

وَقُلْ رَبِّ زِدْنِي عِلْمًا



PERIPHERAL NERVOUS SYSTEM

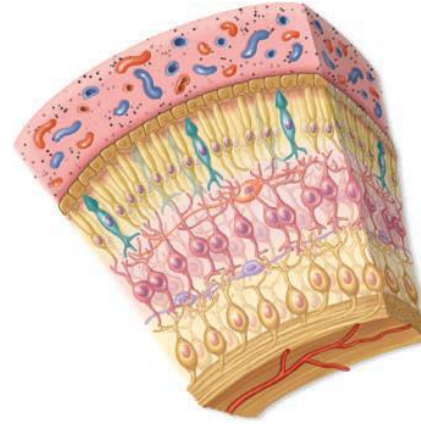
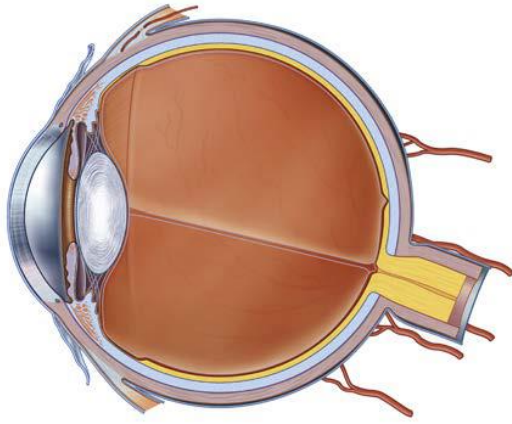


SUBJECT : Anatomy

LEC NO. : 2

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The Orbit and the Eye

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لأول مرة بتكون محاضرة دكتور مصطفى سهلة وما
بطلع فيها عن السلايدات
الدكتور قرأ كل حرف (تركلكم السلايدات نظيفة تحددو
فيها على كيفكم) واي شي زيادة كتبتة وشامل ان شاء

The Orbits

- The orbits are two bony cavities located in the upper part of the face.
- Each orbit contains:
 - An eyeball
 - Muscles
 - Nerves
 - Vessels
 - Most of the lacrimal apparatus
 - Fat
- Two thin, movable folds, the eyelids, guard the orbital opening.

The bones of the orbit

- Seven bones form the pyramidal shaped orbit: frontal, sphenoid, zygomatic, maxillary, lacrimal, ethmoid, and palatine.
- The pyramid has:
 - **Apex** directed posteriorly and formed by the **optic foramen**.
 - **Base** directed anteriorly and is bounded by the orbital margin formed by the **frontal, maxillary, and zygomatic bones**.
 - **Walls**, which are roof, floor, medial, and lateral.
- The medial walls of the two orbits are parallel to each other. The lateral walls are perpendicular to each other.

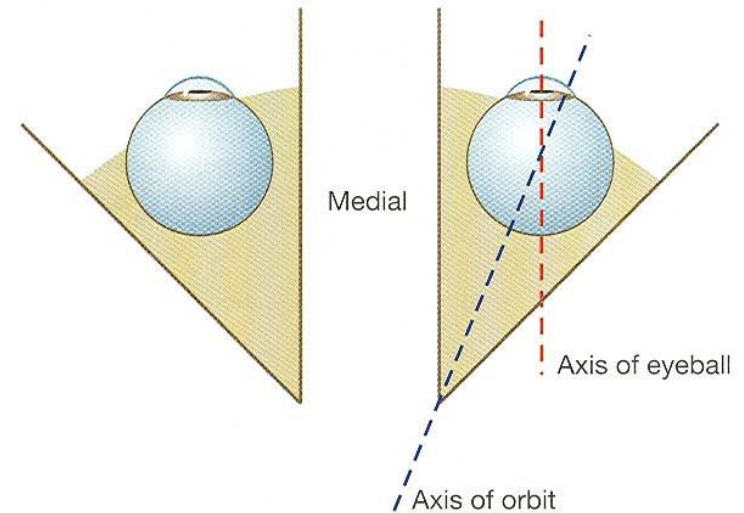


Fig.1: Diagram showing the orbits. Note the parallel medial walls.

متعامدين

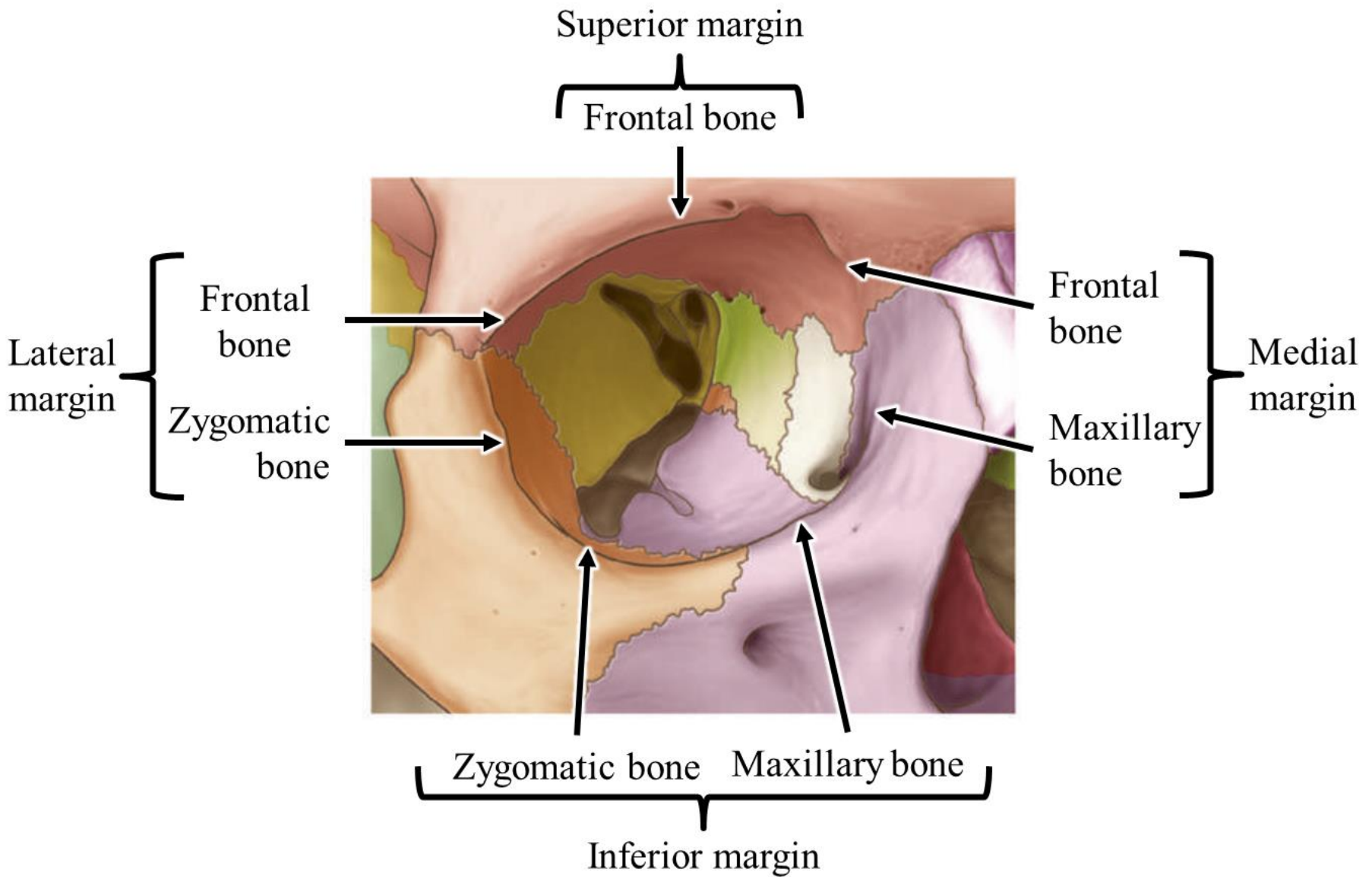
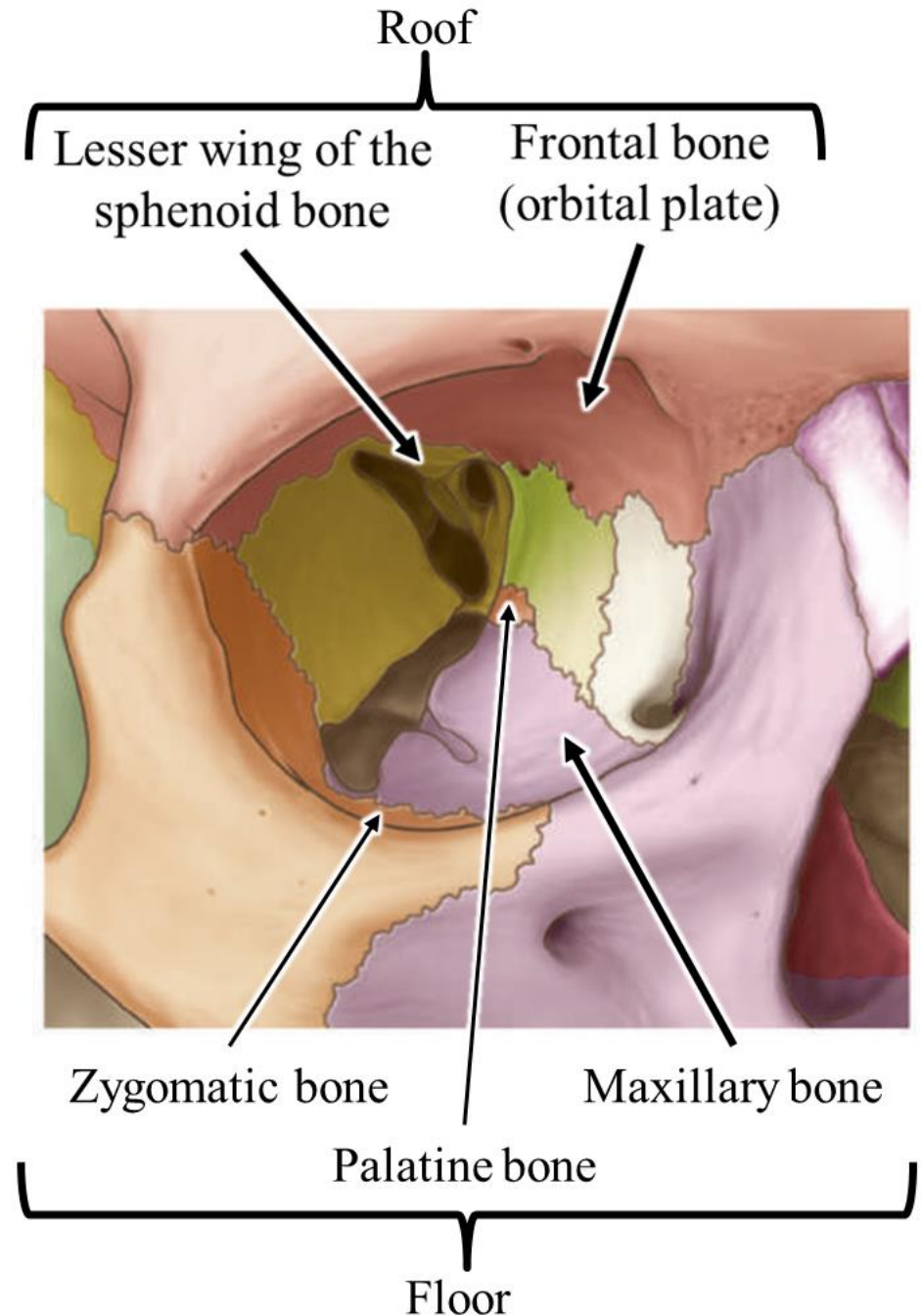


Fig.2: The margins of the orbit.

Walls of the orbit

- The roof of the orbit separates it from the anterior cranial fossa and the frontal lobe.
- The maxillary bone in the floor of the orbit separates it from the maxillary air sinus.

Fig.3: The bones that form the roof and floor of the orbit.



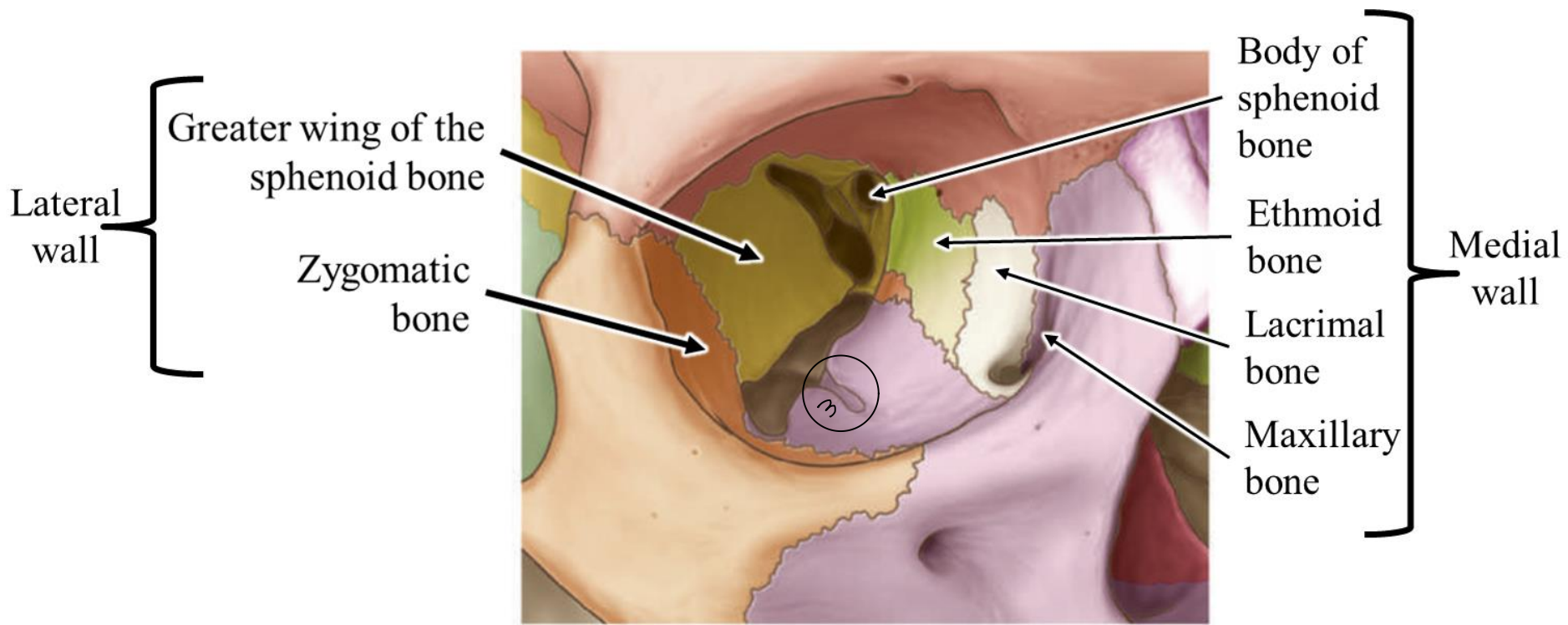


Fig.4: The bones that form the medial and lateral walls of the orbit.

مهم

Thickest wall

- The medial wall is the weakest wall. The ethmoid bone in the medial wall separates the orbit from the ethmoidal air sinuses.
- The lateral wall is the strongest wall of the orbit. It protects the contents of the orbit from a lateral trauma.

Openings of the orbital cavity

تبع على الصورة تحت

1. Anteriorly

- **Orbital opening:** The base of the orbit through which the eyeball protrudes.

2. Superiorly

- **Supraorbital notch (foramen):** Situated on the superior orbital margin. It transmits the *supraorbital nerve and vessels*.

3. Inferiorly

- **Infraorbital groove and canal:** Situated on the floor of the orbit in the orbital plate of the maxilla. They transmit the *infraorbital nerve and vessels*. The canal opens on the face at the infraorbital foramen.

4. Posteriorly

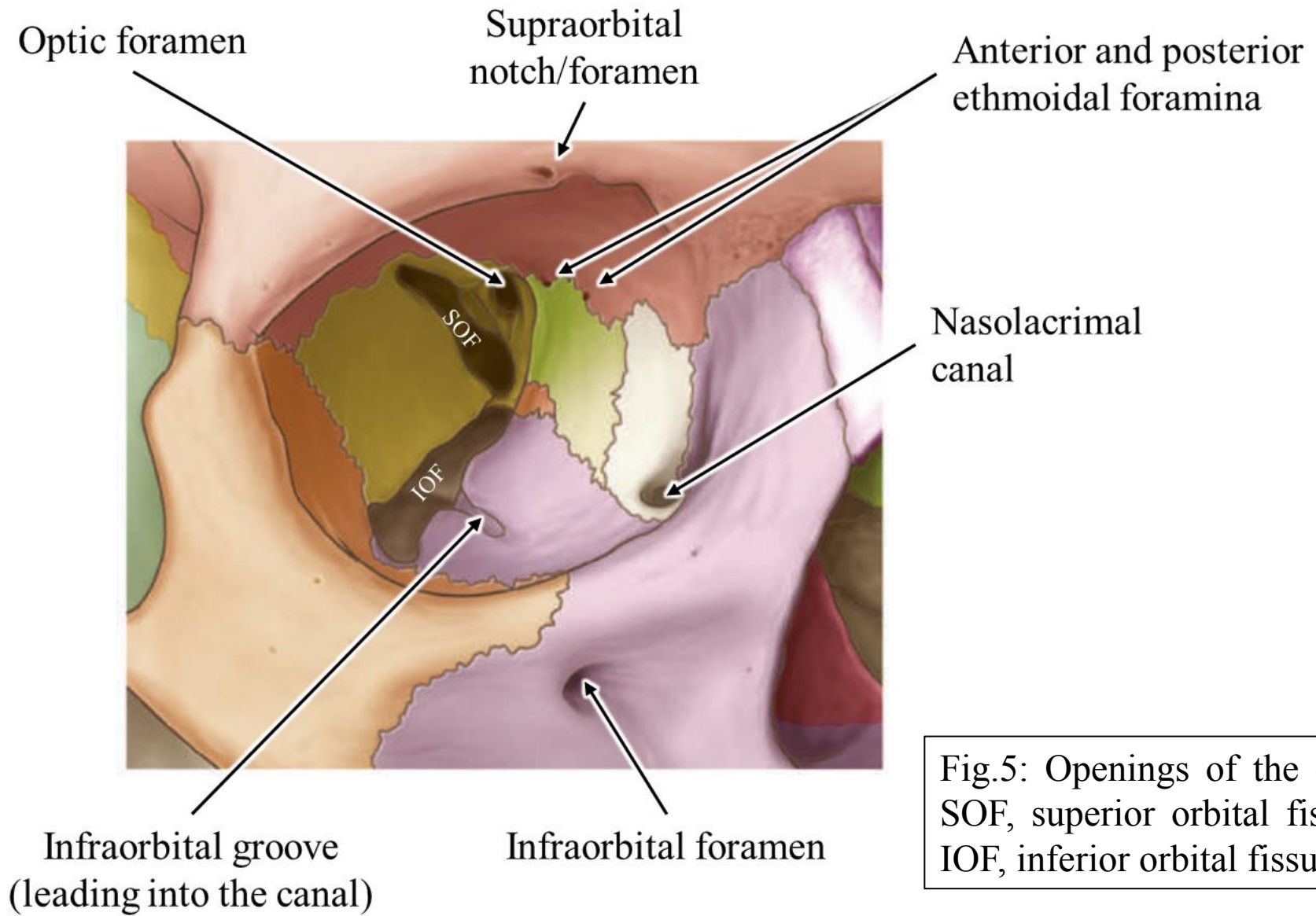
- **Optic canal:** Located in the sphenoid bone. Its opening, the optic foramen, forms the apex of the orbit. It communicates with the middle cranial fossa and transmits the *optic nerve (II)* and the *ophthalmic artery*.
- **Superior orbital fissure (SOF):** Located between the greater and lesser wings of the sphenoid, thus separating the roof from the lateral wall. It communicates with the middle cranial fossa. It transmits the *oculomotor (III), trochlear (IV), abducent (VI), lacrimal, frontal, and nasociliary nerves*, and the *superior (and inferior) ophthalmic vein*.
- **Inferior orbital fissure (IOF):** Located between the maxilla and the greater wing of the sphenoid, thus separating the floor from the lateral wall. It communicates with the infratemporal and pterygopalatine fossae. It transmits the *maxillary nerve and its infraorbital and zygomatic branches*, and *sympathetic nerves*.

5. Medially

- **Nasolacrimal canal:** Located anteriorly on the medial wall, in the lacrimal bone. It transmits the *nasolacrimal duct* and communicates with the inferior meatus of the nose.
- **Anterior and posterior ethmoidal foramina:** Two small openings on the medial wall in the ethmoid bone. They transmit the *anterior and posterior ethmoidal nerves*, respectively.

6. Laterally

- **Zygomaticotemporal and zygomaticofacial foramina:** Two small openings on the lateral wall in the zygomatic bone. They convey the *zygomaticotemporal and zygomaticofacial nerves*, respectively.



Orbital wall fracture

“ A 21-year-old man presented to the emergency room with a history of having slipped at home the previous night and sustaining an injury to the right side of the face. Some two hours after the injury, he blew his nose and ‘his right eye started to swell up’, greatly alarming him. “

- Fracture of the walls of the orbit can occur after trauma.
- Fracture of medial wall is most common because it’s the weakest. Air may pass from the ethmoidal air sinuses into the orbit, especially when there’s high pressure in the upper airways, as in blowing the nose (the case above).
- In medial wall and floor fractures, entrapment of orbital content into the fractured area can occur leading to various symptoms.

ممکن العظمة المكسورة تمسك بالعضلة وتمنعها

The Eyelids

- The eyelids are two anteriorly located shutters that protect the eye and help spread the tears.
- The upper eyelid is larger and more mobile. When opened, the space between the lids is called the *palpebral fissure*. They meet each other at the *medial and lateral angles (canthi)*.

مهم

When the eye is closed, the upper eyelid completely covers the cornea. When the eye is open and looking straight ahead, the upper lid just covers the upper margin of the cornea and the lower lid lies just below the cornea.

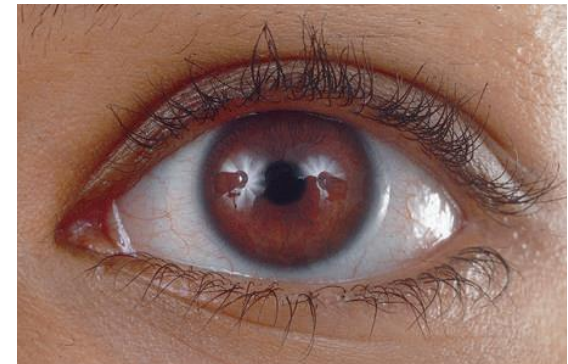


Fig.6: Normal position of the eyelids when the eye is open.

- The medial angle is separated from the eyeball by a small space. This is called the *lacrimal lake* because it may contain a small quantity of tears.
- Within the lacrimal lake, is a reddish elevation called the *lacrimal (eye) caruncle*. This is formed of skin with glands and other types of tissues. Passing lateral to the caruncle is a membrane with a crescent-shaped edge. This membrane is called the *plica semilunaris* and it may help in bringing the tears into the lake.

وظيفته غير معروفة

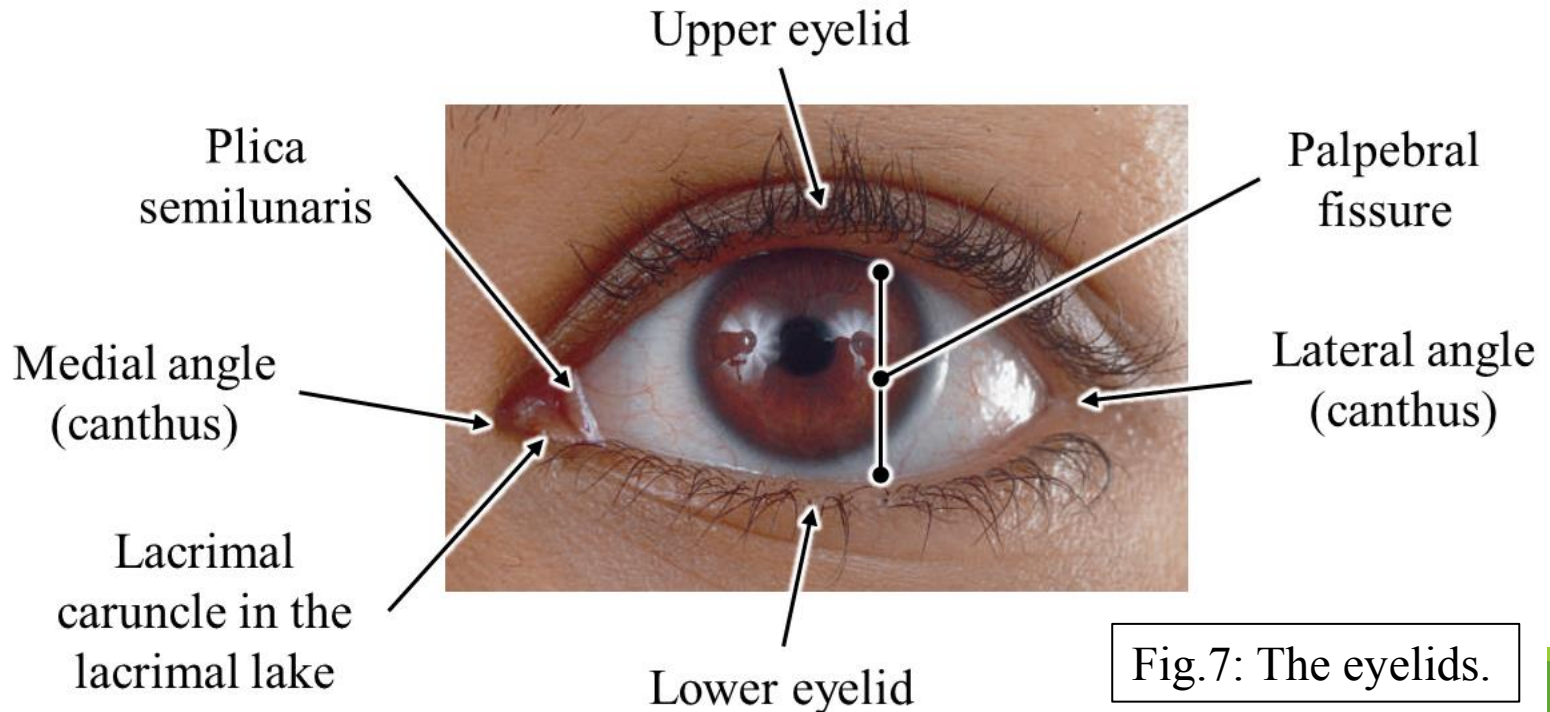


Fig.7: The eyelids.

Structure of the eyelids

- The eyelids are formed of 5 layer. From anterior to posterior these are: (1)Skin, (2)Subcutaneous tissue, (3)Skeletal muscles, (4)Orbital septum and tarsal plate, and (5)conjunctiva.

(1) Skin and (2) subcutaneous tissue:

- The skin of the eyelids is thin with a thin epidermis and dermis. At the edge of the lids, several short, curved hairs emerge. These *eyelashes* are arranged in two or three rows. Sebaceous (ciliary) glands open into the follicles of the eyelashes and modified sweat glands open on the surface between adjacent eyelashes.
- The subcutaneous layer is very thin in the eyelids.

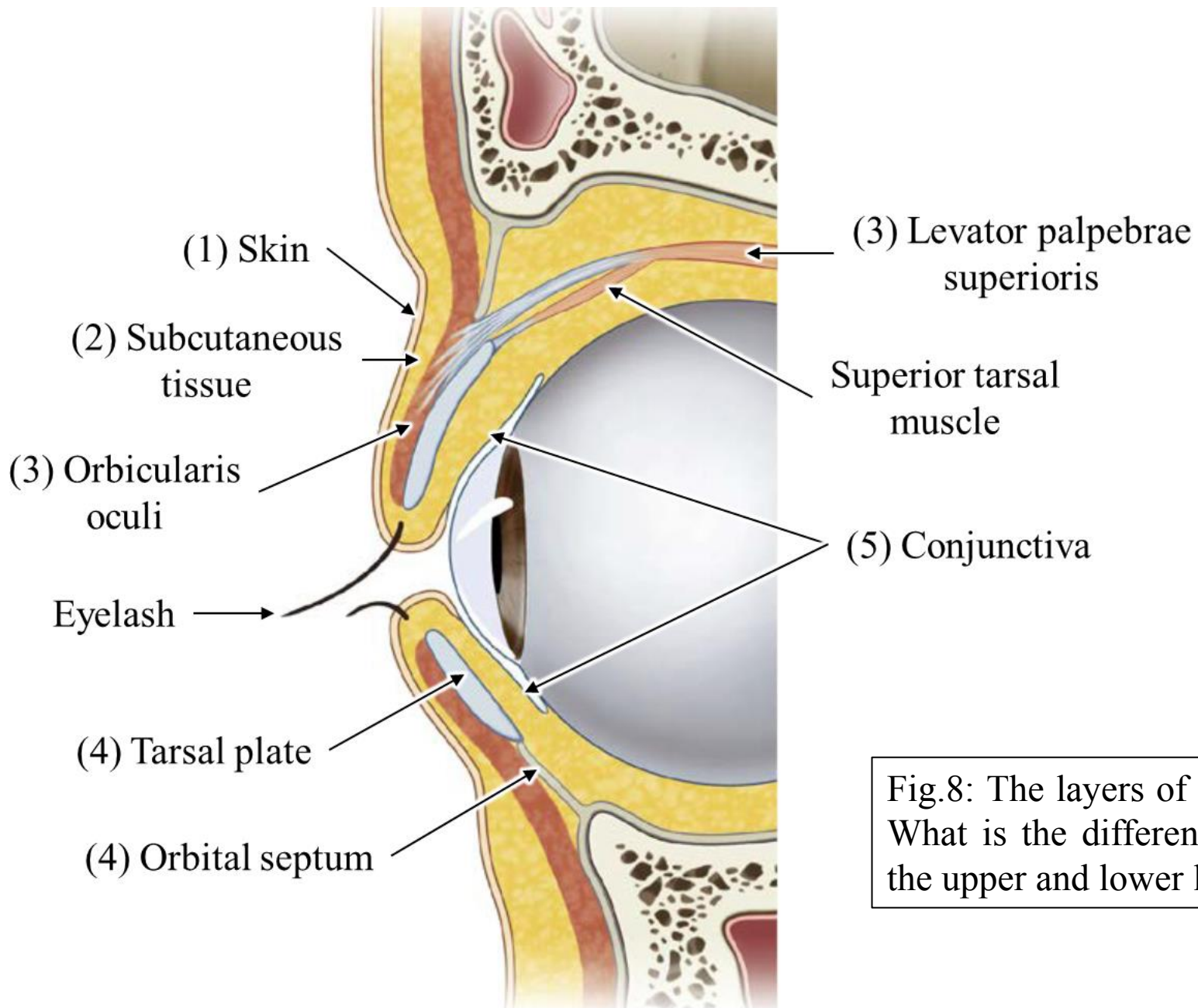


Fig.8: The layers of the eyelids. What is the difference between the upper and lower lids?

(3) The muscle layer:

a) The orbicularis oculi muscle

- This is one of the muscle of the face. It's formed of three parts: ***orbital*** part that surrounds the orbit, ***palpebral*** part that's found in the lids, and ***lacrimal*** part.
- The fibers of the palpebral part in the two lids are attached to the medial and lateral palpebral ligaments.

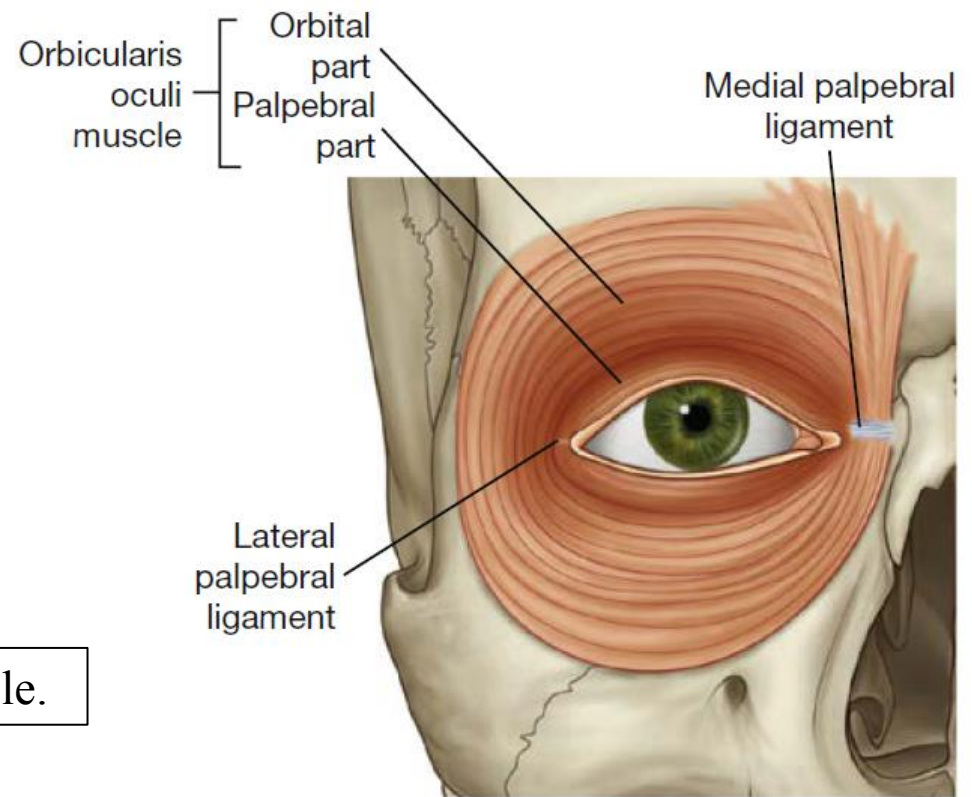


Fig.9: The orbicularis oculi muscle.

b) The levator palpebrae superioris muscle (LPS) ال upper

- Arises from the posterior part of roof of orbit. It forms an aponeurosis that pierces the orbital septum to become attached to the anterior surface of the superior tarsal plate and skin.
- A bundle of smooth muscle cells arises from the undersurface of the levator to insert into the upper edge of the superior tarsal plate. This bundle is called the *superior tarsal muscle*.

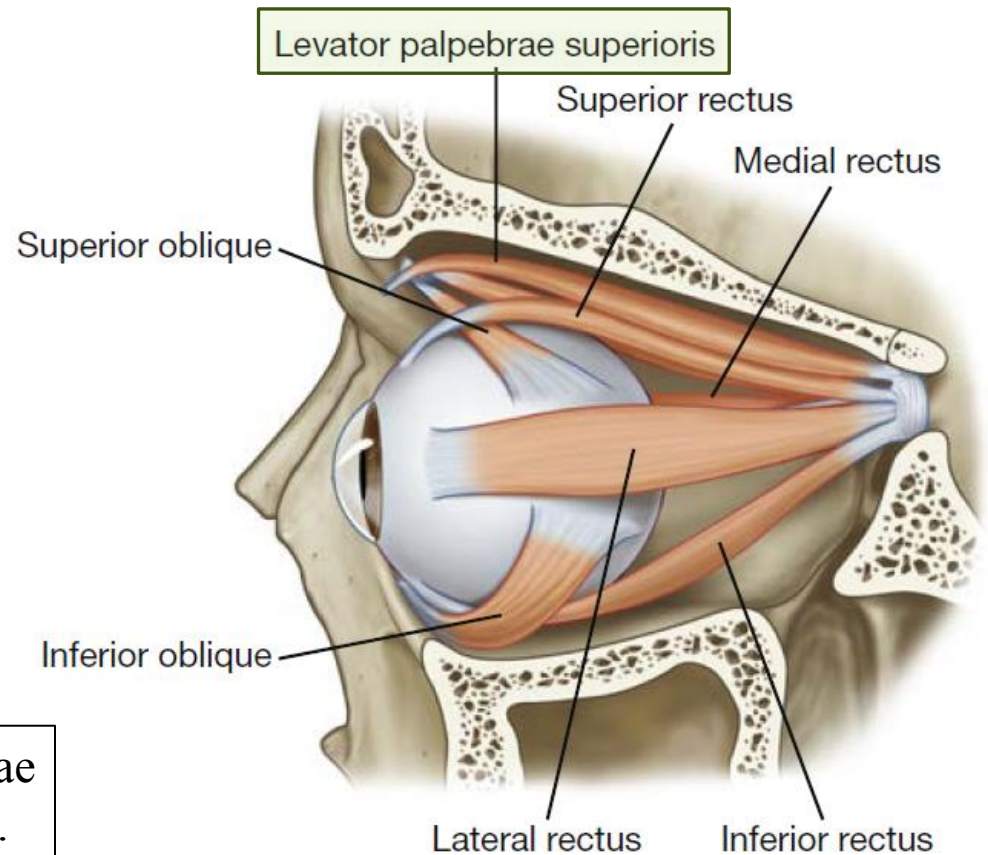


Fig.10: The levator palpebrae superioris muscle. Note its origin.

Tendon of levator palpebrae superioris muscle

Orbital septum

Anterior lacrimal crest

Superior tarsus

Lateral palpebral ligament

Inferior tarsus

Orbital septum

Medial palpebral ligament

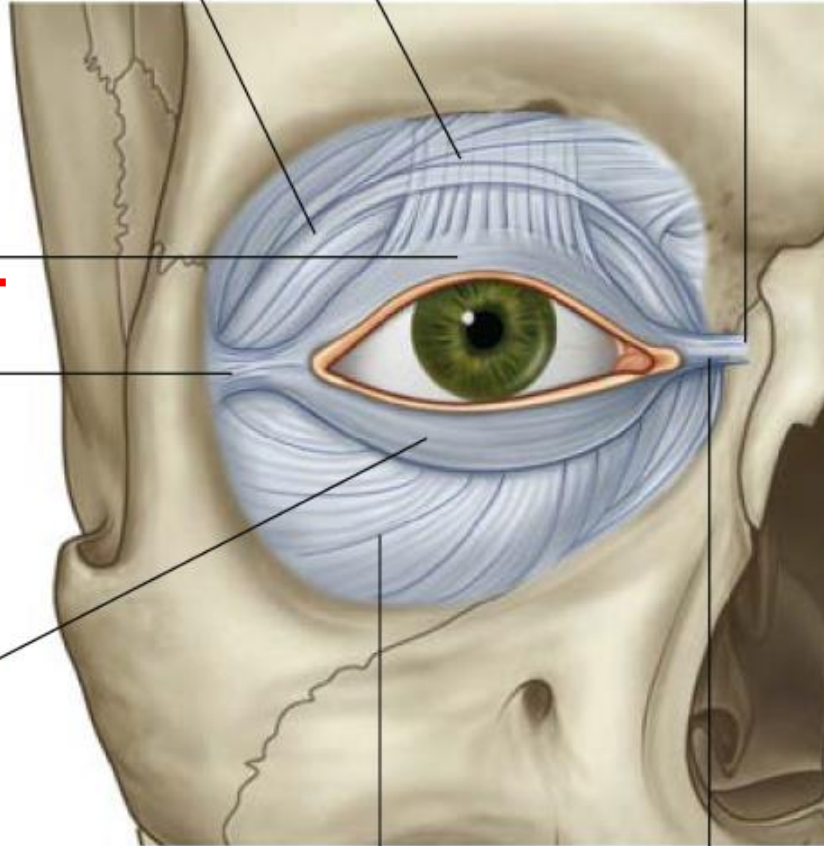


Fig.11: The levator palpebrae superioris muscle. Note its insertion.

Muscles of the Eyelids

Name	Nerve supply	Action
<i>Orbicularis oculi</i>	Facial nerve (VII)	Closes eye
<i>Levator palpebrae superioris</i>	Oculomotor nerve (III)	Raises upper eyelid
<i>Superior tarsal muscle</i>	Sympathetic fibers through the oculomotor nerve (postganglionic fibers arise from the superior cervical ganglia)	Assists in raising the upper eyelid

Horner's Syndrome

- Disruption of the sympathetic supply to the face. It is usually secondary to other pathologies, but it could be congenital.

Rare

- Main features include:

- 2 • Miosis (constriction of pupil – the dilator pupillae muscle is affected)
 - 3 • Partial ptosis (drooping of the eyelid – the superior tarsal muscle is affected)
- Anhidrosis (lack of sweating) of the face



- These symptoms occur on the same side as the lesion.
- Differential diagnosis include oculomotor nerve palsy.

1) The sympathetic supply to the face : the post ganglionic sympathetic fibers come from superior cervical ganglia

فإذا كان عندي مرض بالمنطقة مثلا tumor فممكن يسبب damage to the superior sympathetic fibers

2) لأنه عملية ال dilation of pupillae ال بغضيتها ال sympathetic ال
fibers فبس ينقطع راح يحدث constriction لأنه يلي بغذي ال
constriction هو ال parasympathetic

3) Partial because the levator palpebrae superioris وهي skeletal muscle

(4) The orbital septum and tarsal plates:

- Periosteum covers the bones of the orbit.
- At the orbital margin, an extension of this periosteum passes into the lid forming the *orbital septum*.
- Close to the edge of the lid, the septum thickens to form the *tarsal plate* (tarsus) which is the main support of the lid.
- The two tarsal plates are attached by the medial and lateral palpebral ligaments to the margin of the orbit.
- Within the tarsal plates are several vertical modified sebaceous glands called the *tarsal glands*. These open on the margin of the lids and produce an oily secretion that (1) prevents evaporation of tears and (2) makes the closed lids airtight.

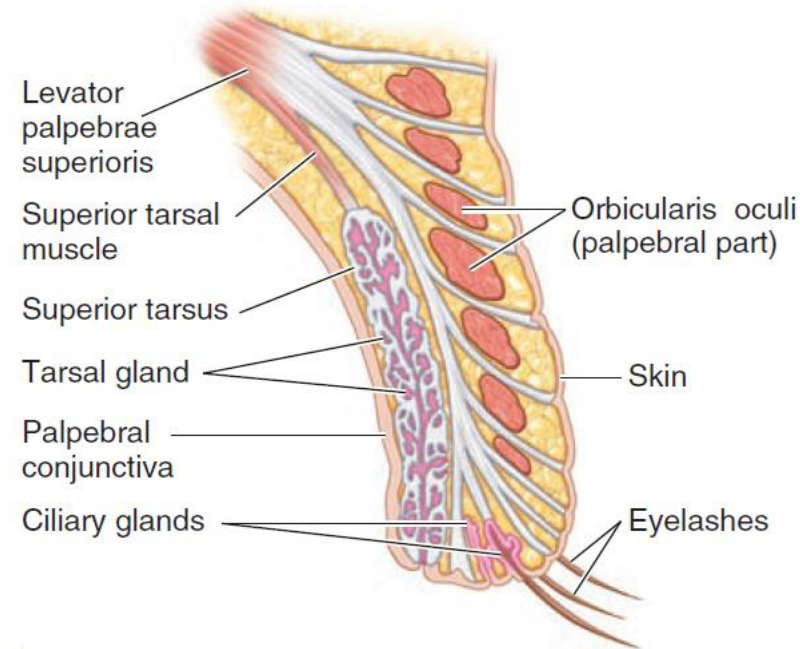


Fig.12: Section through the upper lid (how to know?). Note the tarsal plate and gland.

Dysfunction of the tarsal glands, for any reason, may lead to dryness of the eye.

(5) The conjunctive:

- A thin, transparent membrane that lines the inside of the eyelids (*palpebral conjunctiva*). It's reflected at the superior and inferior conjunctival fornices onto the anterior surface of the eyeball to cover the sclera (*bulbar conjunctiva*). The conjunctiva ends at the corneocleral junction.
- *Histology:*
 - Formed of stratified squamous to columnar epithelium with goblet cells. This epithelium is supported by a thin lamina propria of loose vascular connective tissue.
 - The conjunctiva also contains accessory lacrimal glands and lymphoid tissue.
 - The mucus secreted by goblet cells contribute to the tear film over the cornea.

The cornea is covered with three layers of; mucus layer - watery layer (tears)- lipid layer) al of these layers we call it the tear film

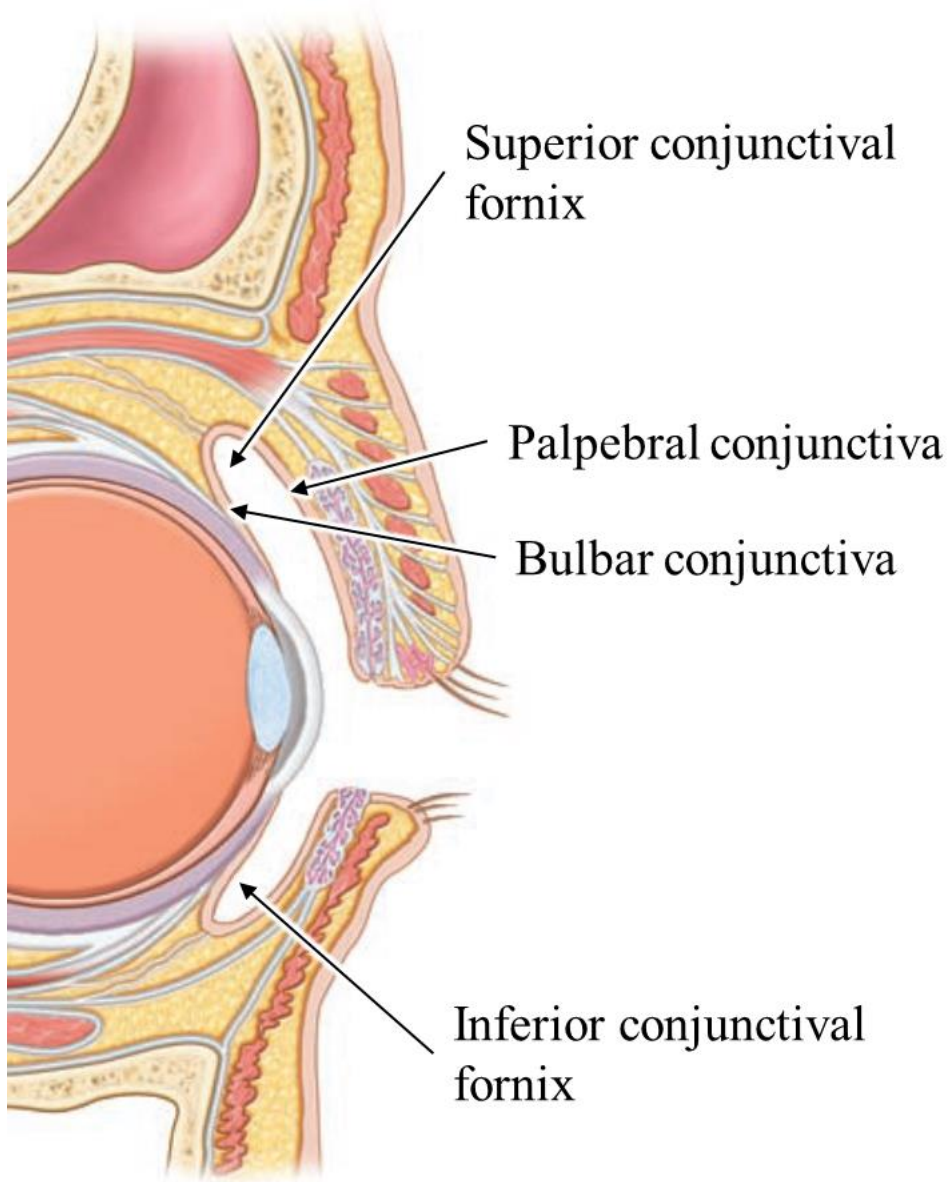
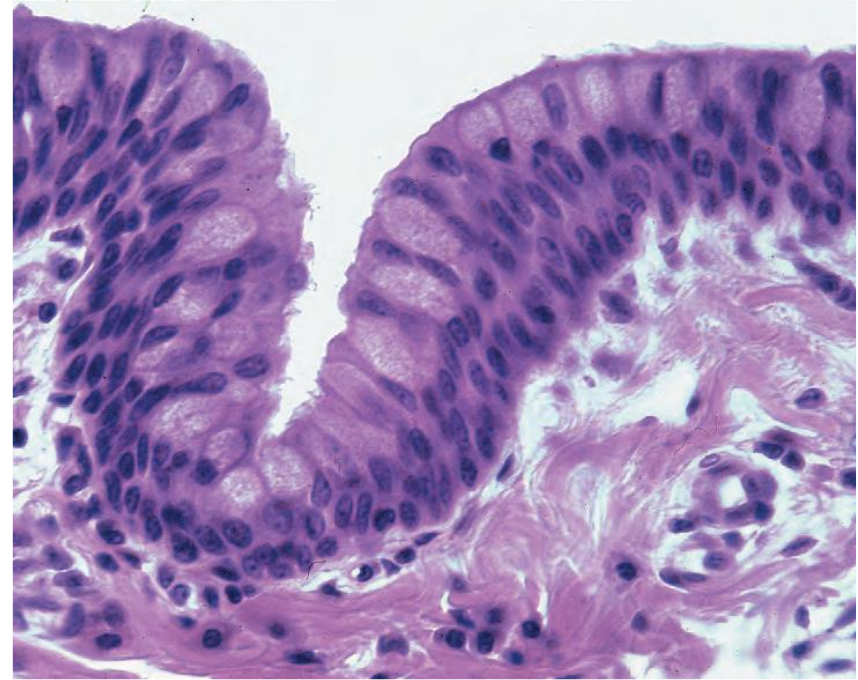


Fig.13: Left, parts of the conjunctiva. Below, histology of the conjunctiva. Note the paler goblet cells.



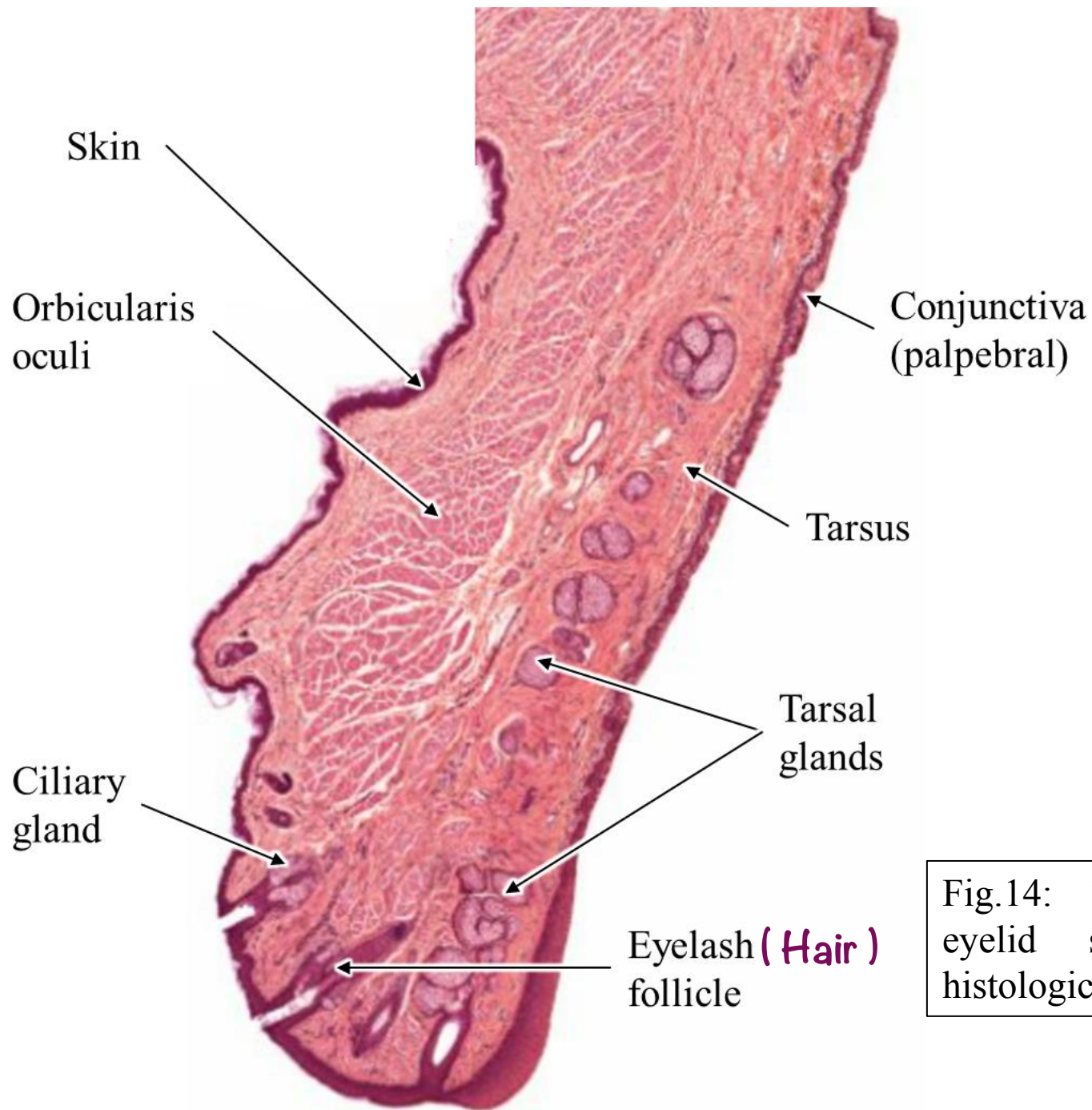


Fig.14: Section through an eyelid showing its main histological features.

Blood supply of the eyelids:

- Branches from various arteries.
- They form arches near the lid margin.
- Veins correspond to the arteries. Internally connected to ophthalmic vein

Lymphatic drainage of the eyelids:

- Parotid lymph nodes
- Some to submandibular lymph nodes

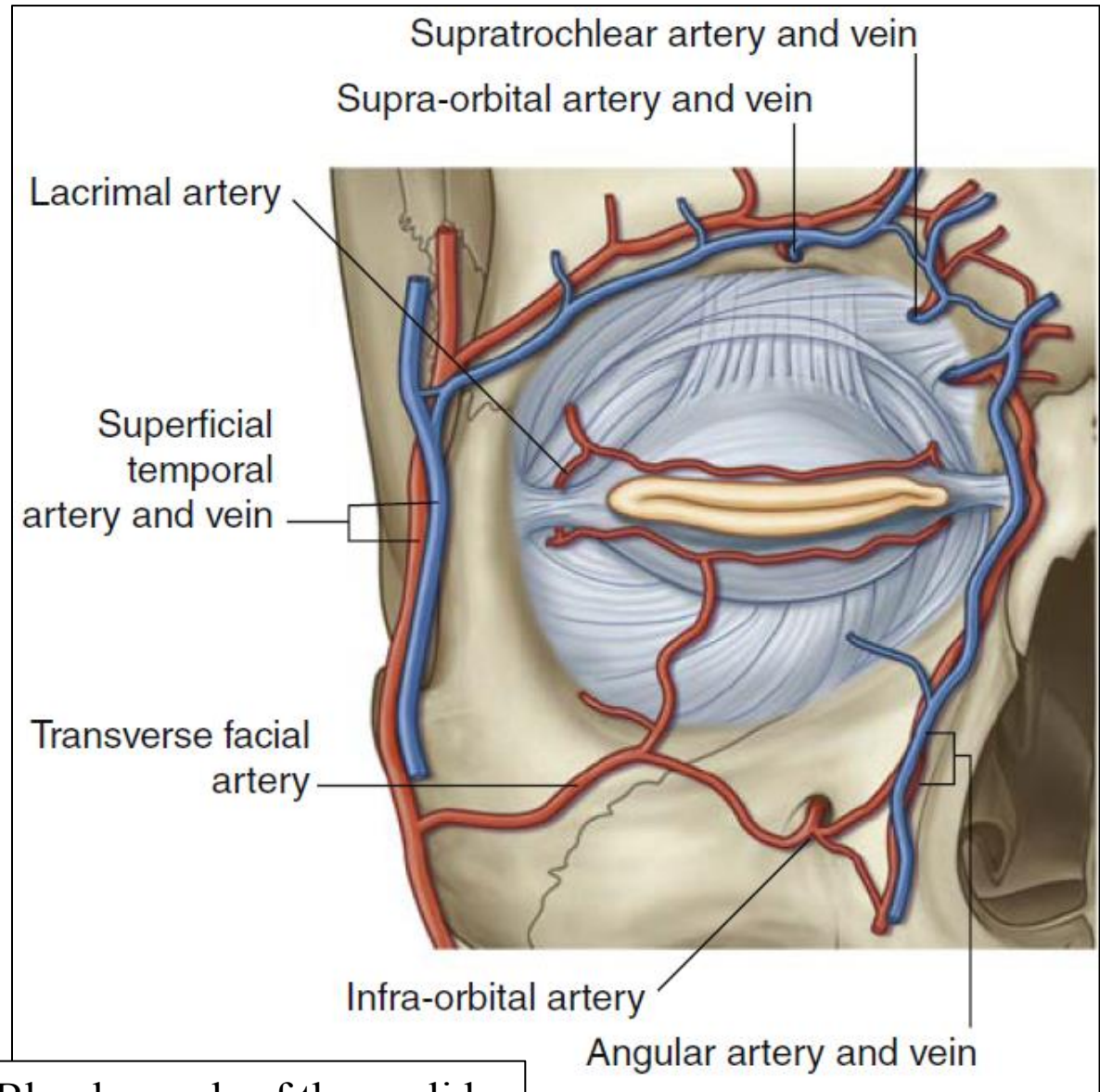


Fig.15: Blood vessels of the eyelids.

Nerve supply of the eyelids:

- Upper eyelid is supplied by branches of the ophthalmic nerve.
- Lower eyelid by infraorbital branch of maxillary nerve.

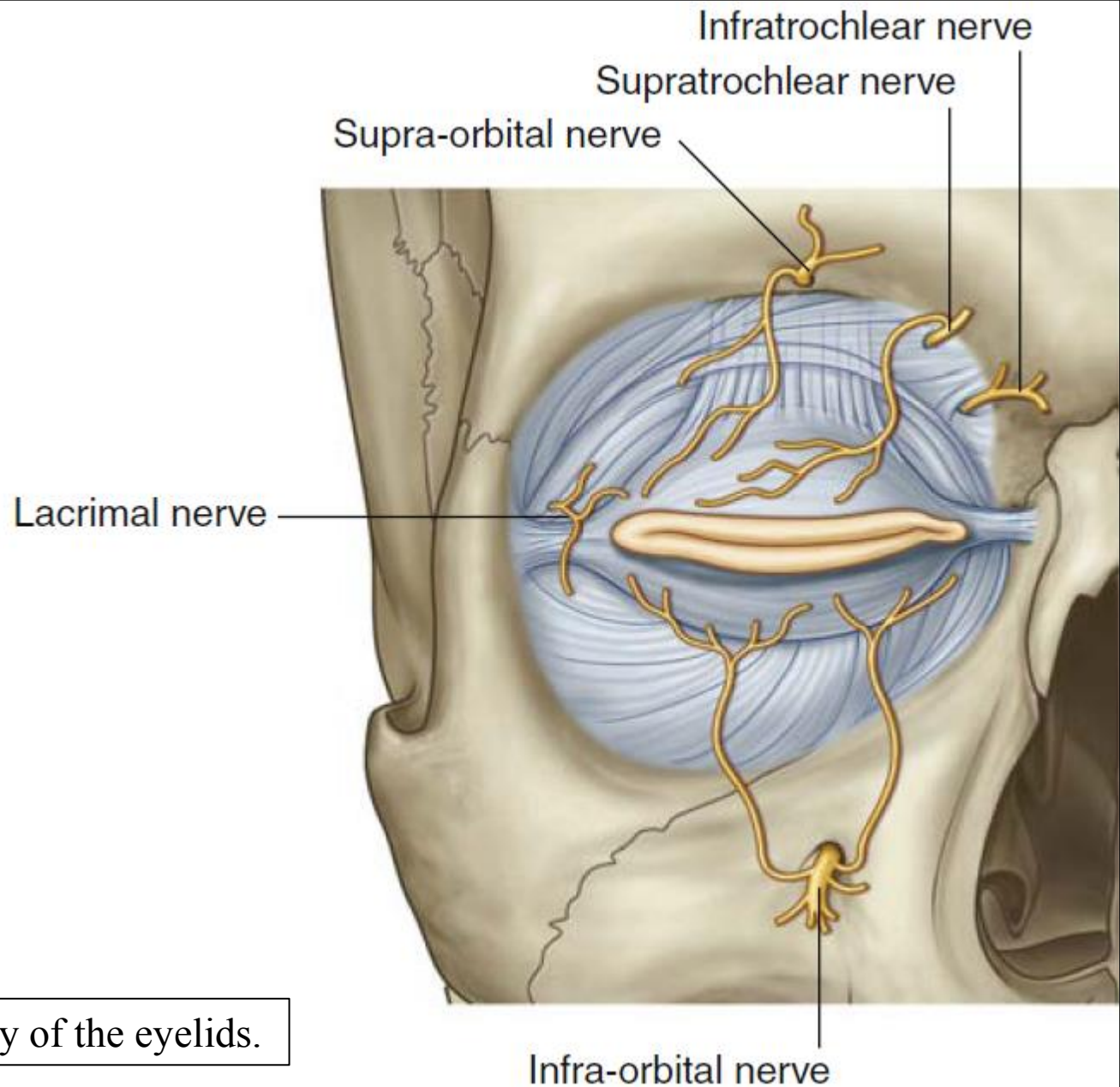


Fig.16: Nerve supply of the eyelids.

The Lacrimal Apparatus

- The lacrimal apparatus consists of structures that secrete and collect tears:
 - Lacrimal gland and its ducts
 - Lacrimal canaliculi
 - Lacrimal sac
 - Nasolacrimal duct

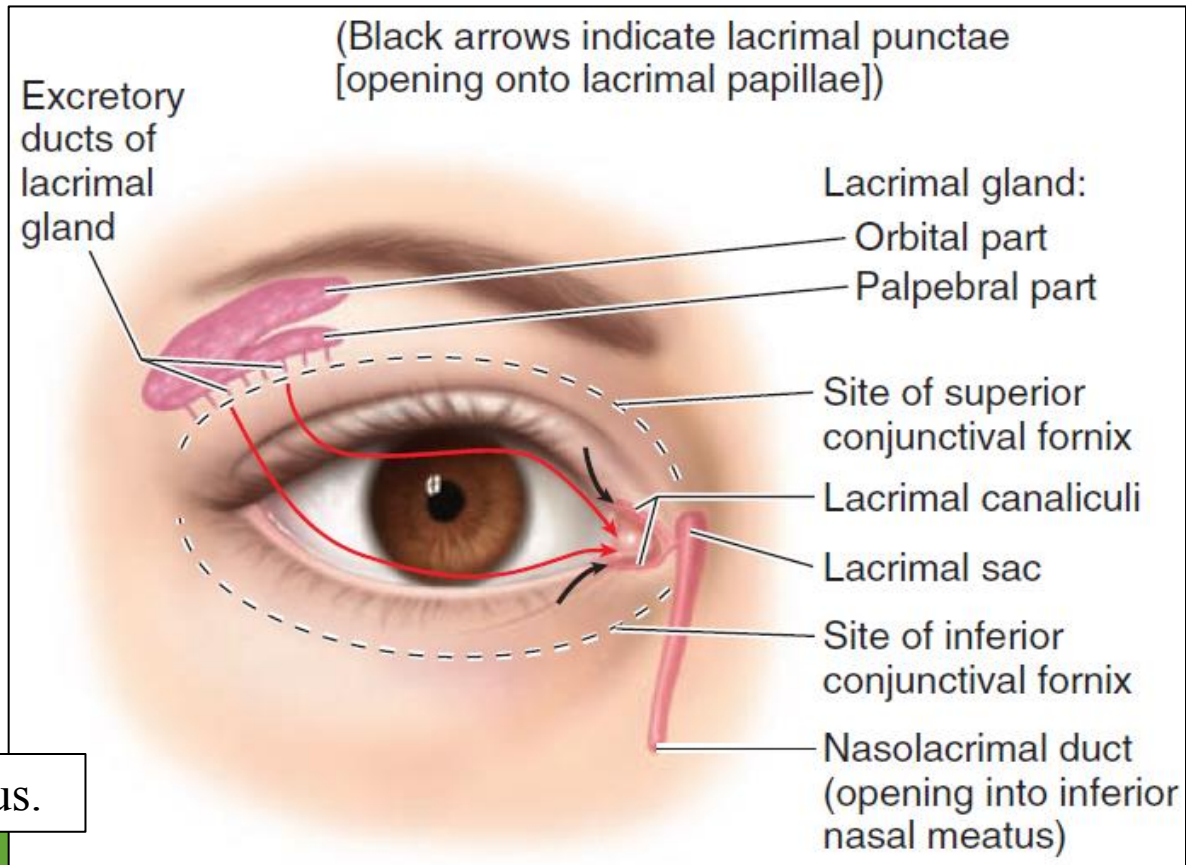


Fig.17: The lacrimal apparatus.

(1) The lacrimal gland and ducts:

Watery secretions

- The lacrimal gland is a serous gland with myoepithelial cells.
- The levator palpebrae superioris divides the gland to two parts:
 - **Orbital part** located in a fossa in the anterolateral part of the roof of the orbit
 - **Palpebral part** located inferior to the levator.
- About 12 ducts carry the secretion from the gland. They open into the superior fornix of the conjunctiva.
- Small accessory lacrimal glands are found in the conjunctiva.

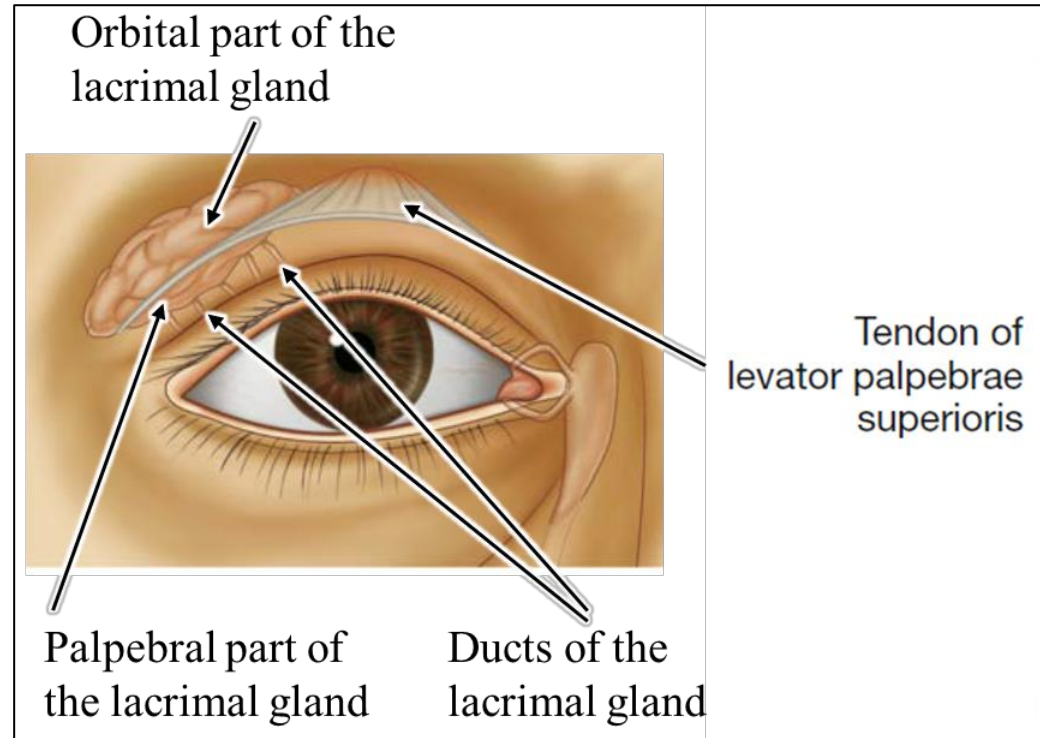


Fig.18: The lacrimal gland and duct. Note relation to levator palpebrae superioris tendon.

Blood supply of the lacrimal gland:

- The lacrimal artery supply the gland.
- Venous blood is drained into the ophthalmic veins.

Nerve supply of the lacrimal gland:

- The gland receives sensory, parasympathetic secretomotor, and sympathetic nerve fibers.
 - Sensations* from the gland are carried through the lacrimal branch of the ophthalmic nerve (V_1).
 - Postganglionic *sympathetic* fibers arise from the superior cervical ganglion, travel along the internal carotid plexus, the deep petrosal nerve, and the nerve of the pterygoid canal. These fibers, then pass through the pterygopalatine ganglion, ^{for} without synapsing, to enter the maxillary nerve (V_2), the zygomatic nerve, the zygomaticotemporal nerve, and finally the lacrimal nerve through a communicating branch.

Nerve supply of the lacrimal gland:

c. *Parasympathetic* secretomotor

- The preganglionic parasympathetic fibers arise from *lacrimal nucleus* of the *facial nerve* (VII).
- Pass through the nervus intermedius, the greater petrosal nerve, and the nerve of the pterygoid canal.
- The nerve of the pterygoid canal eventually joins the pterygopalatine ganglion where the preganglionic parasympathetic neurons synapse with postganglionic parasympathetic neurons.
- The postganglionic neurons join the maxillary nerve, the zygomatic branch of the maxillary, the zygomaticotemporal nerve, and finally the lacrimal nerve through a communicating branch.

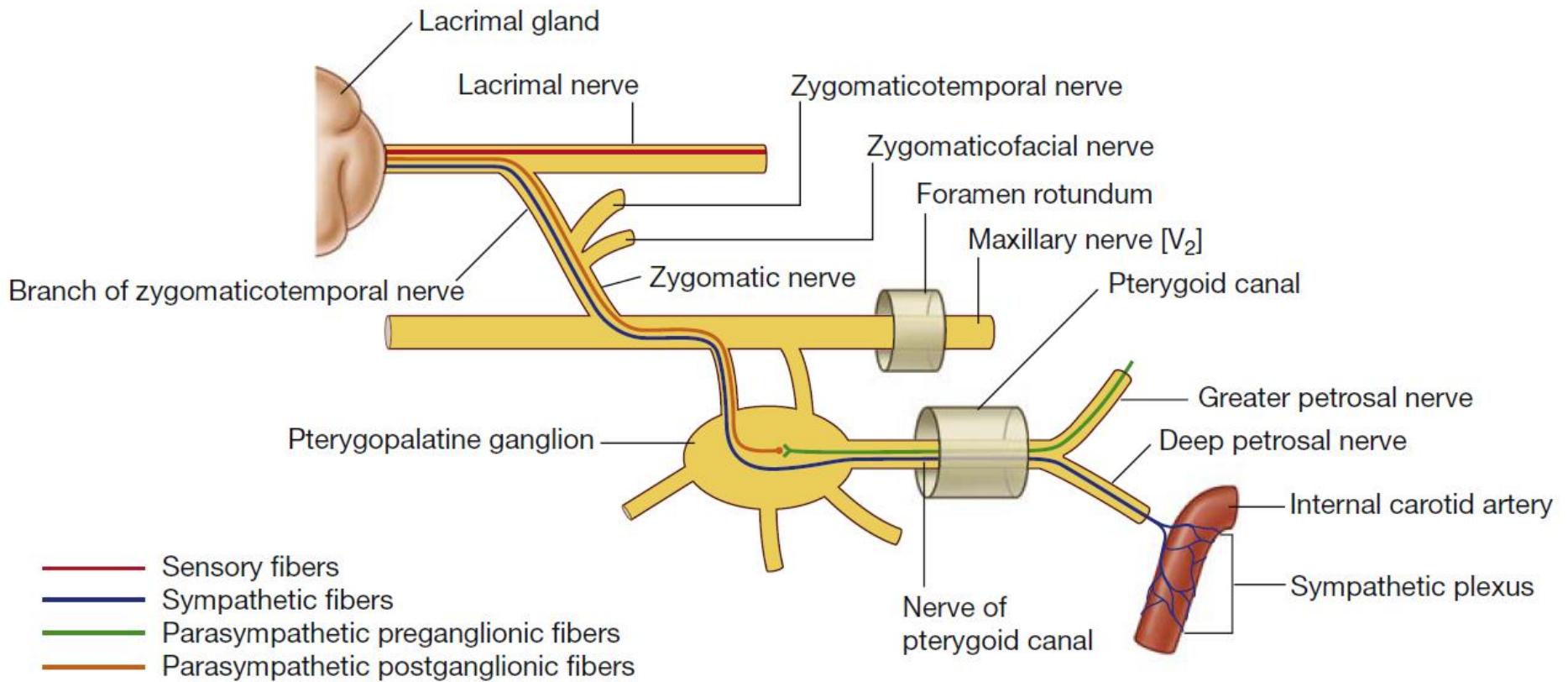


Fig.19: Innervation of the lacrimal gland.

Thank You