



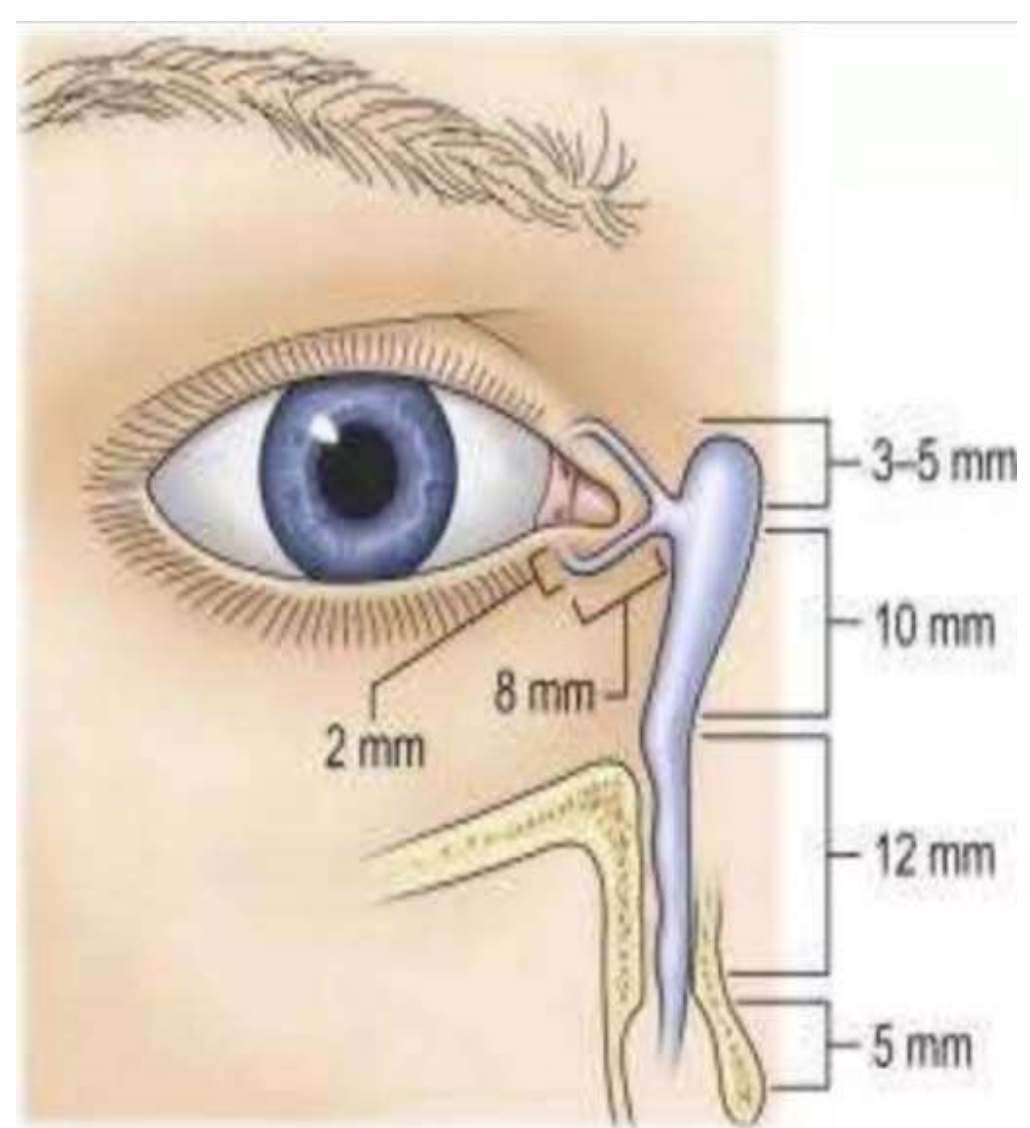
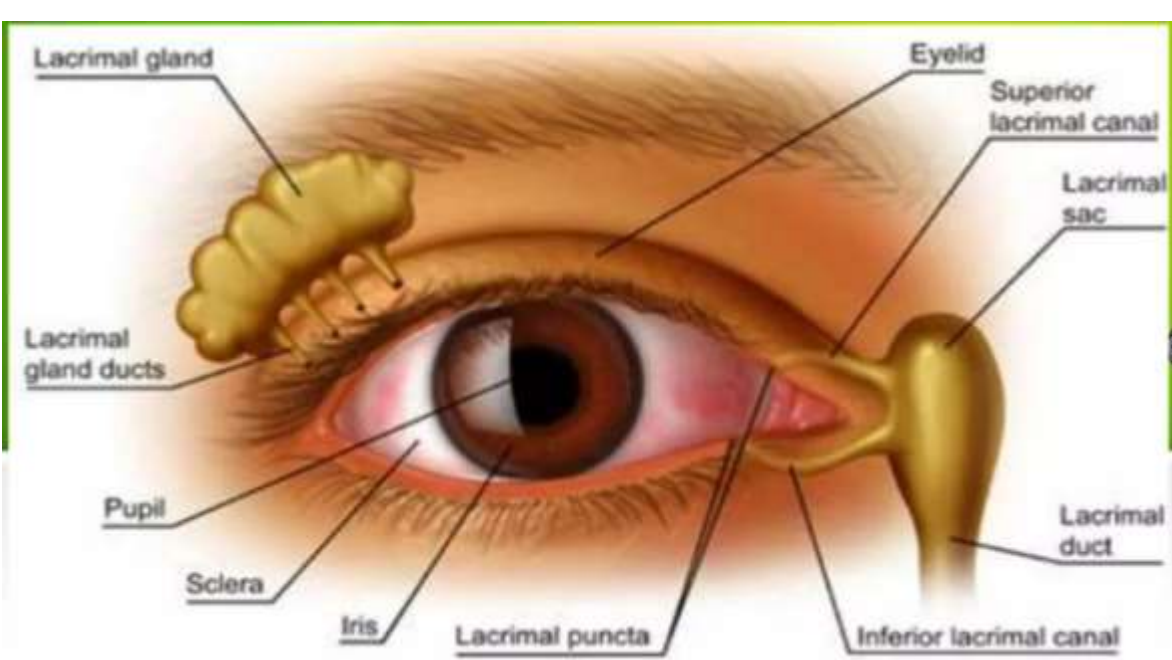
المرحلة الاولى ٢٠٢٣-٢٠٢٤

## Anatomy of the eye

### 2<sup>nd</sup> Lecture : **Lacrimal apparatus-Anatomical structures of the lachrymal ducts. Nerve supply of lacrimal gland**

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## **Anatomical structures of the lacrimal ducts:**

The lacrimal apparatus consists of several anatomical structures involved in the production and drainage of tears. The main components of the lacrimal ducts include:

**1-Lacrimal Gland:** The lacrimal gland is located in the upper outer corner of the orbit, above the lateral end of the eye. It is responsible for producing tears, which contain water, electrolytes, proteins, and antibodies.

**2-Lacrimal Canaliculi:** The lacrimal canaliculi are small ducts that begin with tiny openings called lacrimal puncta on the upper and lower eyelids near the inner corner of the eye.

- These canaliculi serve as channels for tear drainage from the ocular surface.

### **3-Lacrimal Sac:**

The lacrimal sac is a dilated portion of the nasolacrimal duct located in the lacrimal fossa of the lacrimal bone.

It acts as a temporary storage reservoir for tears before they are transported to the nasolacrimal duct.

**4-Nasolacrimal Duct:** The nasolacrimal duct is a thin tube that extends from the lacrimal sac to the inferior nasal meatus. It allows tears to drain from the lacrimal sac into the nasal cavity, aiding in the elimination of excess tears.

## Anatomical Structure

The lacrimal gland is approximately 2cm long. It can be divided into two main parts:

- Orbital** – larger and sits on the lateral margin of the levator palpebrae superioris muscle.
- Palprebral** – smaller and is located along the inner surface of the eyelid.

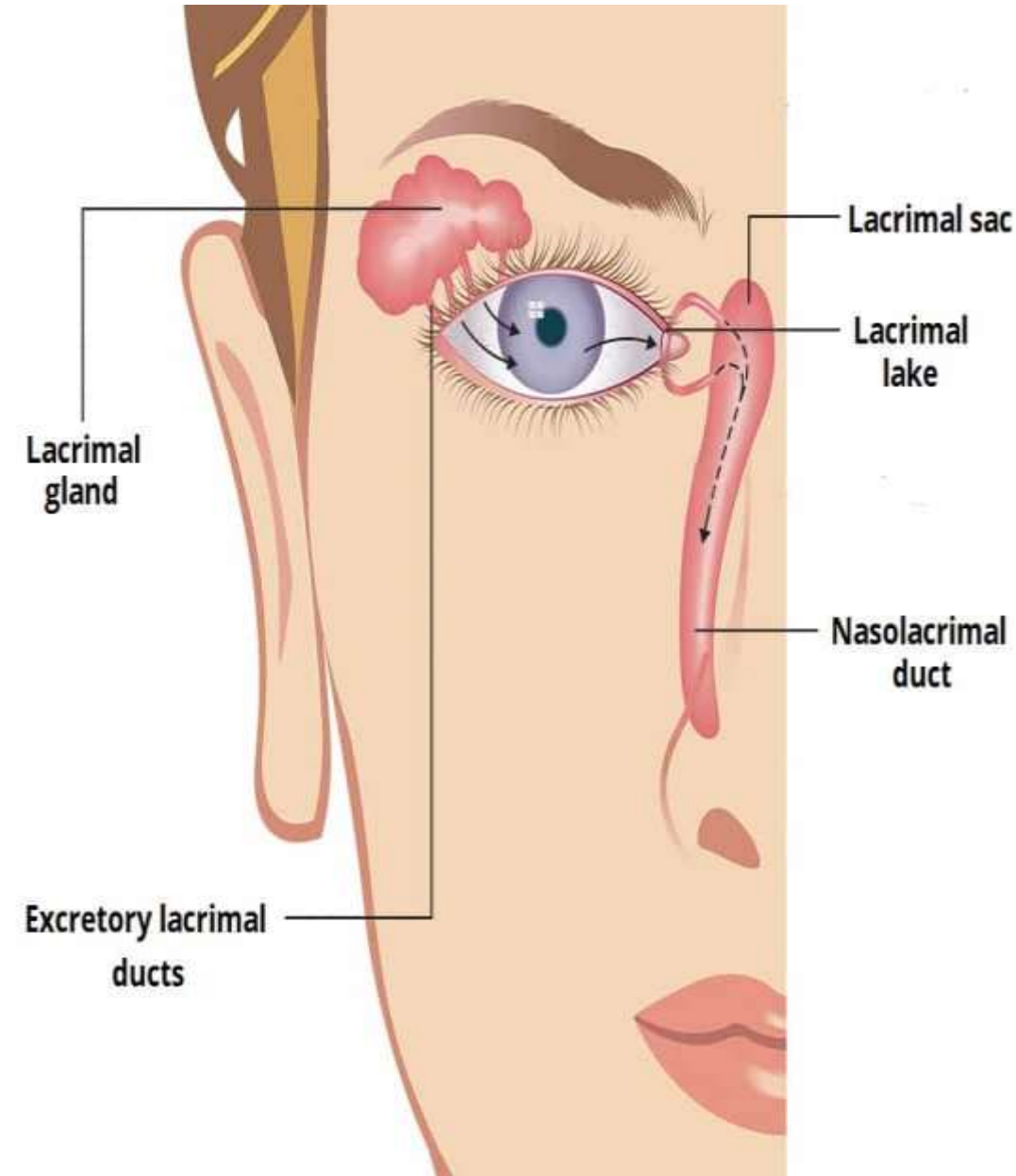
The lacrimal gland is a compound **tubuloacinar** gland, comprised of lobules – which are formed by multiple acini. The acini contain serous cells and produce a watery serous secretion (lacrimal fluid). The lacrimal fluid produced by the gland is secreted into excretory ducts, which empty into the **superior conjunctival fornix**. The fluid is then ‘spread’ over the cornea by the process of blinking.

## Lacrimal Apparatus

The **lacrimal apparatus** is the system responsible for the drainage of lacrimal fluid from the orbit.

After secretion, lacrimal fluid circulates across the eye, and accumulates in the **lacrimal lake** – located in the medial canthus of the eye. From here, it drains into the lacrimal sac via a series of canals.

The lacrimal sac is the dilated end of the **nasolacrimal duct**, and is located in a groove formed by the lacrimal bone and frontal process of the maxilla. Lacrimal fluid drains down the nasolacrimal duct and empties into the inferior meatus of the nasal cavity.



## Nerve Supply of Lacrimal Gland

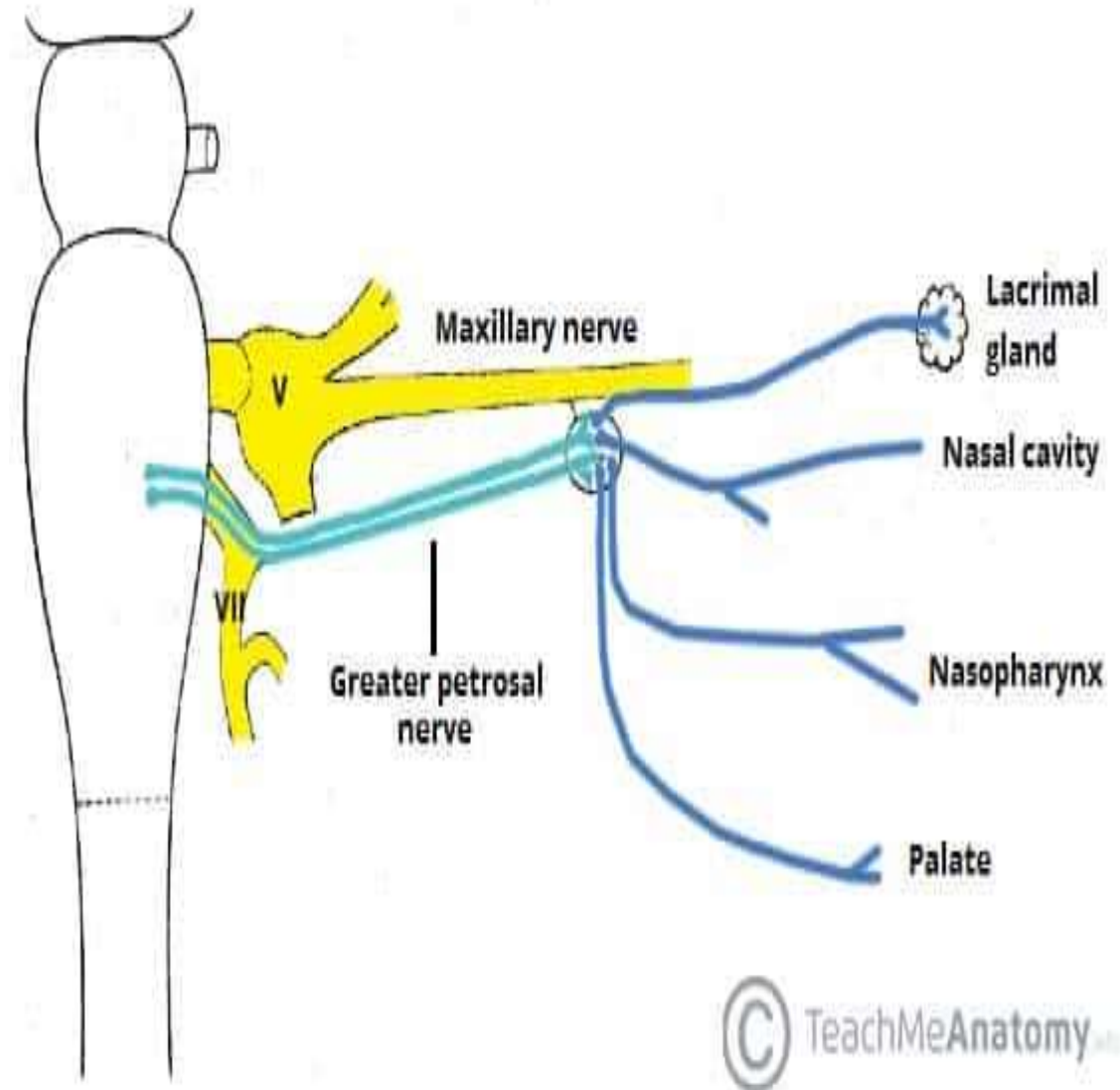
- The lacrimal gland receives its nerve supply from the parasympathetic and sympathetic divisions of the autonomic nervous system.

### 1. Parasympathetic Nerve Supply:

- Parasympathetic fibers responsible for lacrimation (tear production) originate from the facial nerve (cranial nerve VII).
- These fibers synapse in the pterygopalatine ganglion, located in the pterygopalatine fossa.
- Postganglionic fibers then travel through the zygomatic branch of the maxillary nerve and reach the lacrimal gland, stimulating tear production.

### 2. Sympathetic Nerve Supply:

- Sympathetic fibers, which regulate tear secretion, originate from the superior cervical ganglion.
- These fibers travel through the carotid plexus and reach the lacrimal gland through the deep petrosal nerve and the vidian nerve.
- Sympathetic stimulation results in vasoconstriction and reduced tear production.

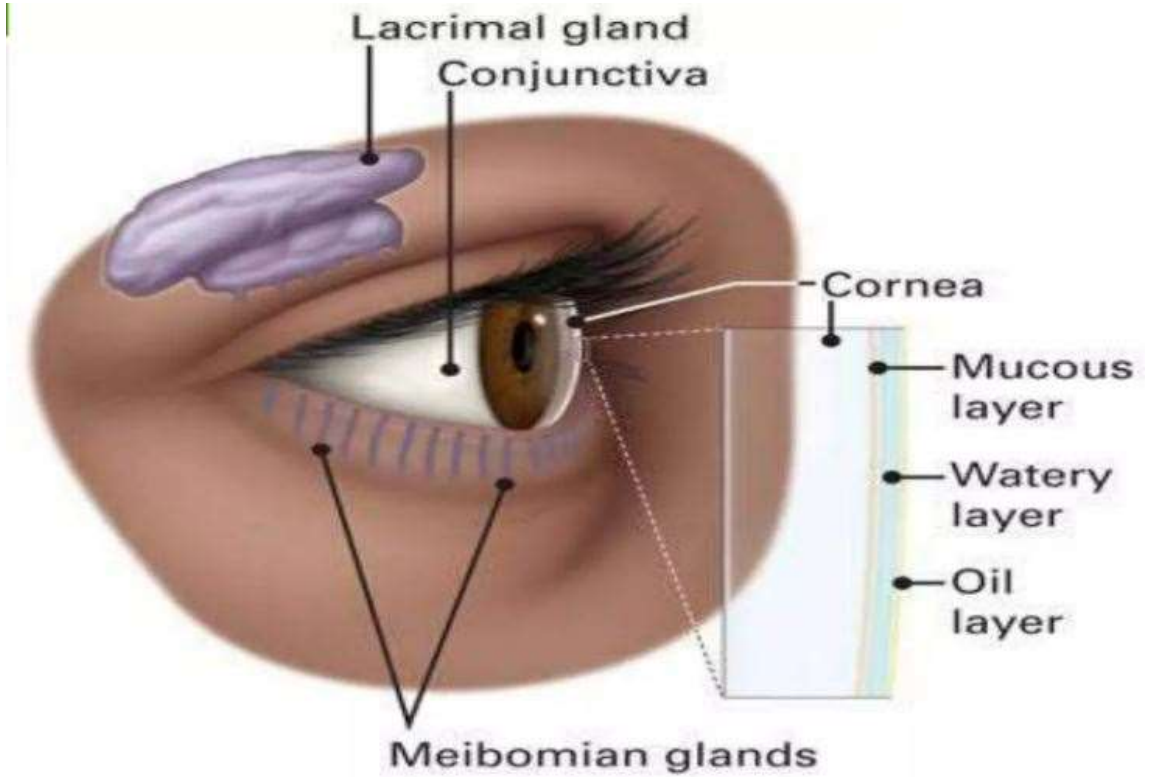


## Secretion of tear

- Tears are continuously secreted throughout the day by accessory (basal secretion) and main (reflex secretion) lacrimal glands.
- Reflex secretion is in response to sensations from the cornea and conjunctiva, probably produced by evaporation and breakup of tear film.
- Hyperlacrimation occurs due to irritative sensations from the cornea and conjunctiva.
- Afferent pathway of this secretion is formed by fifth nerve and efferent by parasympathetic (secretomotor) supply of lacrimal gland.

## Function of tear

1. Keeps moist the cornea and conjunctiva.
2. Provides oxygen to the corneal epithelium.
3. Washes away debris and noxious irritants.
4. Prevents infection due to presence of anti-bacterial substances.
5. Facilitates movements of the lids over the globe.



## Control of Tear Production

- Tear production is regulated by a complex interplay of signals from the autonomic nervous system and ocular surface conditions.

### 1.Parasympathetic Stimulation:

- Parasympathetic stimulation leads to increased tear production through activation of the lacrimal gland by the facial nerve.

### 2.Sympathetic Stimulation:

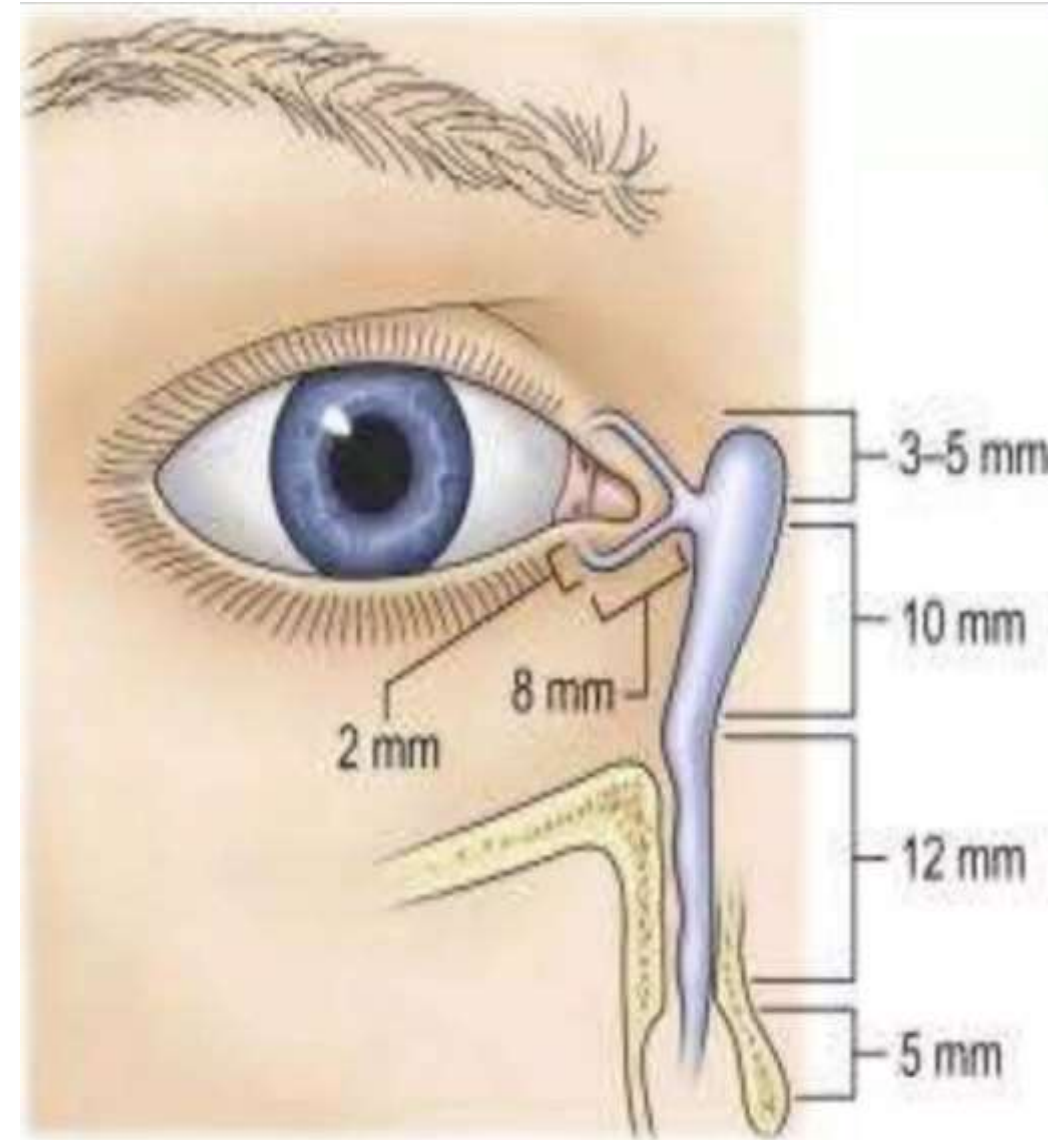
- Sympathetic stimulation, originating from the superior cervical ganglion, reduces tear production.

### 3.Reflexive Tear Production:

- Tear production can also be triggered by reflexes, such as blinking, ocular irritation, or emotional responses.

## Summary

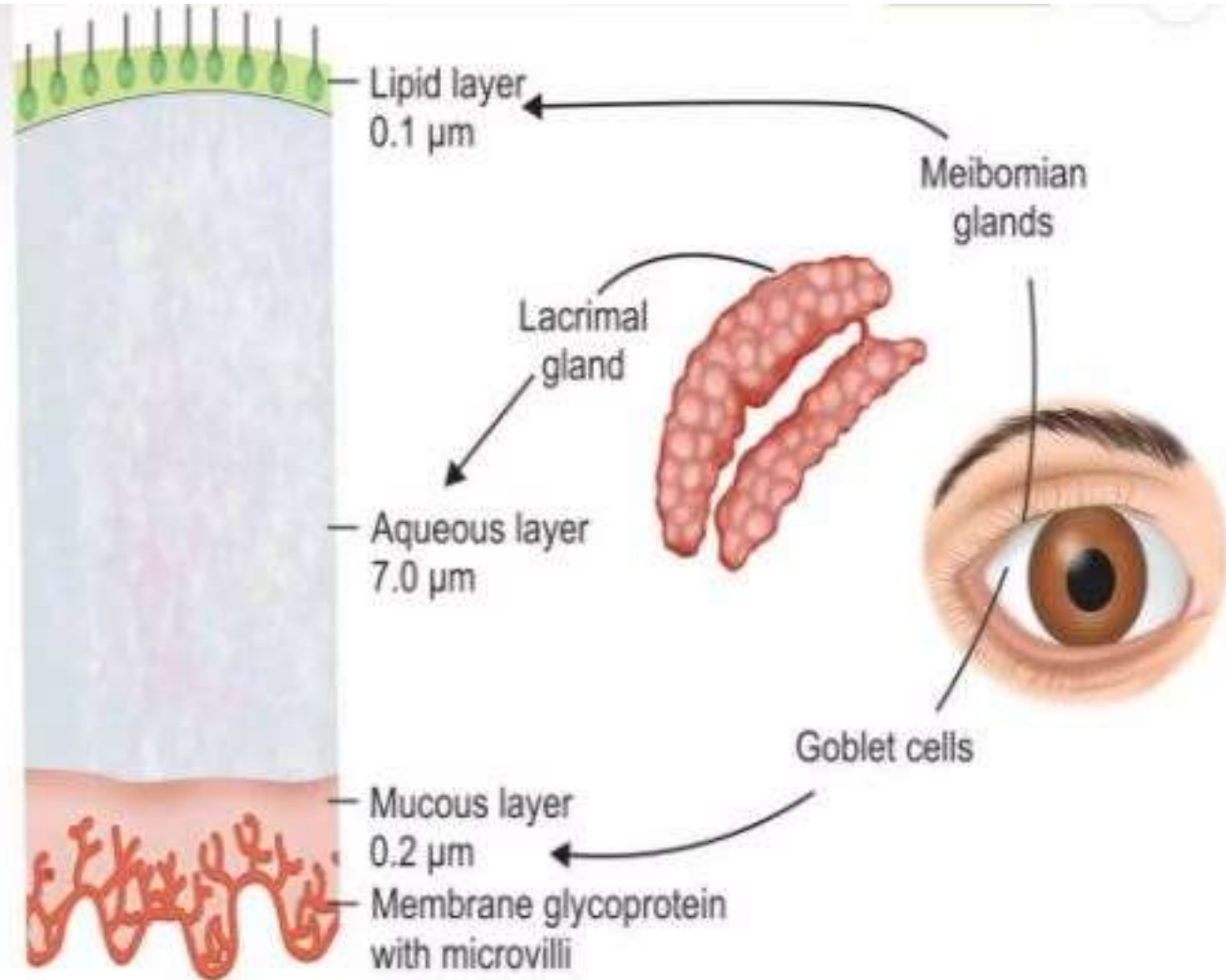
- The lacrimal apparatus is responsible for tear production and drainage, ensuring the maintenance of a healthy ocular surface.
- The lacrimal ducts, including the lacrimal gland, lacrimal canaliculi, lacrimal sac, and nasolacrimal duct, work together to produce, distribute, and eliminate tears.
- The lacrimal gland receives its nerve supply from the parasympathetic and sympathetic divisions of the autonomic nervous system, regulating tear production.



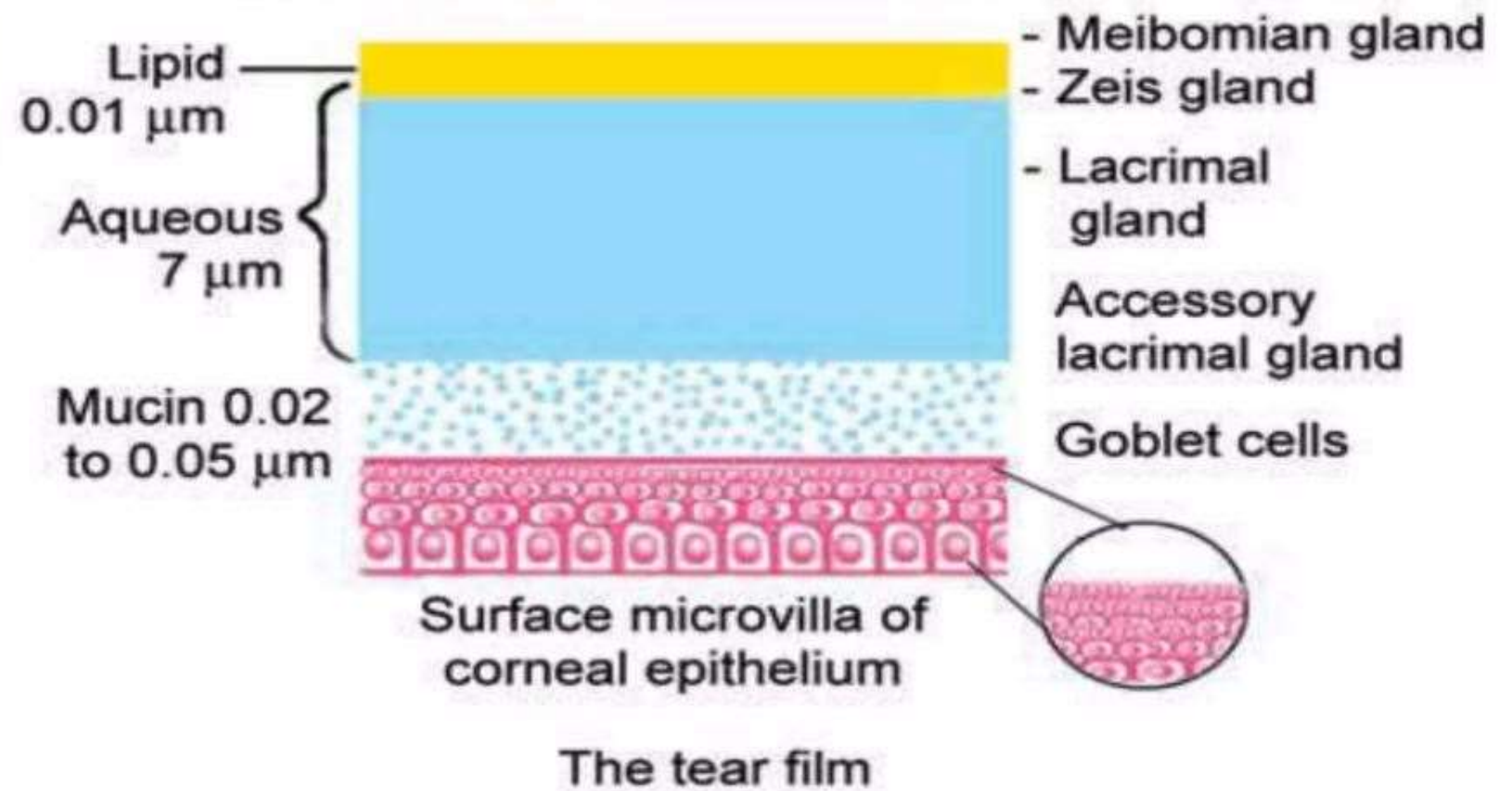


## Tear film

- Fluid covering the cornea and called it precorneal film.
- consist of three layers, which from posterior to anterior are mucus layer, aqueous layer and lipid or oily layer.



## Liquid or oily layer



- This is the outermost and thinnest (0.1 mm) layer of tear film formed at air-tear interface from the secretions of meibomian, zeis, and moll glands.
- This layer prevents the overflow of tears, retards their evaporation and lubricates the eyelids as they slide over the surface of the globe

## **Mucus layer**

- It is the innermost and about 0.2 mm thick stratum of the tear film.
- It consists of mucin secreted by conjunctival goblet cells and glands of Manz.
- It converts the hydrophobic corneal surface into hydrophilic one.

## **Aqueous layer layer**

- The bulk of tear film (7.0 mm) is formed by this intermediate layer which consists of tears secreted by the main and accessory lacrimal glands.
- The tears mainly comprise of water and small quantities of solutes such as sodium chloride, sugar, urea and proteins.
- Therefore, it is alkaline and salty in taste. It also contains antibacterial substances like lysozyme, betalysin and lactoferrin.

thank  
you