



# The Orbit-2

Dr. Heba Kalbouneh DDS, MSc, DMD/PhD  
Associate Professor of Anatomy and Histology

# Eyelids

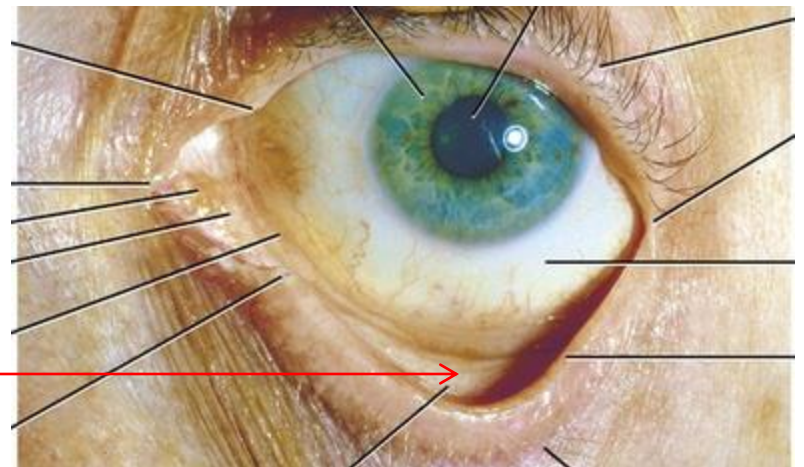
❖ The eyelids (act like the curtains) protect the eye from injury and **excessive light** by their closure

❖ 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**.

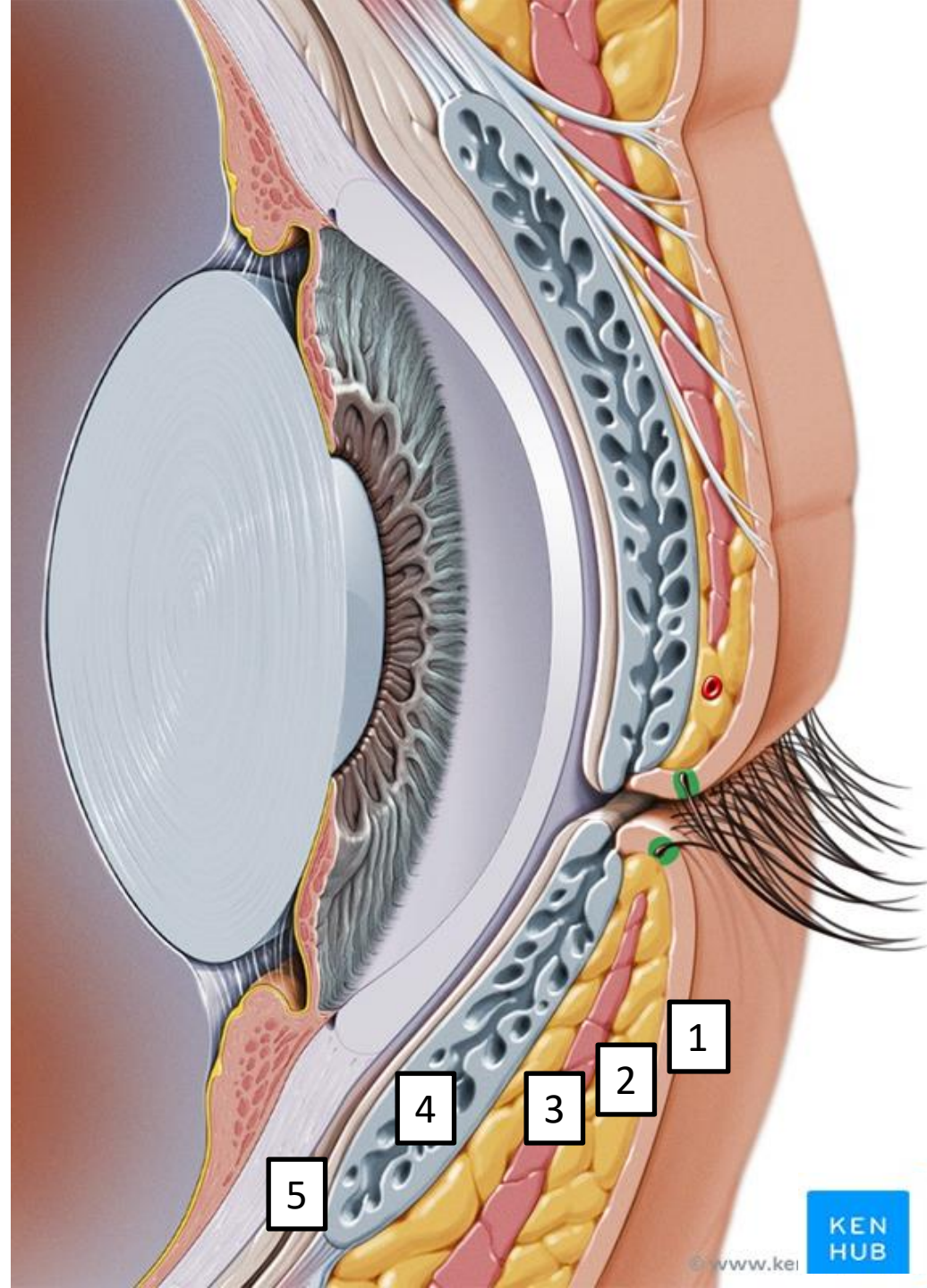
❖ The **palpebral fissure** is the space between the eyelids when they are open

❖ The **palpebral fissure** is the entrance into the **conjunctival sac**



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

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



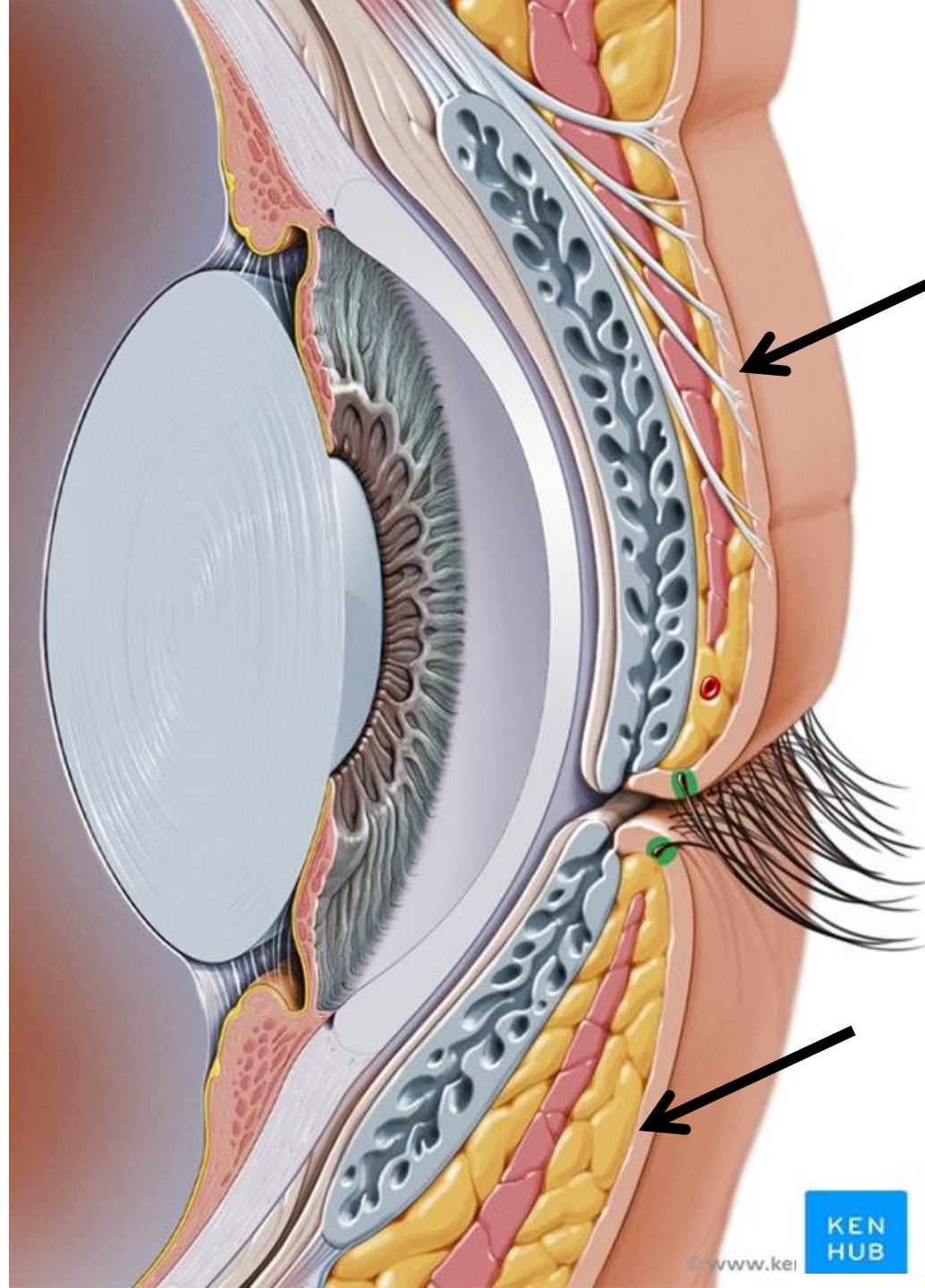
## Structure of the eyelids

### 1 & 2: Skin and subcutaneous tissue:

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

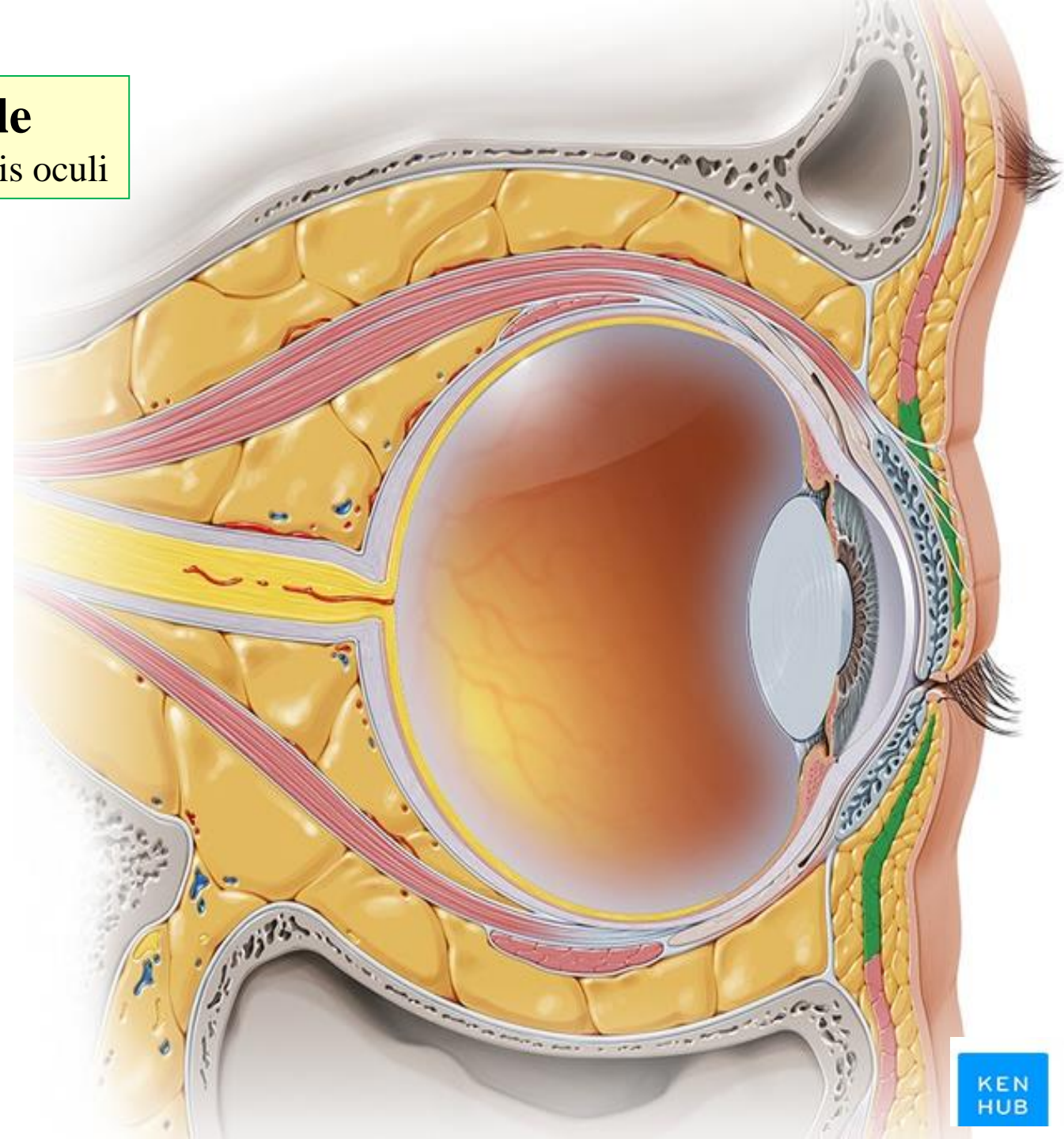
Contains:

- 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



### 3- Voluntary muscle

Palpebral part of orbicularis oculi



#### 4- Orbital septum (Palpebral fascia)

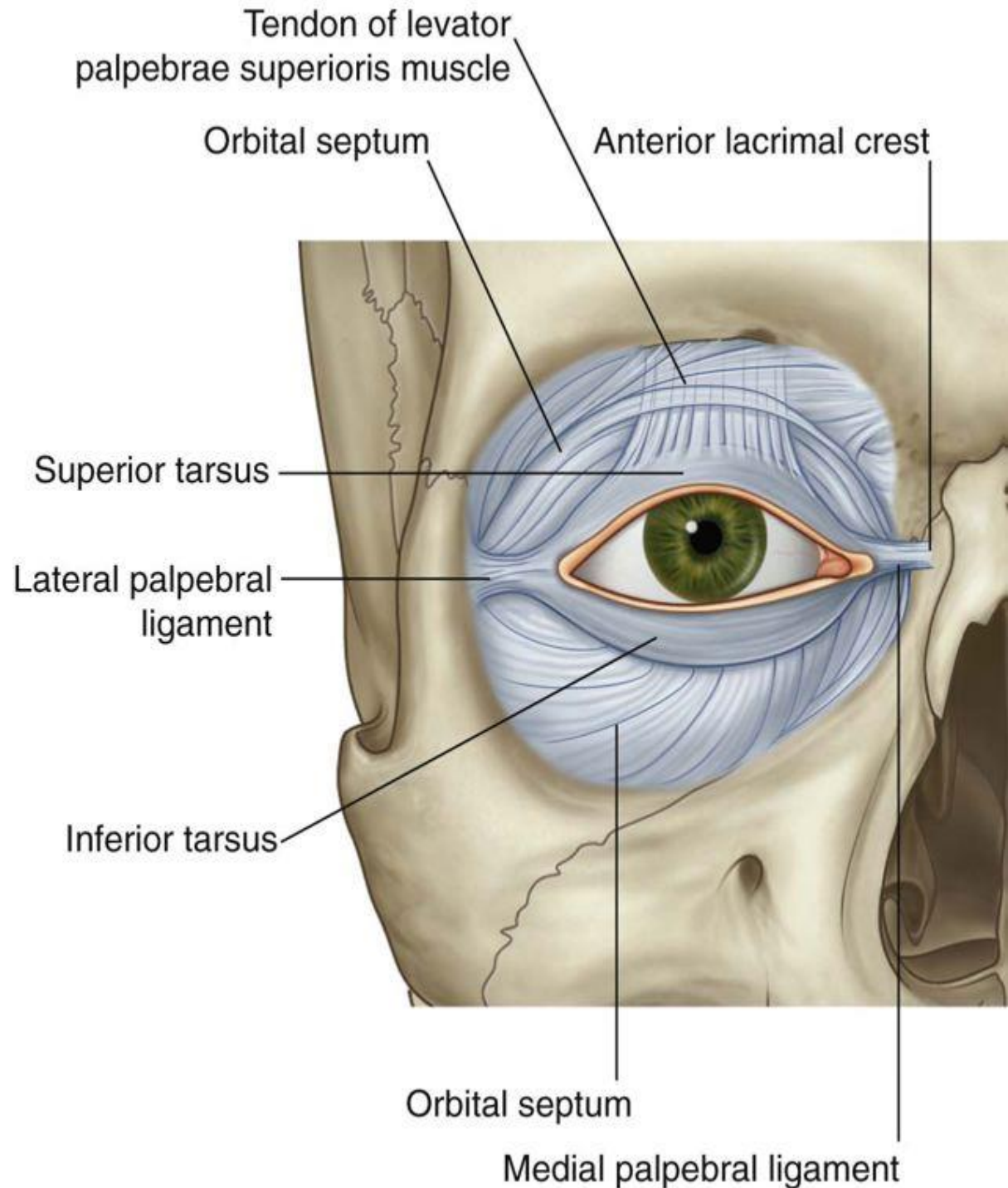
An extension of periosteum into both the upper and lower eyelids from the orbital margin

➤ The orbital septum is thickened at the margins of the lids to form **the superior and inferior tarsal plates**

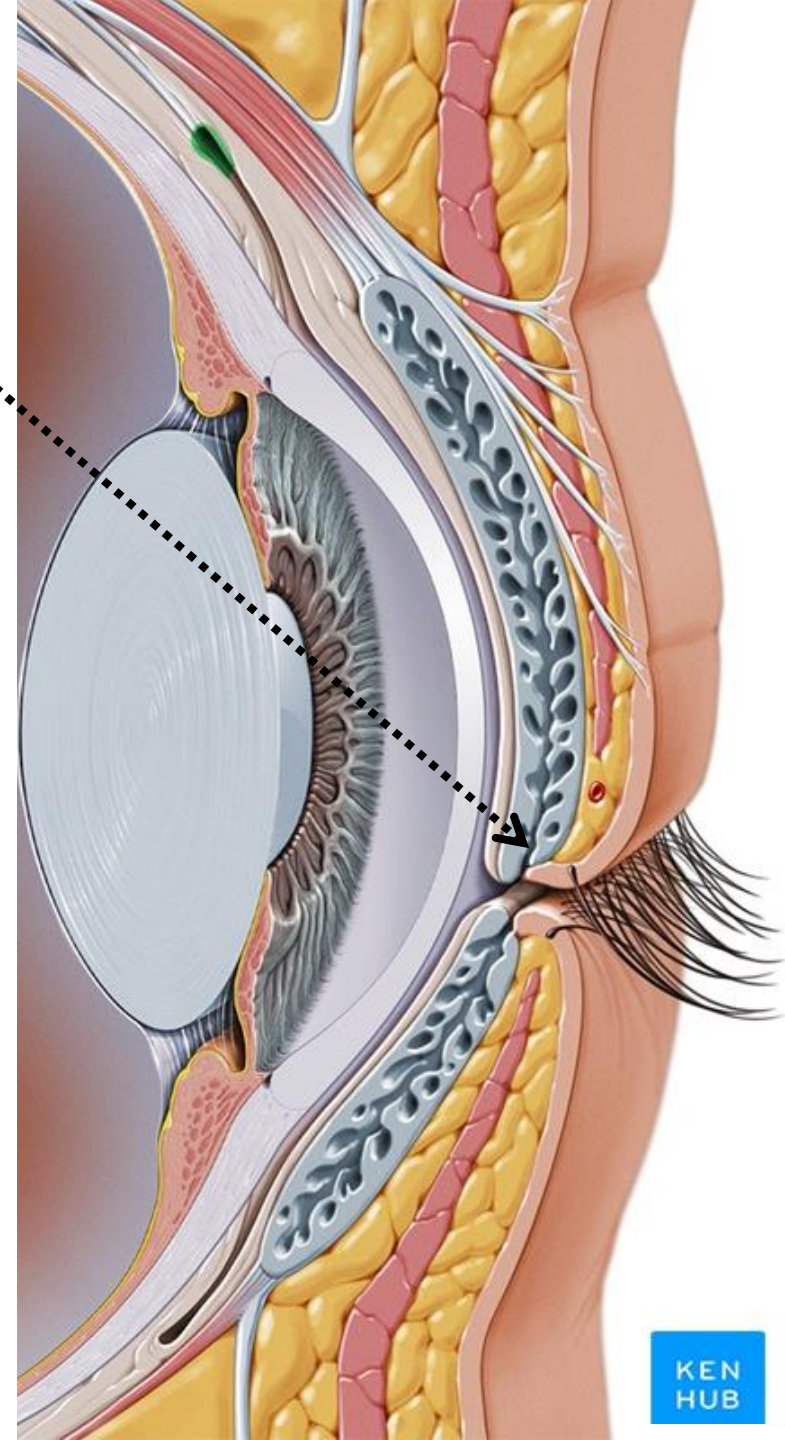
The lateral ends of the tarsal plates are attached by a band, **the lateral palpebral ligament**, to the orbital margin

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



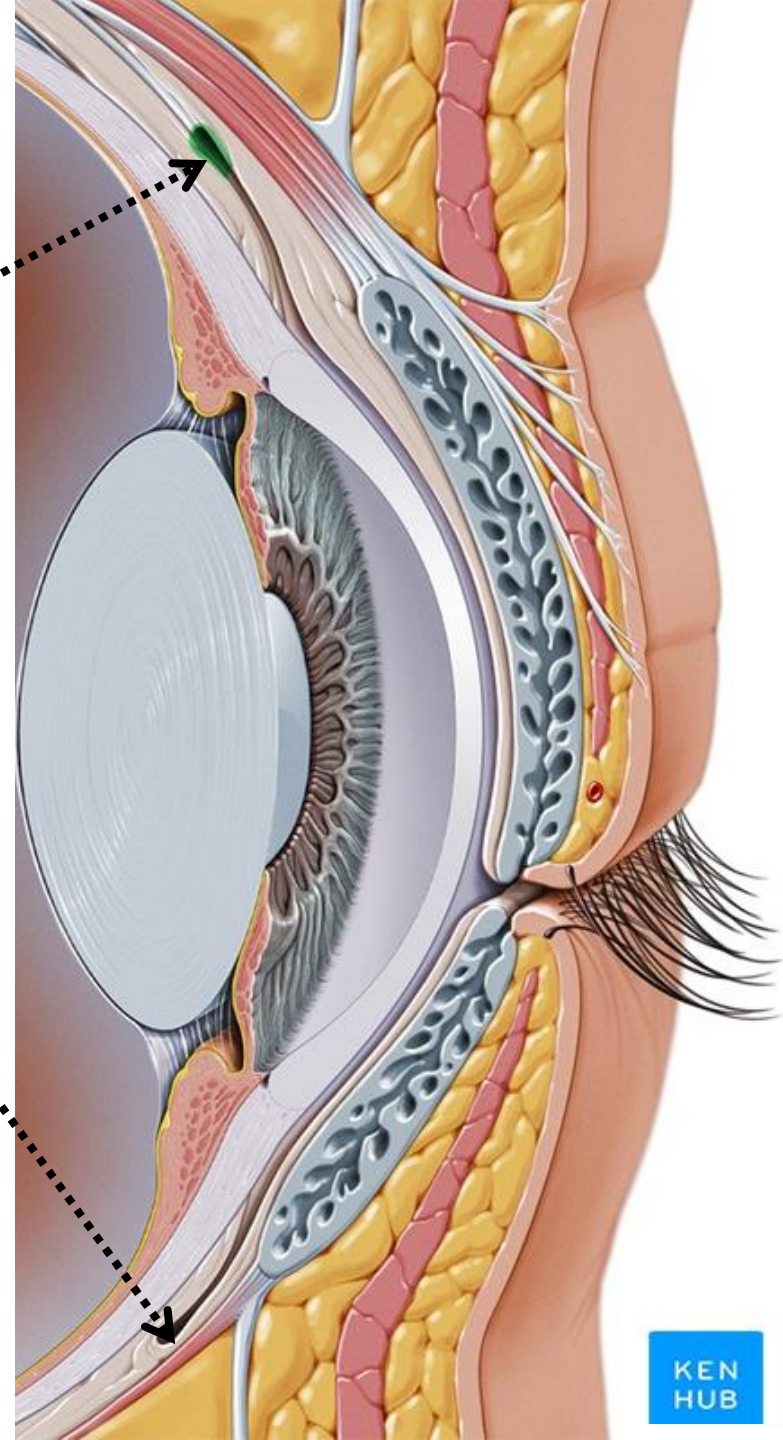
- The **tarsal glands** are long, modified sebaceous glands that pour their oily secretion onto the free margin of the lid; their openings lie behind the eyelashes
- This oily material prevents the overflow of tears and helps make the closed eyelids airtight.  
(Meibomian glands)



## 5-The conjunctiva

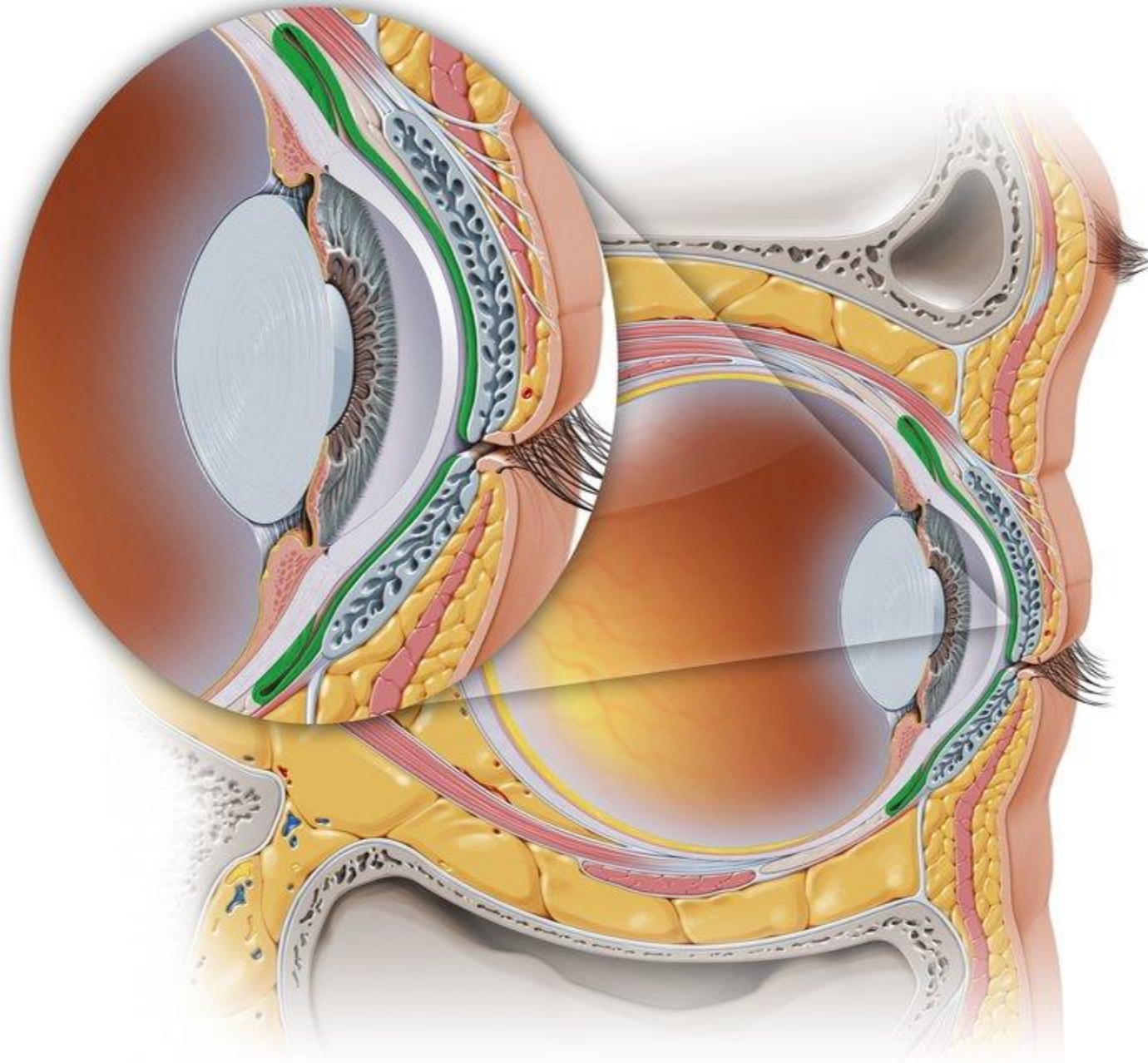
Is a thin mucous membrane that lines the eyelids and covers the sclera

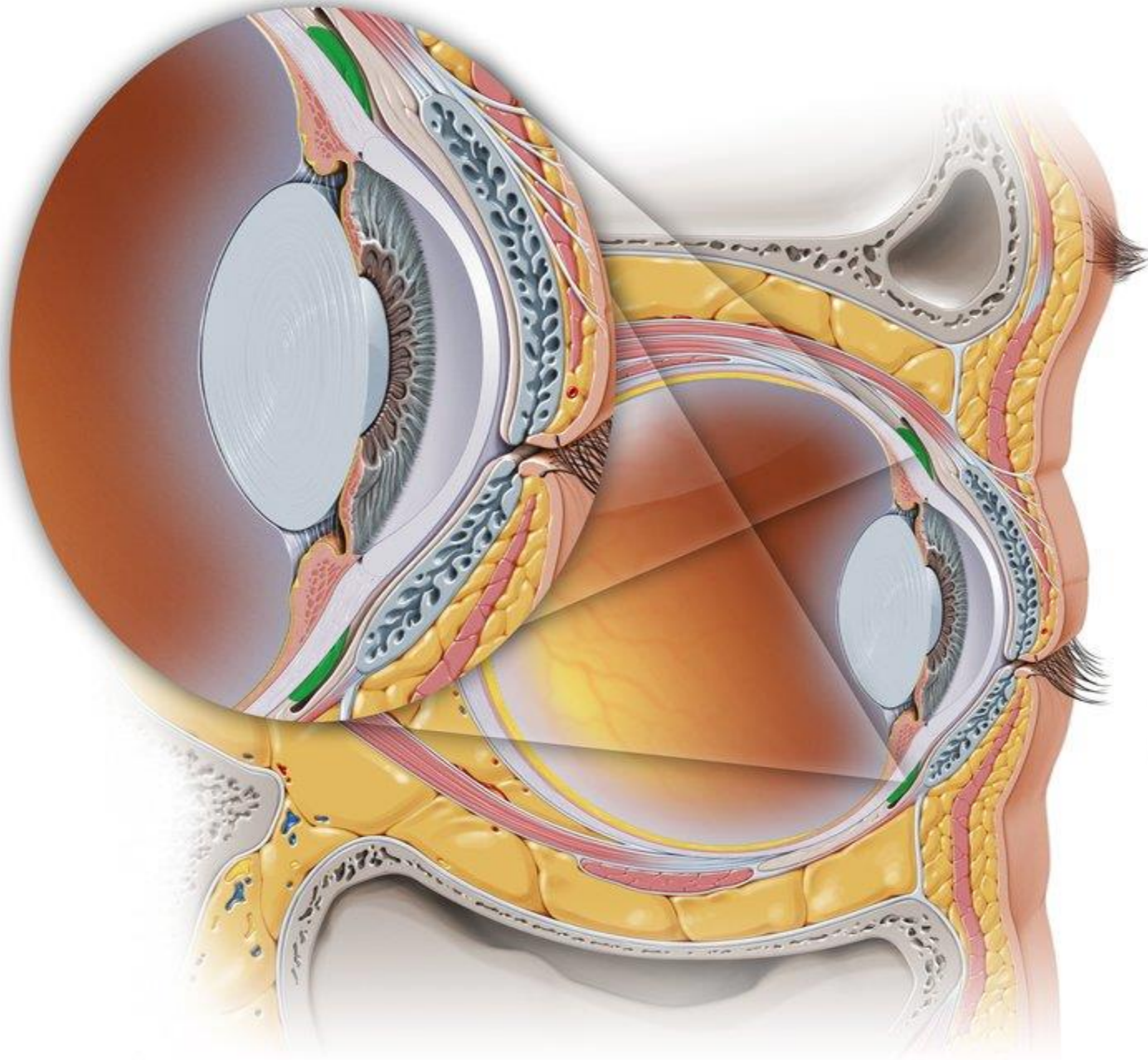
- It is reflected at **the superior and inferior fornices**





## The conjunctiva

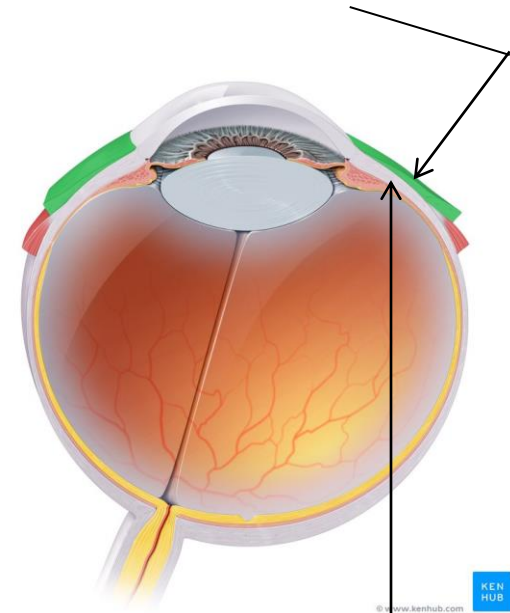




## Bulbar conjunctiva

The part that covers the sclera

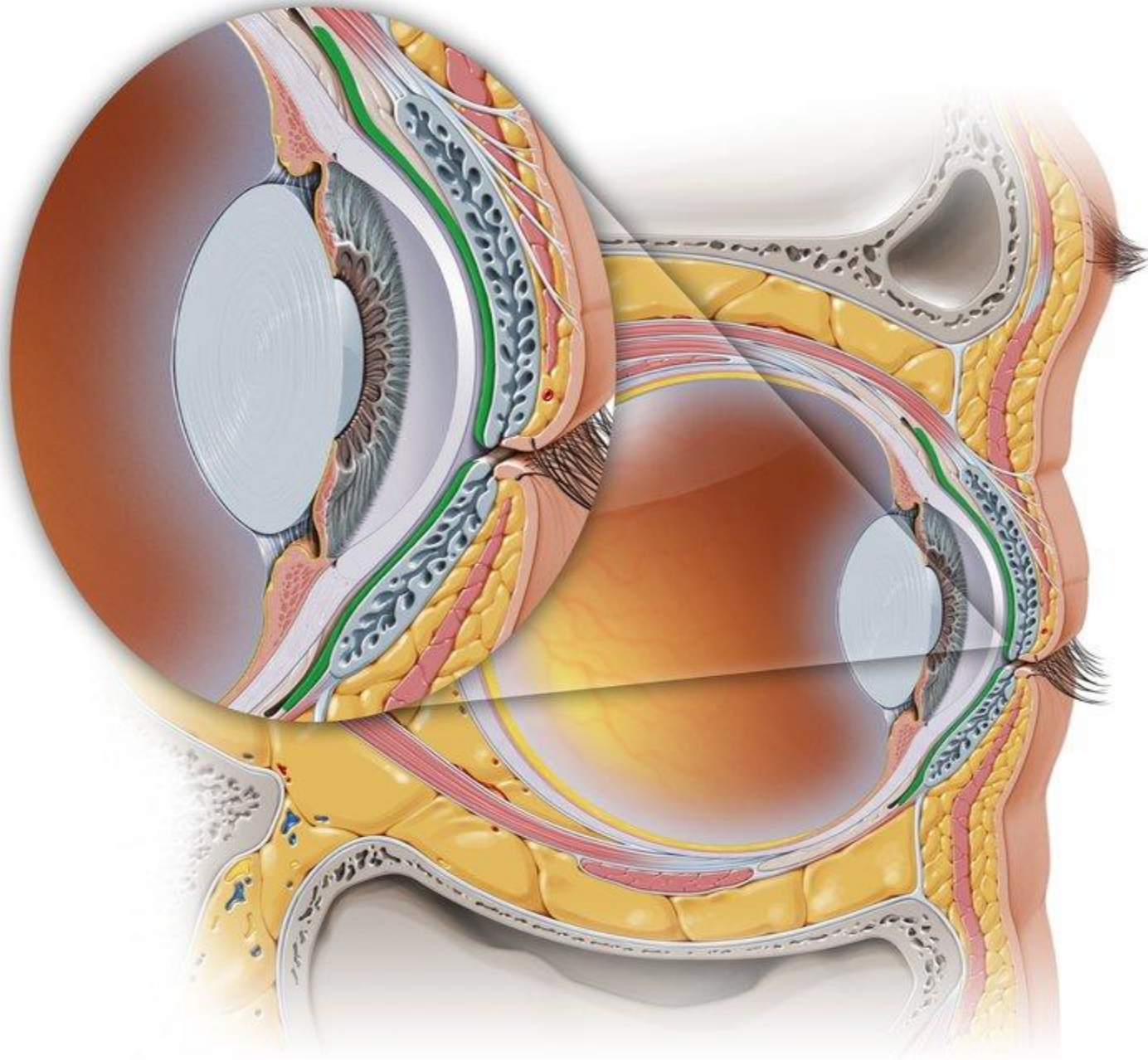
## Bulbar conjunctiva



Sclera

## Palpebral conjunctiva

The part that lines the inside of the eyelids



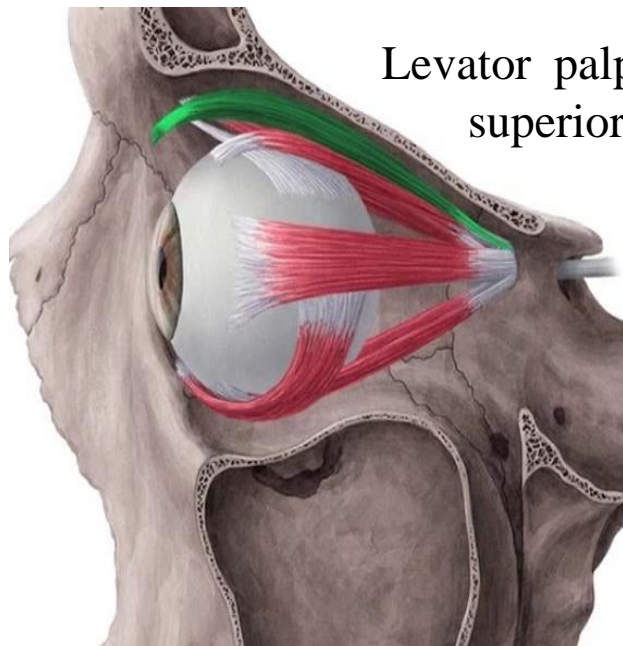
The eyelids are closed by:

1-The contraction of the orbicularis oculi  
and

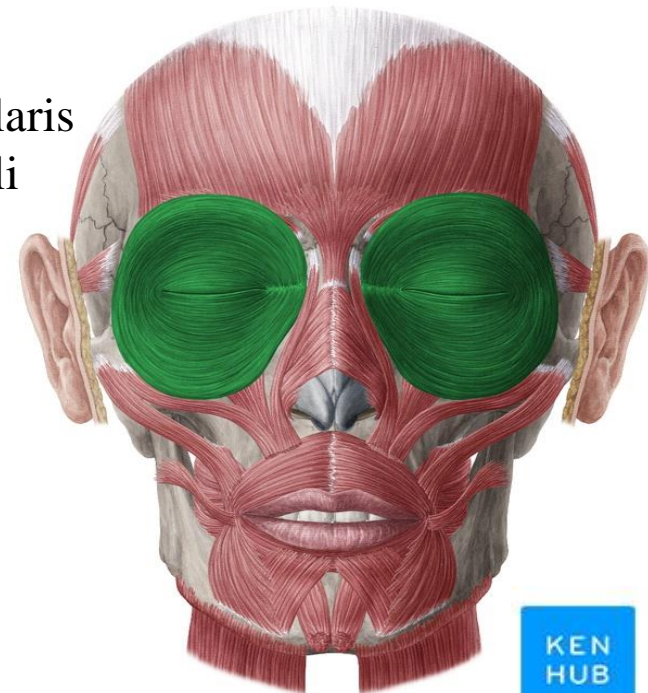
2-The relaxation of the levator palpebrae superioris muscles in the  
upper eyelids

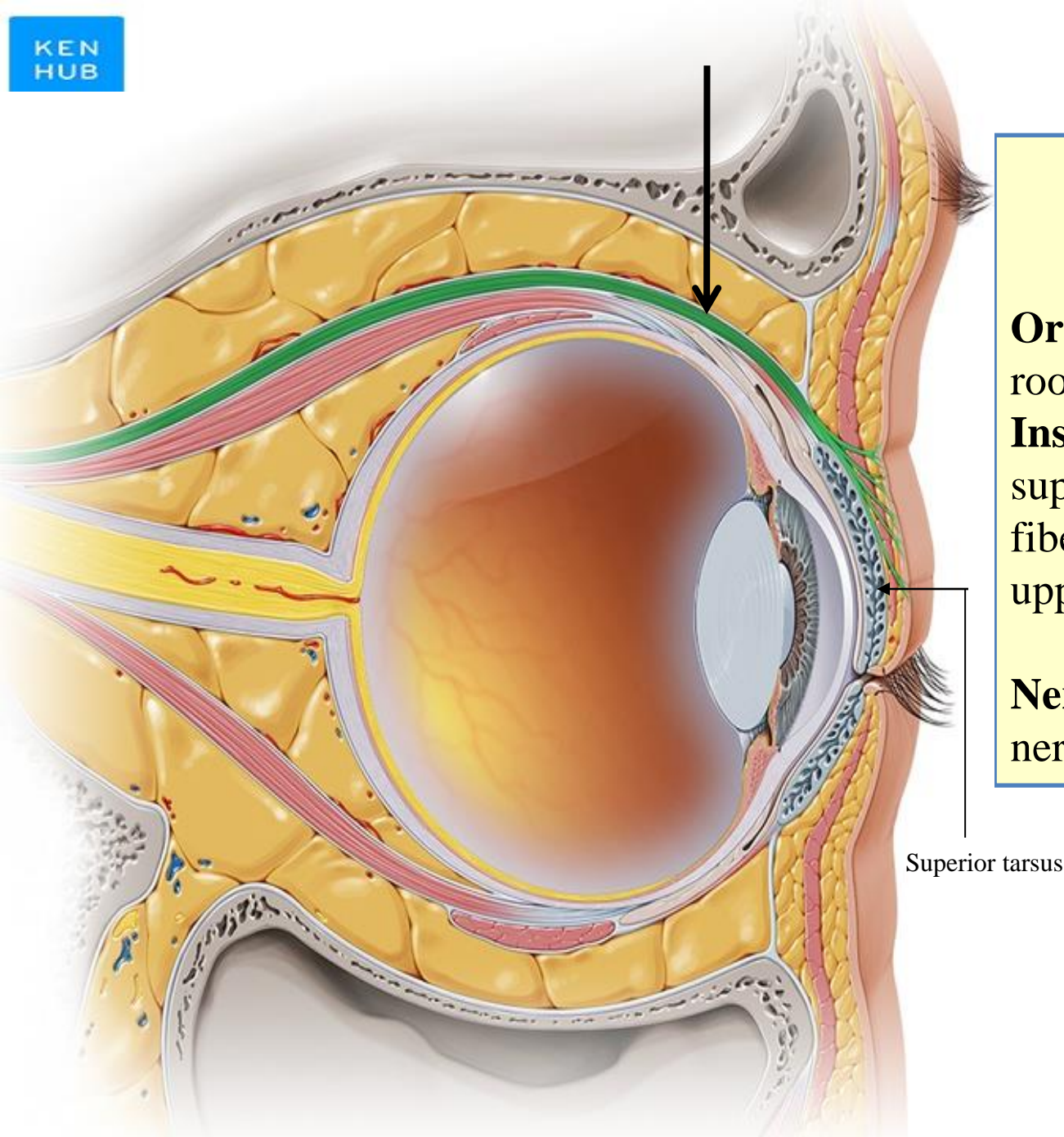
The upper eyelid is elevated by:

**THE LEVATOR PALPEBRAE SUPERIORIS**



Orbicularis oculi





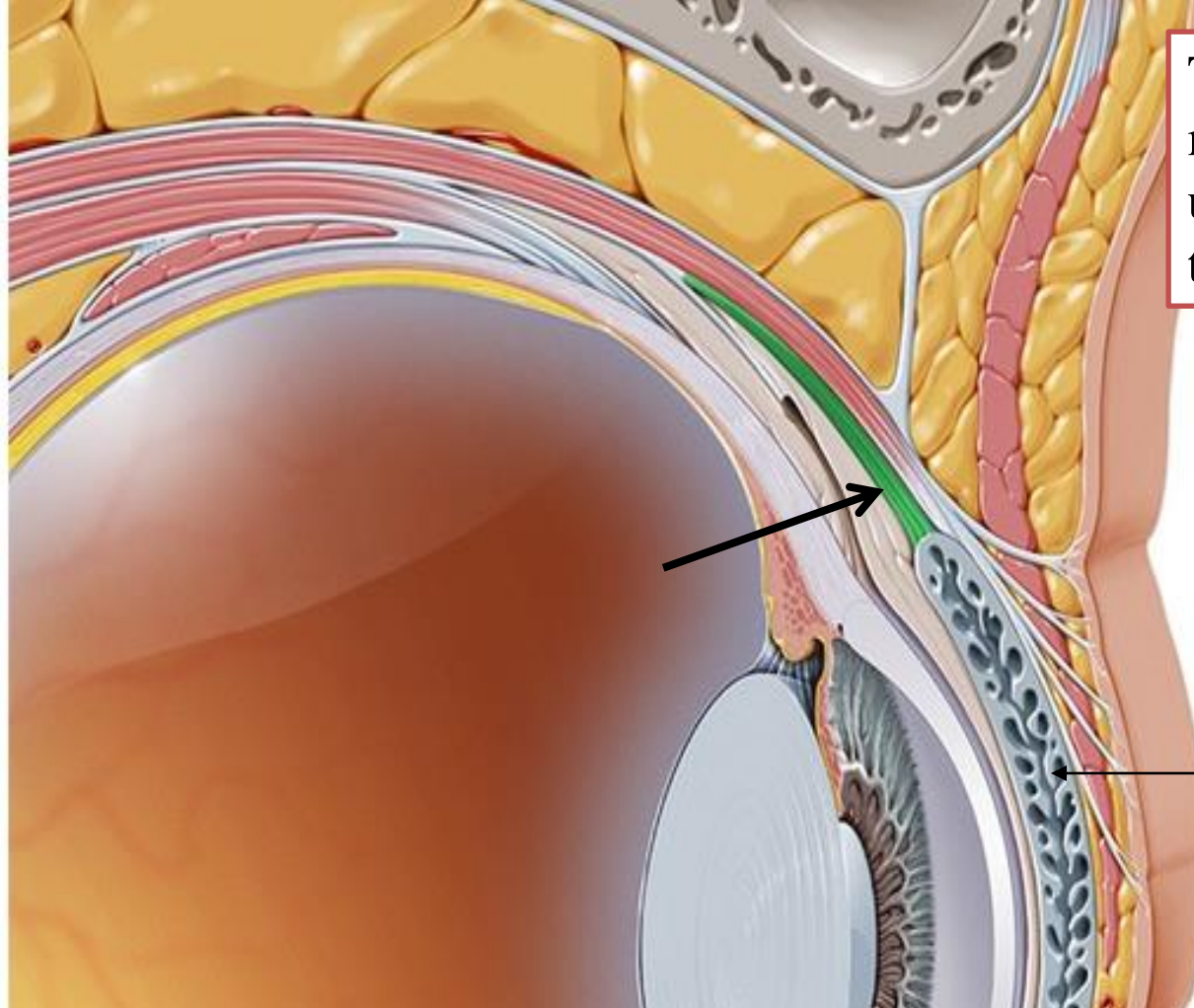
## Levator palpebrae superioris

**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

Superior tarsus



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



Superior tarsus

Terminology  
Ptosis: drooping of the upper eyelid  
Proptosis: bulging of the eyeball anteriorly out of the orbit=  
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

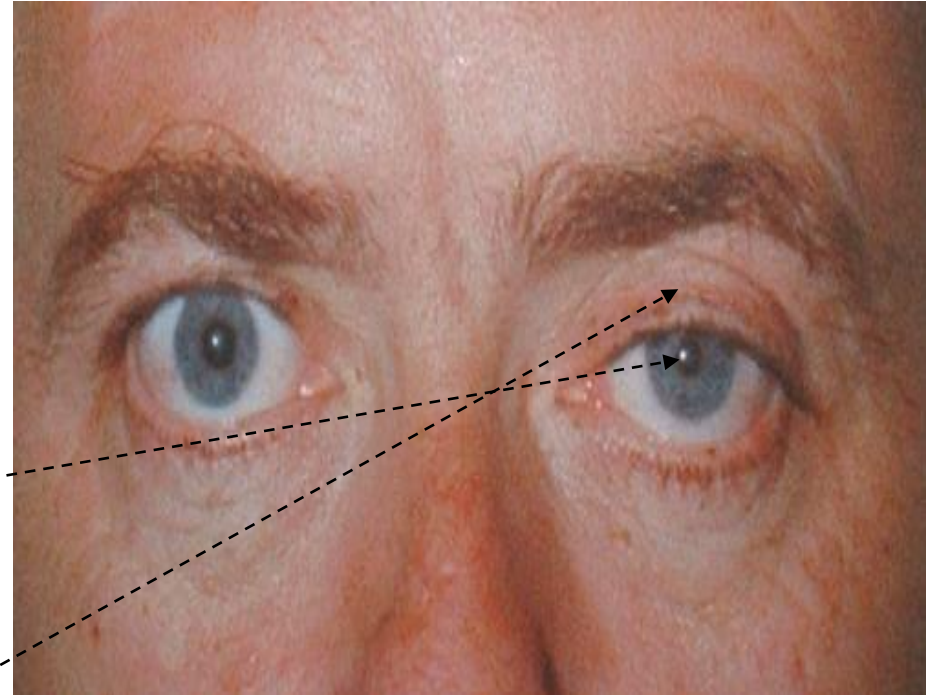
Horner's syndrome is caused by a lesion in the **sympathetic trunk** in the neck that results in sympathetic dysfunction.

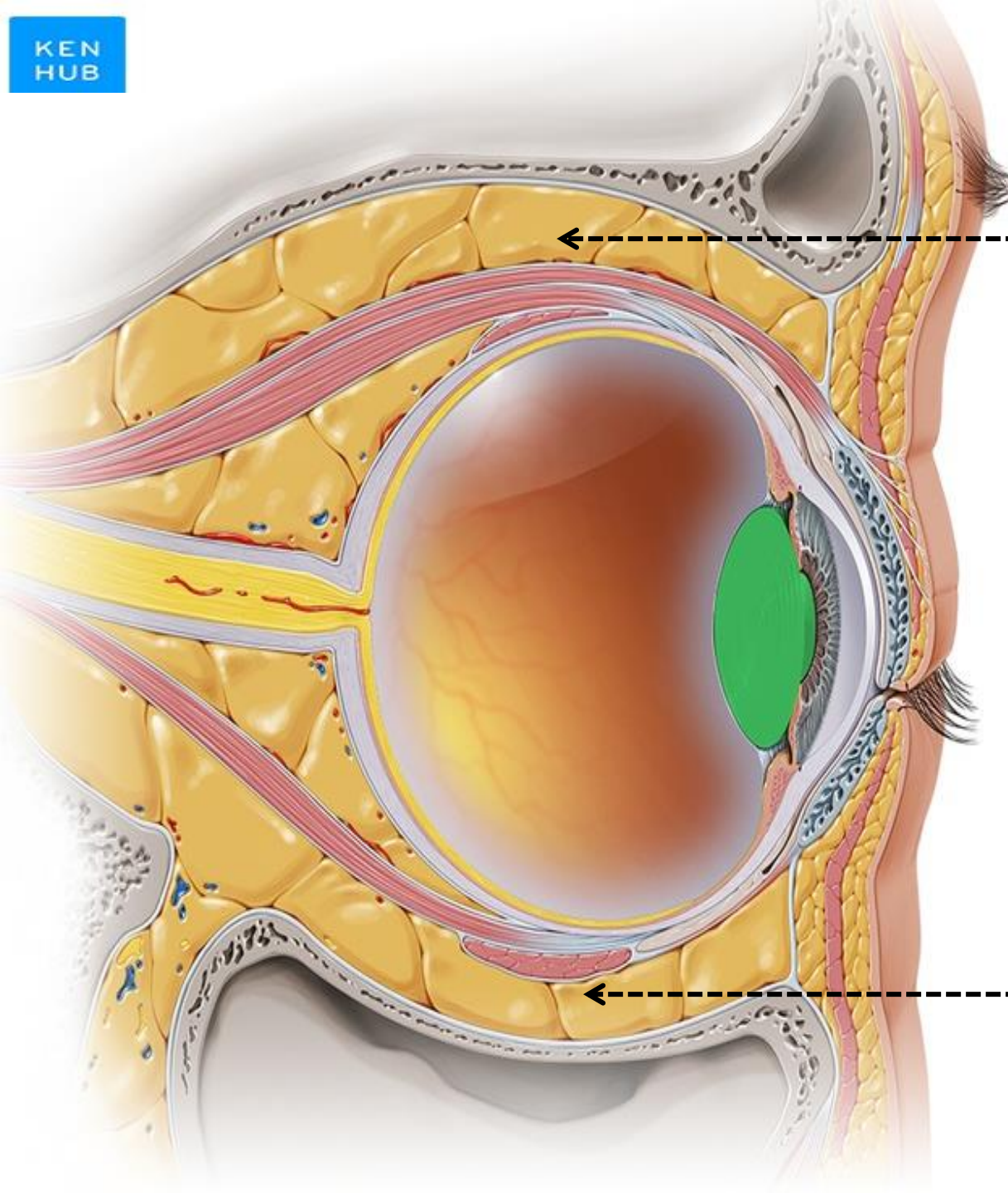
It is characterized by three typical features:

**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





## ORBITAL FAT

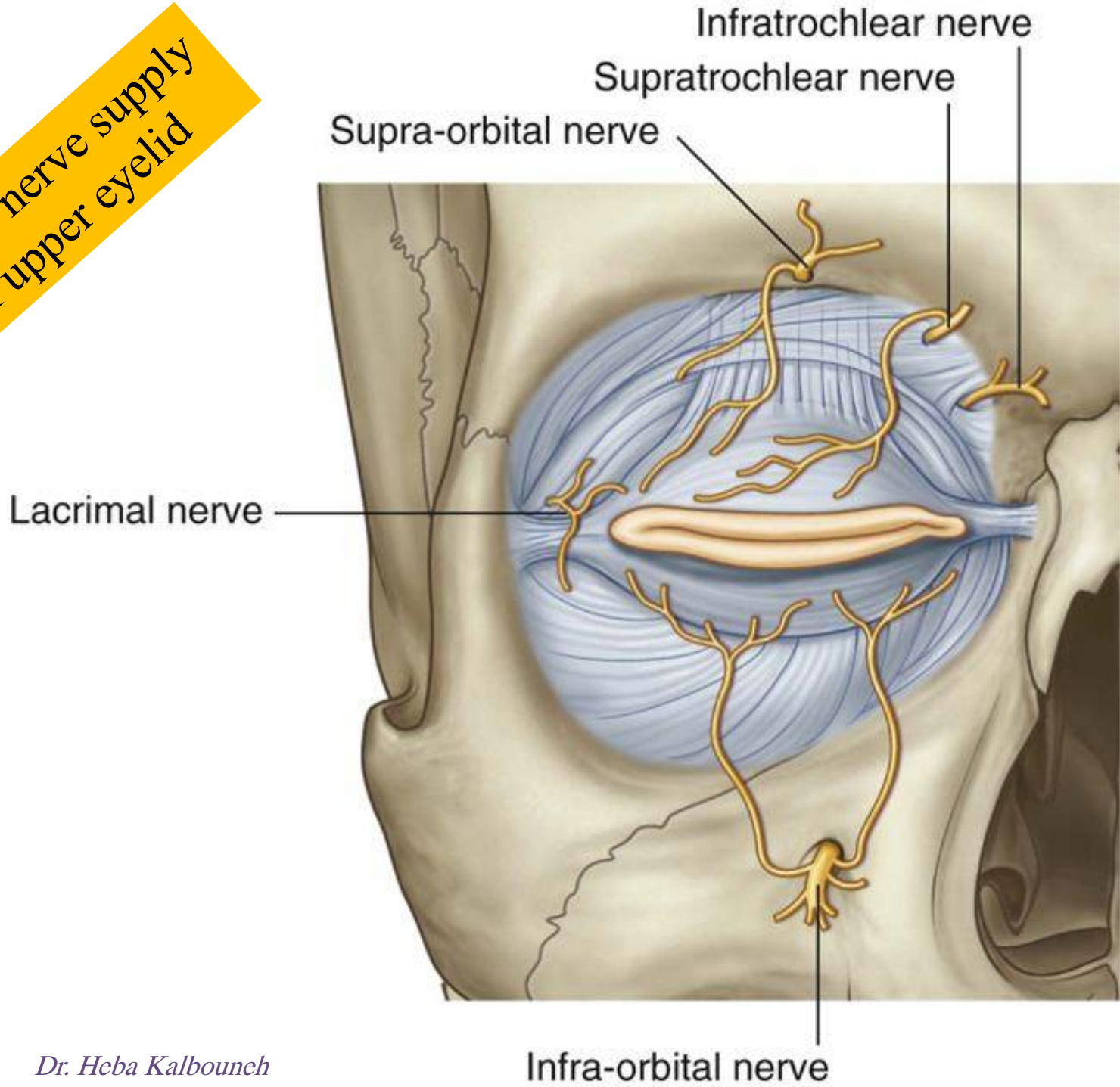
- ✓ The spaces between the main structures of the orbit are occupied by fat
- ✓ The fat helps to stabilize the position of the eyeball and also acts as a socket within which the eye can rotate.

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**



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

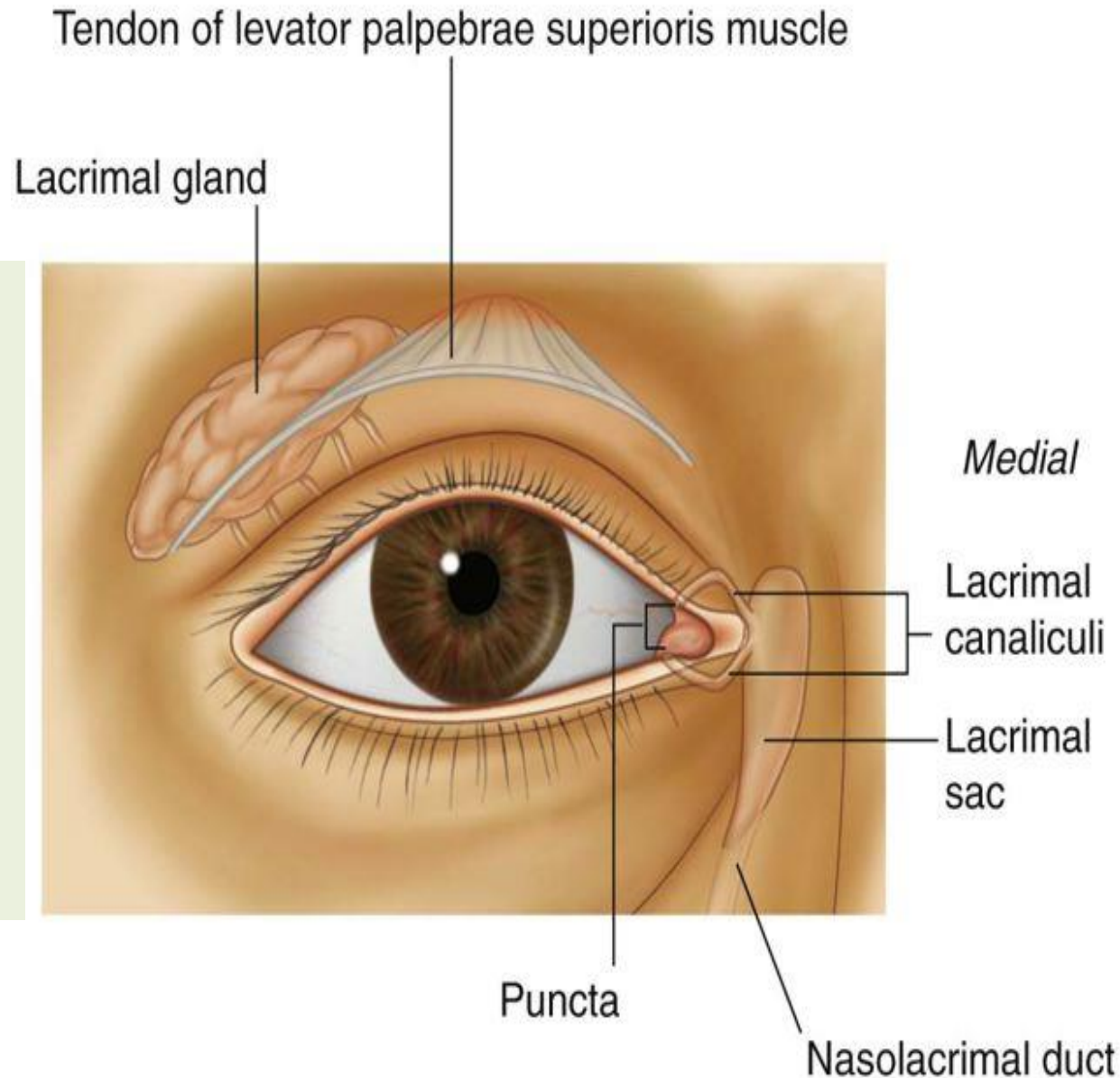
✓ Its made up of:

**Lacrimal gland and its ducts**

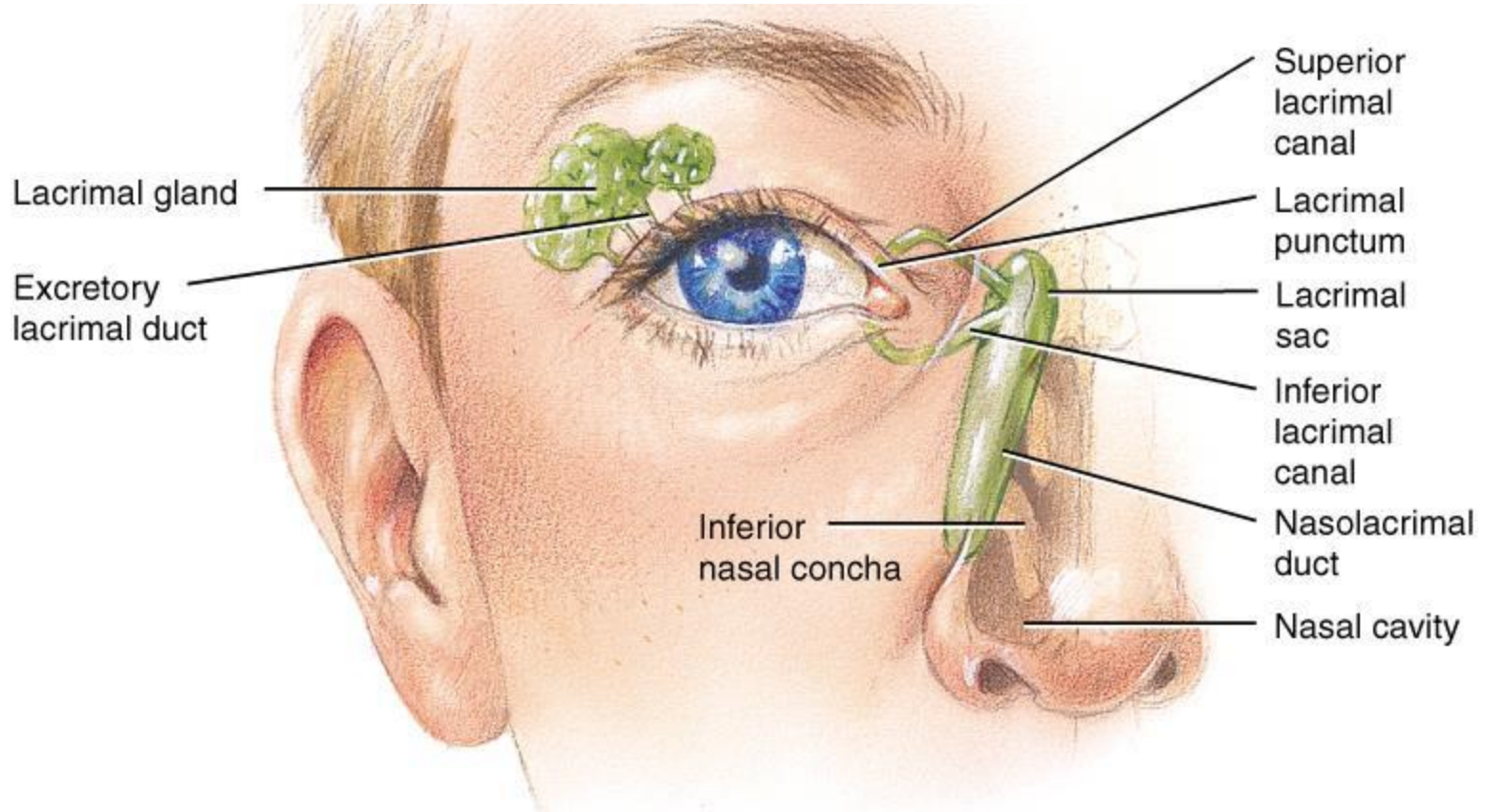
**Lacrimal canaliculi**

**Lacrimal sac**

**Nasolacrimal duct**



# Lacrimal Apparatus of the Eye



# Lacrimal Gland

*Lacrimal fossa is a depression on the inferior surface of the orbital plate of frontal bone*

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

➤ The lacrimal gland consists of:

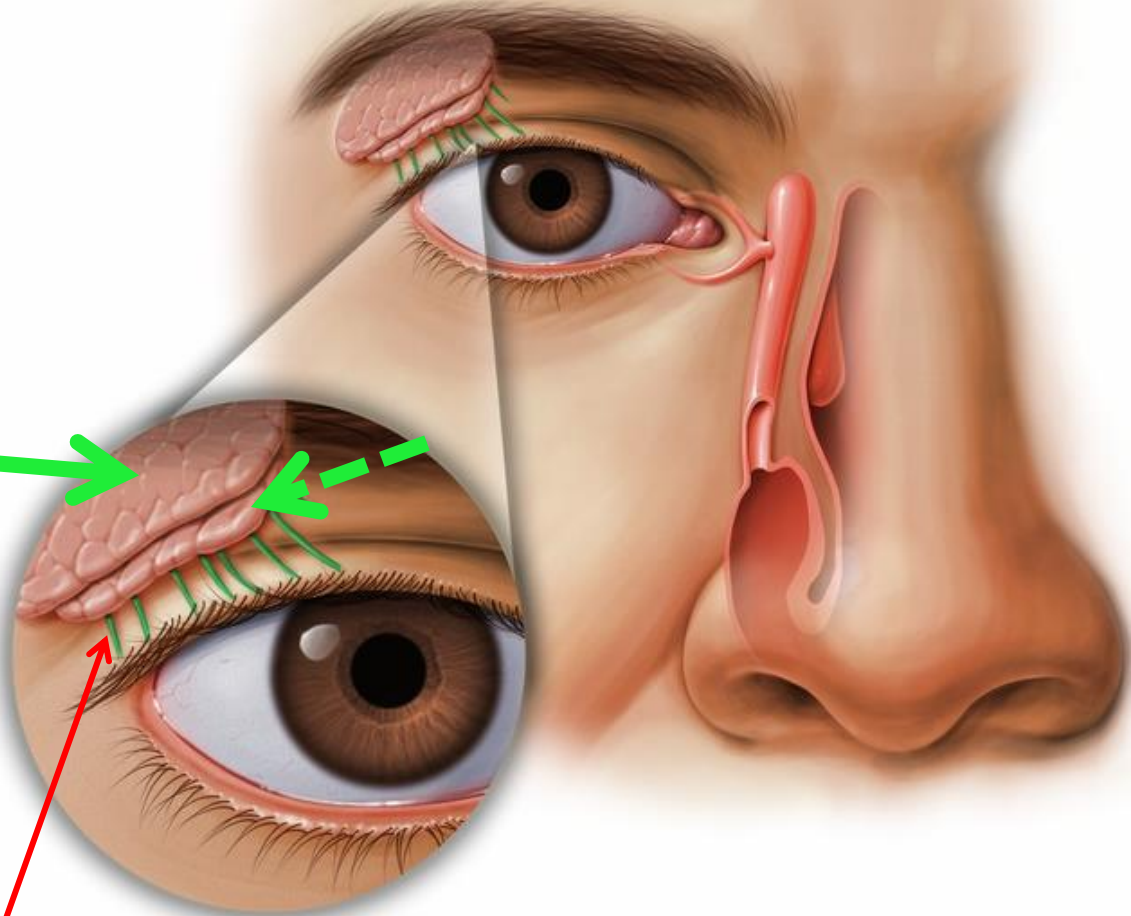
1- a large **orbital part**

(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.**

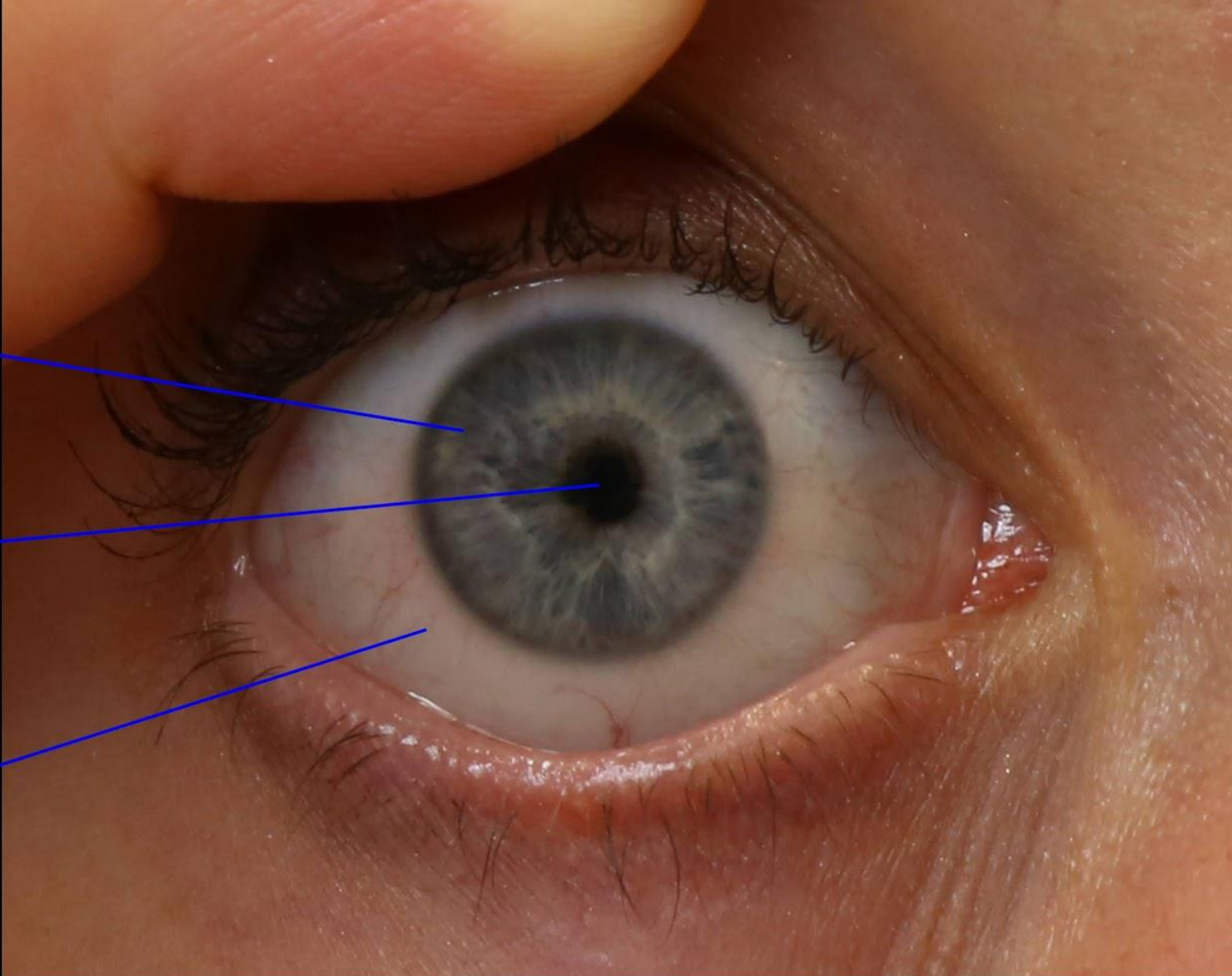


Fluid is continually being secreted by the lacrimal gland and moved across the surface of the eyeball from lateral to medial as the eyelids blink

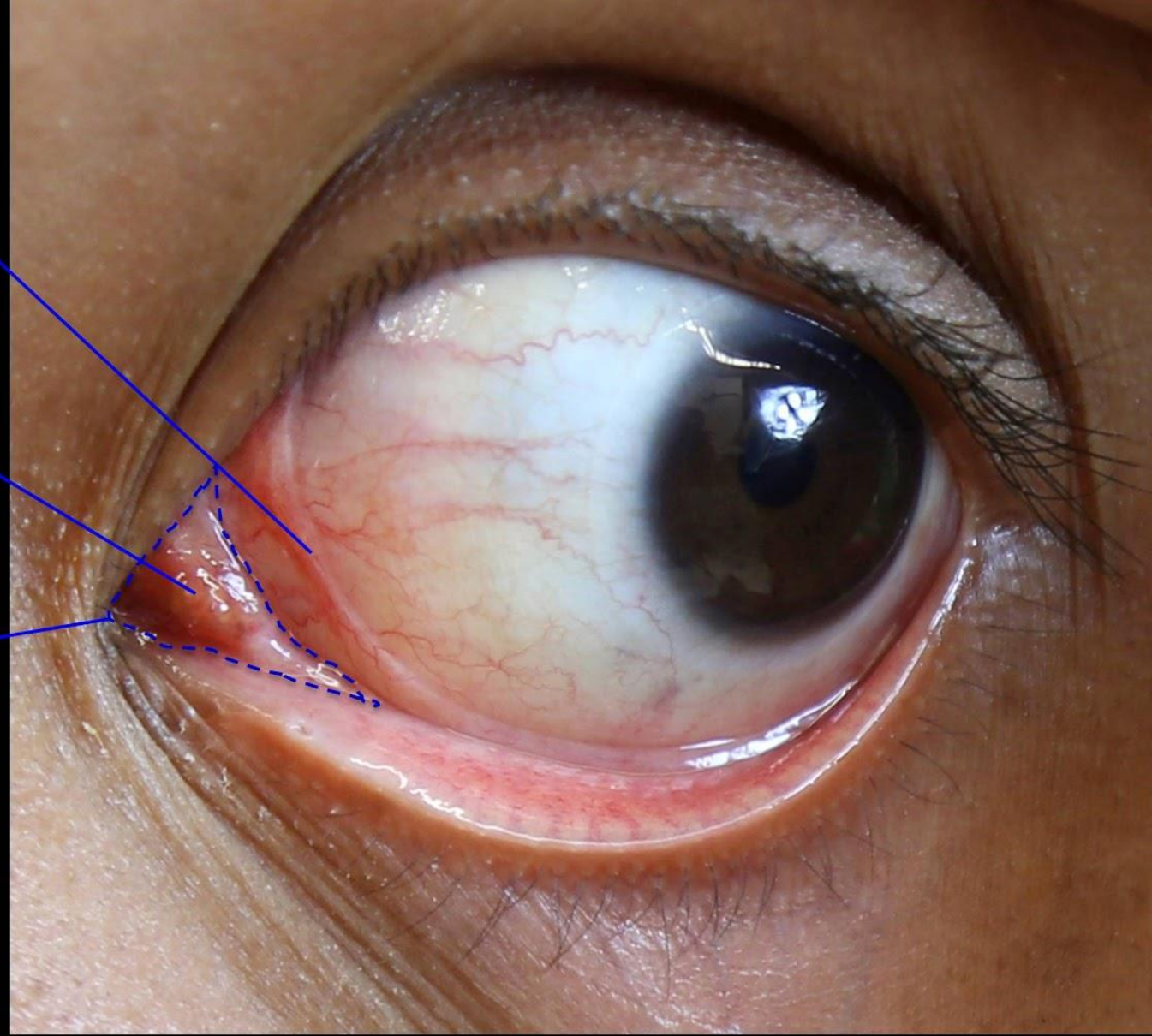
Iris

Pupil

Sclera



Orbital region, anterior

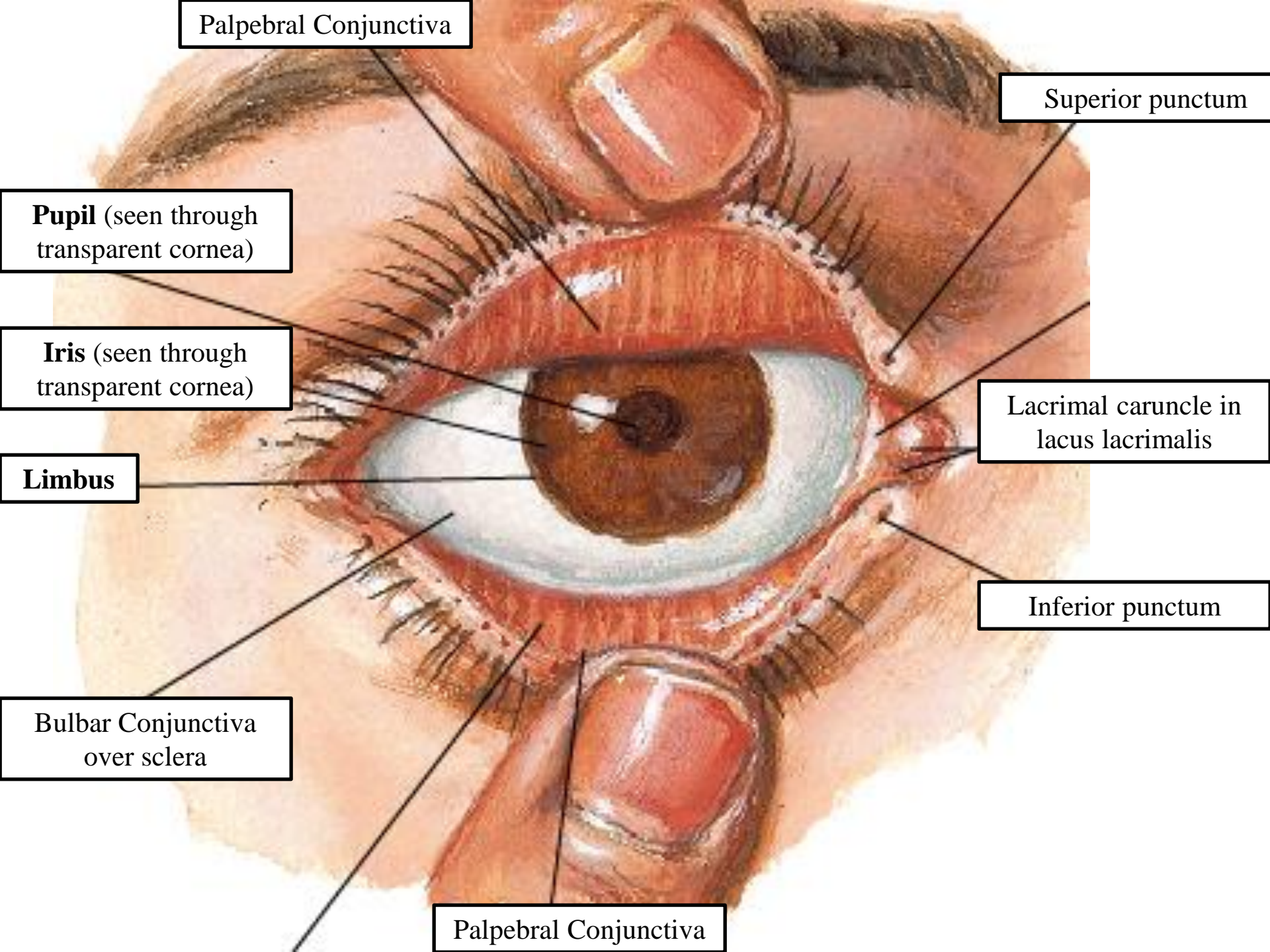


Semilunar fold

Lacrimal caruncle

Lacrimal lake

Medial canthus structures, anterior



Palpebral Conjunctiva

Superior punctum

**Pupil** (seen through transparent cornea)

**Iris** (seen through transparent cornea)

Lacrimal caruncle in lacus lacrimalis

**Limbus**

Inferior punctum

Bulbar Conjunctiva over sclera

Palpebral Conjunctiva

# Lacrimal Ducts

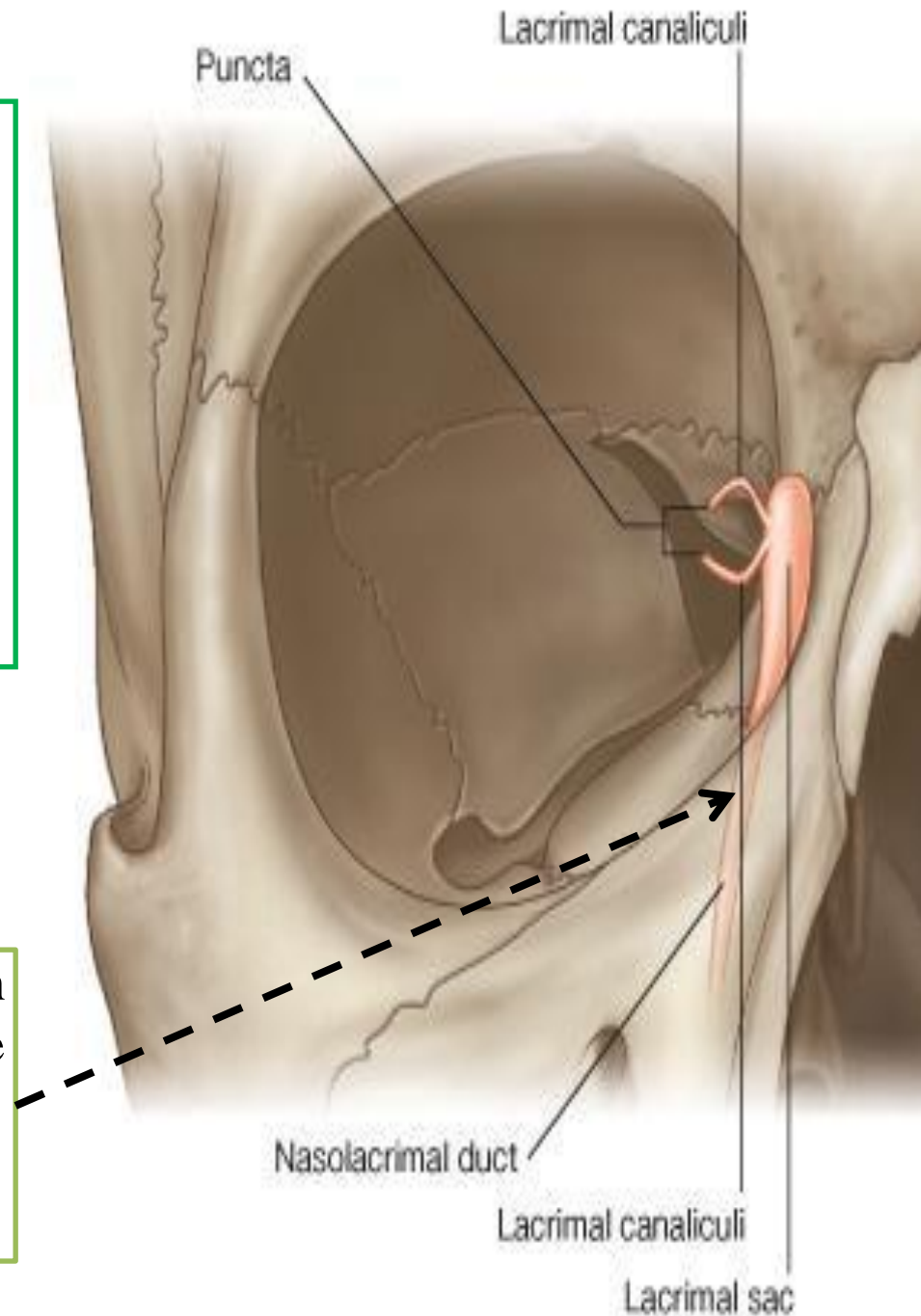
The tears circulate across the cornea and accumulate medially in the lacus lacrimalis (lacrimal lake).

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

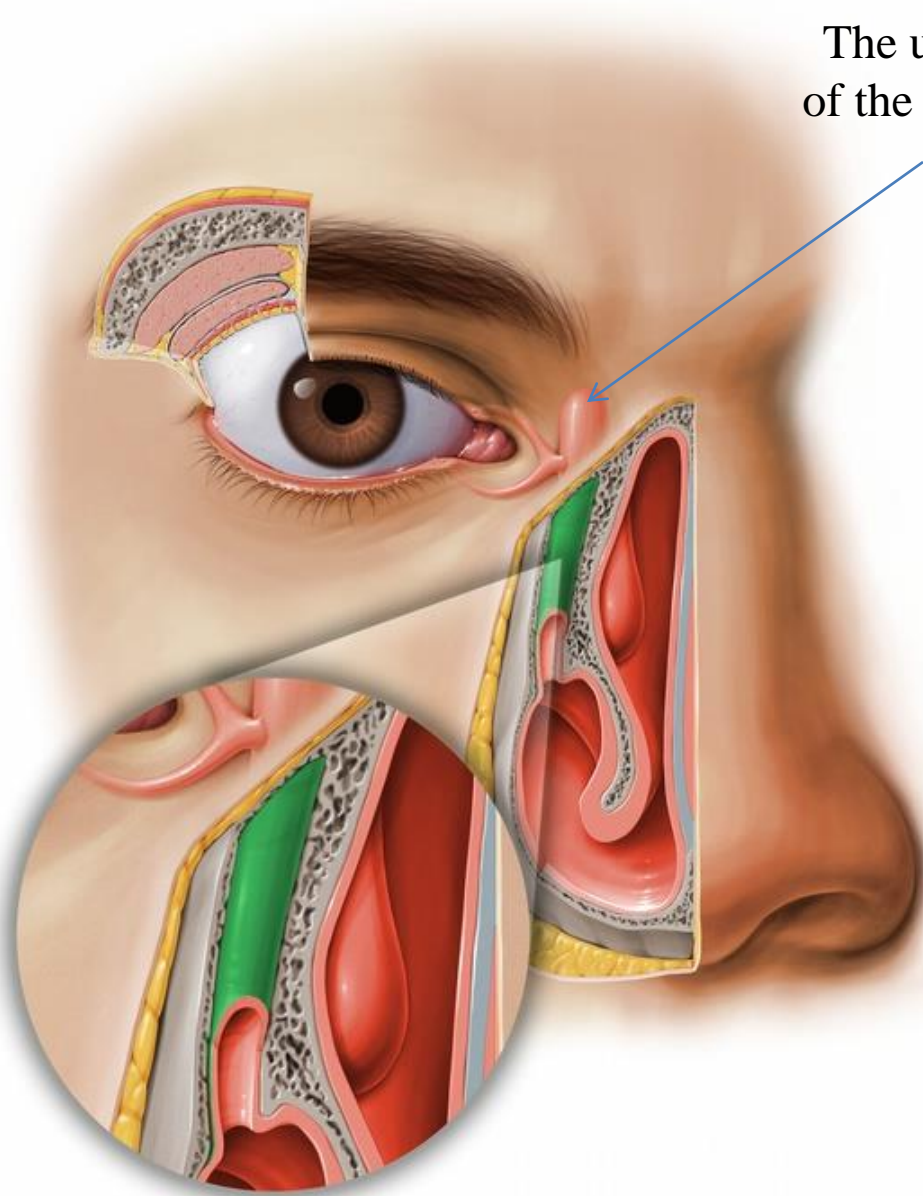
➤ **The nasolacrimal duct** is about 0.5 inch long and emerges from the lower end of the lacrimal sac

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



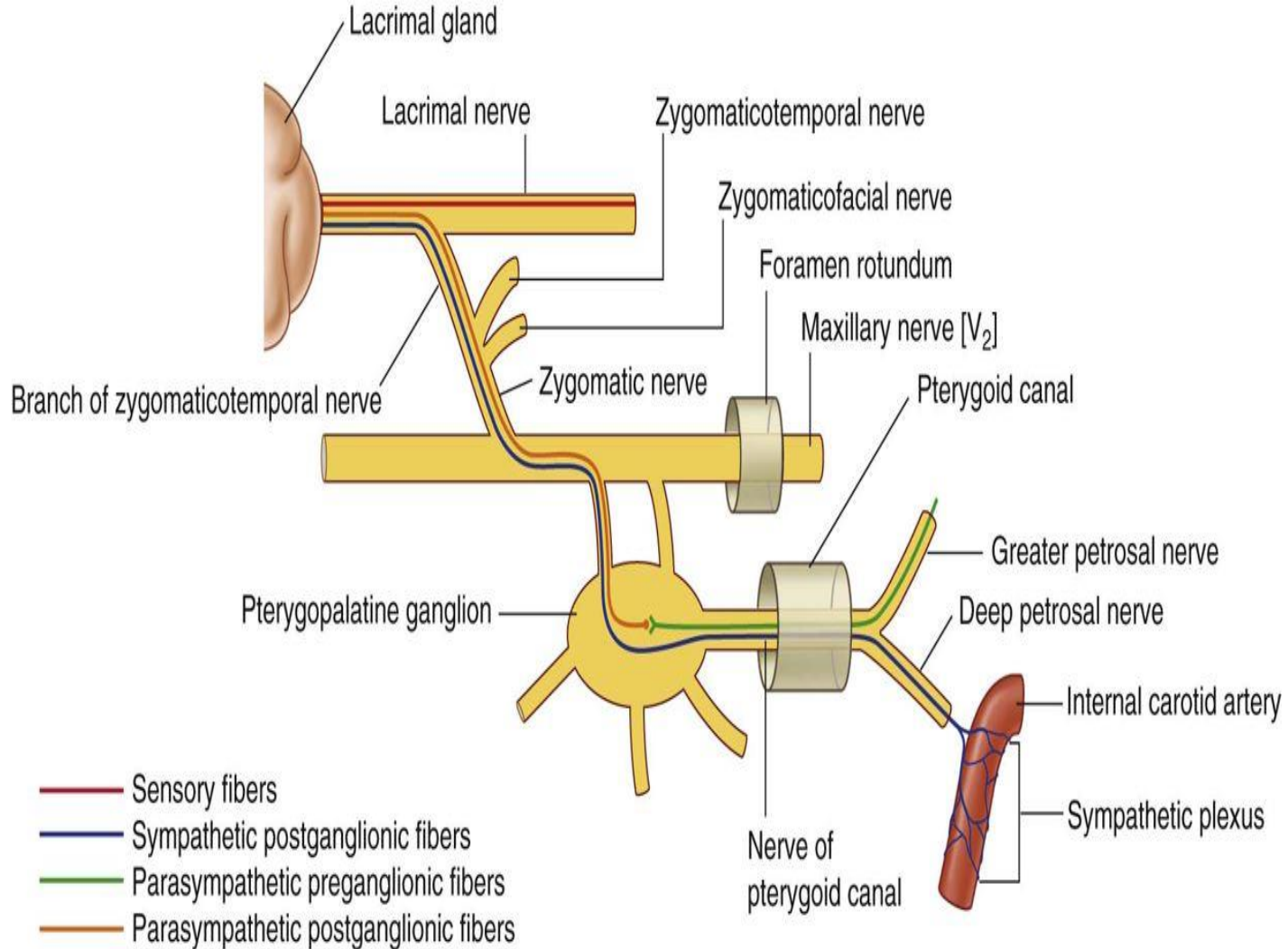


The upper dilated blind part  
of the nasolacrimal duct is the  
**lacrimal sac**



**Nasolacrimal canal**





### 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

3<sup>rd</sup>, 7<sup>th</sup>, 9<sup>th</sup>

Sensory root

*Does not relay*

**Glands in the head**

Salivary glands

(Parotid, sublingual and submandibular)

Lacrimal glands

Palatine and nasal glands

Postganglionic parasympathetic

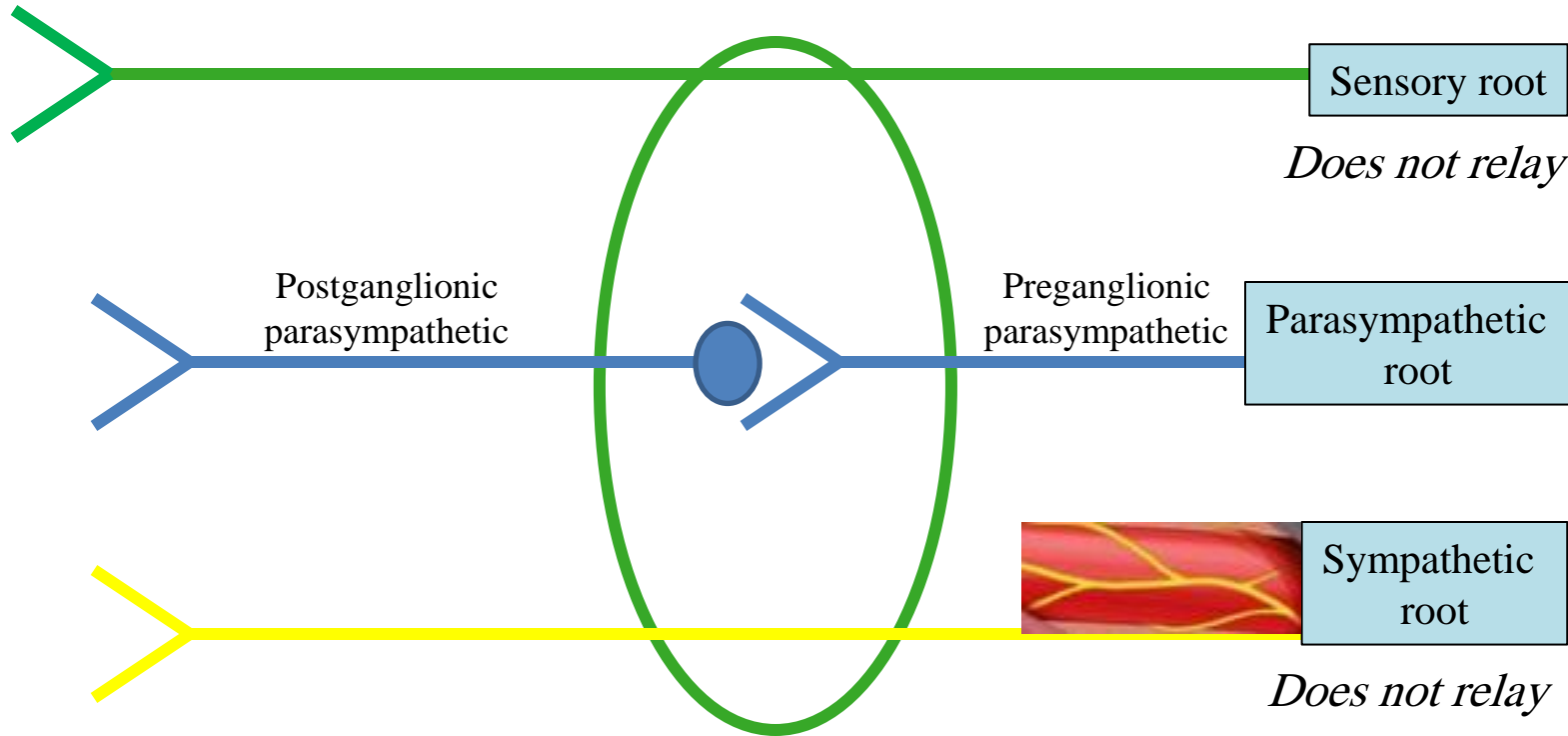
Preganglionic parasympathetic

Parasympathetic root

**Smooth muscles in the eye**

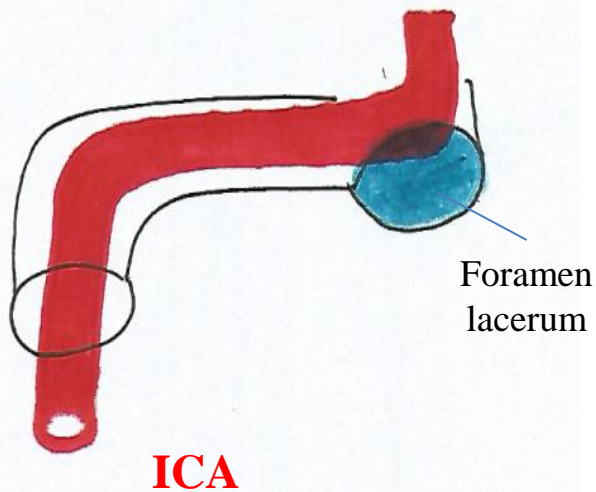
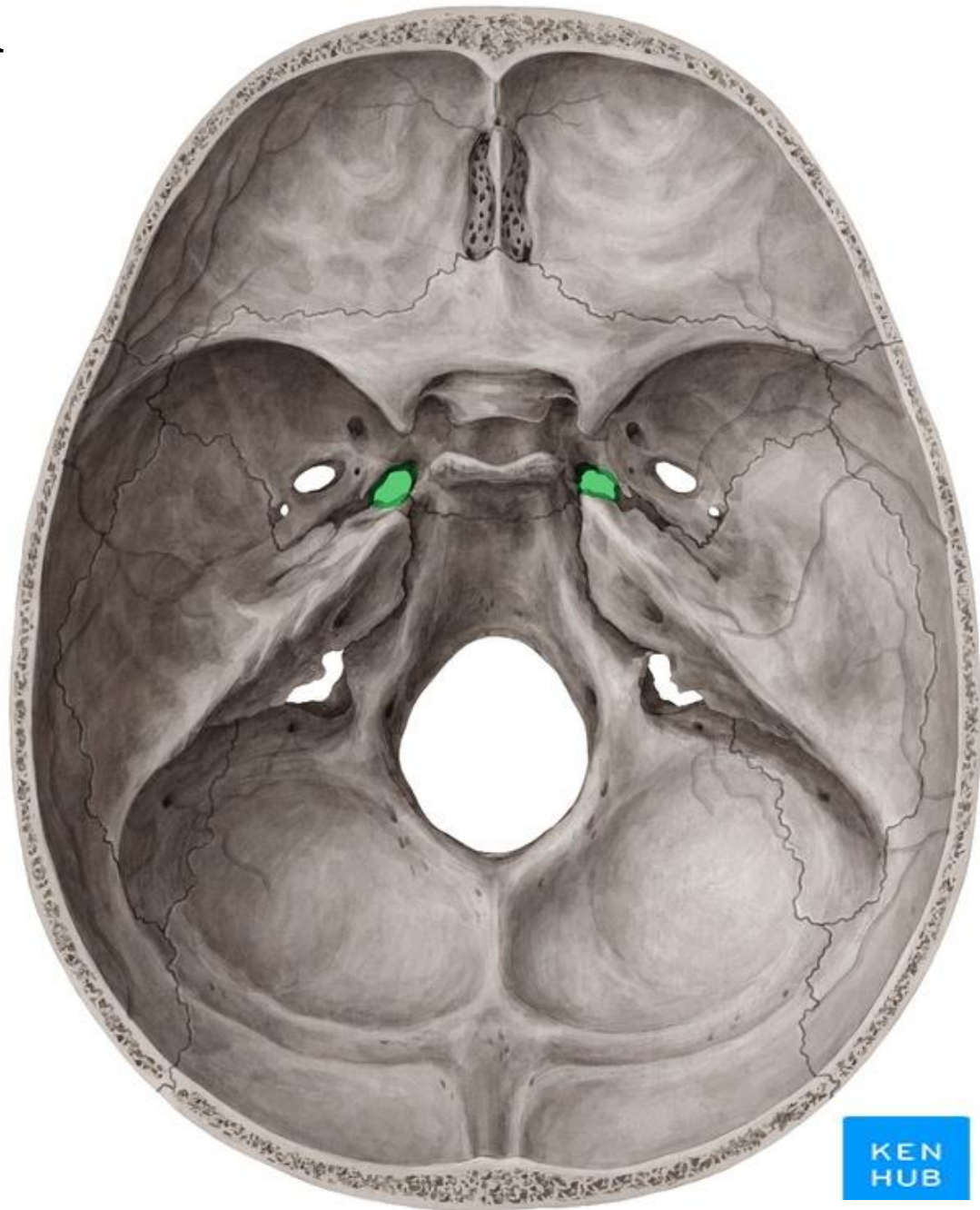
Sympathetic root

*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

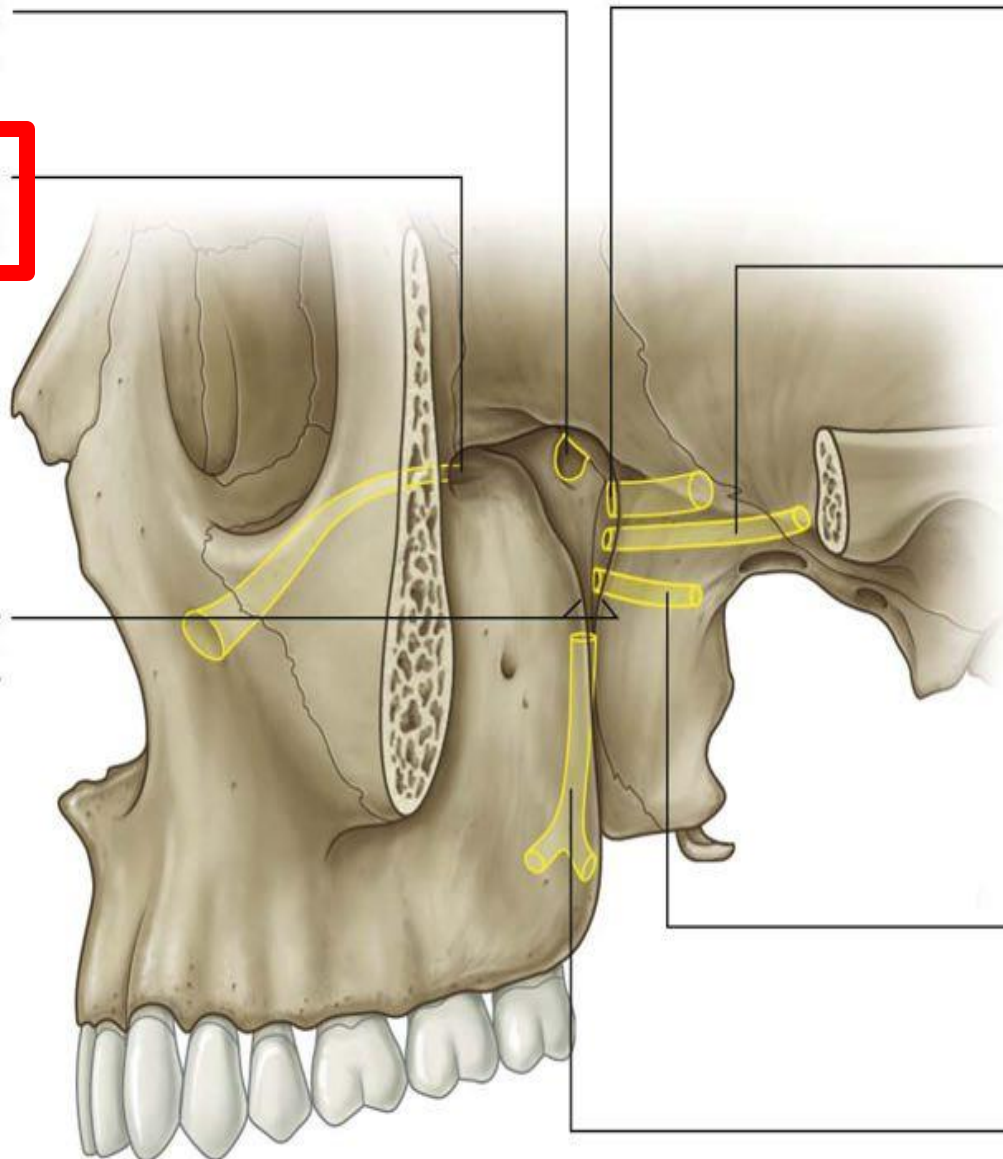
**Pterygomaxillary fissure**  
infratemporal fossa

**Foramen rotundum**  
cranial cavity  
(middle cranial fossa)

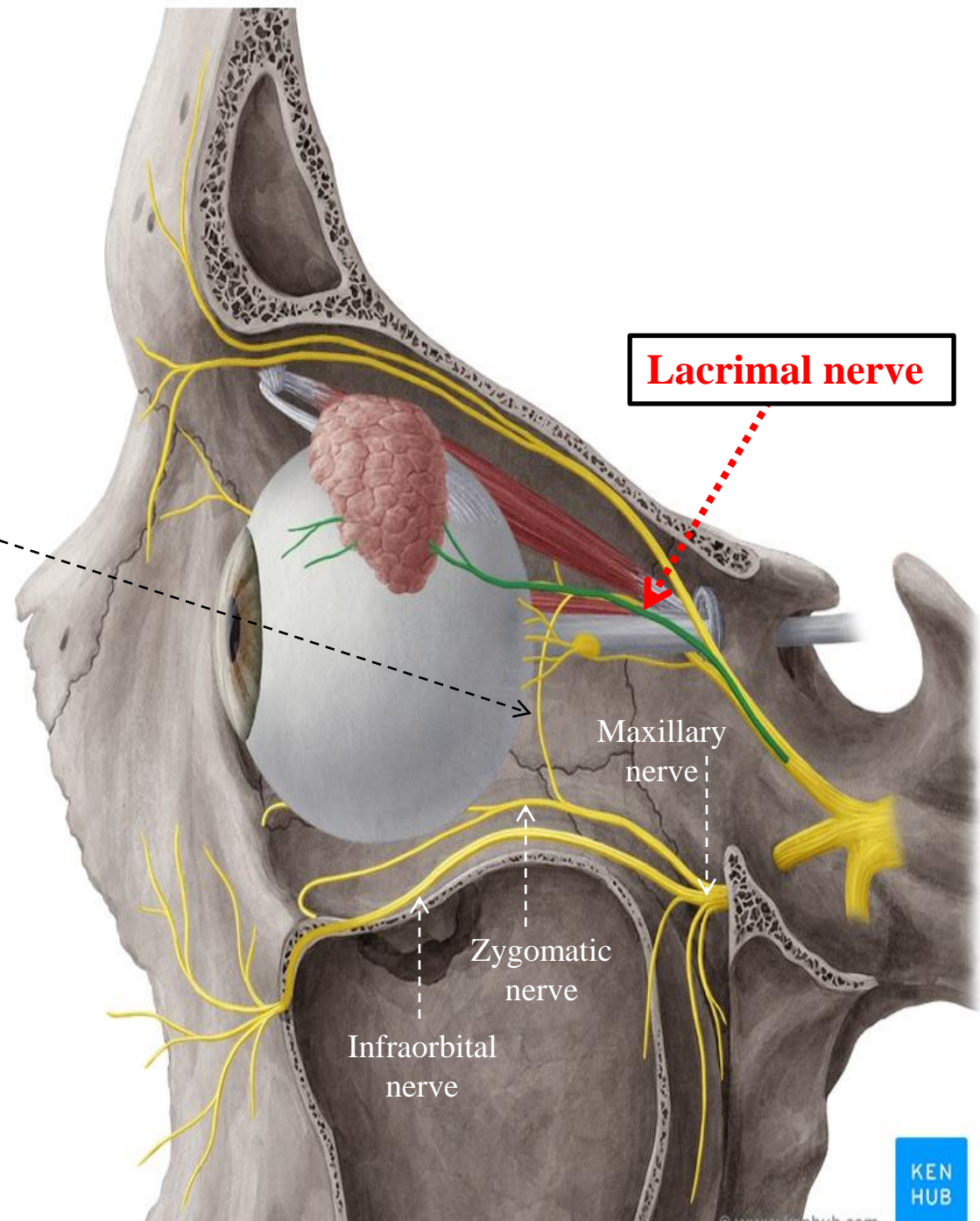
**Pterygoid canal**  
cranial cavity  
(middle cranial fossa)

**Palatovaginal canal**  
nasopharynx

**Palatine canal**  
roof of oral cavity (palate)



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

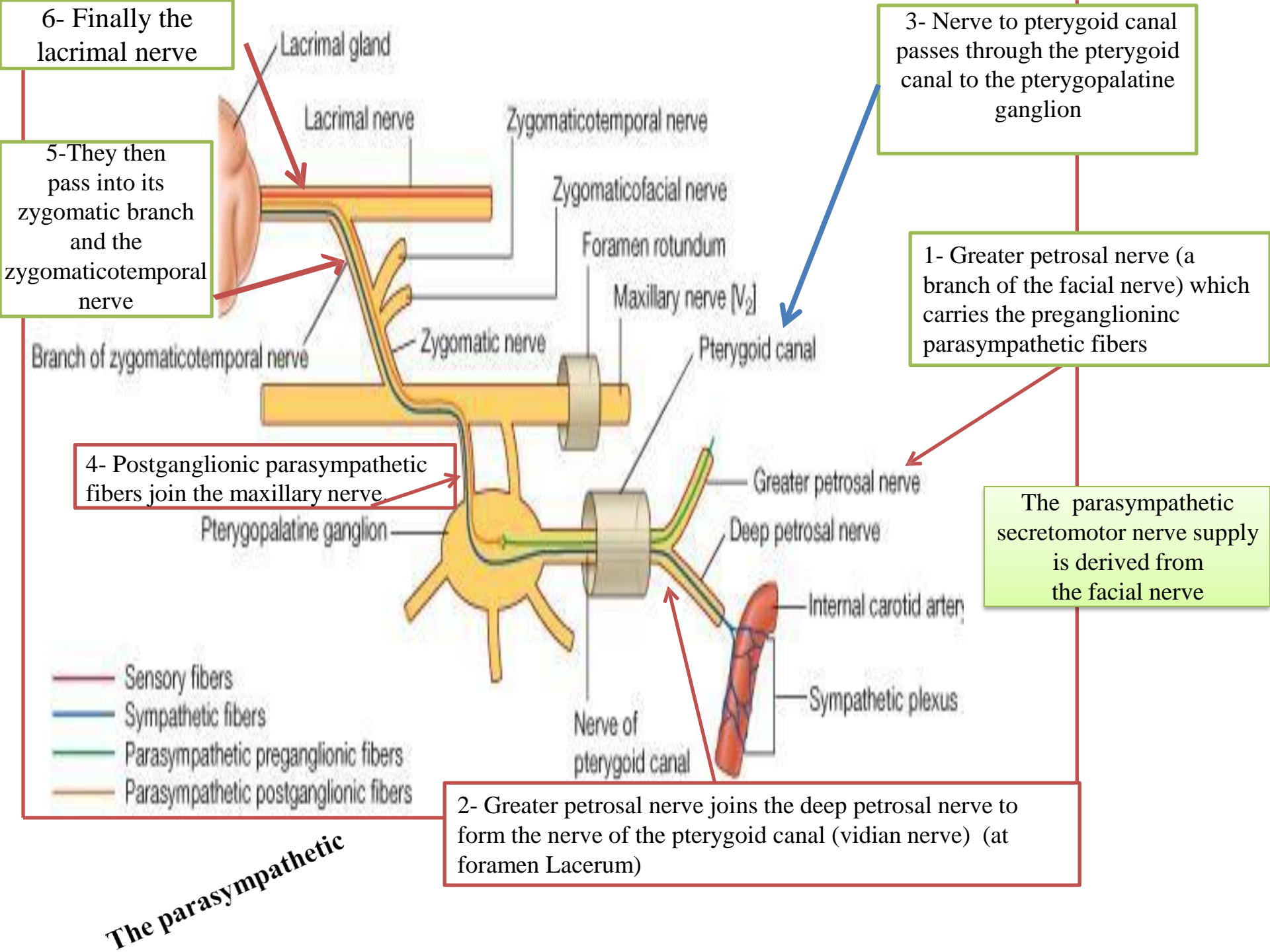


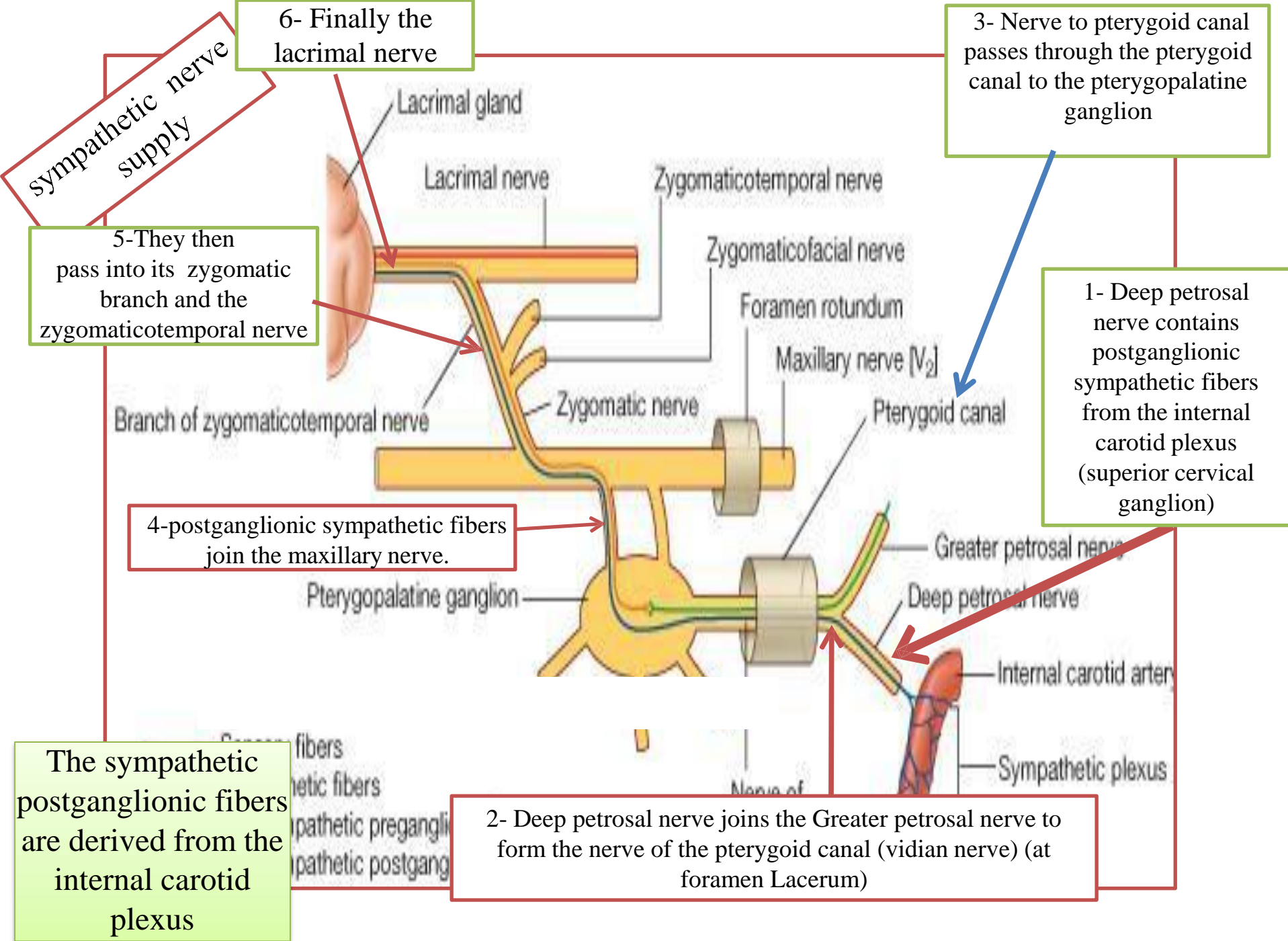
**Lacrimal nerve**

Maxillary  
nerve

Zygomatic  
nerve

Infraorbital  
nerve





The sympathetic postganglionic fibers are derived from the internal carotid plexus

2- Deep petrosal nerve joins the Greater petrosal nerve to form the nerve of the pterygoid canal (vidian nerve) (at foramen Lacerum)

1- Deep petrosal nerve contains postganglionic sympathetic fibers from the internal carotid plexus (superior cervical ganglion)

3- Nerve to pterygoid canal passes through the pterygoid canal to the pterygopalatine ganglion

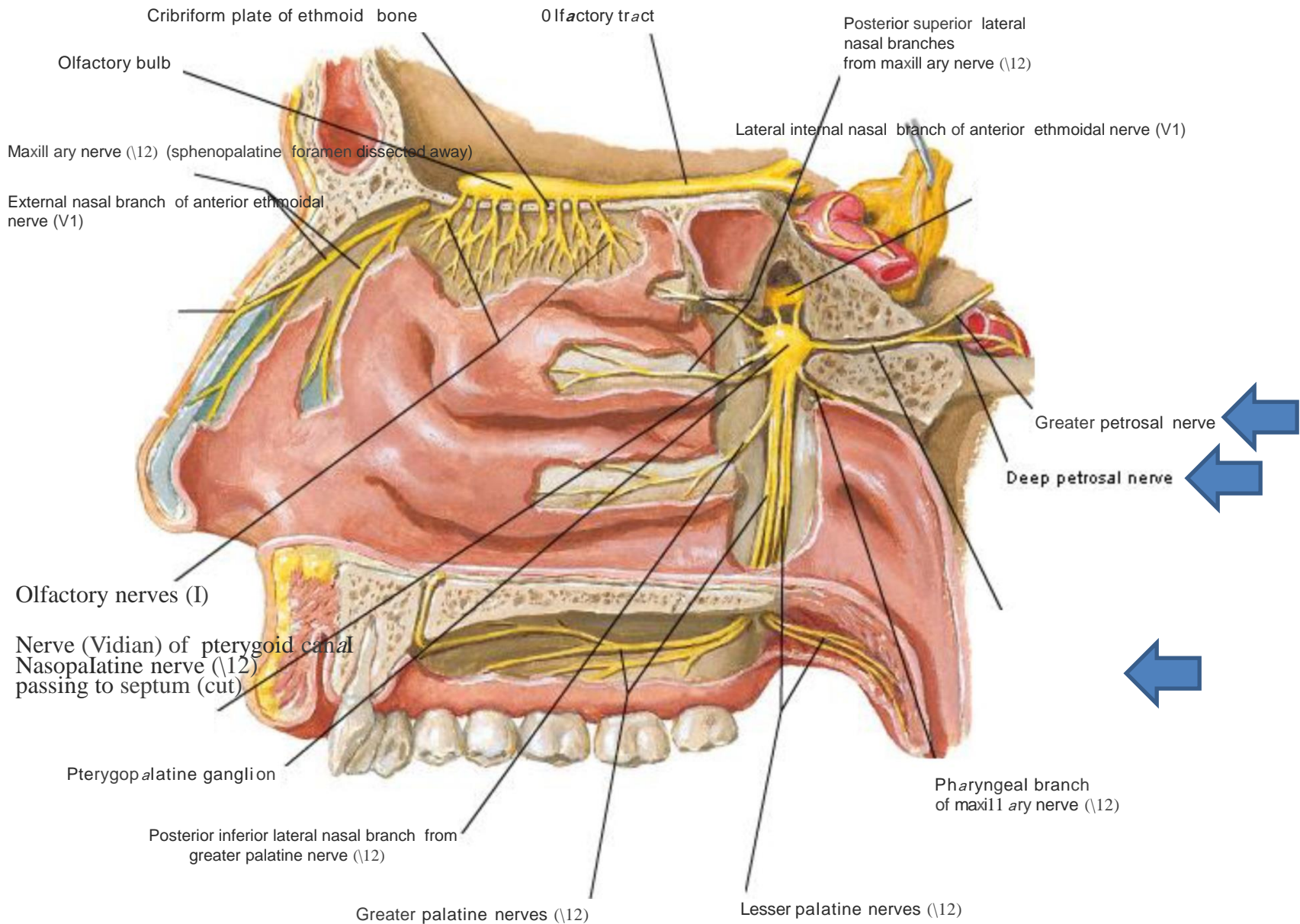
5- They then pass into its zygomatic branch and the zygomaticotemporal nerve

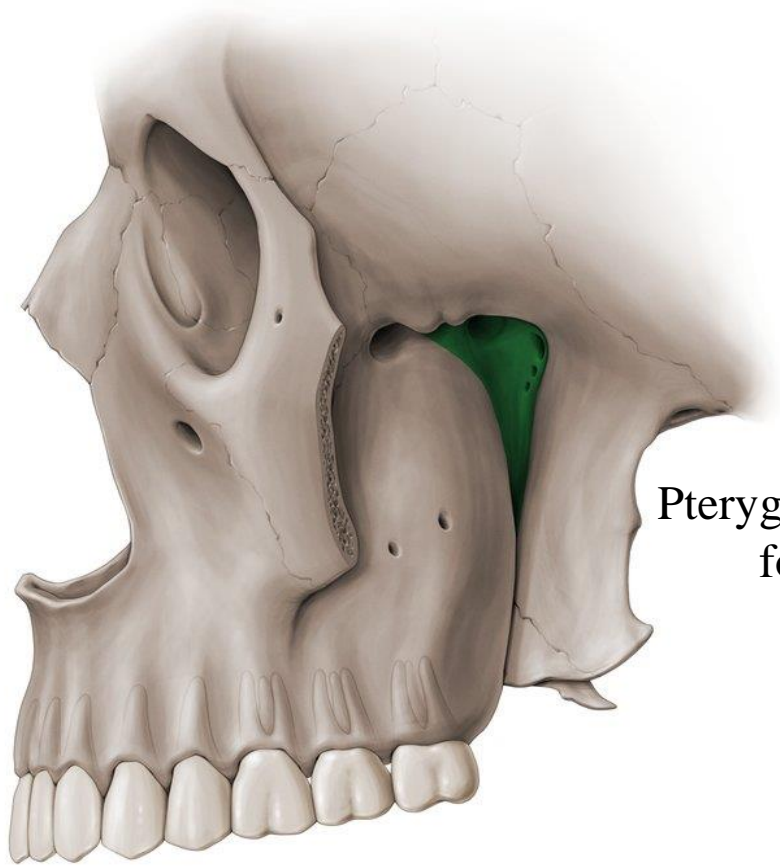
4- postganglionic sympathetic fibers join the maxillary nerve.

6- Finally the lacrimal nerve

sympathetic nerve supply

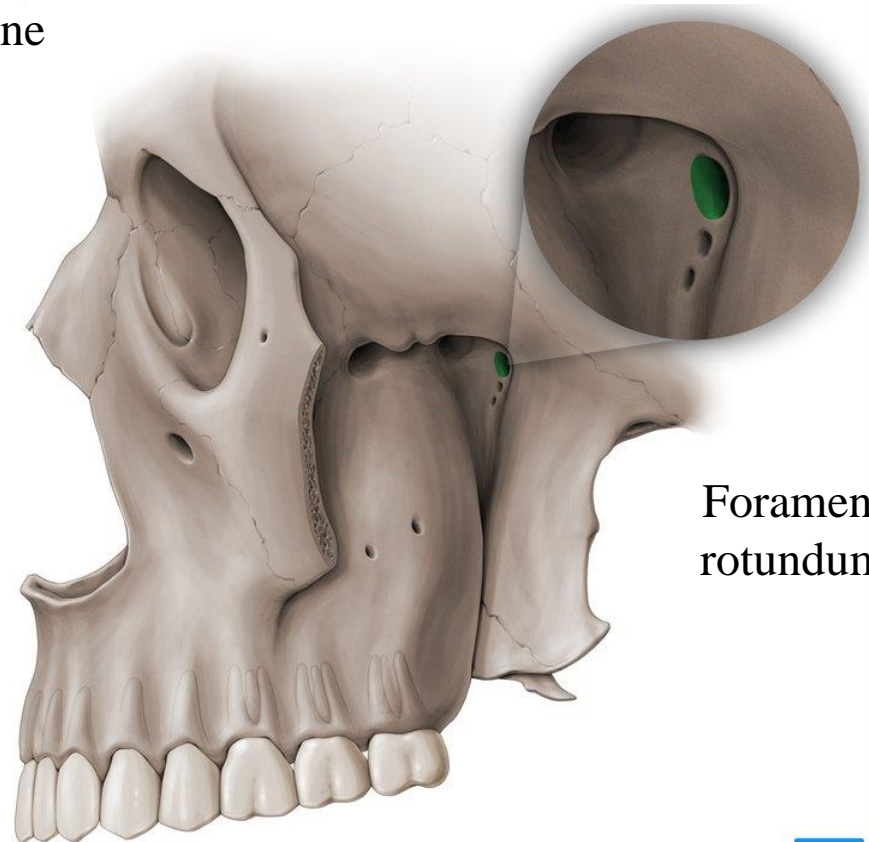






Pterygopalatine  
fossa

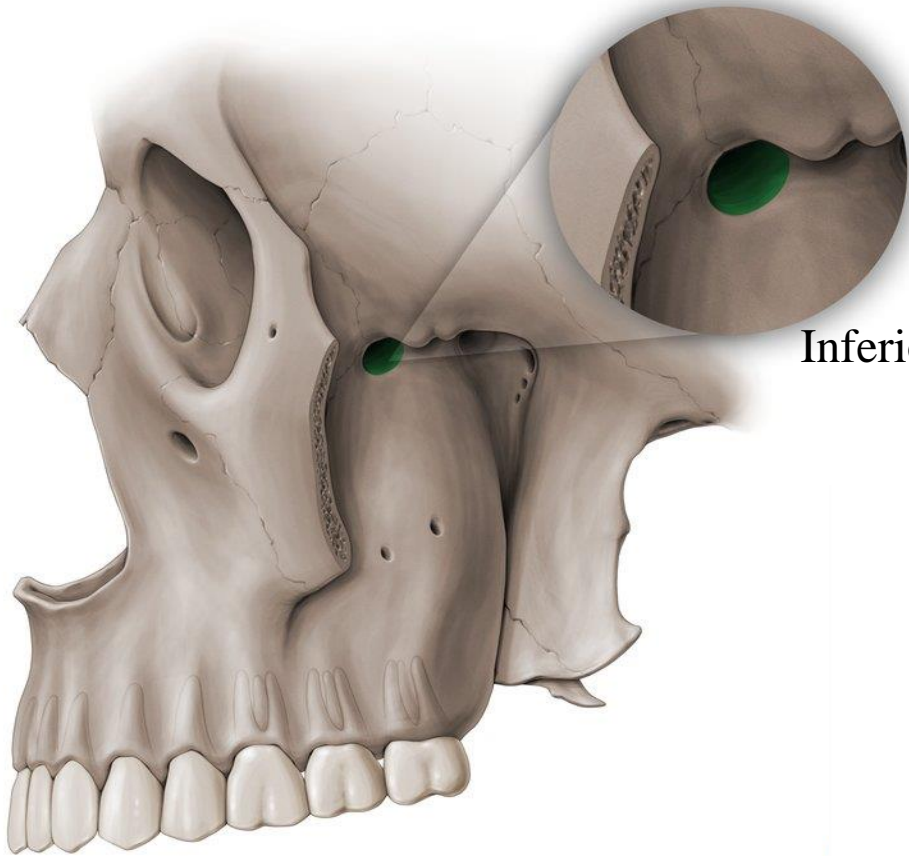
© www.kenhub.com



Foramen  
rotundum

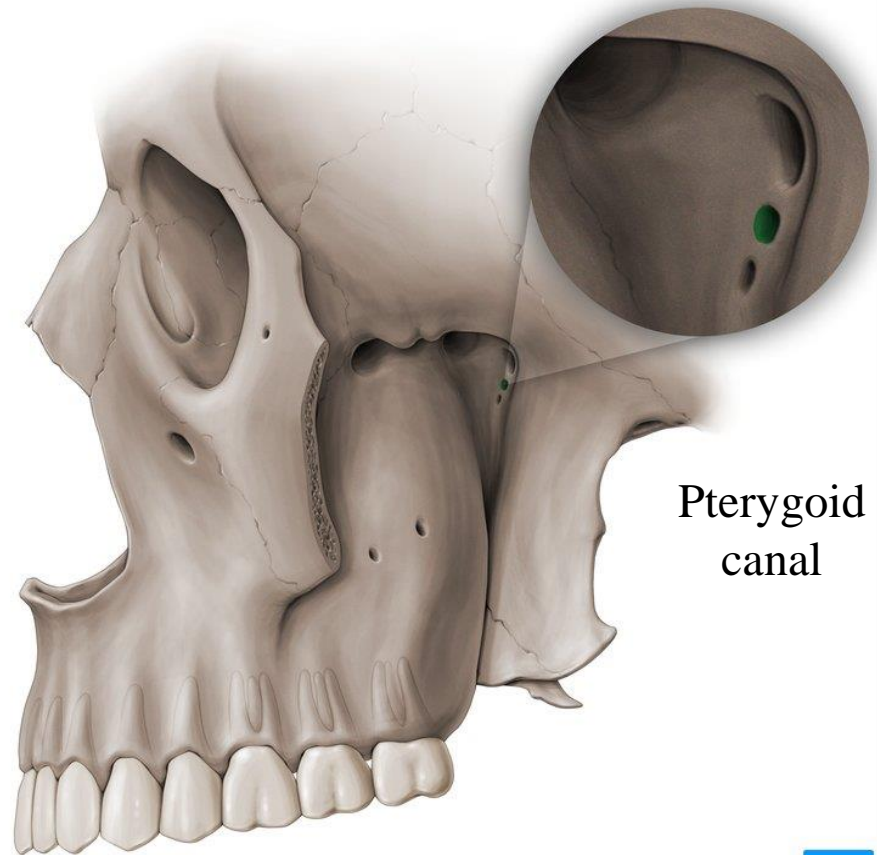
© www.kenhub.com





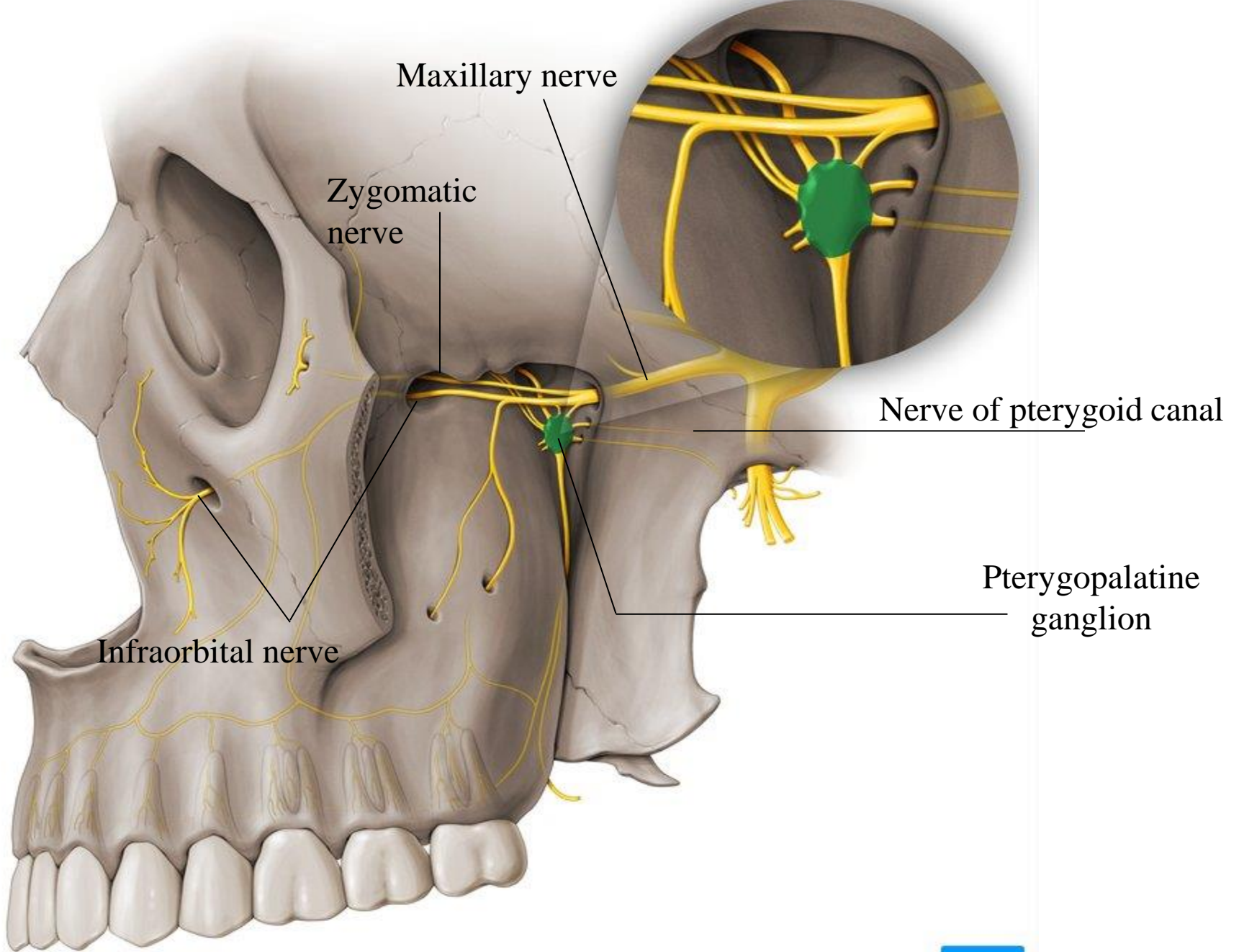
Inferior orbital fissure

© www.kenhub.com

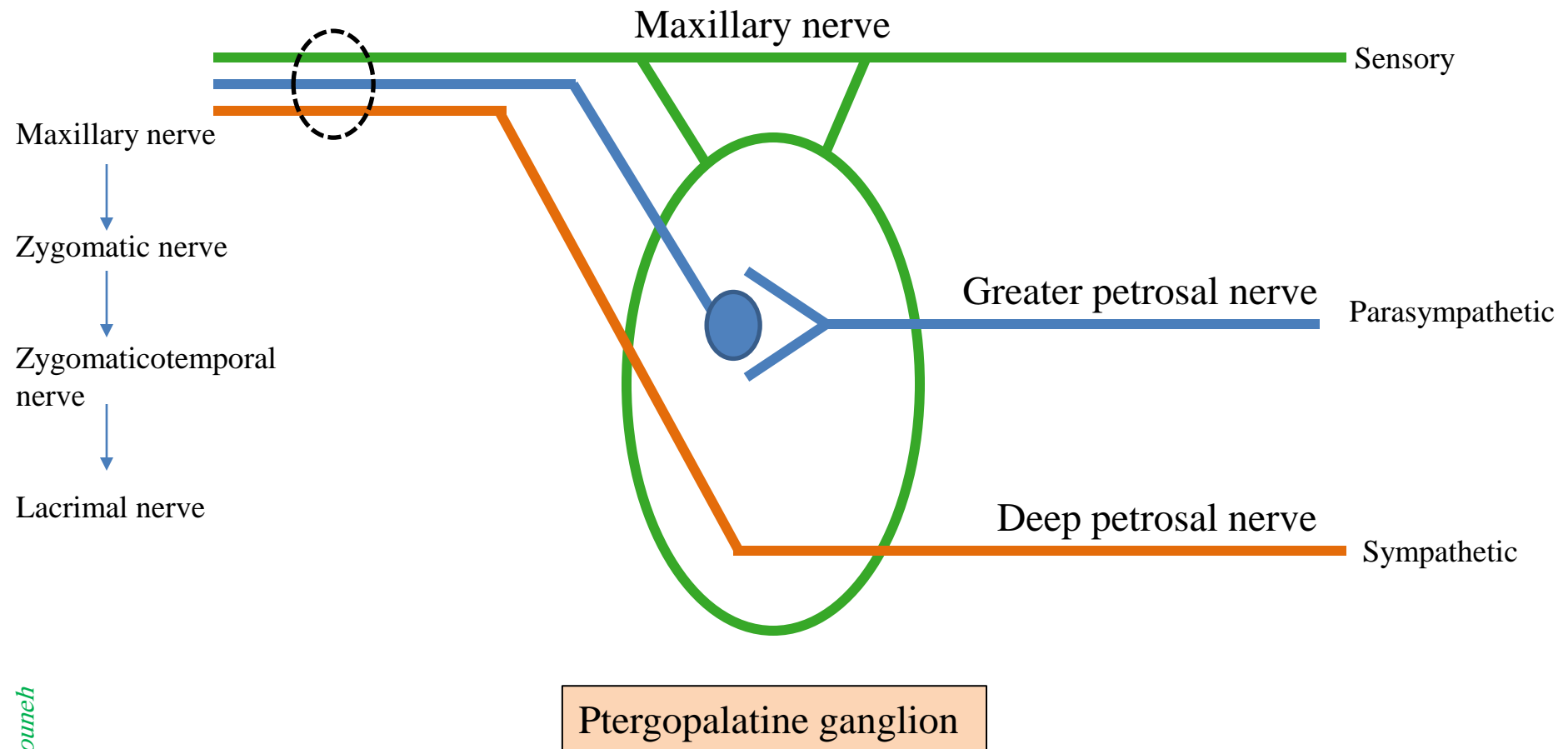


Pterygoid canal

© www.kenhub.com



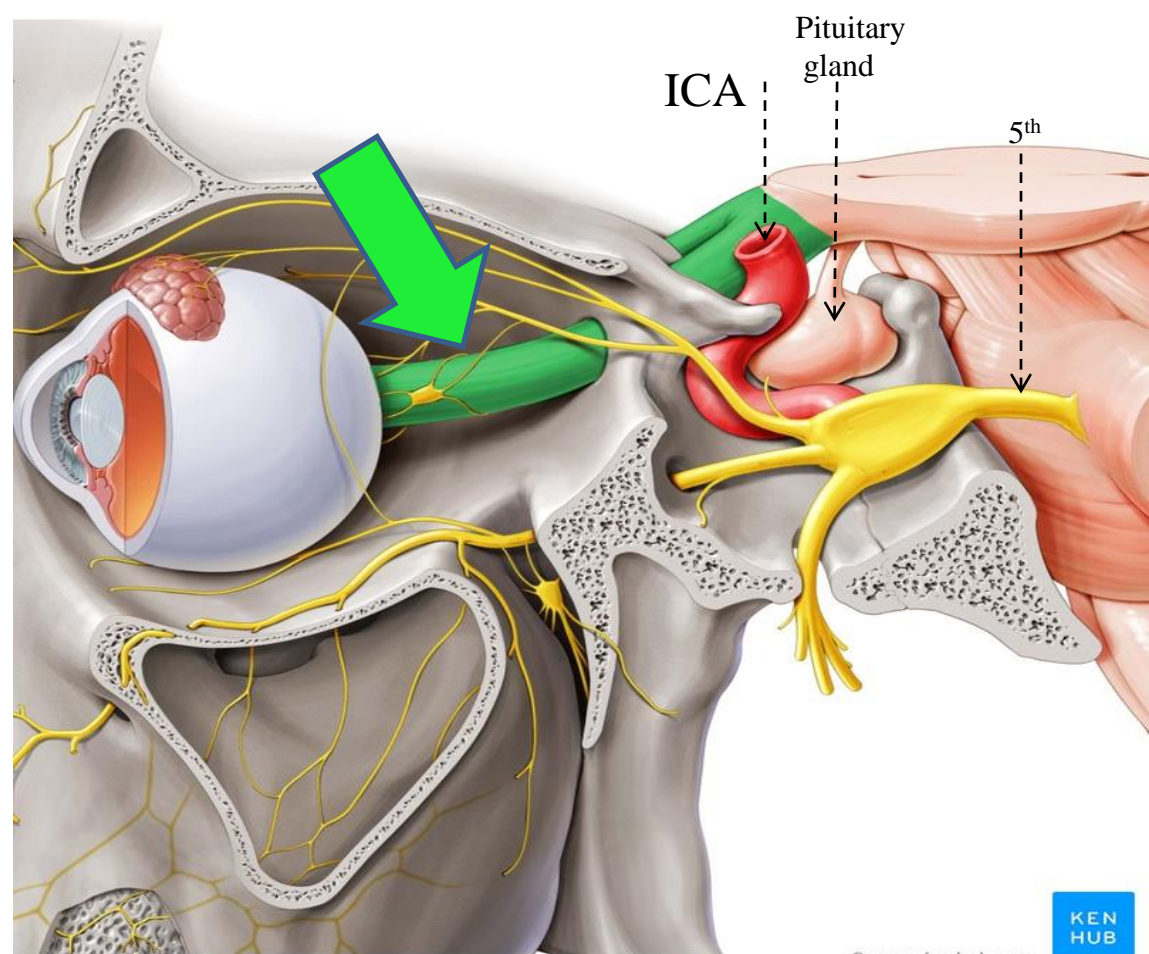
*Anatomically, it's connected to maxillary nerve (through a ganglionic branch)*  
*Functionally, it's associated with the facial nerve*



# Nerves of the Orbit

## Optic Nerve

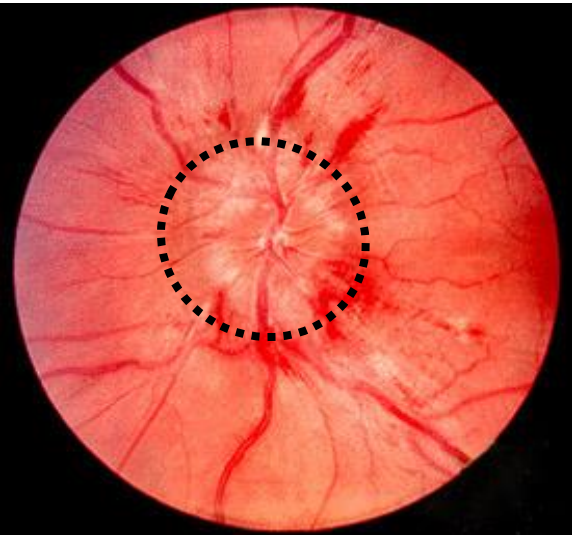
- ❖ The optic nerve enters the orbit from the middle cranial fossa by passing through the **optic canal**
- ❖ It is accompanied by the **ophthalmic artery**
- ❖ The nerve is surrounded by sheaths of pia mater, arachnoid mater, and dura mater
- ❖ It pierces the sclera at the posterior pole of the eyeball (optic disc)



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

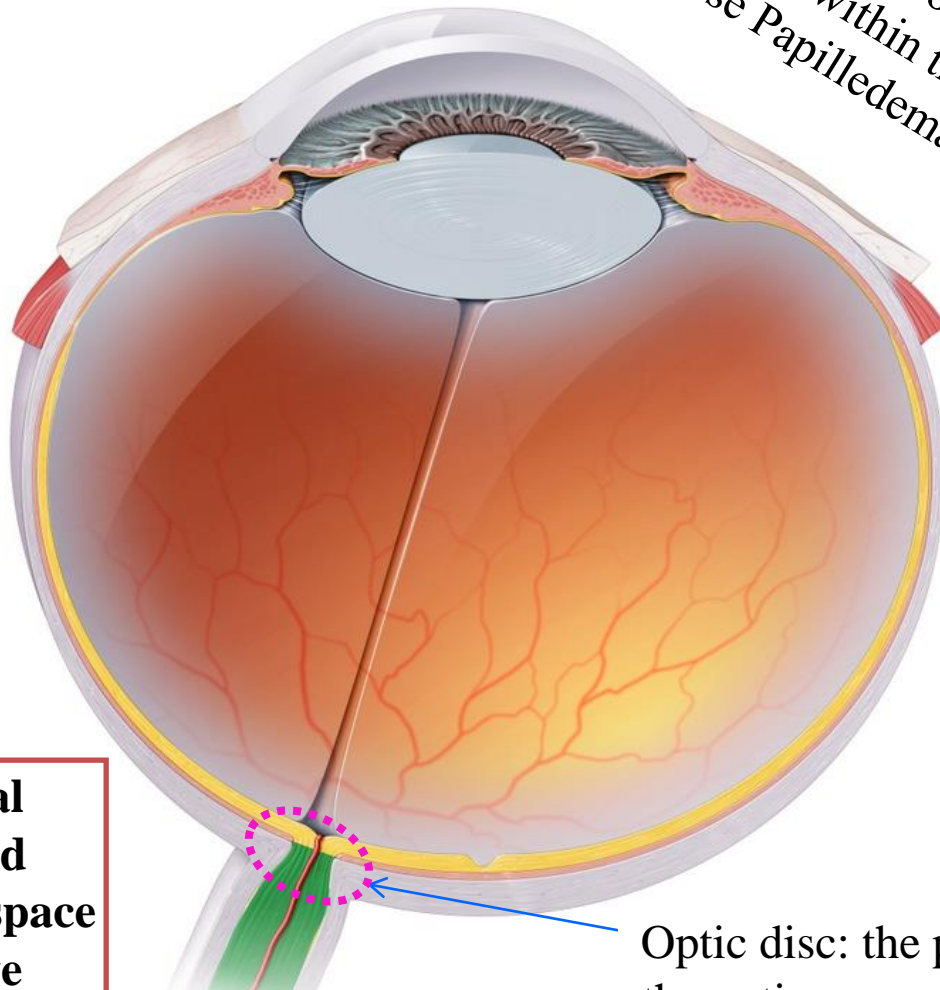


A swollen optic disc caused by increased intracranial pressure

*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**

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



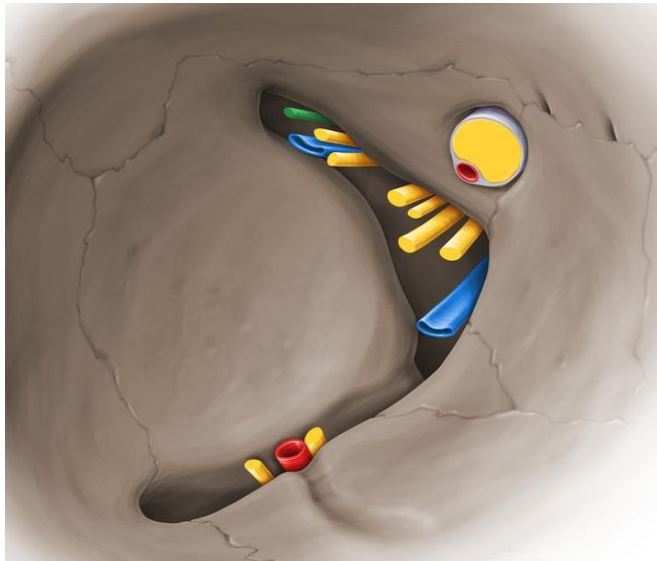
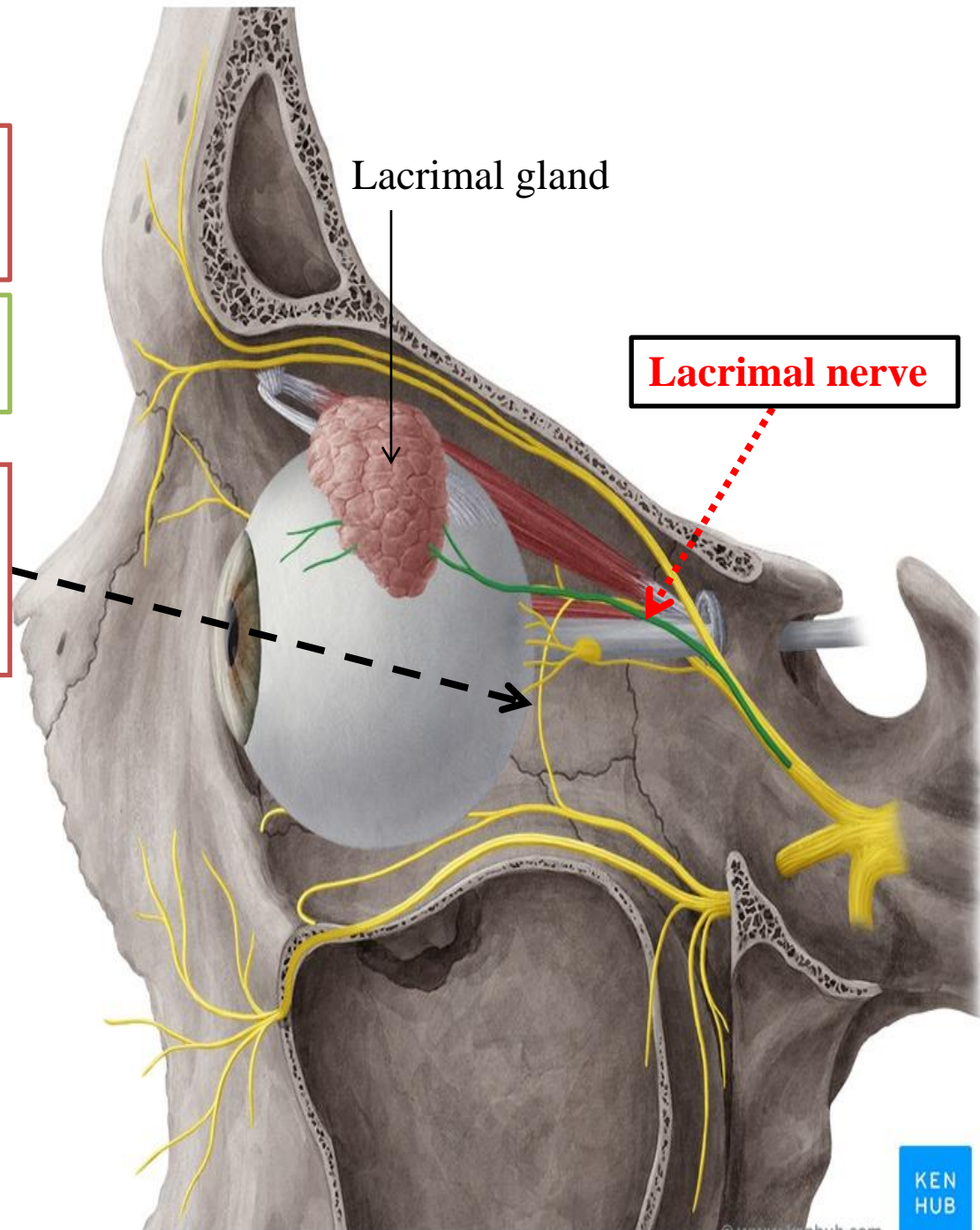
Optic disc: the point of exit of the optic nerve, lacking visual receptors (blind spot)

# 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 zygomatic nerve (or zygomaticotemporal nerve)  
*(parasympathetic to lacrimal gland)*



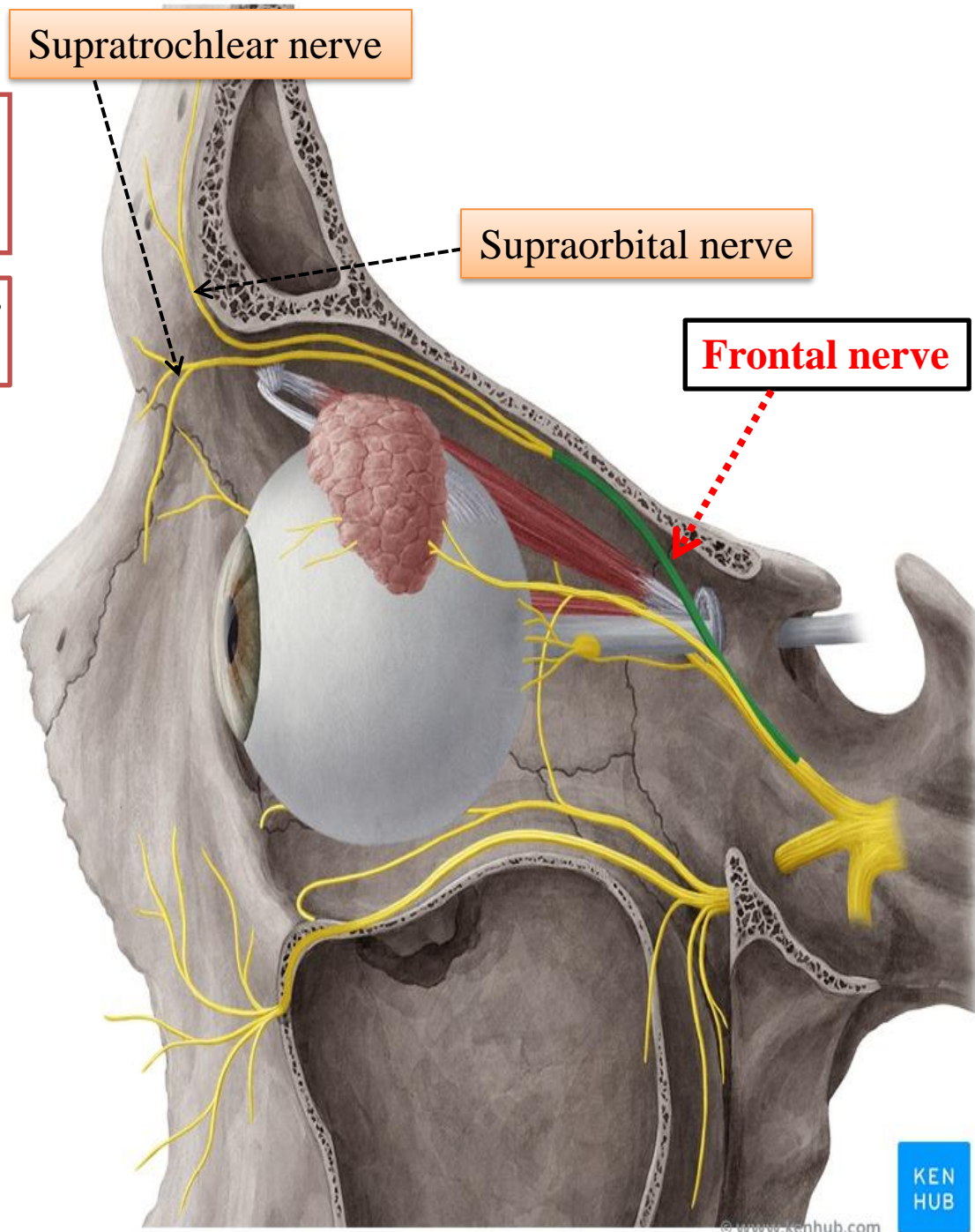


# Frontal Nerve

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

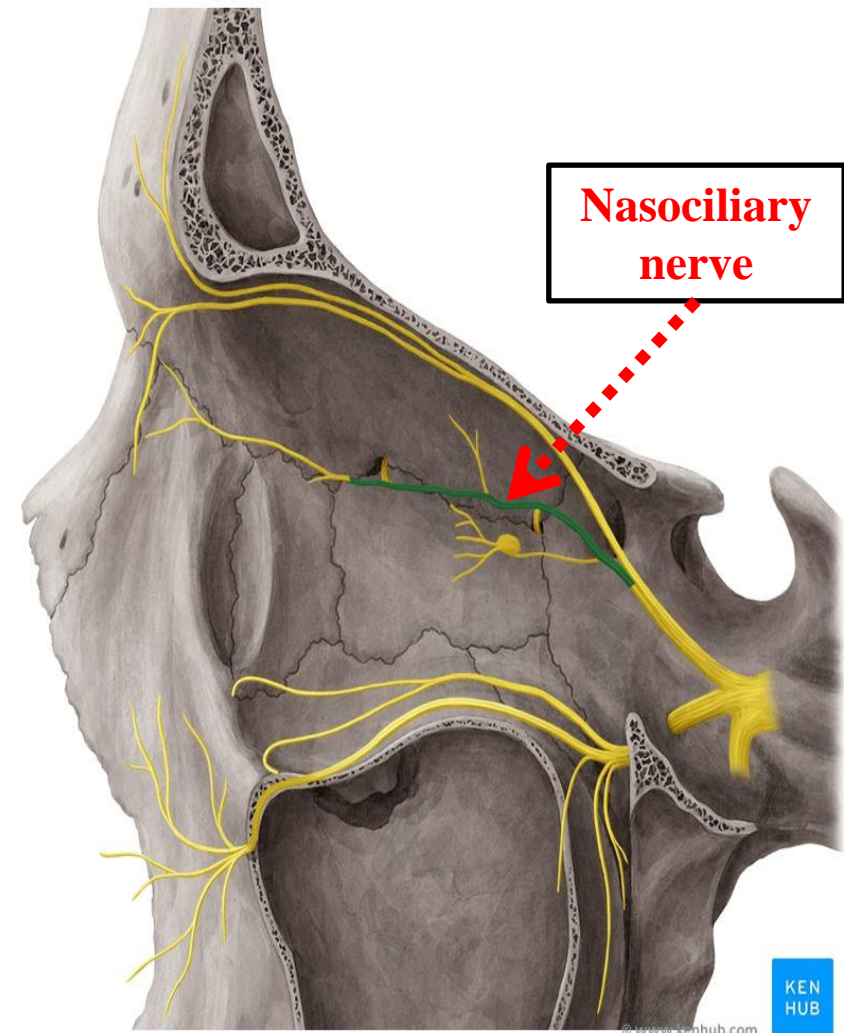
It enters the orbit through the **superior orbital fissure**

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**



## 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.

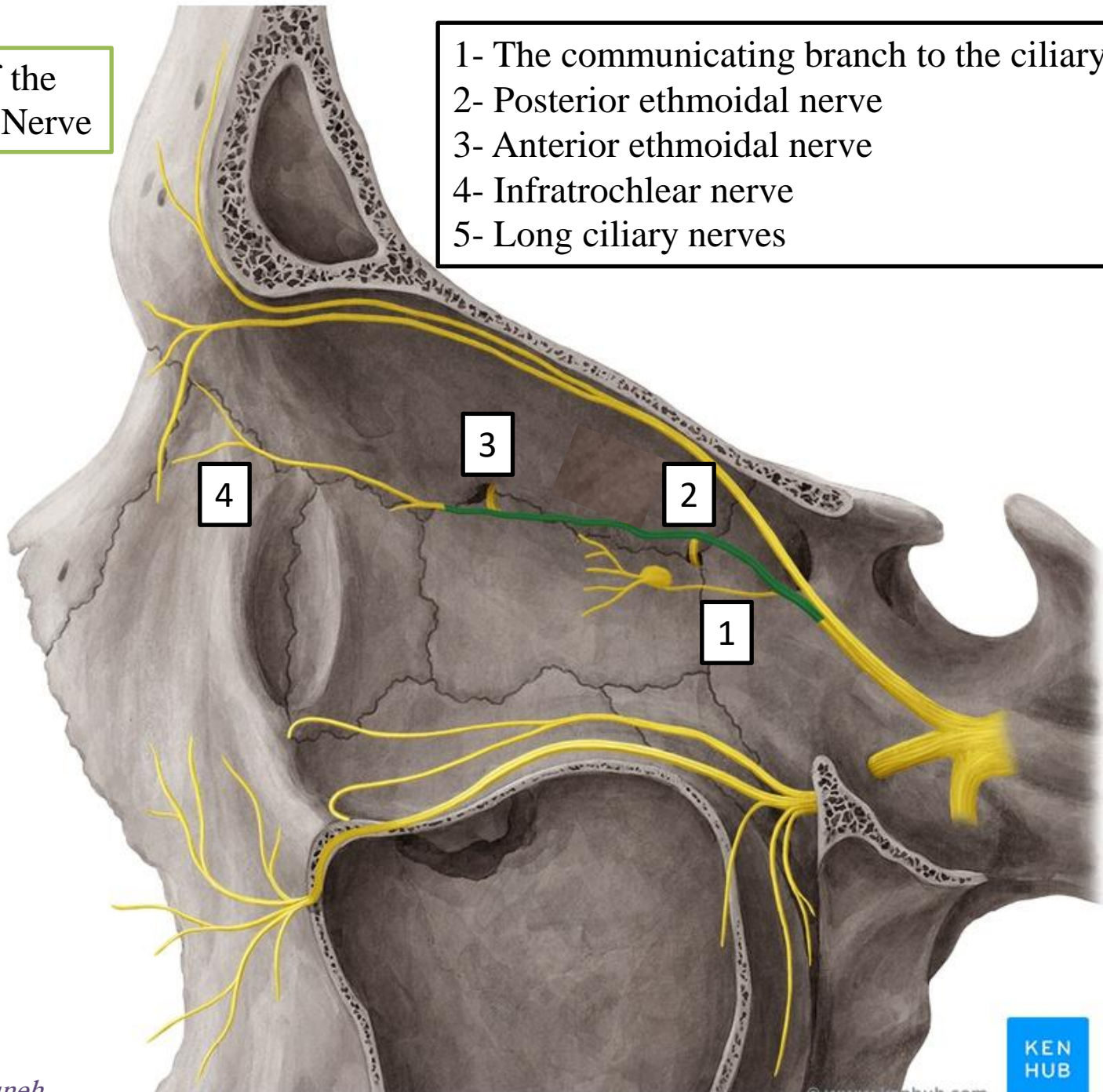
3-**The posterior ethmoidal nerve** supplies the ethmoidal and sphenoidal air sinuses

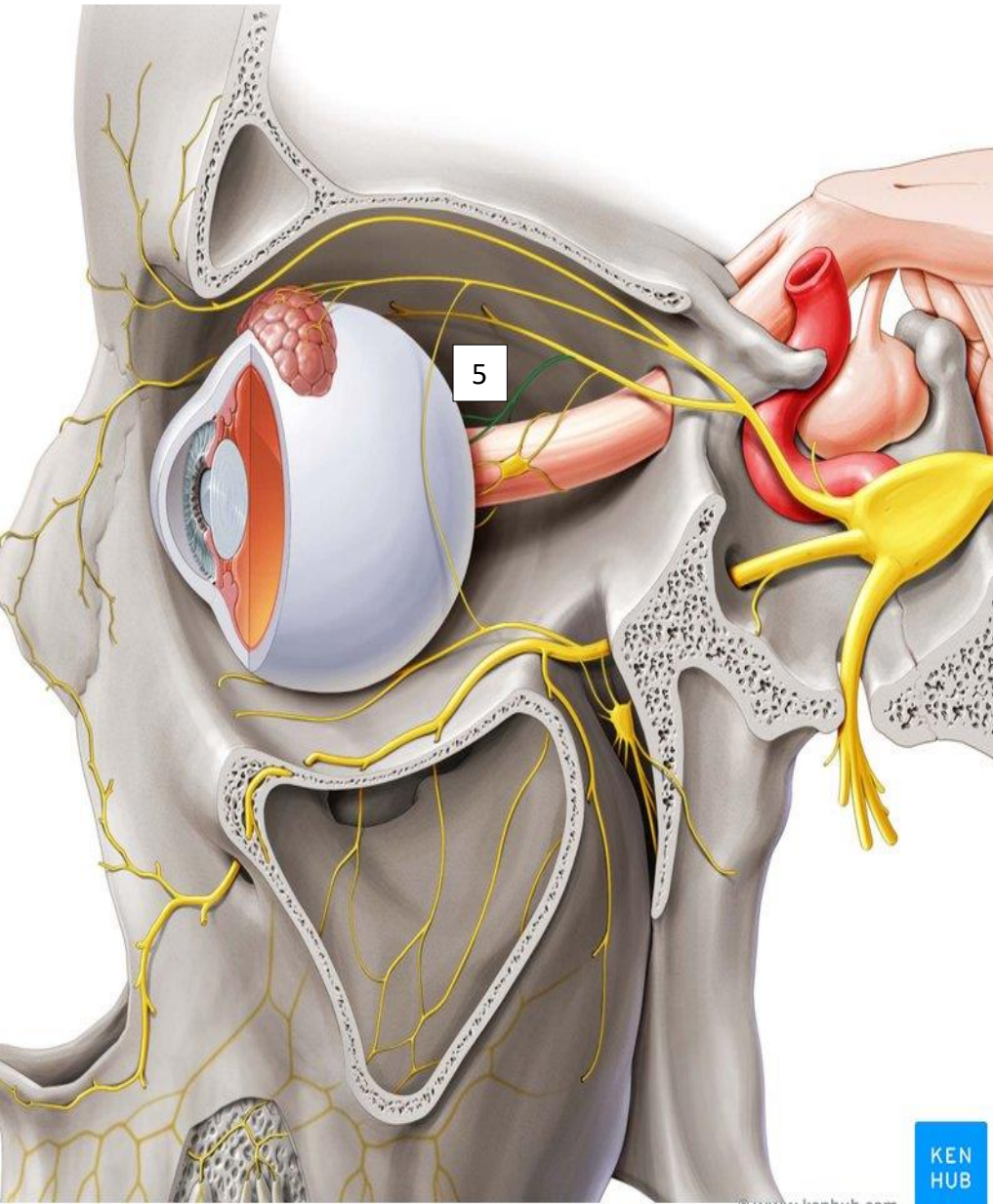
4-**The infratrochlear nerve** supplies the skin of the medial part of the upper eyelid and the adjacent part of the nose

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

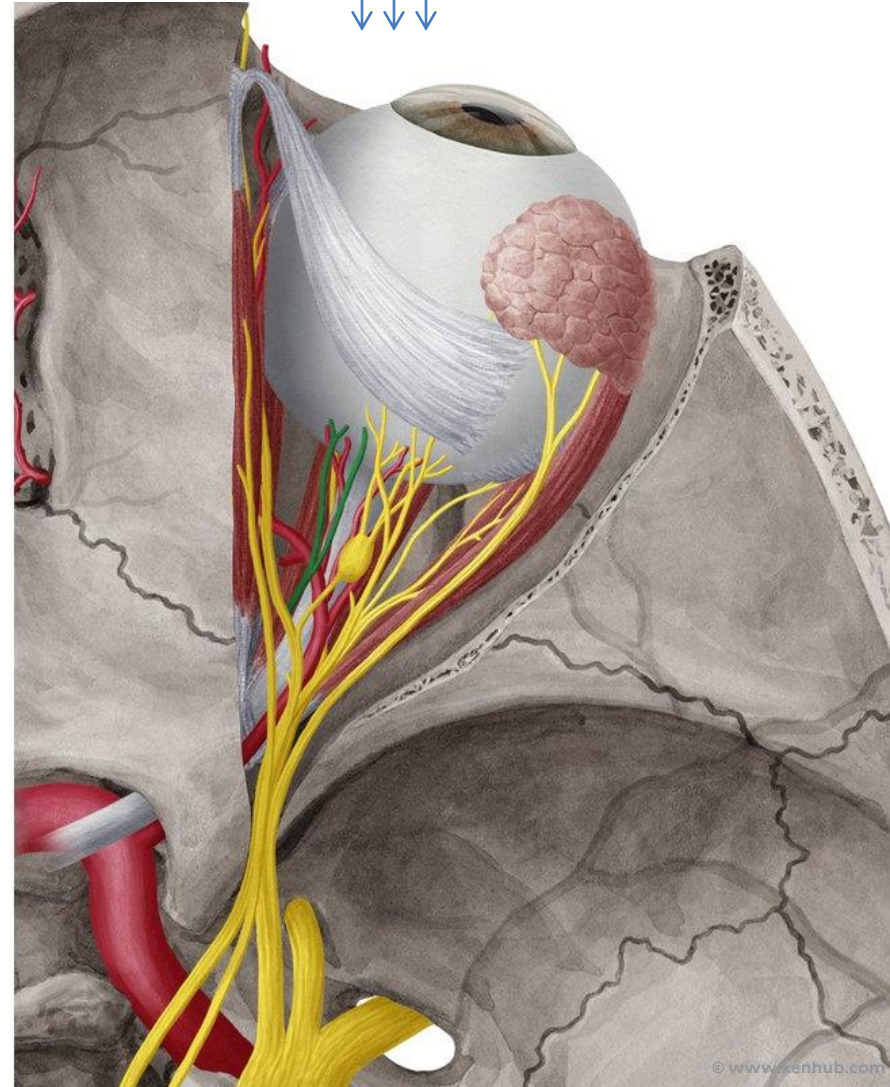
## Branches of the Nasociliary Nerve

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





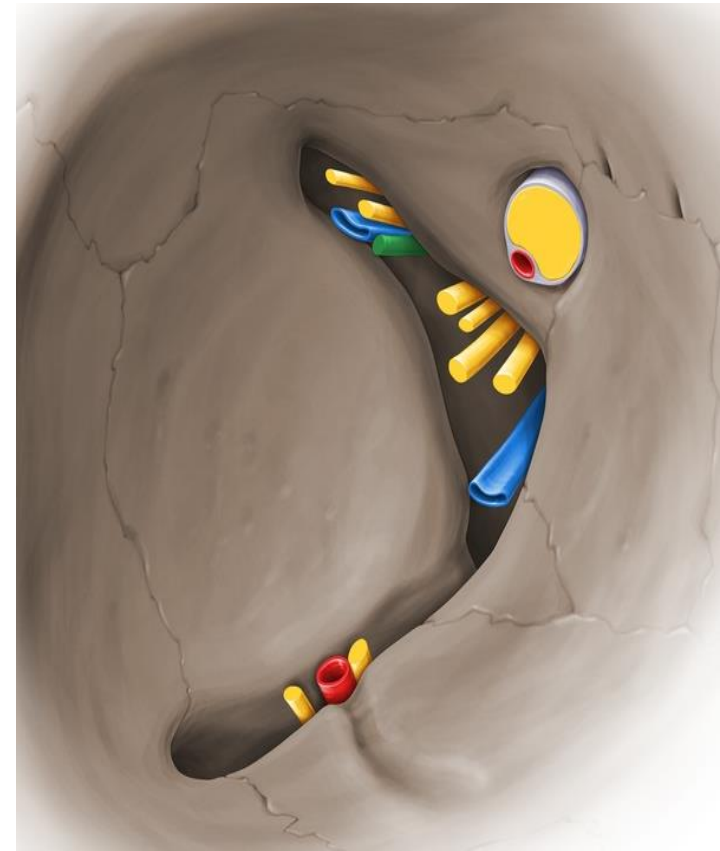
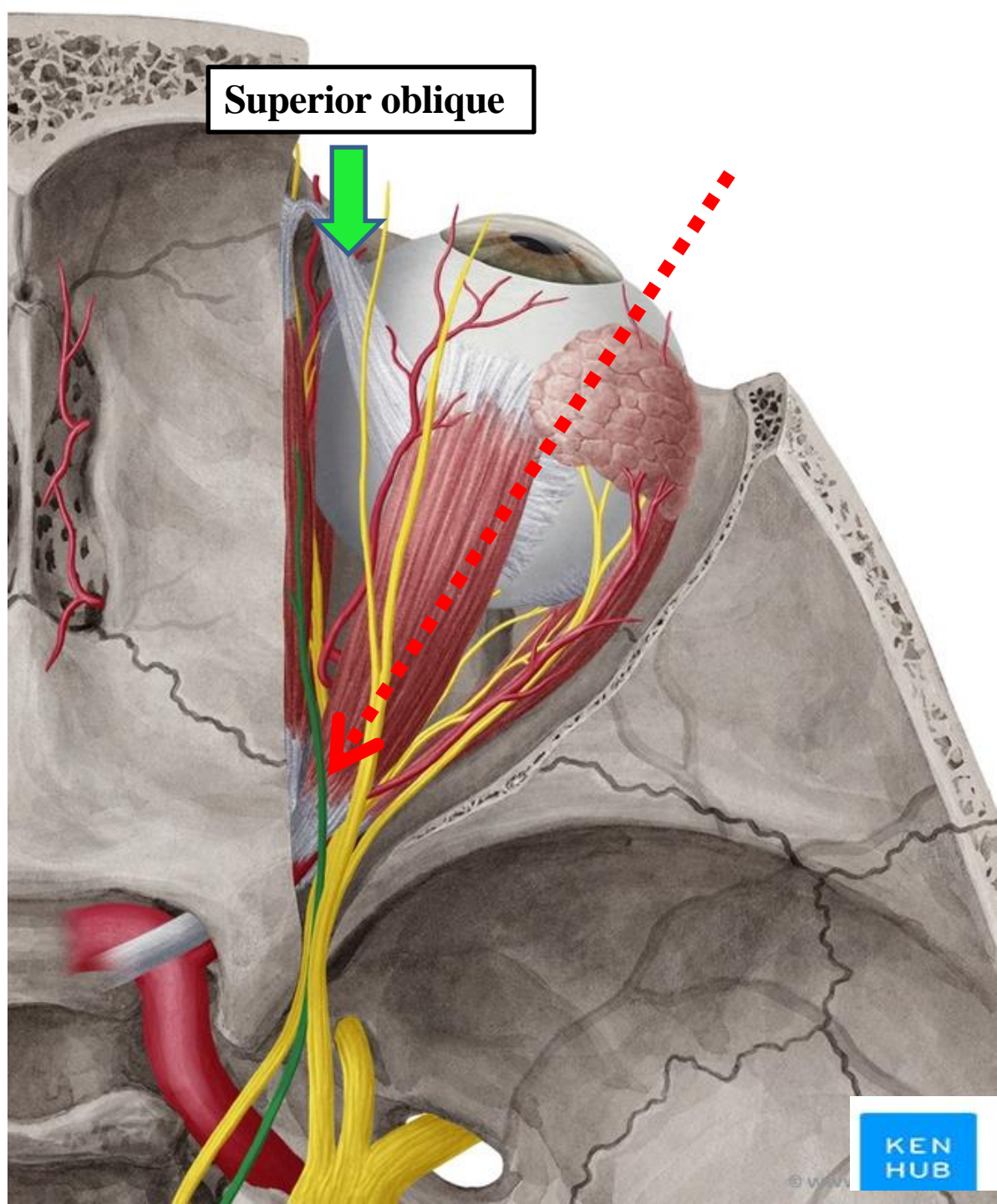
Long ciliary nerves



# Trochlear Nerve

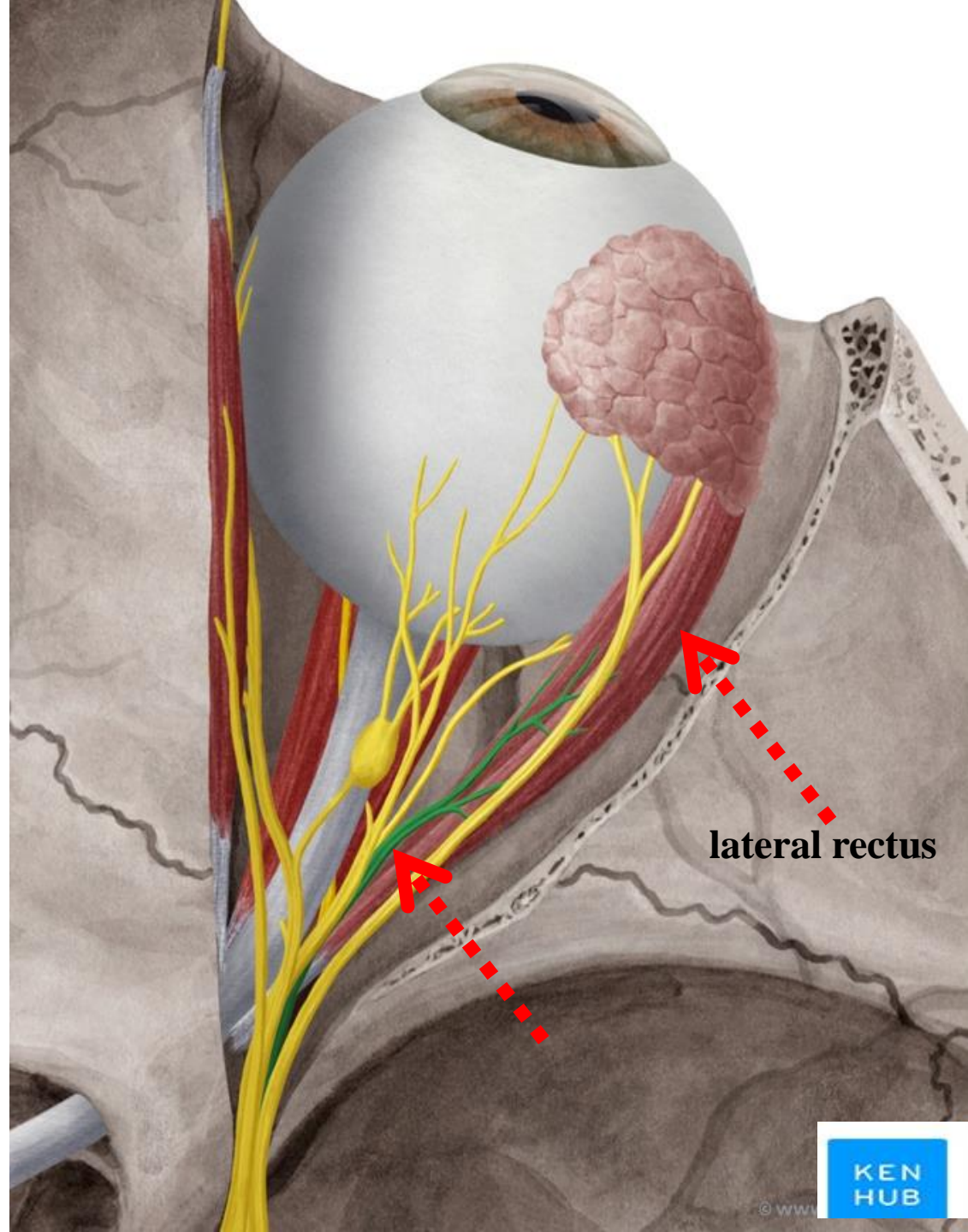
The trochlear nerve enters the orbit through **the superior orbital fissure**

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

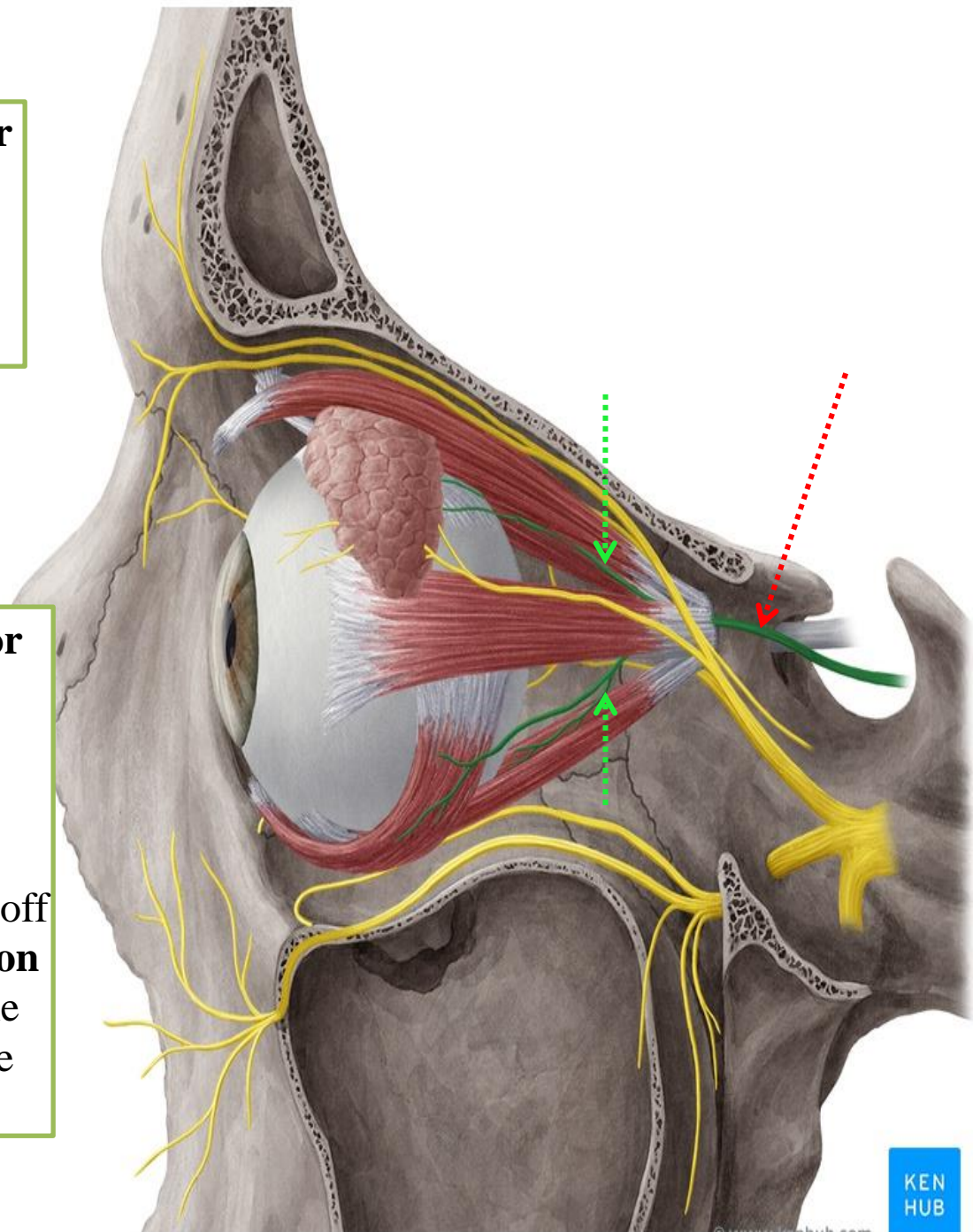
The superior division of the oculomotor nerve enters the orbit through **the superior orbital fissure**

- 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



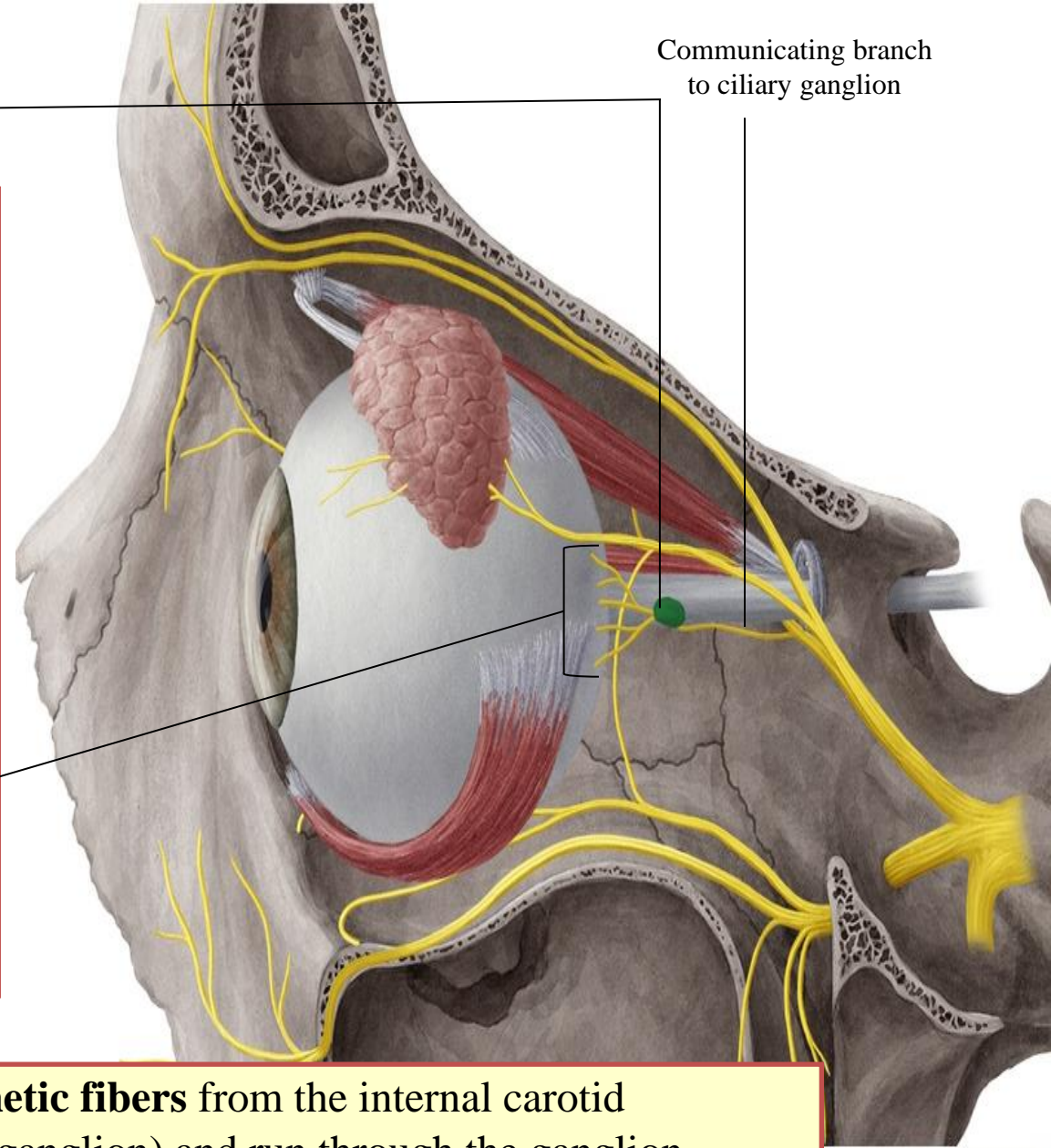


# Ciliary Ganglion

- 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**

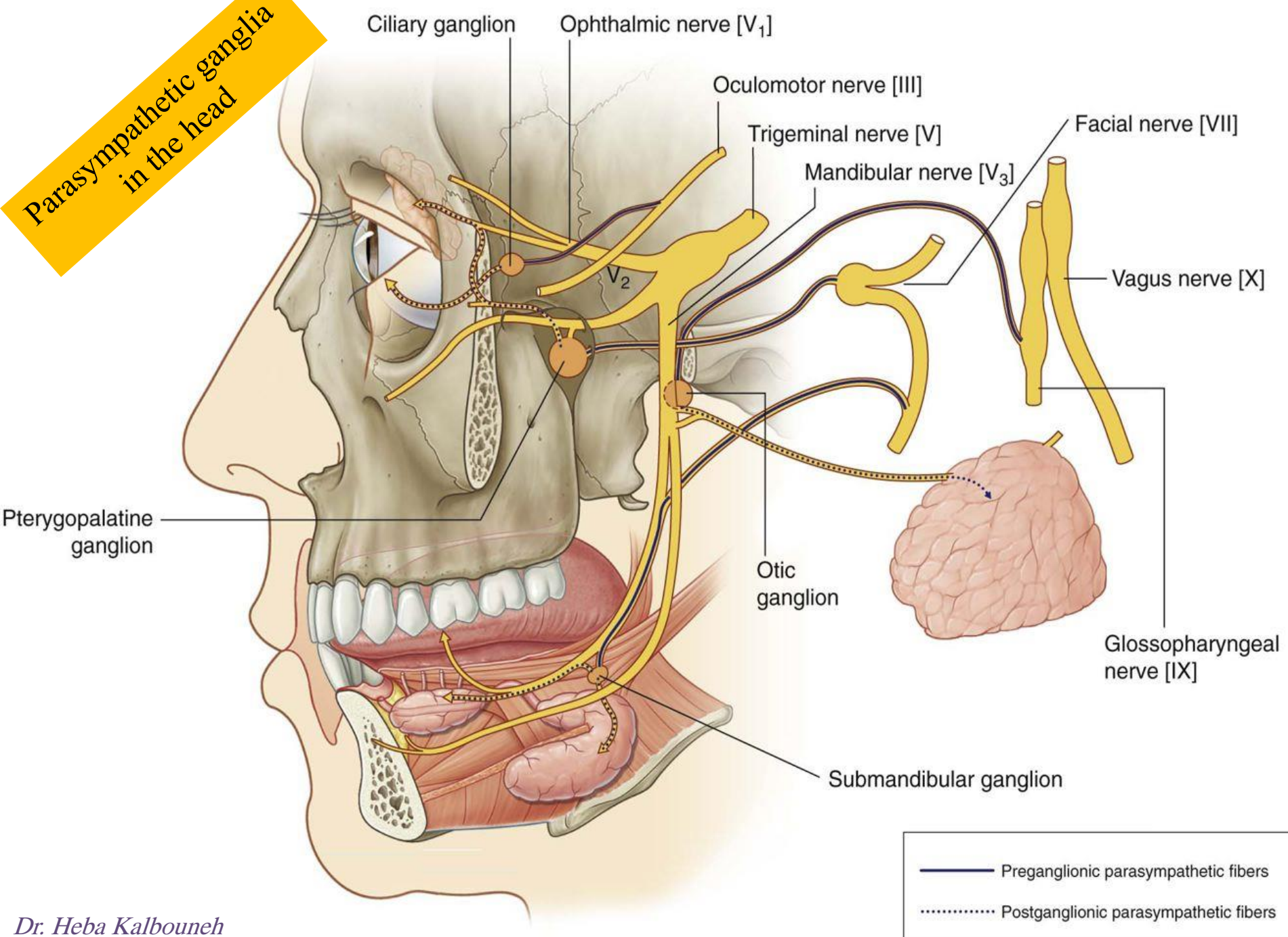
**The postganglionic fibers leave the ganglion in the short ciliary nerves, which enter the back of the eyeball and supply the sphincter pupillae and the ciliary muscle.**

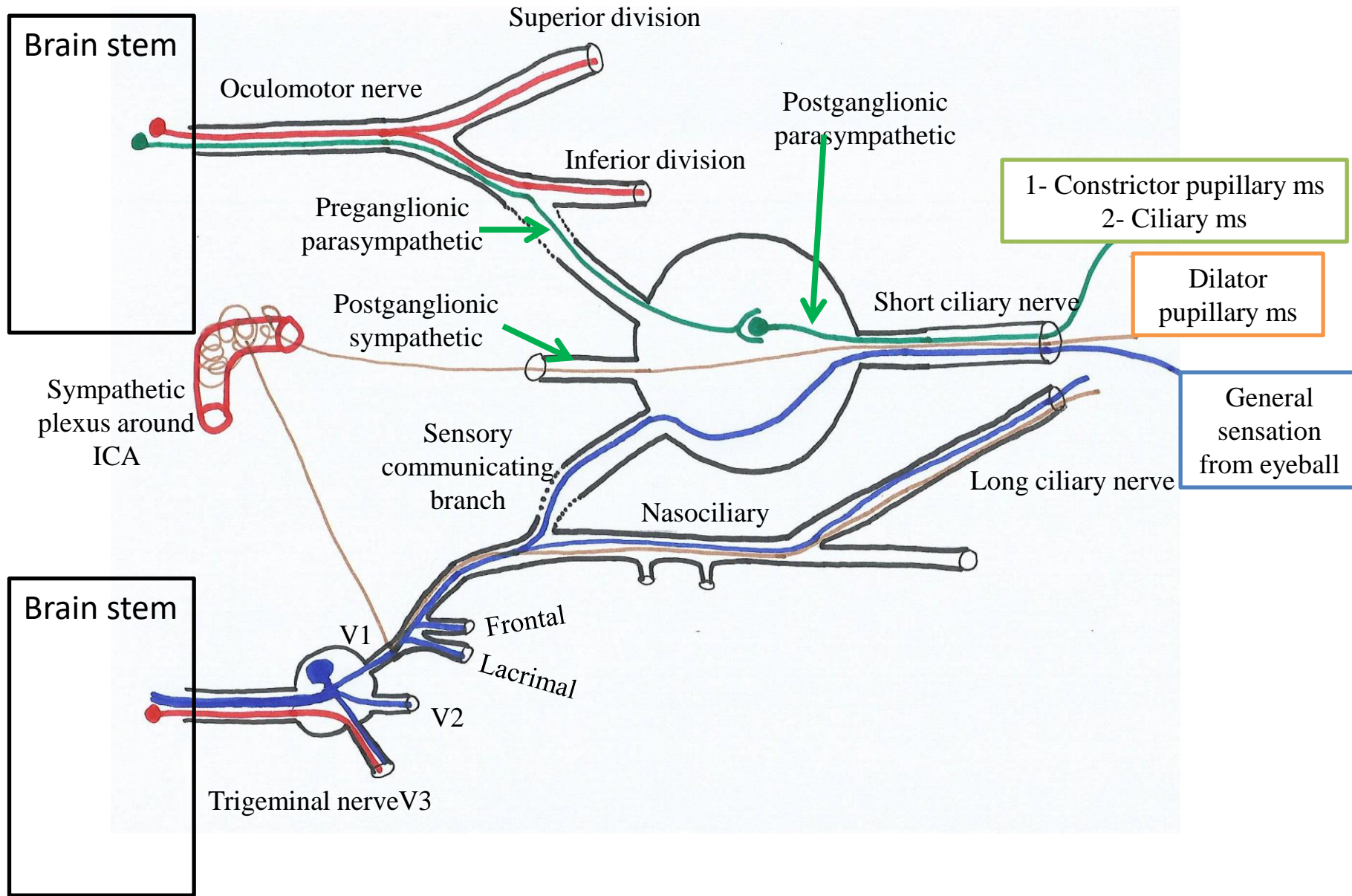
It receives its postganglionic **sympathetic fibers** from the internal carotid sympathetic plexus (superior cervical ganglion) and run through the ganglion without interruption.

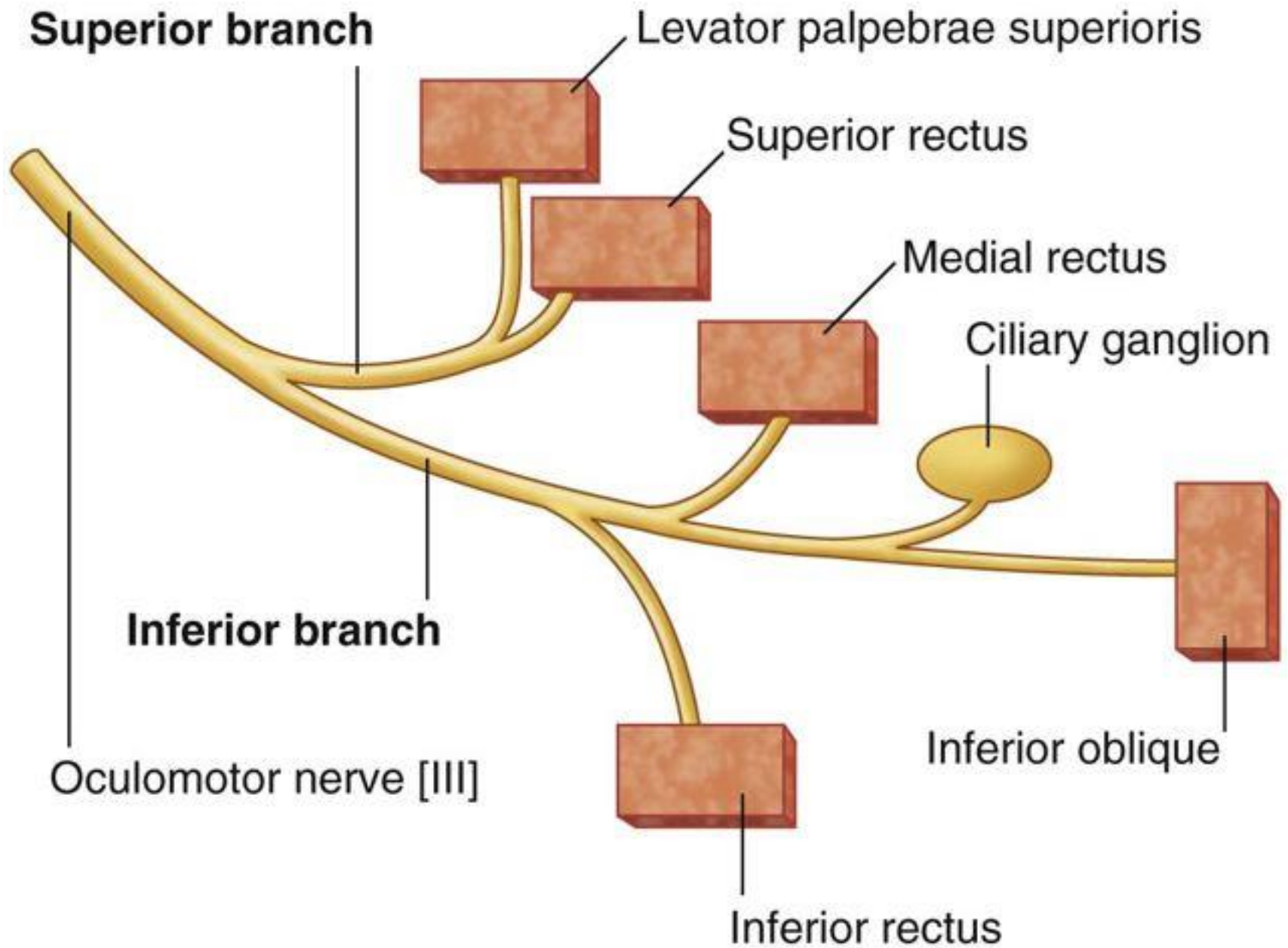


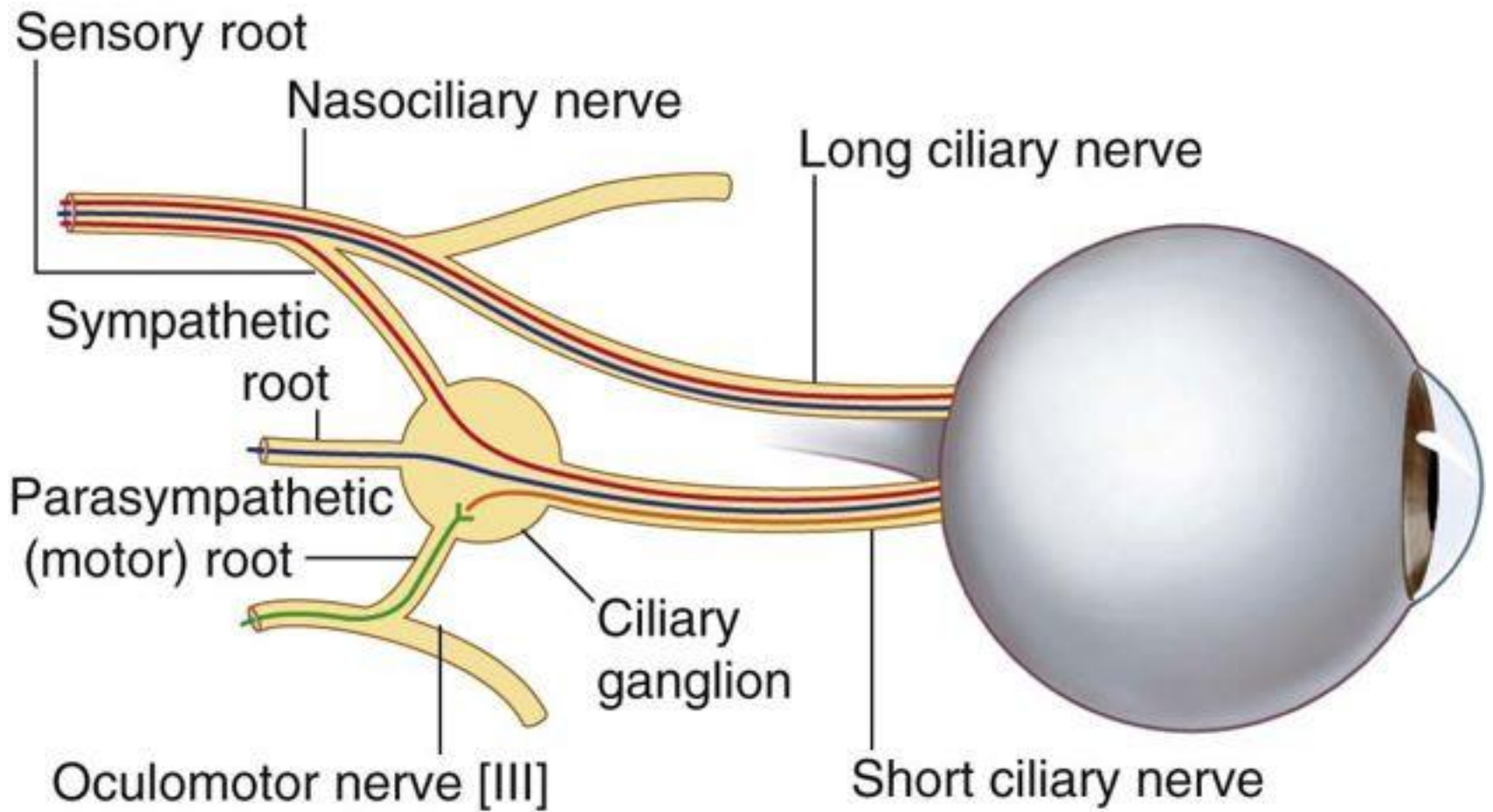
Communicating branch  
to ciliary ganglion

**Parasympathetic ganglia in the head**



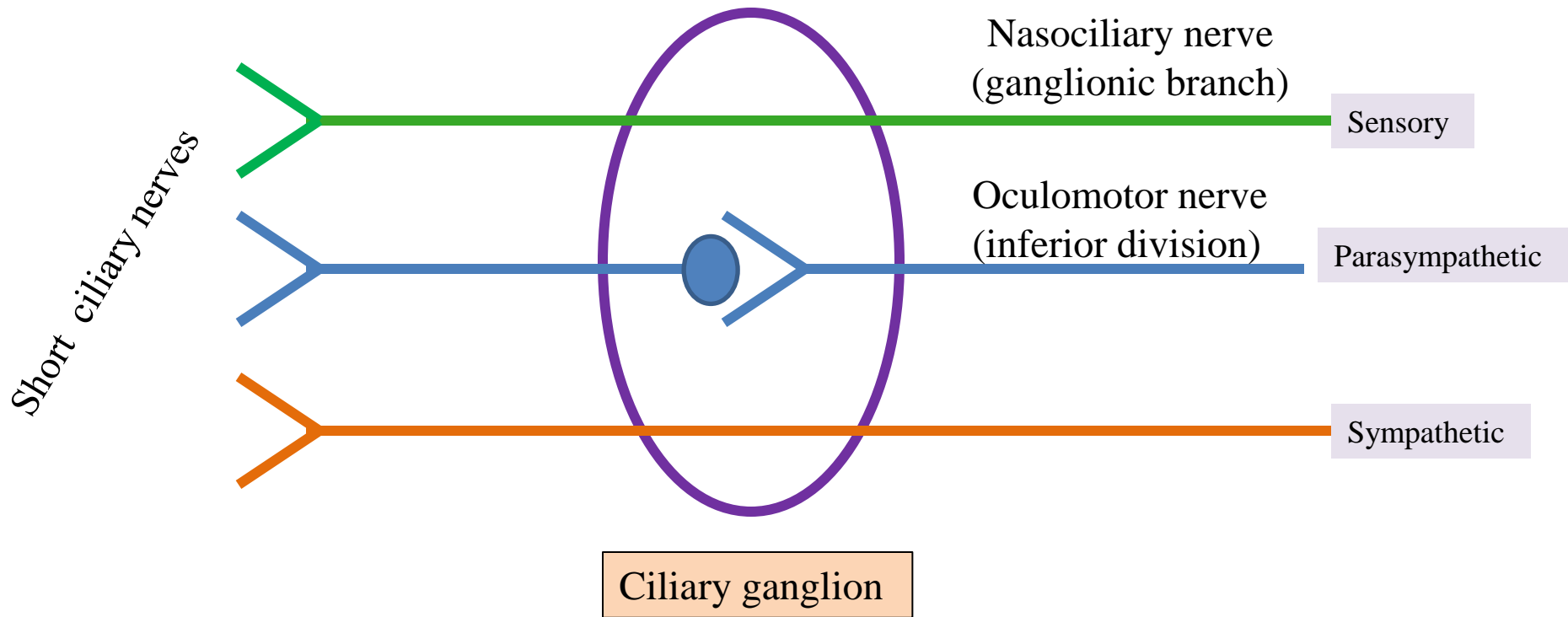




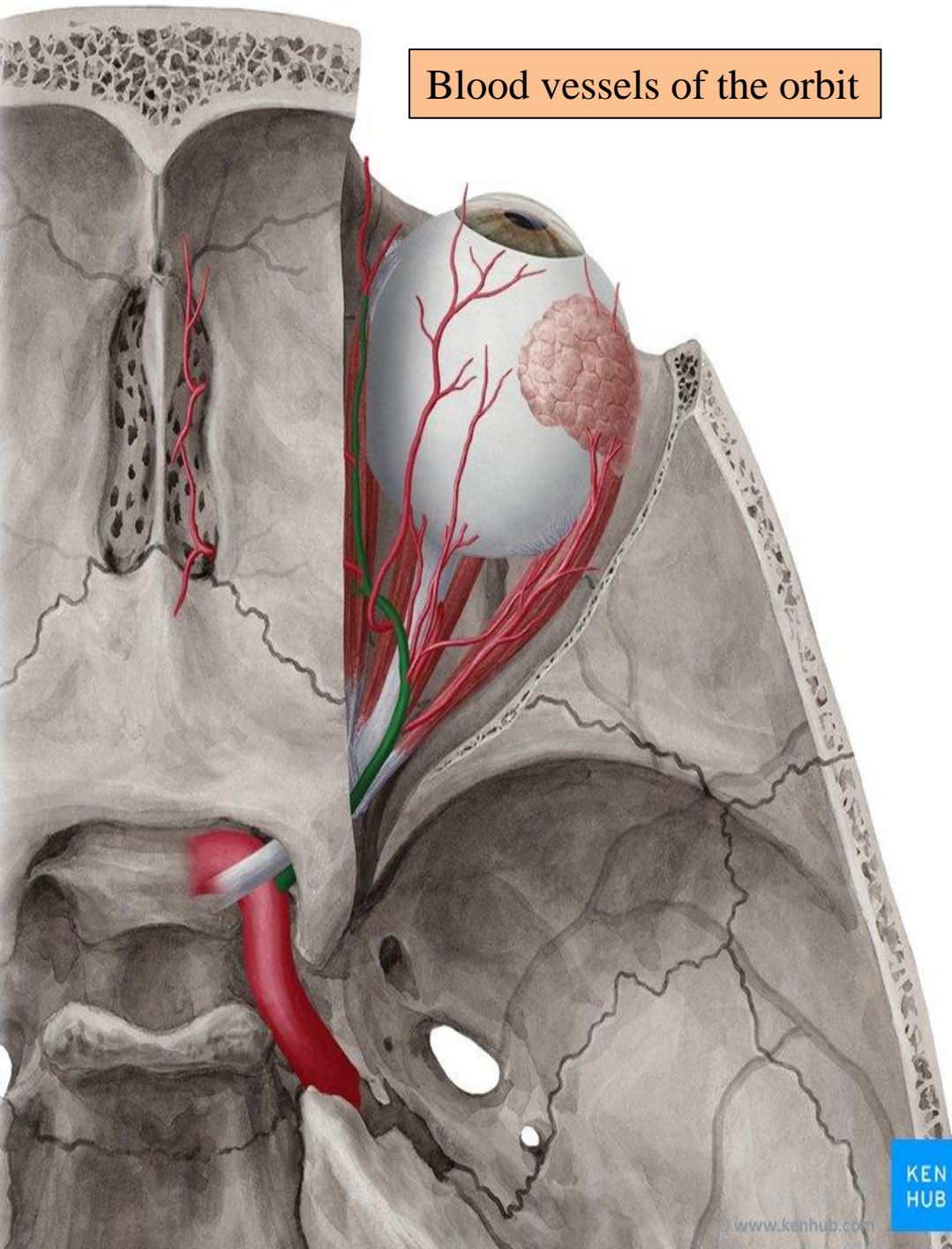


- Sensory fibers
- Sympathetic postganglionic fibers
- Parasympathetic preganglionic fibers
- Parasympathetic postganglionic fibers

*Anatomically, it's connected to nasociliary nerve (through a ganglionic branch)*  
*Functionally, it's 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)**

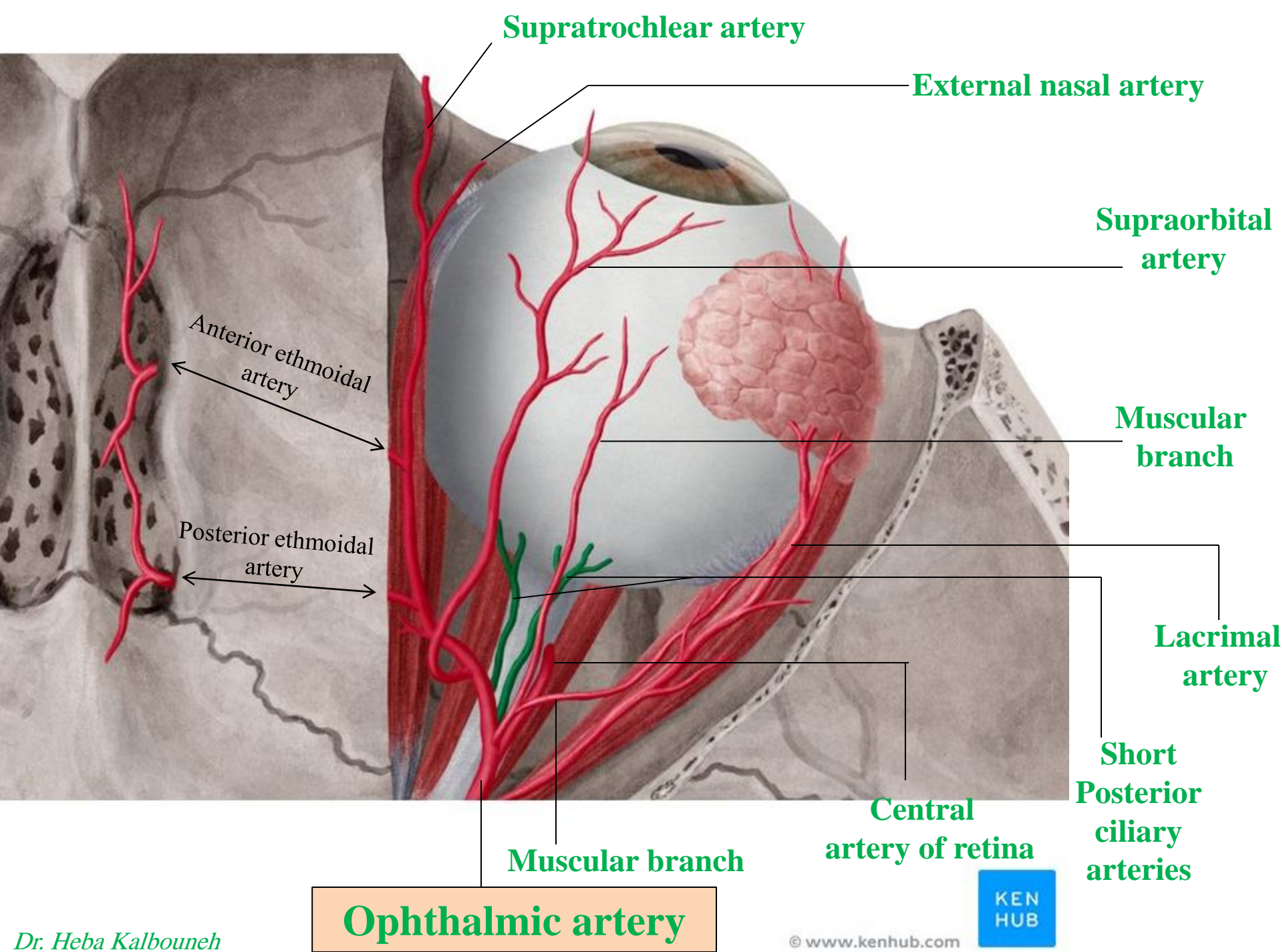
**Muscular branches:** supplies extra ocular muscles

**Anterior and posterior ethmoidal arteries**

**Supraorbital artery**

**Supratrochlear artery**

**External nasal artery**



Supratrochlear artery

External nasal artery

Supraorbital artery

Muscular branch

Lacrimal artery

Short Posterior ciliary arteries

Central artery of retina

Muscular branch

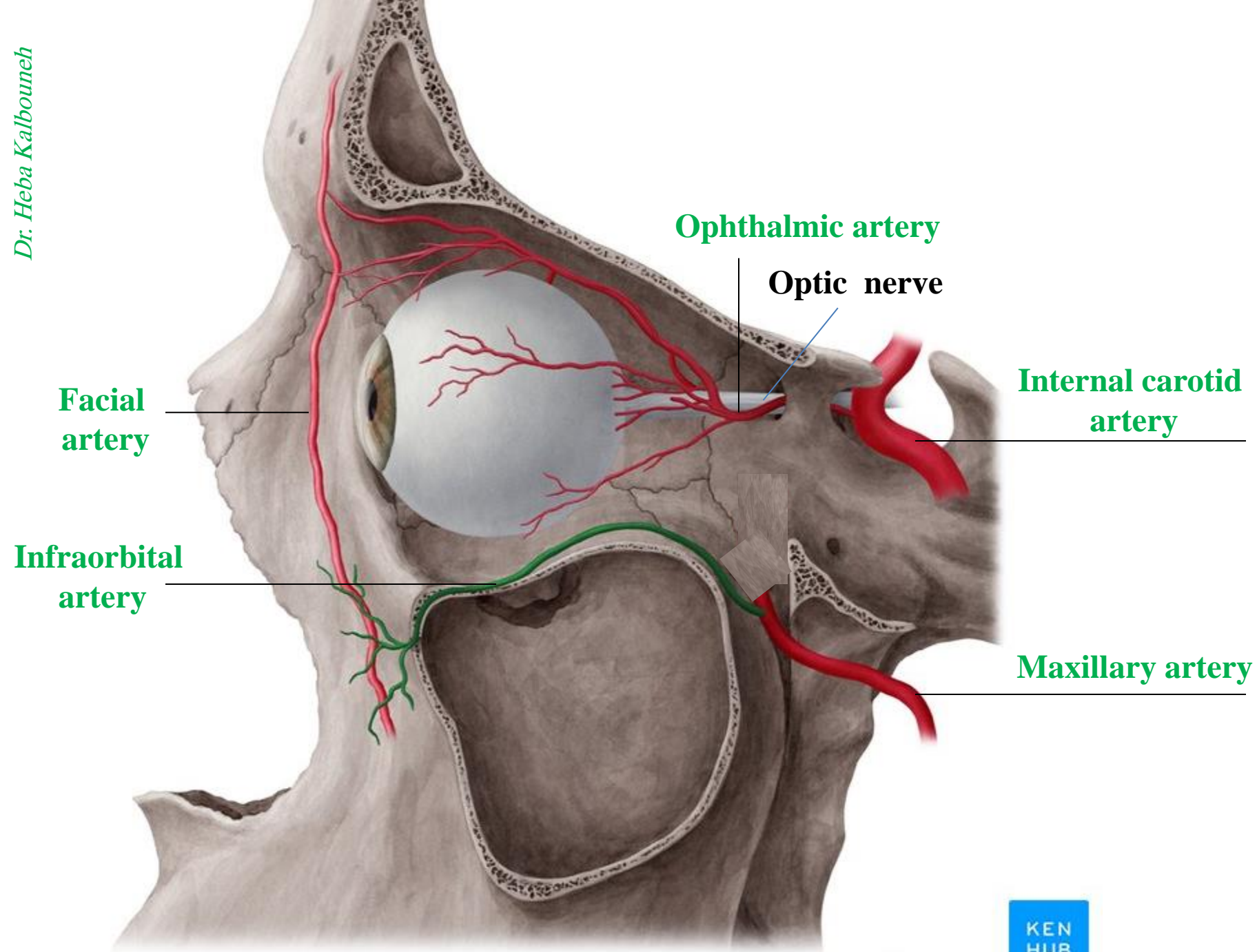
Anterior ethmoidal artery

Posterior ethmoidal artery

Ophthalmic artery







Ophthalmic artery

Optic nerve

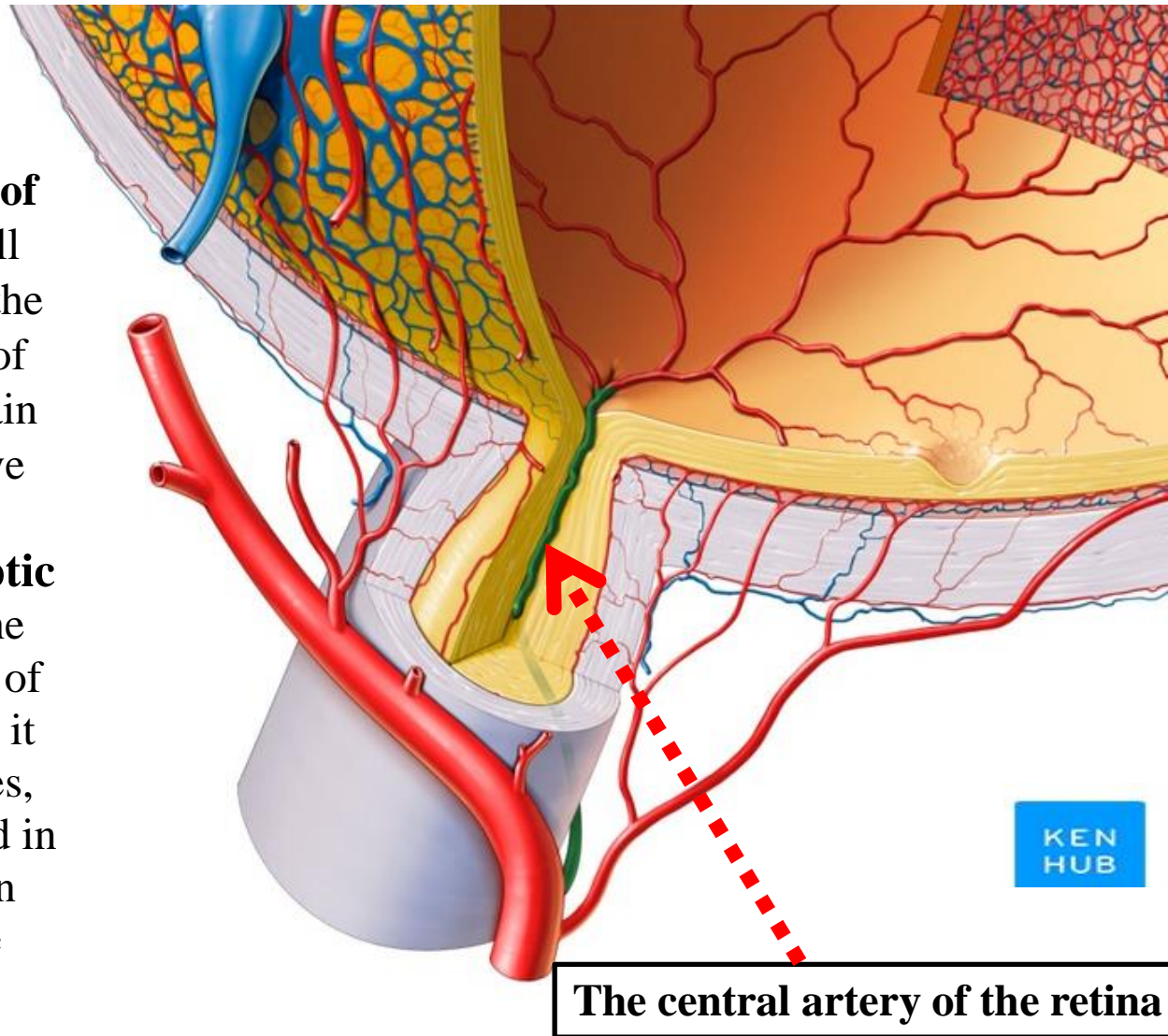
Internal carotid artery

Facial artery

Infraorbital artery

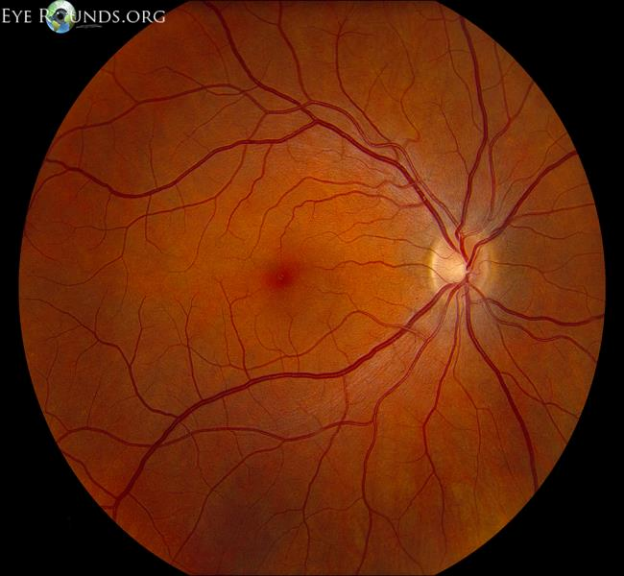
Maxillary artery

**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**

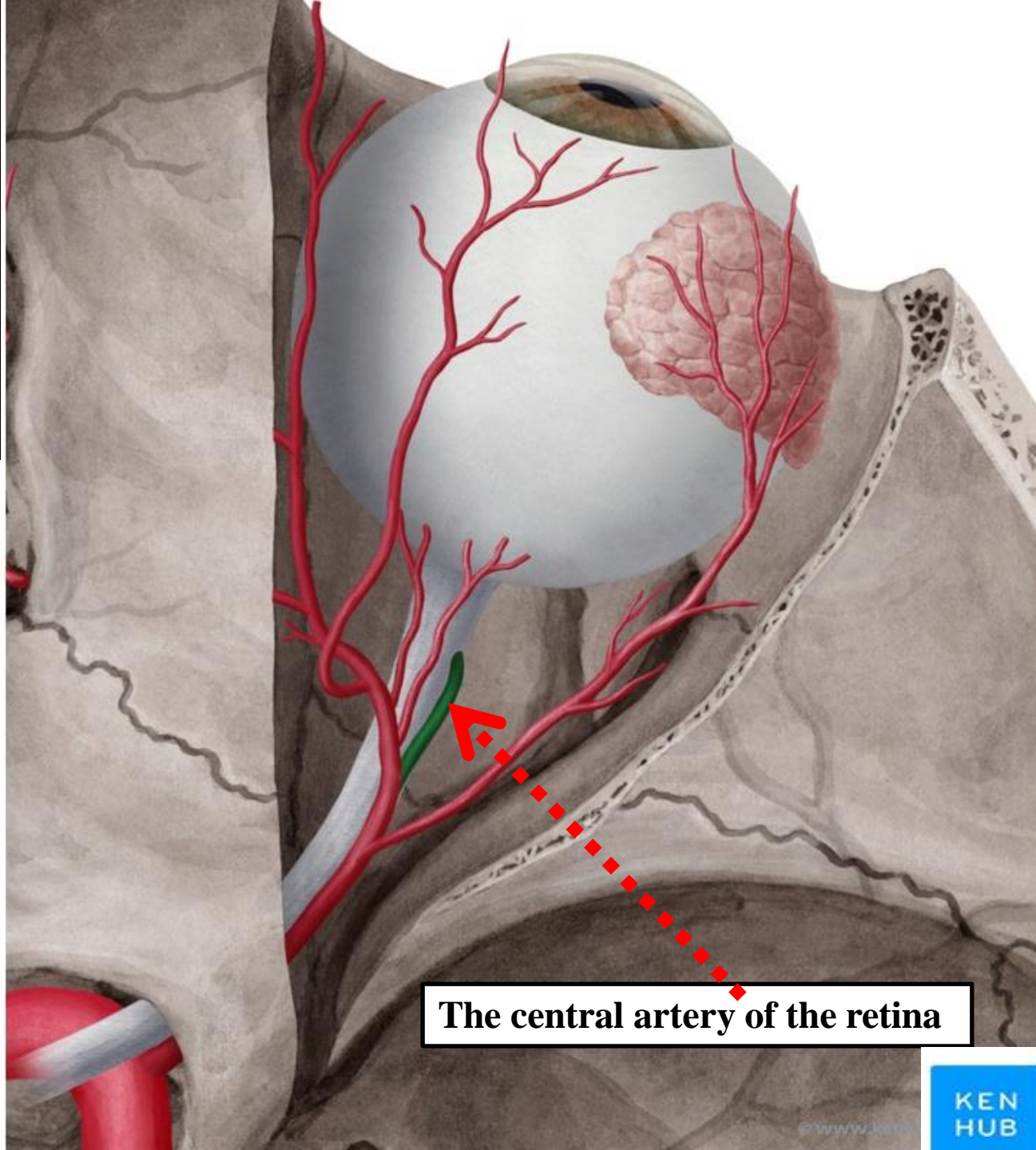


**The central artery of the retina**

Occlusion of central artery  
of retina results in  
blindness



**Ophthalmoscopic  
(Fundoscopic) exam**



**The central artery of the retina**

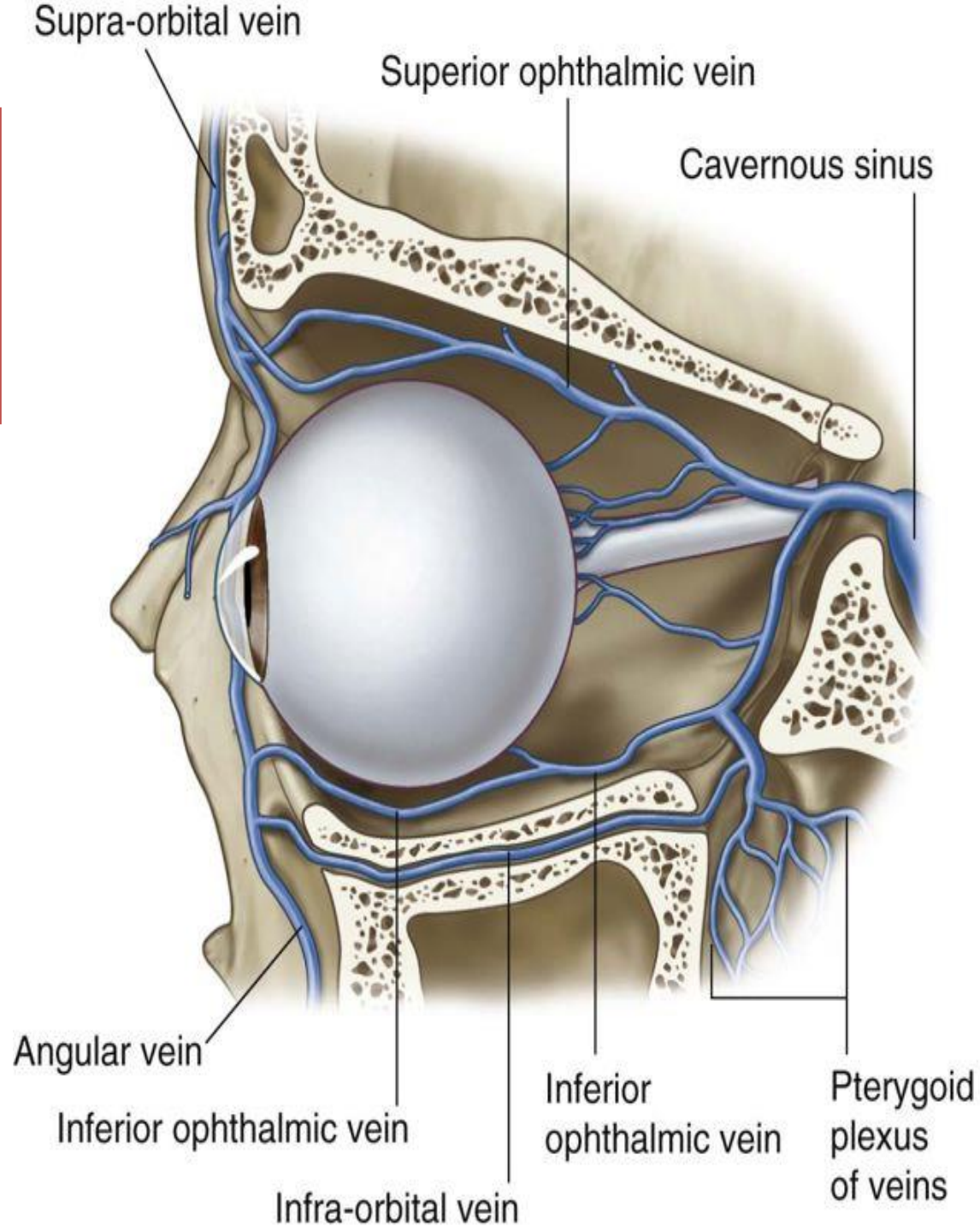
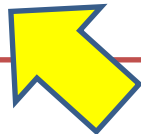
# Ophthalmic Veins

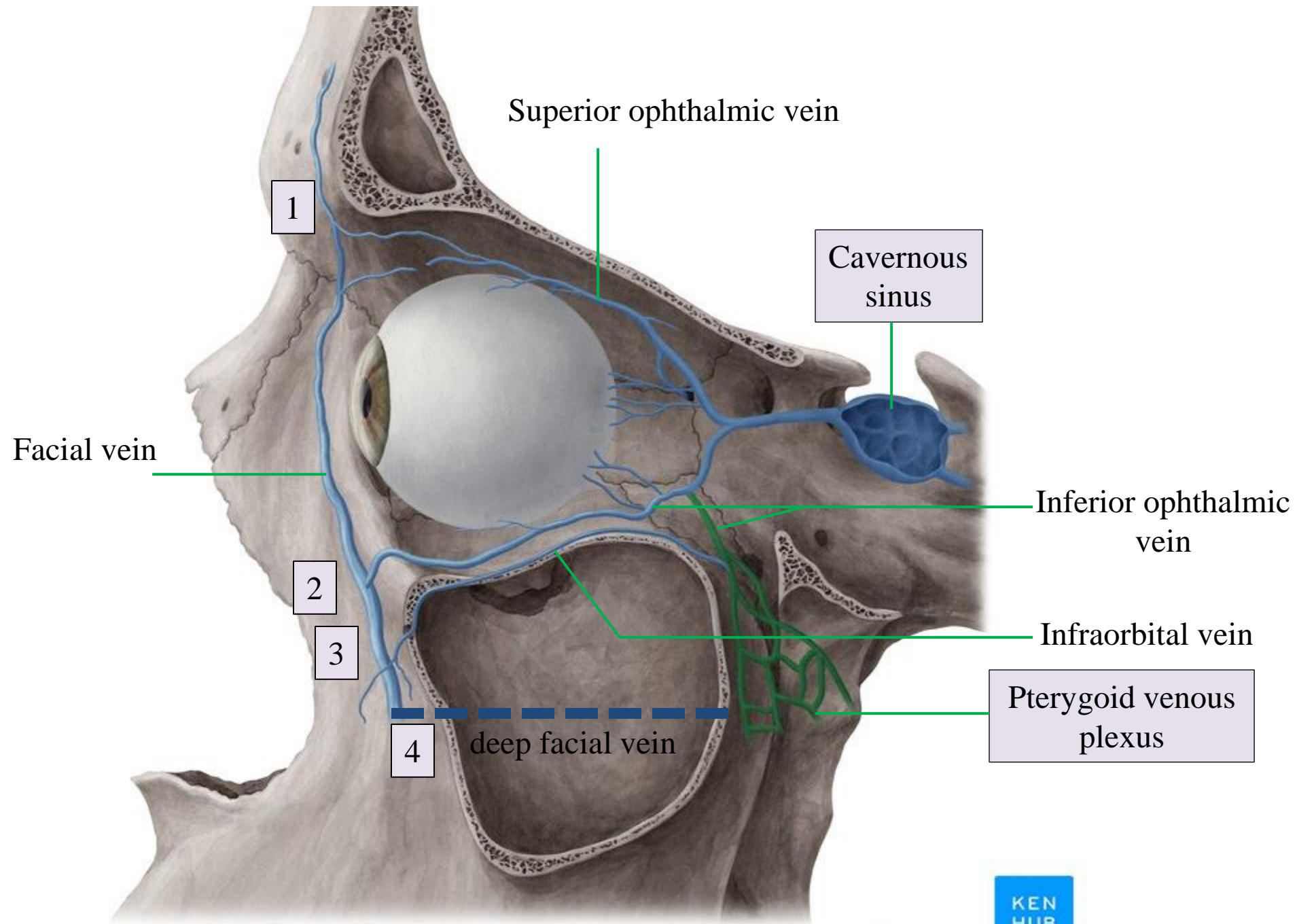
## Superior ophthalmic vein

- ✓ 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 vein
- OR
  - 2-Passing through the superior orbital fissure on its own to join the cavernous sinus
- OR
  - 3- Passing through the inferior orbital fissure to join with pterygoid venous plexus.





# Danger area of the face

Remember that pterygoid venous plexus drains also nasal sinuses, teeth, ears, nose and deep structures

Infection spreading from the nose, sinuses, ears, or teeth

May cause



Septic cavernous sinus thrombosis (the formation of a blood clot within the cavernous sinus)

*Staphylococcus aureus* and *Streptococcus* are often the associated bacteria.

