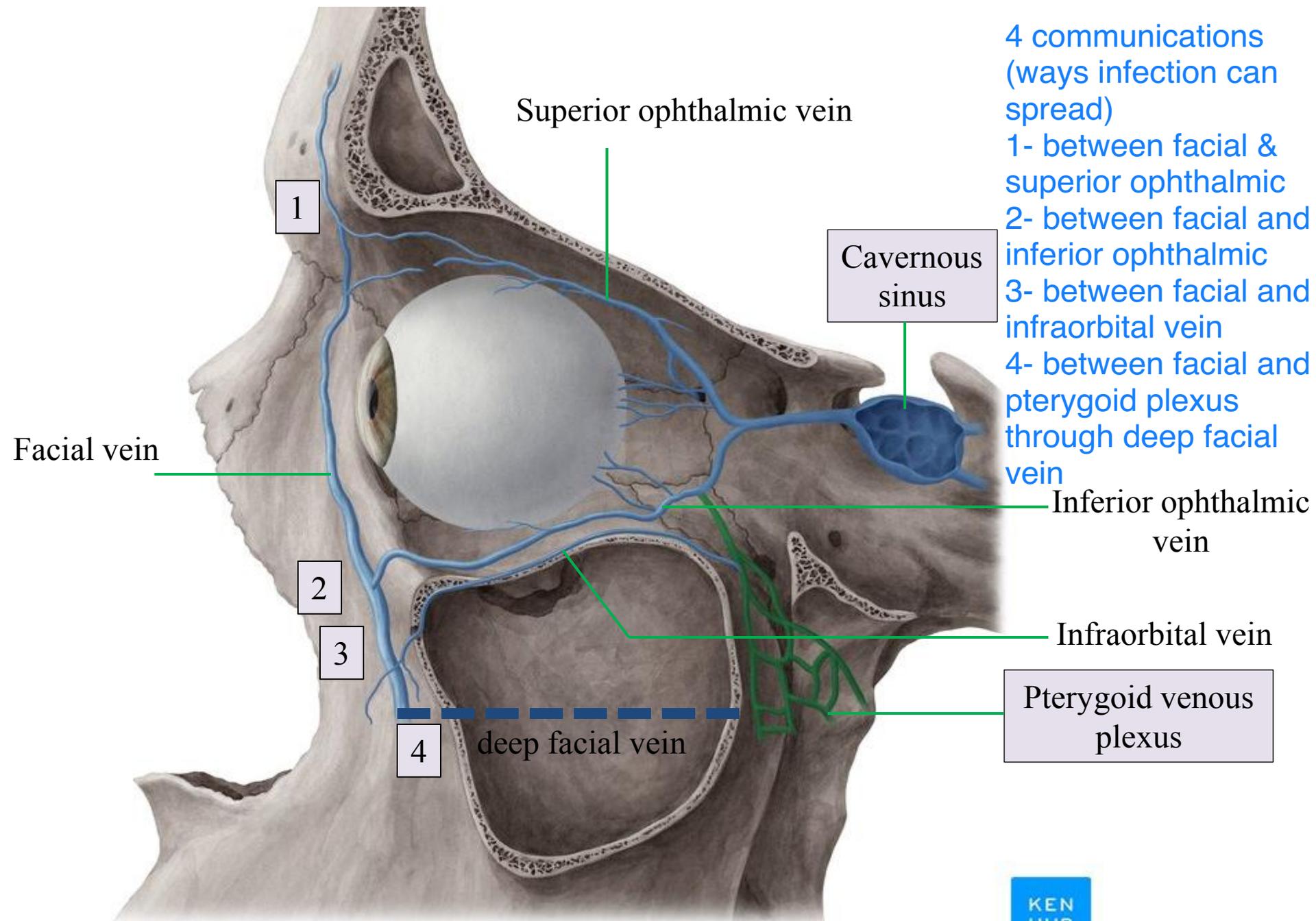
Superior ophthalmic vein

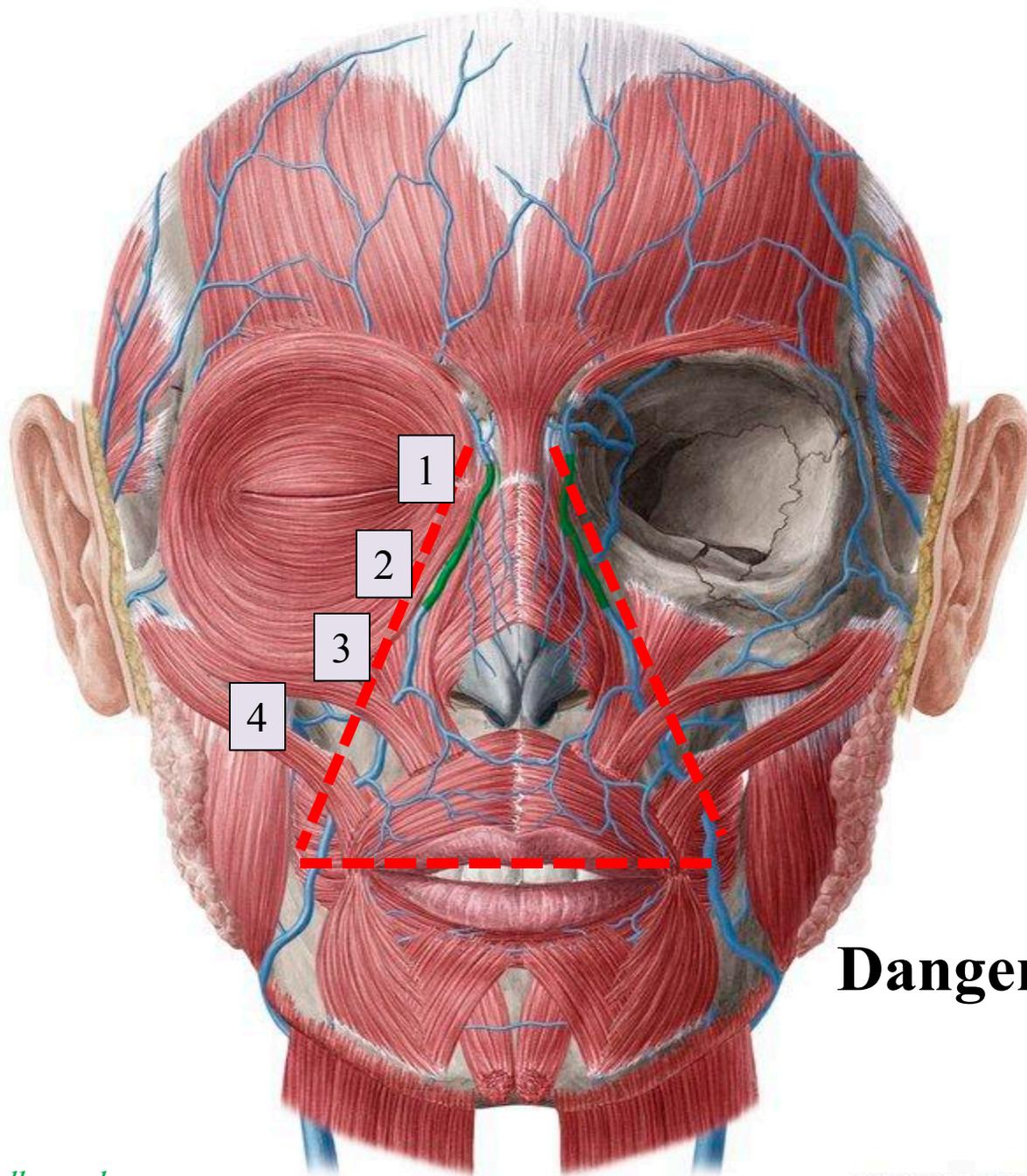
- ✓ Communicates in front with the facial vein
- ✓ Leaves the orbit through the superior orbital fissure and enters the cavernous sinus

Inferior ophthalmic vein

- ✓ Leaves the orbit by:
 - 1-Joining the superior ophthalmic veinOR
 - 2-Passing through the superior orbital fissure on its own to join the cavernous sinusOR
 - 3- Passing through the inferior orbital fissure to join with pterygoid venous plexus.







Danger area of the face