

# ANATOMY OF EYELID

*SOURAV*

# INTRODUCTION

Mobile tissue curtains

Act as shutters

Spread tear film over the cornea

Contribution to facial features

Position relays information- wake/asleep

# EXTENT

## Upper eyelid

- From eyebrow downwards to end in a free margin
- Superior boundary of palpebral fissure

## Lower eyelid

- Merges with the skin of cheek

# LID FOLDS

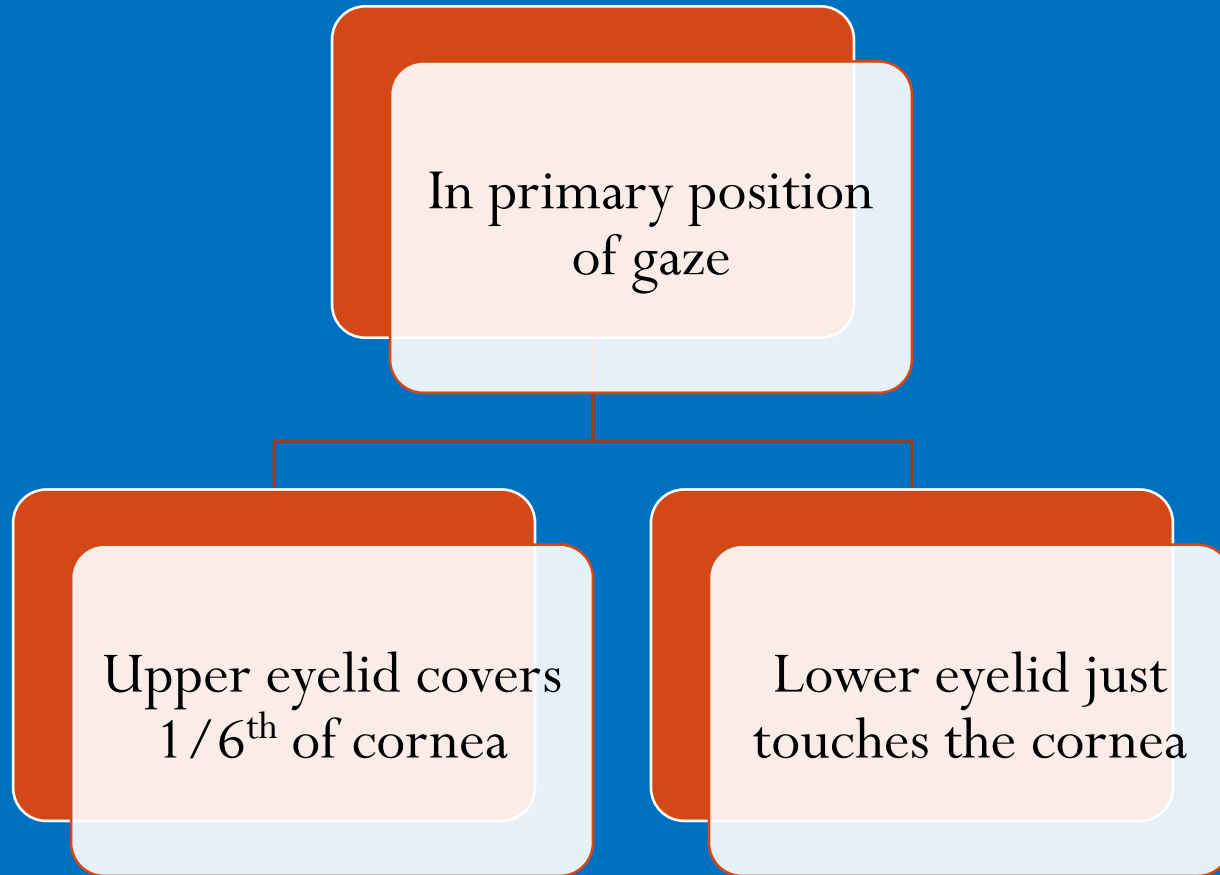
## Superior lid fold

- Orbital & tarsal portion
- Formed by fibrous slips, from tendon of levator

## Inferior lid fold

- On skin of lower eyelids
- Fibrous slips from fascia of inferior rectus

# POSITION OF EYELIDS



# CANTHI

Lateral canthus: 5-7 mm from lateral orbital margin

contact with globe

60 deg. with eyes wide open

30-40 deg. with eyes normally open

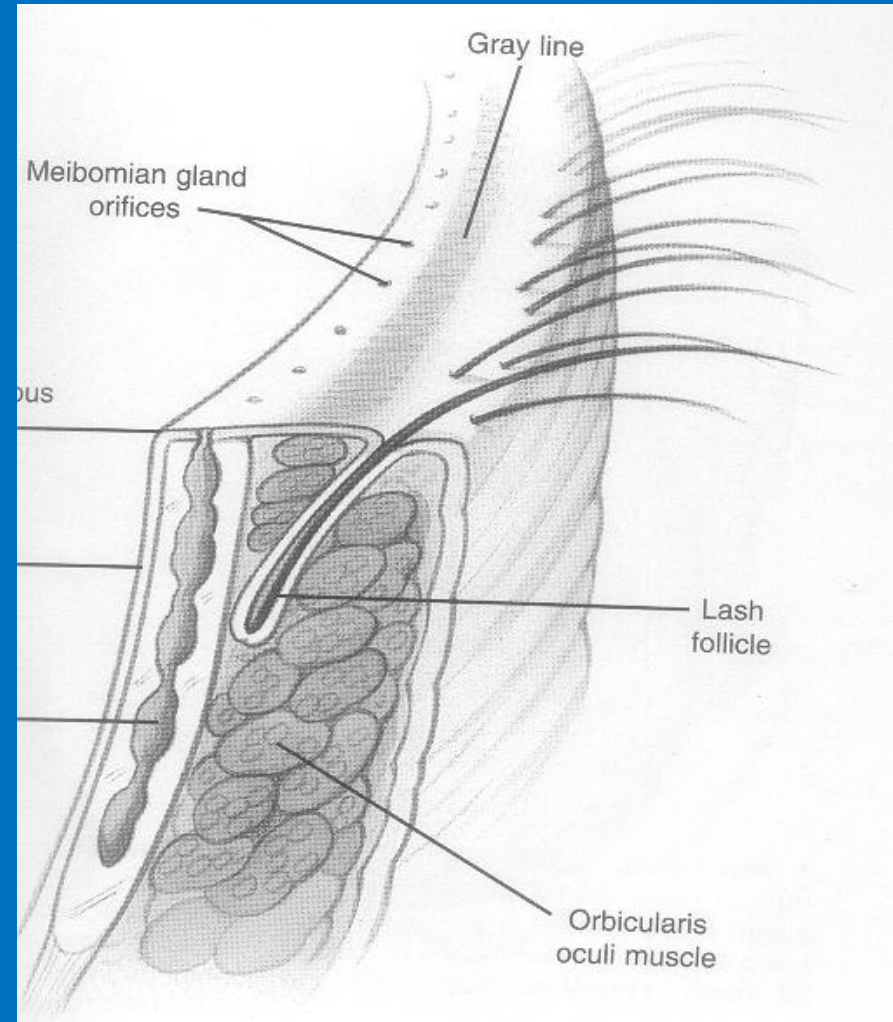
Medial canthus: Rounded

Lacus lacrimalis

Caruncle & Plica semilunaris

# EYELASHES

- 2-3 rows (6 to 12 mm)
- 150-100 in upper lid and 75- 50 in lower lid
- No interlacing
- Tapering (20 – 120 microns)
- 3-4 months
- Glands of Zeis & Moll- empty into infundibulum of each piliary gland



# PALPEBRAL APERTURE

- Elliptical space b/w upper & lower lid margins
- Caucasians :
  - In half , both medial canthi and lateral canthi at the same level
  - In half of them lateral canthus is slightly higher than medial canthi
- Mongoloid & antimongoloid slant



# PALPEBRAL APERTURE

- **At Birth**

Horizontally- 18 to 21 mm

Vertically = 8mm

- **In Adults**

28 to 30 mm (horizontal)

9 to 11 mm (vertical)

# STRUCTURE OF UPPER LID

Skin

Subcutaneous areolar tissue

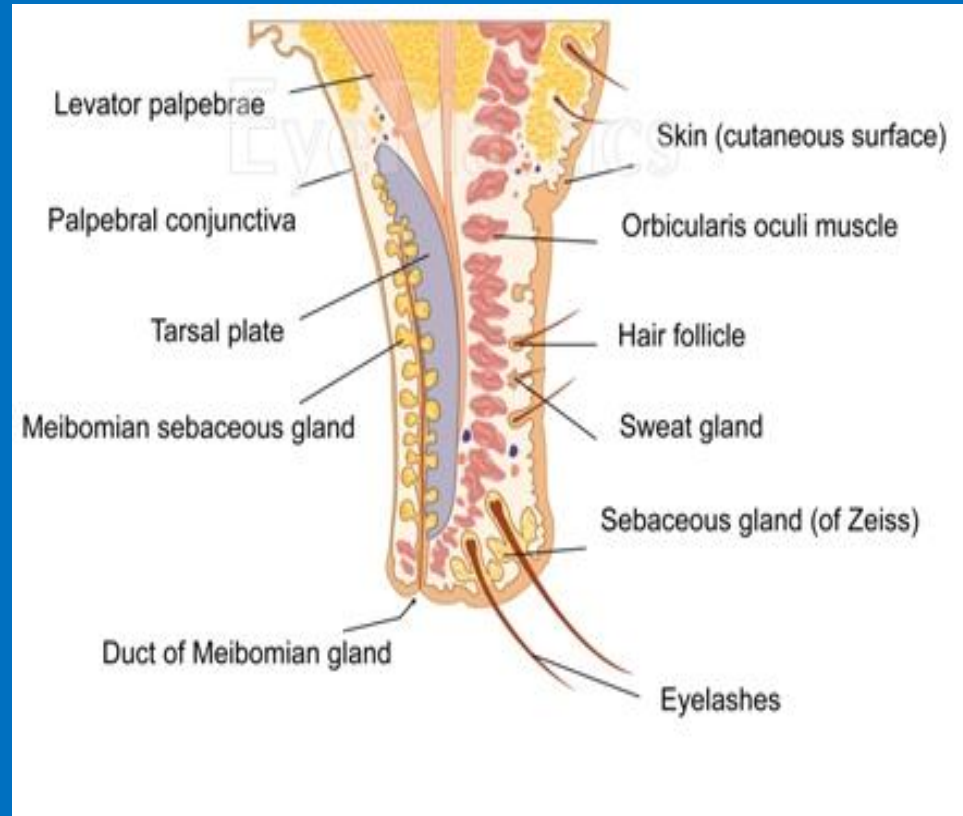
Layer of striated muscles

Sub muscular areolar tissue

Fibrous layer

Non-striated muscle

Conjunctiva



# SKIN

- Elastic , fine texture, thinnest in the body
- **Epidermis**
  - 6-7 layers , stratified squamous epithelium
  - Basal layer- unicellular sebaceous glands, sweat glands
- **Dermis**
  - Thin layer , dense connective tissue
  - Rich network : BV, elastic fibers, lymphatics, nerve
  - Variable no. of melanocytes

# SUBCUTANEOUS AREOLAR TISSUE

- Beneath the skin
- No fat
- Readily distended by blood/ edema
- Nonexistent
  - Near ciliary margin
  - At lid folds
  - Medial & lateral angles

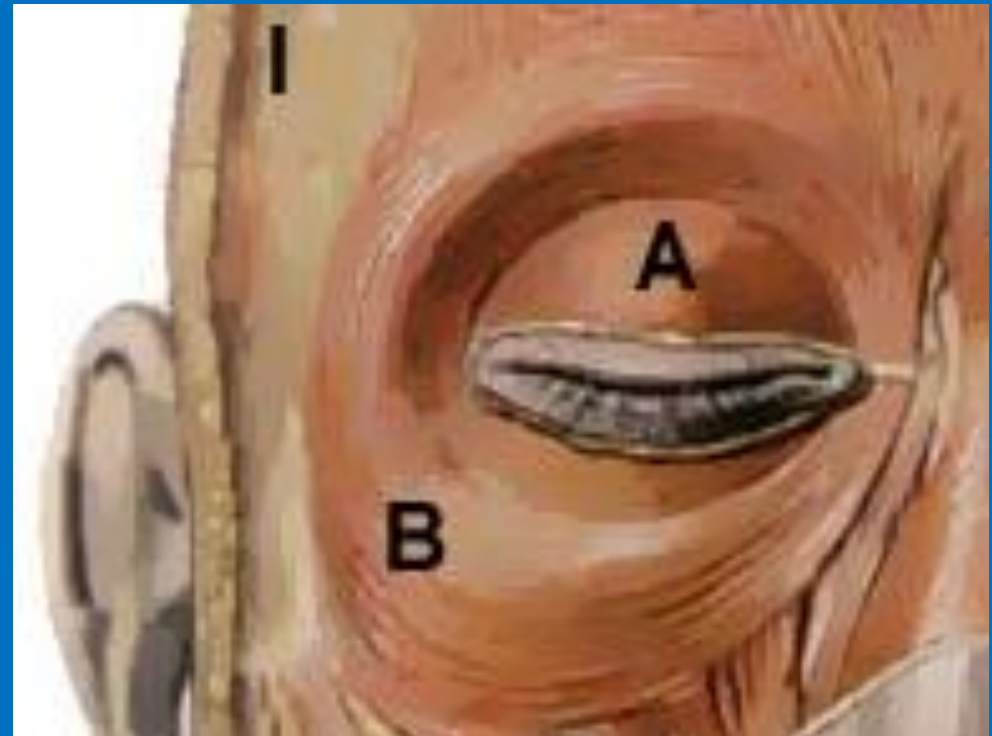
# LAYER OF STRIATED MUSCLE

- Orbicularis muscle  
thin oval sheet across  
eyelids

Divided into  
two parts

Palpebral  
part

Orbital  
part



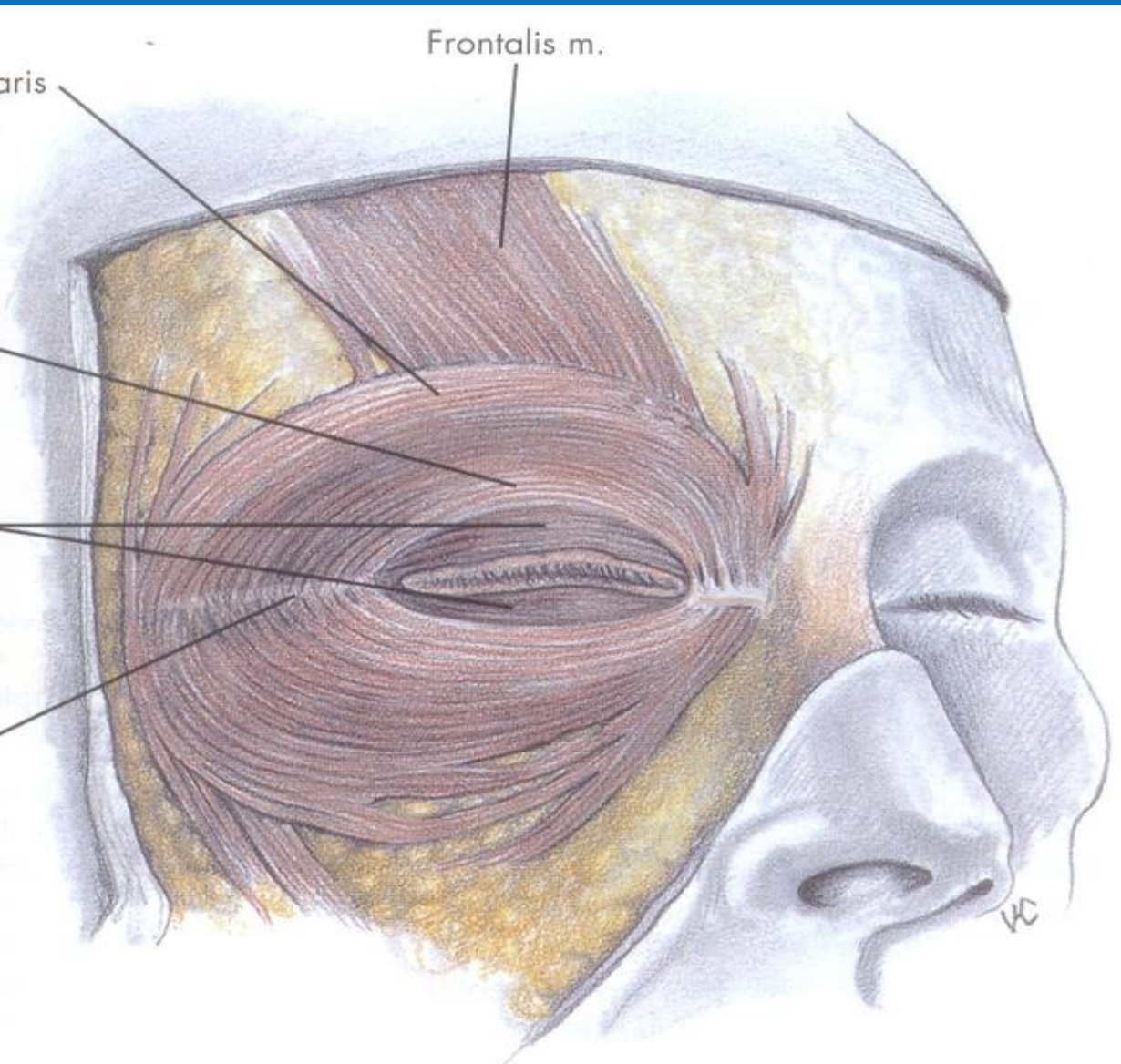
Orbital orbicularis

Frontalis m.

Preseptal orbicularis

Pretarsal orbicularis

Raphe



# PALPEBRAL PART OF ORBICULARIS

## Preseptal fibres

- Deep head
  - From lacrimal fascia & post. lacrimal crest
- Superficial head
  - From medial palpebral ligament
  - Pass superiorly & inf. In front of orbital septum
  - Unite at lateral palpebral raphe

# PRETARSAL FIBRES

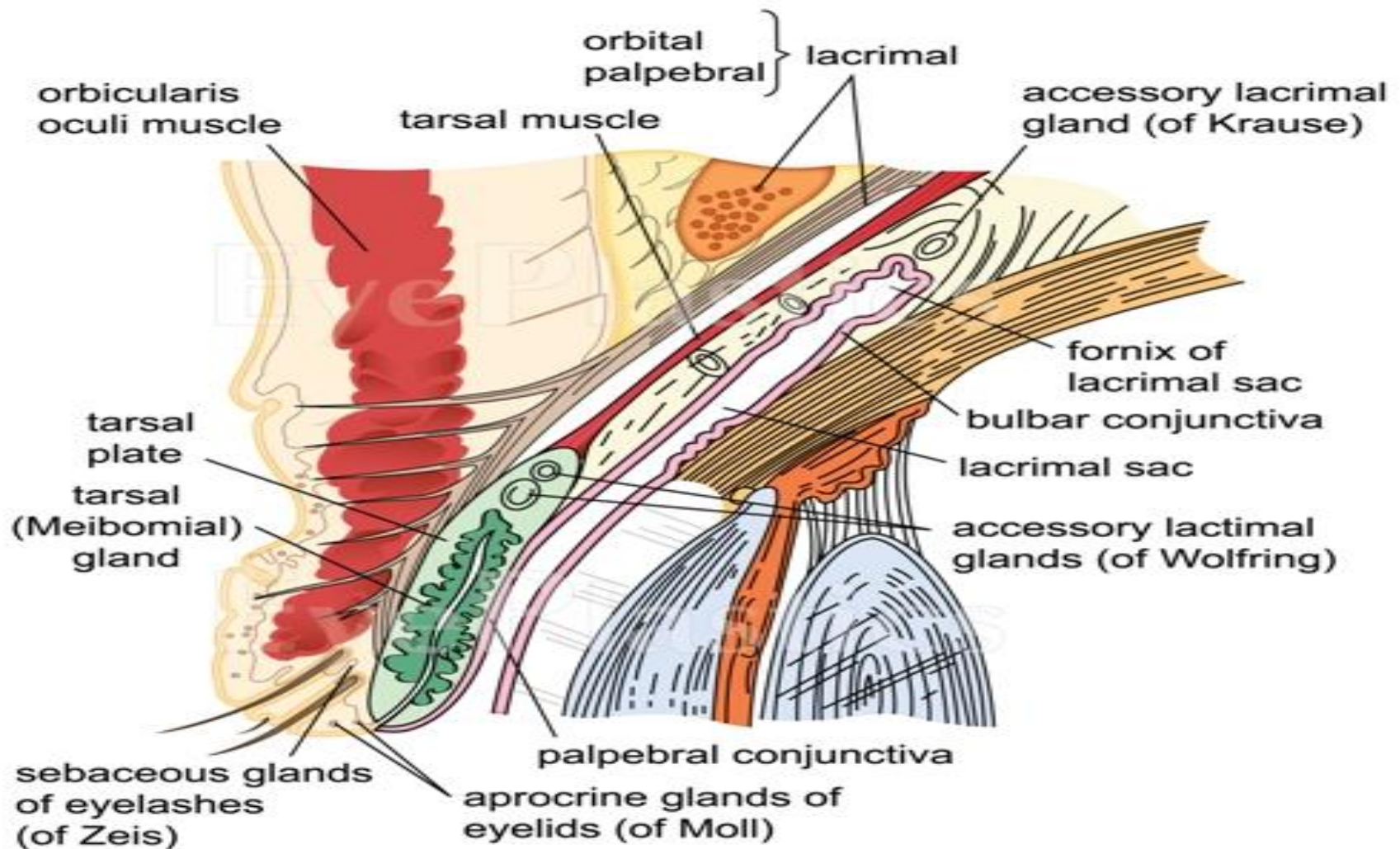
- **Deep head** - From lacrimal fascia & post. lacrimal crest
- **Superficial head** – From MPL
  
- ✓ Overlies upper & lower tarsus
- ✓ Join laterally to form **Lateral Canthal tendon**
- ✓ It is inserted to **lateral orbital tubercle of Whitnall**
- ✓ Pars lacrimalis (Horner's muscle)- drainage
- ✓ Pars ciliaris (muscle of Riolan)- gentle closing



# FUNCTIONS OF ORB. OCULI.

- **Orbital part**
  - Forced closure of eyelids
  - Thus pull eyebrows downwards
- **Palpebral part**
  - Helps in gentle closure during blinking, sleep, soft voluntary closure
- **Branches of 7<sup>th</sup> nerve**

# LEVATOR PALPEBRAE SUPERIORIS



# Origin of LPS

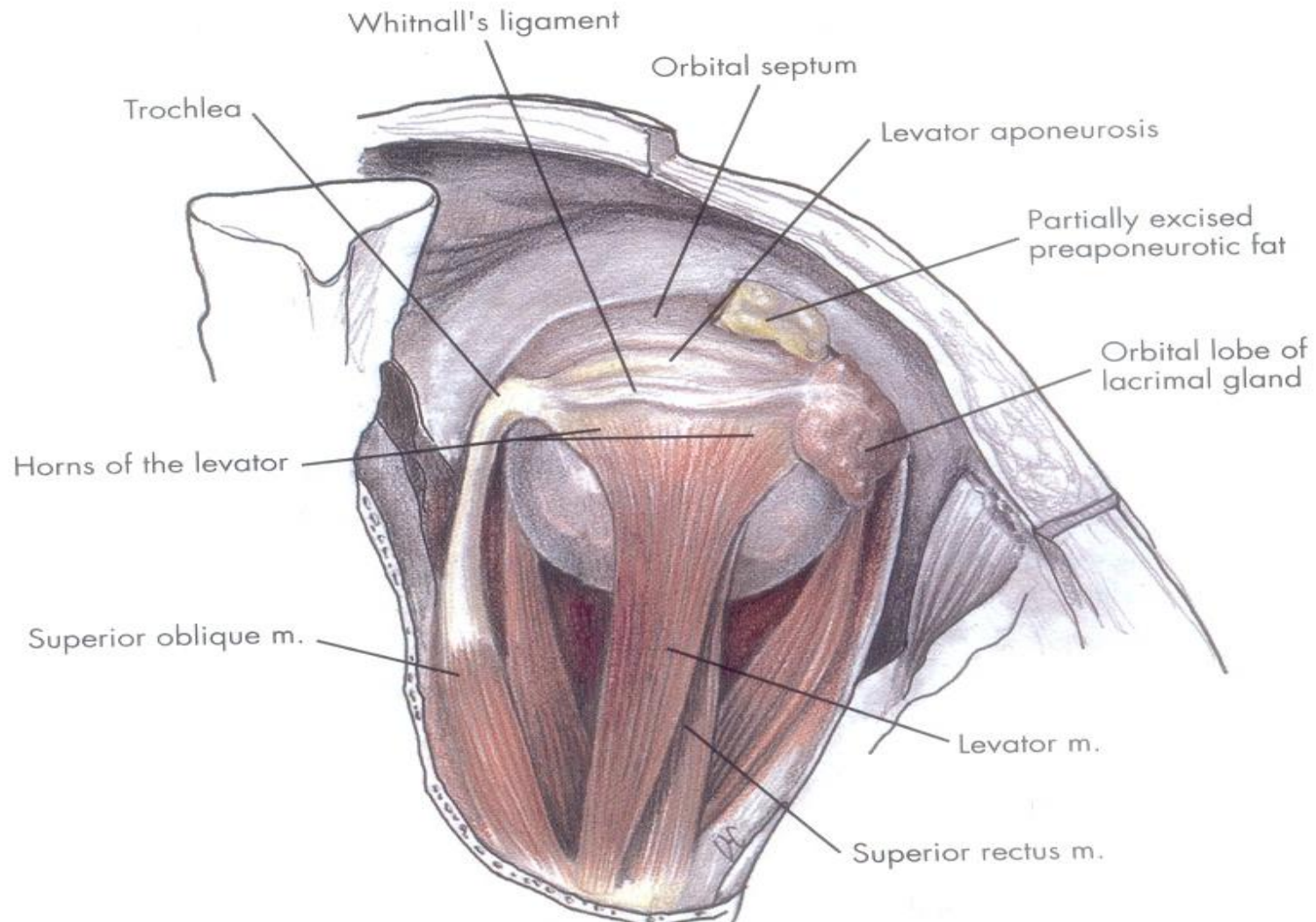
At apex of orbit

Under surface  
of lesser wing  
of sphenoid

Above Annulus  
of Zinn

Short tendon

Blended with  
origin of SR



# Sup. Transverse ligament of Whitnall

- Thickened band of orbital fascia
- From trochlear pulley to the capsule of orbital lobe of lacrimal gland
- Formed by condensation of the sheath of LPS & sheath of reflected tendon of SO muscle
- During ptosis surgery, severing leads to failure of LPS function

# Nerve supply & action of LPS

- Branch of superior division of 3<sup>rd</sup> nerve
- Elevator of upper lid
- Action antagonised by the palpebral portion of Orbicularis Oculi

# MUSCULAR AREOLAR TISSUE

- Layer of loose connective tissue
- Between Orbicularis muscle & fibrous layer
- Nerves & vessels lie in this layer
- Splits lid into anterior & posterior lamina
- Superiorly communicates with sub aponeurotic layer of scalp

Lower lid – single space behind orbicularis

Upper lid

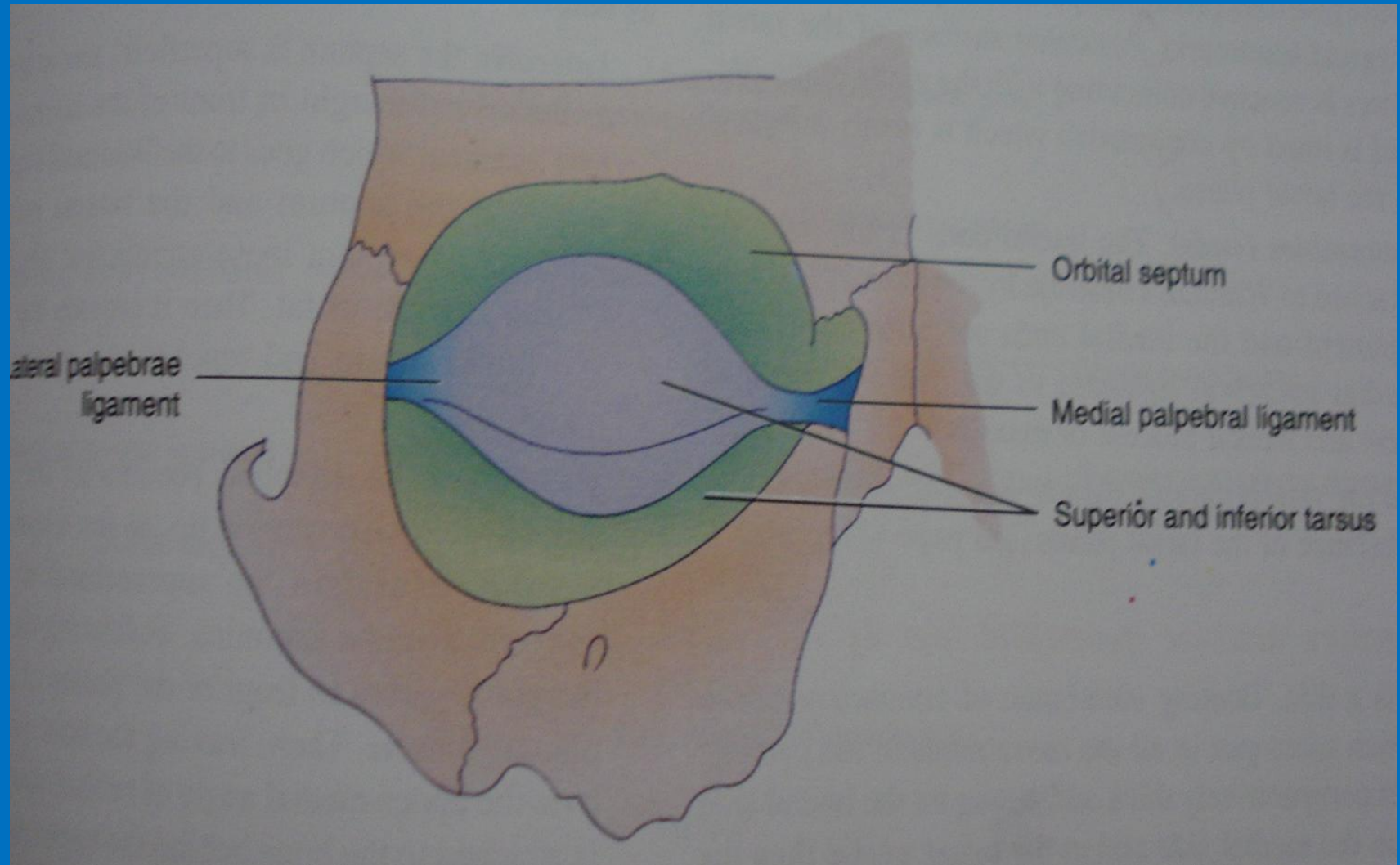
- Pretarsal space- has peripheral arcade
- Preseptal space- triangular, Orbicularis, septum orbitale

Preseptal cushion of fat – Crescent shaped

In front of septum  
behind orbicularis

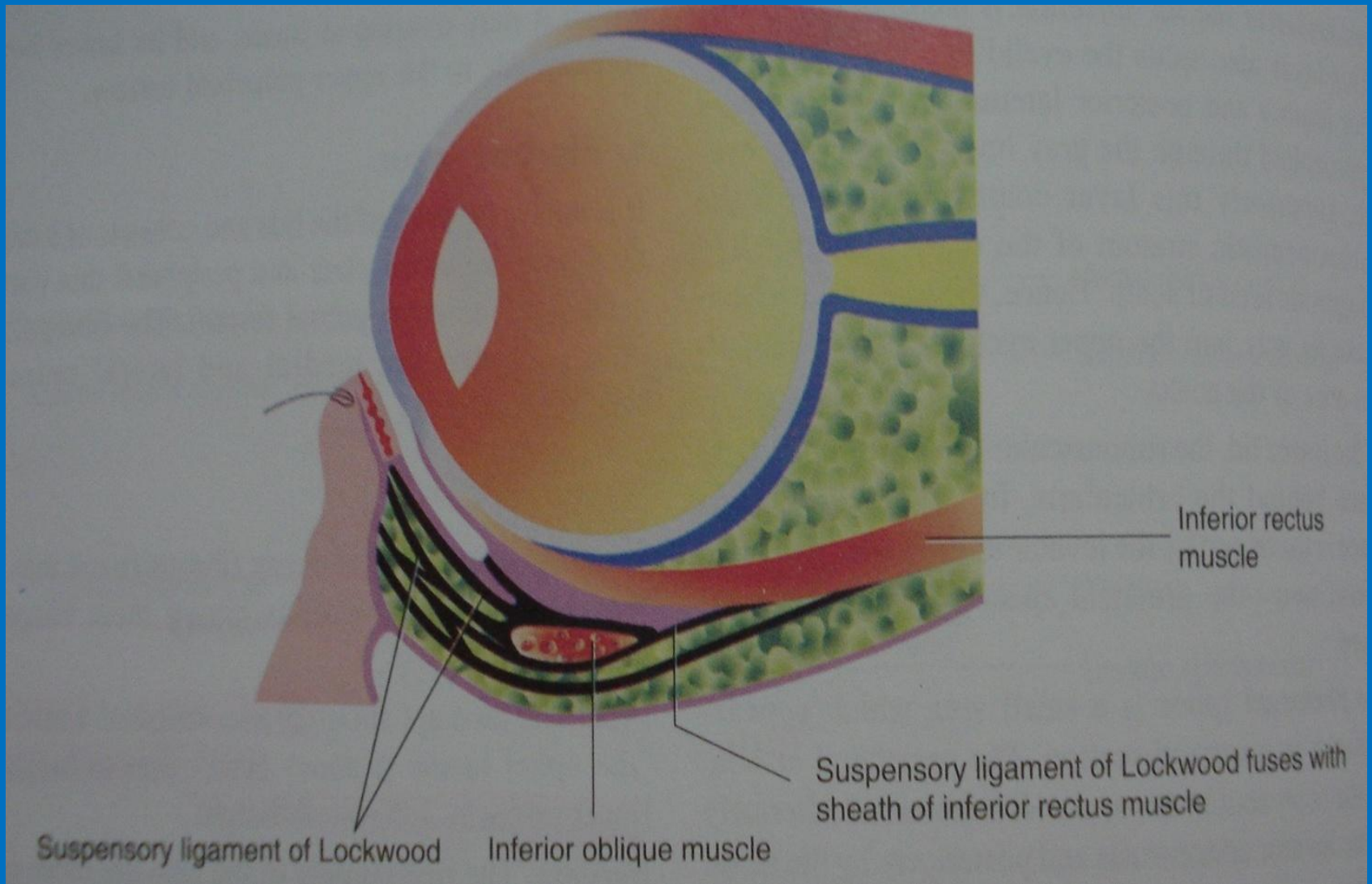


# FIBROUS LAYER



# TARSAL PLATES

- Dense fibrous tissue, skeleton of lids
- 29mm long, 1mm thick
- Upper (10-11 mm) & lower tarsus (4-5 mm)
- Superior borders – septum orbitale, muller's muscle
- Inf border – septum, capsulopalpebral fascia & inferior palpebral muscle
- LPL to Whitnall's tubercle, MPL to Ant Lacrimal crest & maxilla
- Tarsal glands embedded in substance of tarsal plates

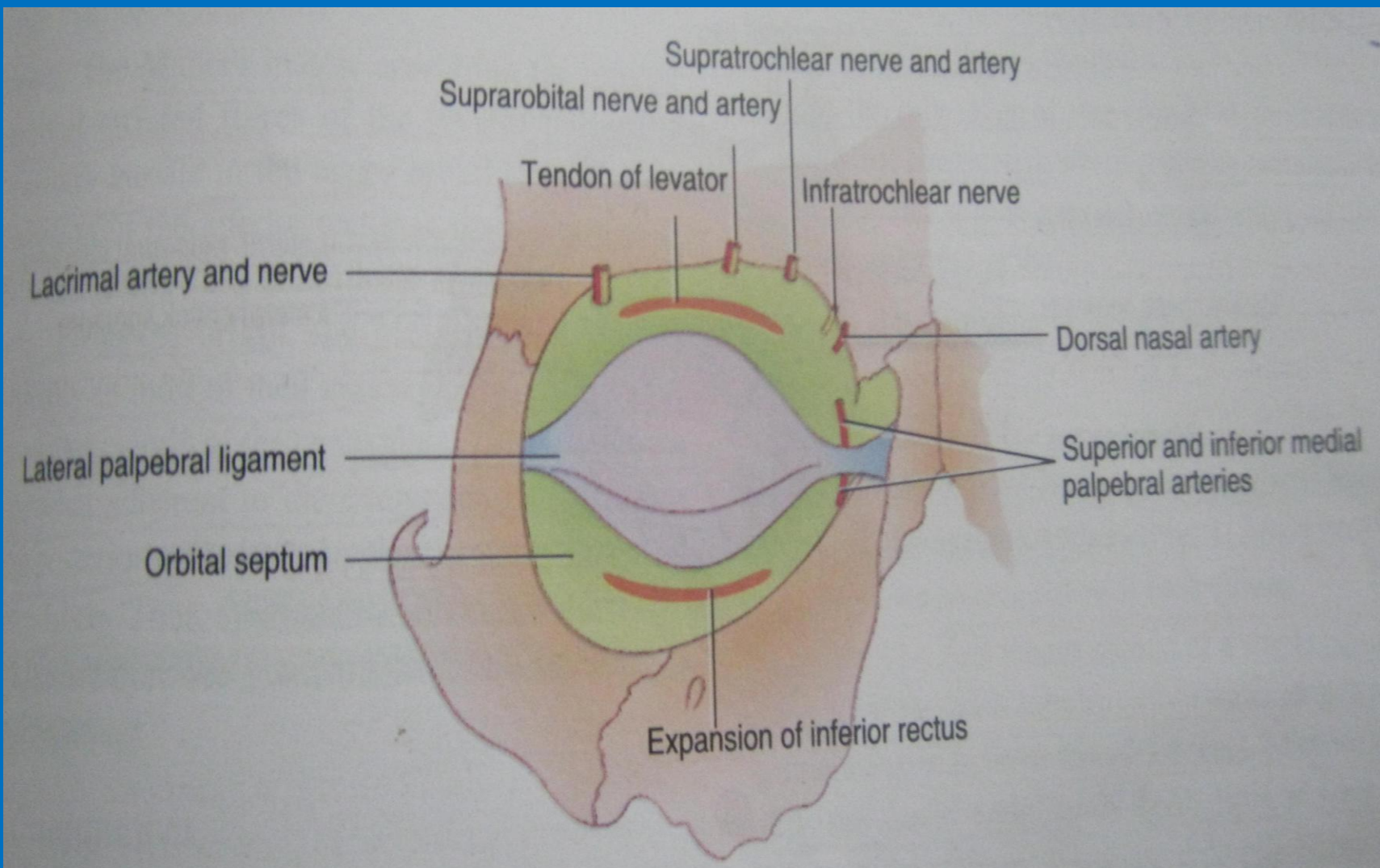


Attachment of capsulopalpebral fascia at inferior border of lower tarsal plate

# SEPTUM ORBITALE

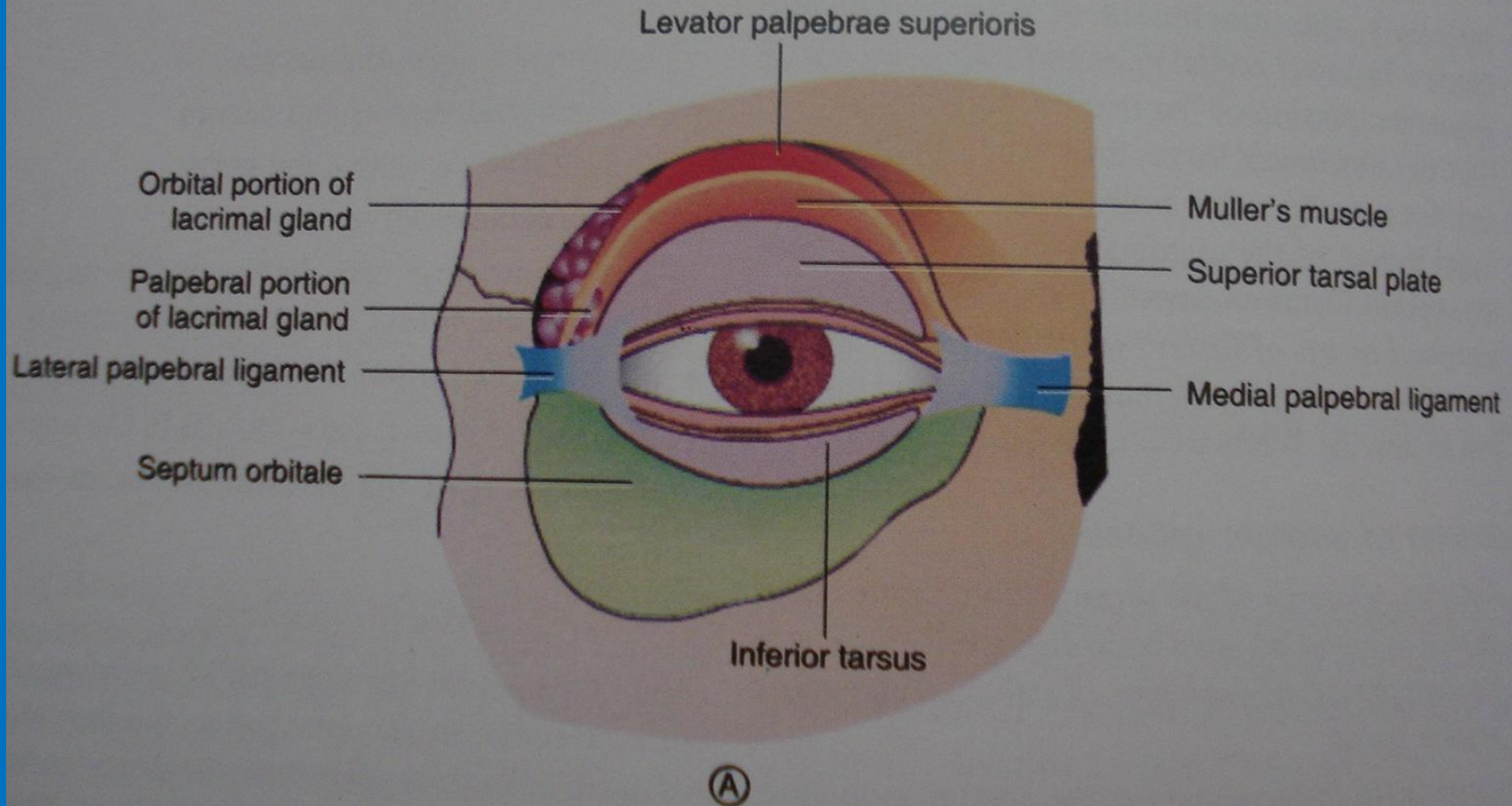
- Thin , floating membrane of connective tissue
- Takes part in all movements of lids
- Thick & strong on lateral and upper side
- Centrally attached to convex borders of tarsi
- Peripherally attached to the orbital margins
- Laterally superficial and is attached in front of LPL
- Forms supraorbital foramina
- Medially lies deep to the lacrimal sac

- Posteriorly septum is in close relation to the orbital fat, which separates it from lacrimal gland, the LPS, tendon of SO
- In lower lid, fat separates the expansion of IR and IO



Structures piercing septum orbitale

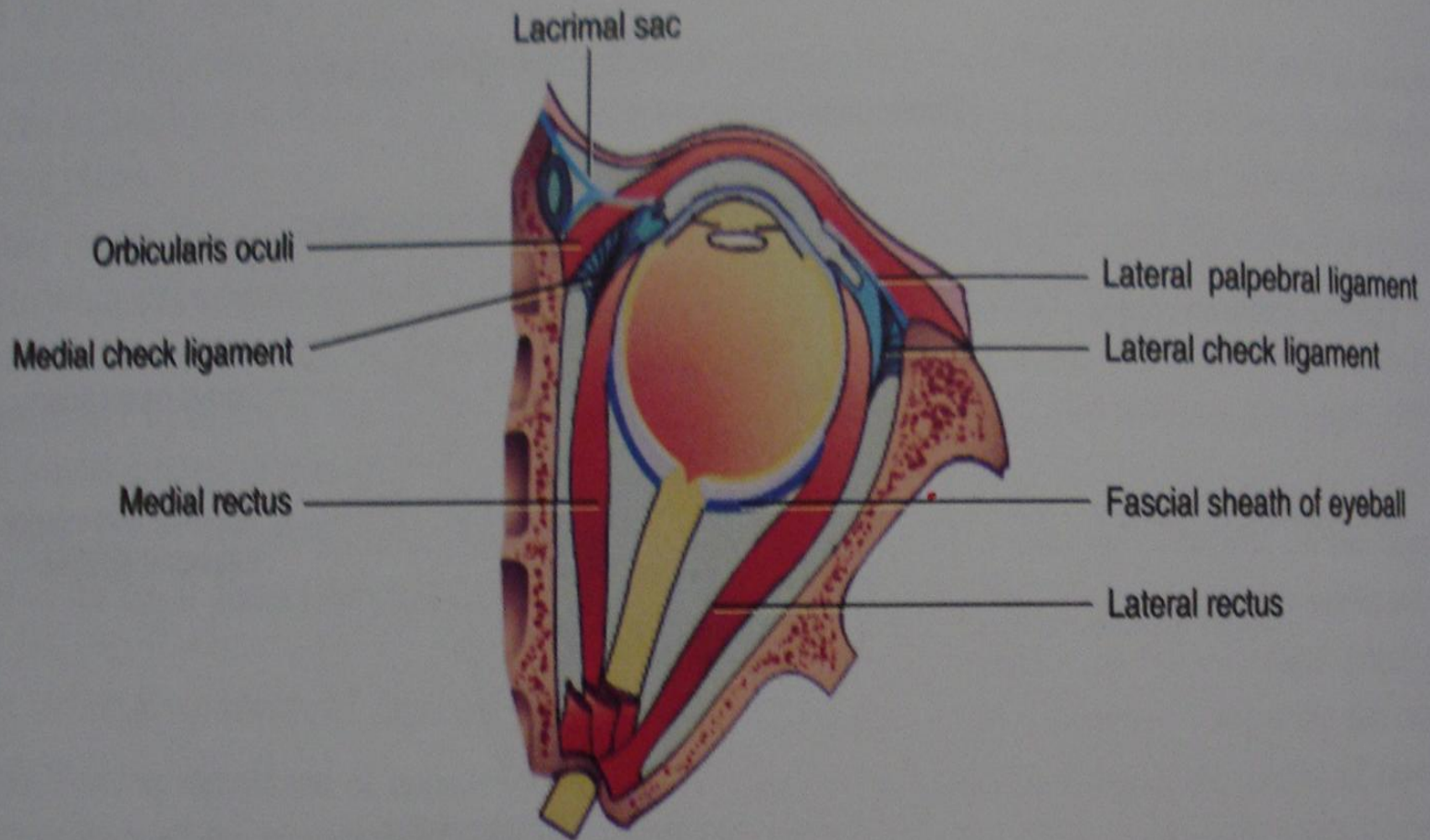
# MEDIAL PALPEBRAL LIGAMENT



## Ant. Part of MPL

- Gives origin to superficial portion of Orbicularis
- Angular vessels pass over the medial portion of ant surface
- Continues laterally, splits into lower and upper band – tarsal plate
- Delimits and gives shape to medial canthus
- Two portions are tubular and corresponds to lacrimal part of lid margin, contains lacrimal canaliculi and encloses caruncle



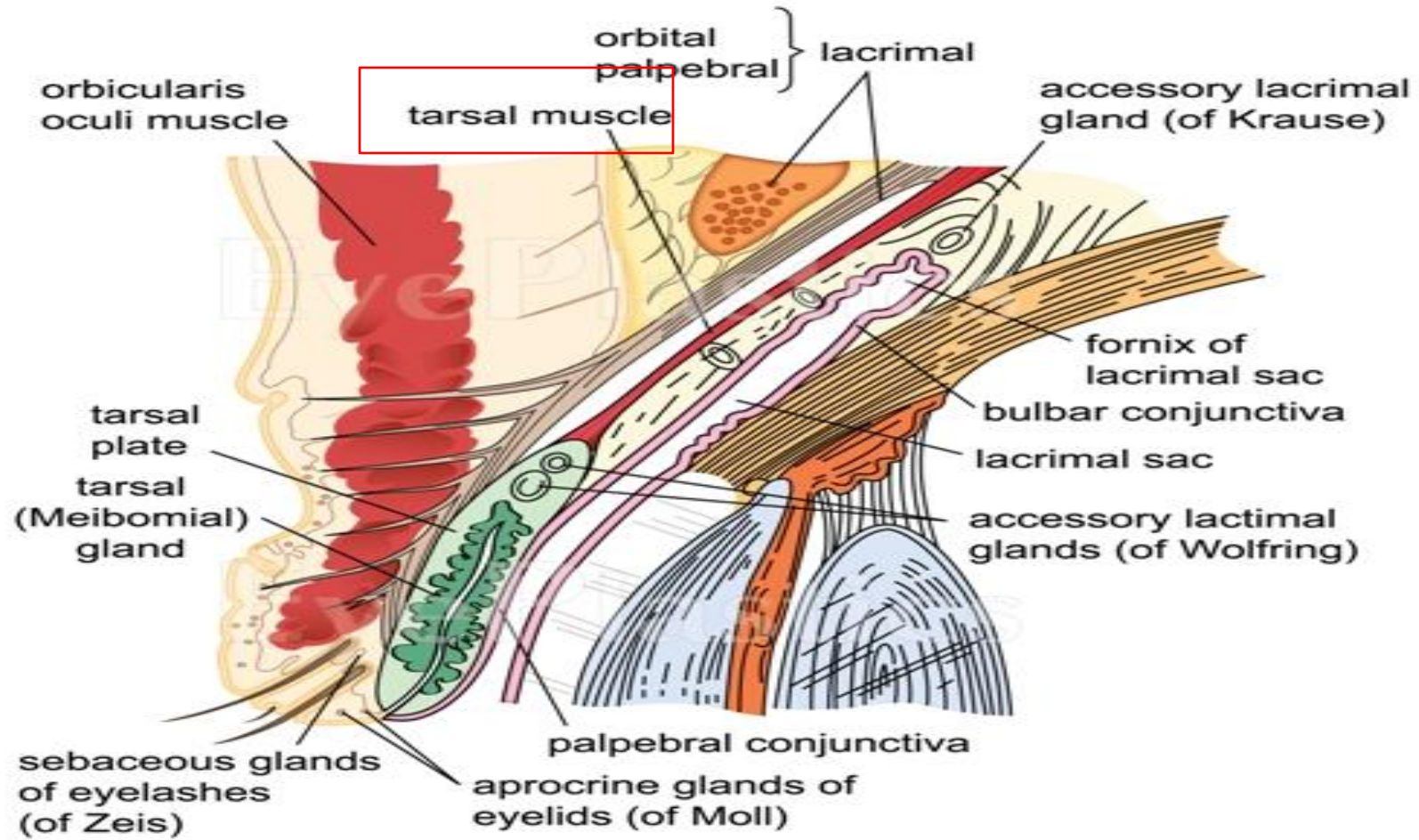


Medial and lateral palpebral ligaments in coronal section

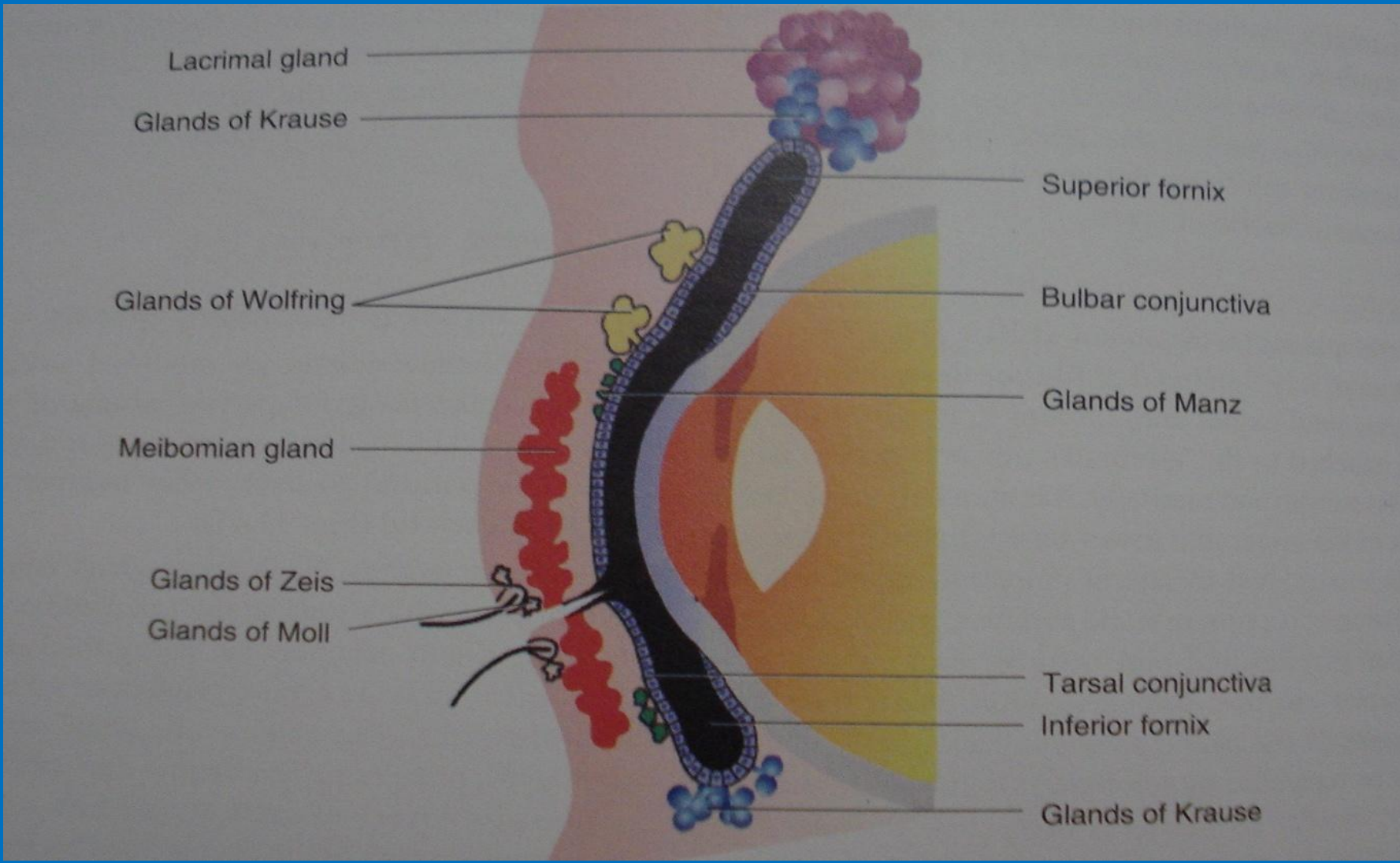
# Lateral palpebral ligament

- Thin band
- Lateral- Whitnall's tubercle
- Medially- lateral ends of upper & lower tarsi
- Anterior surface- lat.palpebral raphe
- Posterior surface- check ligament of LR
- Upper border- lateral expansion of LPS aponeurosis
- Lower border- lateral expansion of IO ,IR

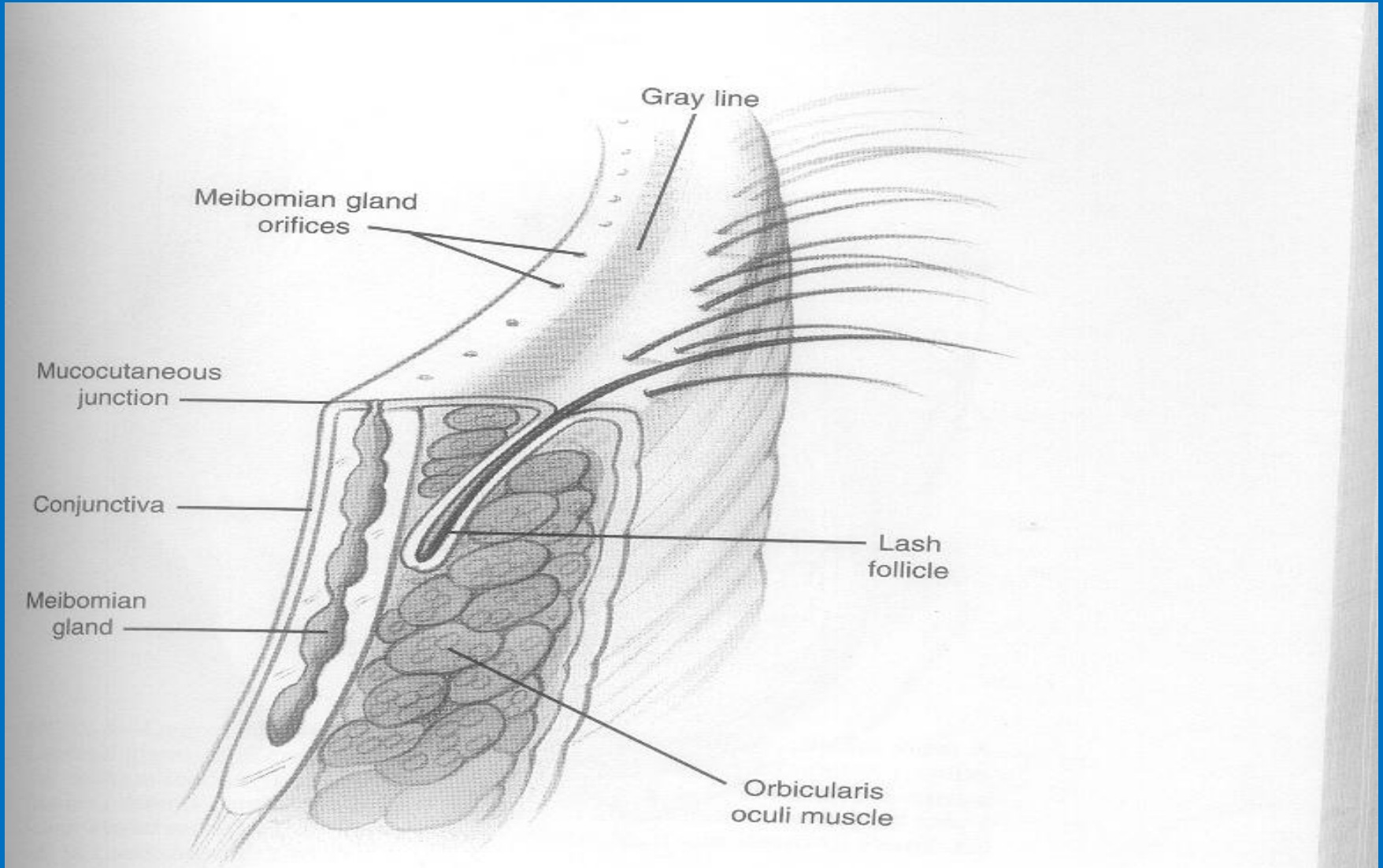
# Layer of non striated muscle fiber



# Glands of Eyelids



# Tarsal (meibomian) glands



# GLANDS OF ZEIS

- Modified sebaceous glands
- 2 glands are attached directly to eyelash follicle
- Single cul-de-sac or 2-3 lobules only
- Secretion
  - Sebum, prevents lashes becoming dry
  - Oily layer of tear film

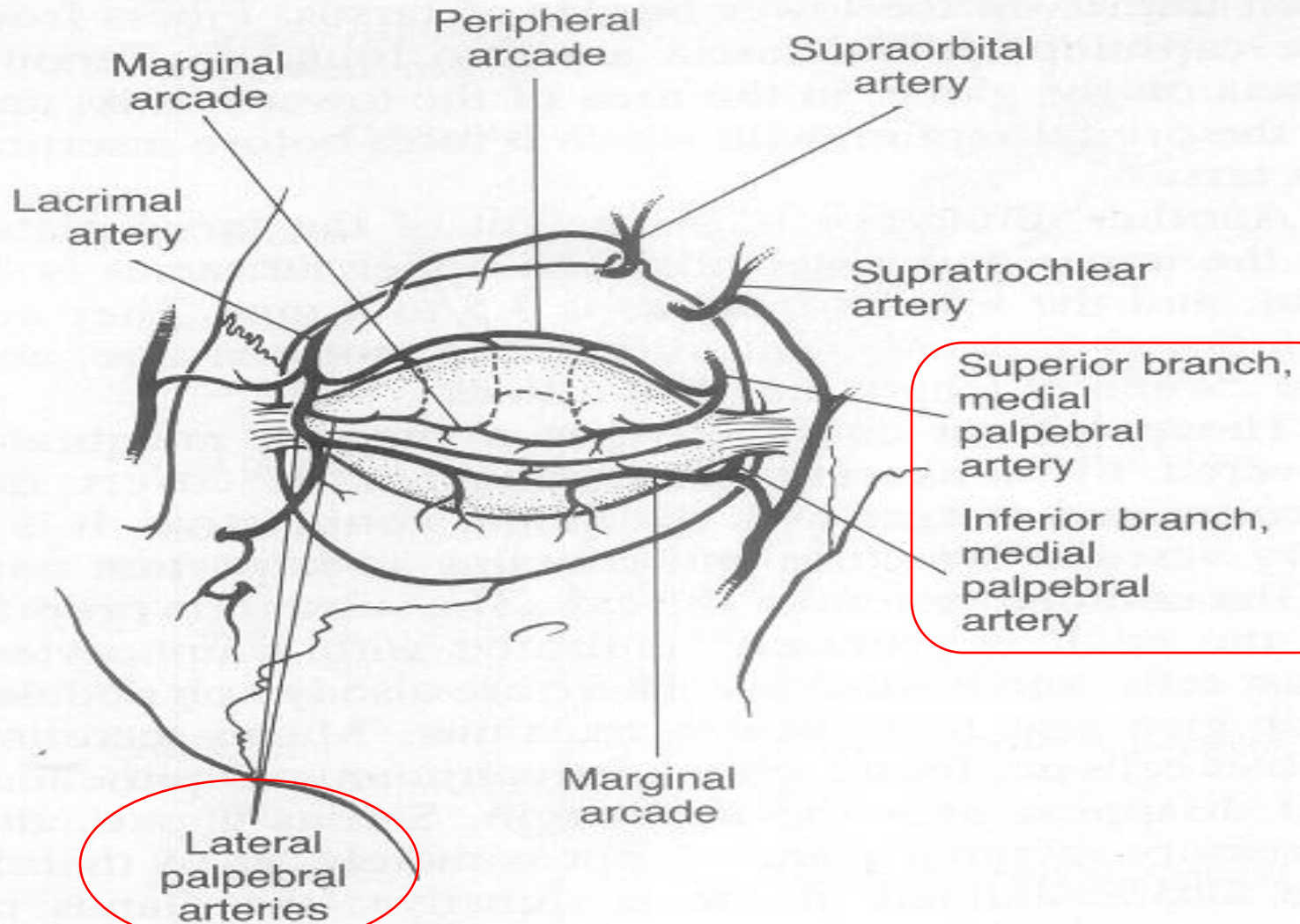
# GLANDS OF MOLL

- Modified sweat gland, lies b/w the cilia
- More in the lower eyelid than the upper
- **Gross structure**
  - Un branched spiral shape
  - Fundus, body, ampullary portion & neck
  - Duct of the gland passes through dermis, epidermis and may terminate
    - Separately between the two lashes
    - b/w the lash and its epithelial covering
    - Into the ducts of zeis gland

# Vessels & nerves of eyelids



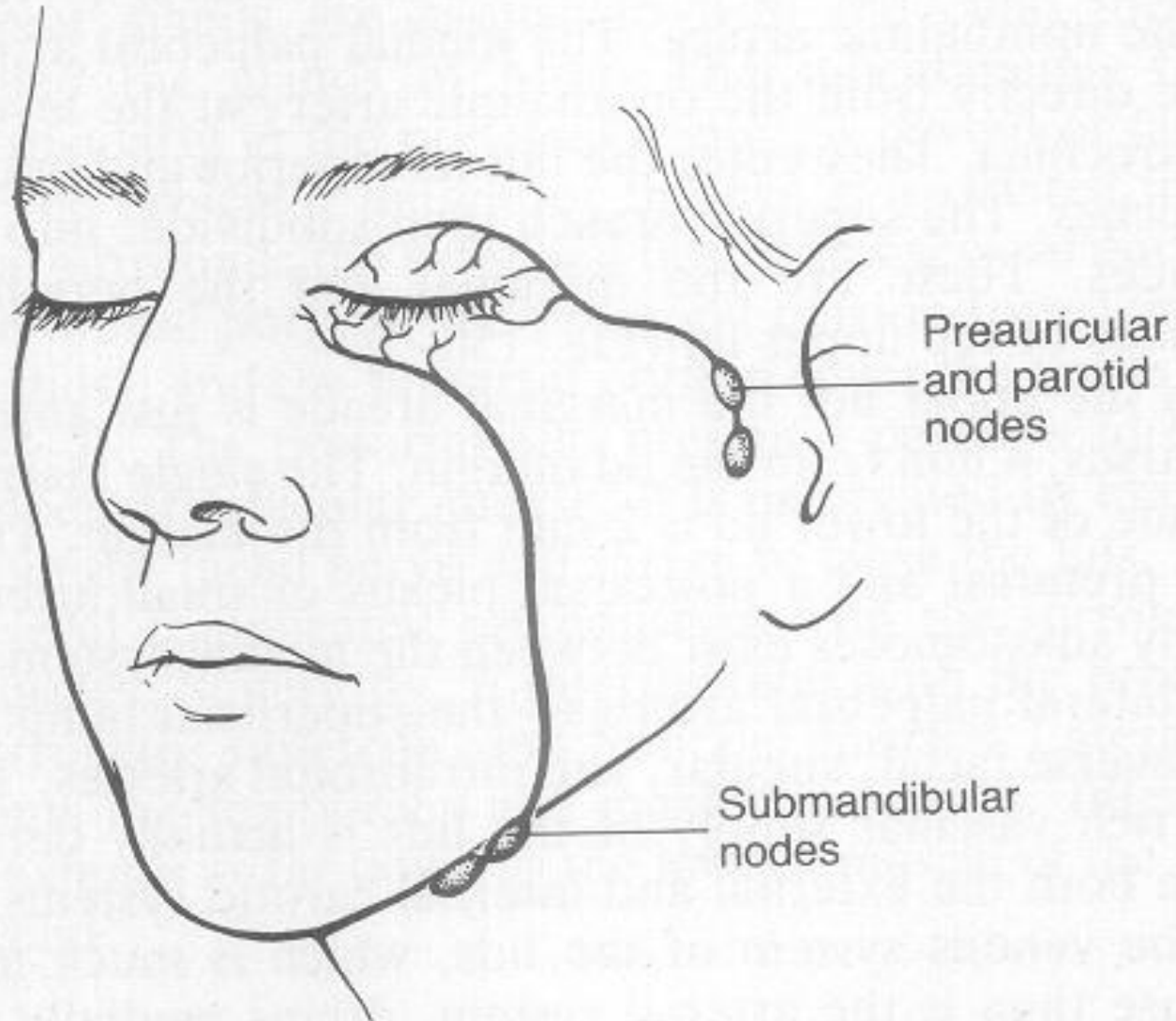
# ARTERIAL SUPPLY



# VENOUS DRAINAGE

- Larger & more numerous than the arteries
- **Pretarsal Venous Plexus**
  - Superficial to the tarsus
  - Angular vein– Internal jugular vein
  - sup. temporal, lacrimal vein - External jugular vein
- **Post-tarsal venous plexus**
  - Structures posterior to tarsal plate
  - Ophthalmic veins

# LYMPHATIC DRAINAGE



## 2 deep medial channels drain

- ✓ the conjunctiva of the medial 2/3 of the lower lid
- ✓ caruncle

 Deep sub mandibular LN

## Lateral group- Superficial lateral trunk drains

- ✓ lateral  $\frac{3}{4}$  of upper lid
- ✓ lateral part of lower lid

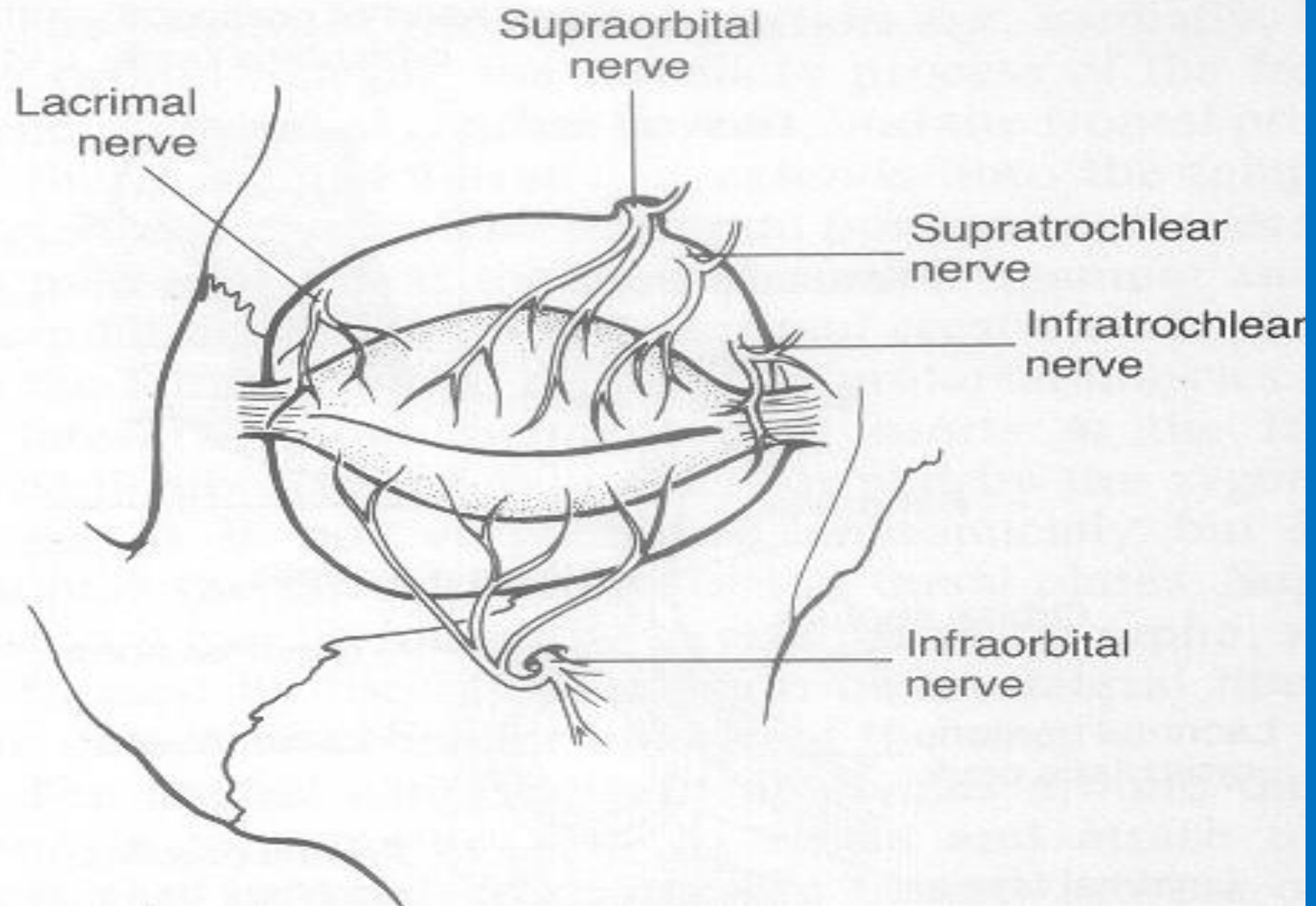
 Superficial parotid LN & Pre auricular LN

## Deep lateral trunk drains

- ✓ entire conjunctiva of UL
- ✓ conjunctiva of lateral third of LL

 Deep parotid LN

# NERVE SUPPLY



- Sympathetic nerves
  - Muller's muscle
  - Vessels and glands of skin
- Arrangement of the nerves
  - most of the nerves are arranged in sub muscular plane
  - injection of anaesthetic agents

# Physiology of eyelid movements

# Opening movements

## Upper Lid

- LPS muscle – primary elevator
- Fronatalis muscle – Accessory elevator
- Muller's muscle – Long term adjustment

## Lower Lid

- Elastic recoil of tissues
- Traction exerted by attachment of IR to IT
- Muller's muscle – Long term adjustment



# Eyelid excursion during opening movements

Upper eyelid raised 10 – 15 mm without frontalis action

When added additional 3-5 mm elevation

# B/L coordination & their basis

Opening movements are B/L symmetric- Direction  
Amplitude

Can be voluntarily inhibited

Fine, gross, slow and fast movements

Yoke muscles (obey Hering's law)

In U/L weakness, other eye may be retracted

# Tone of LPS

- Directly related to tone of EOM
- In upward gaze, tone increases in both SR and LPS in concert



Elevation of visual axis

&

Elevation & Retraction of UL

# Reciprocal innervation pattern

- Exists between LPS and Orbicularis Oculi
- LPS receives maximal innervation during opening & Orbicularis Oculi receives min innervation & vice versa (Sherrington's law)

- **Blink rate**

- Normal blink rate varies 12-20/min
- Varies with alertness, activity & environmental factors
- Increases with
  - Extremely dry conditions
  - Strong air currents
  - Emotion situations such as surprise, anger & fight

- Decreases with visual observation, voluntarily inhibited

- Complete blink 9 - 12 mm

- Incomplete blink 4 – 5 mm

# Dynamics of opening

- Opening of UL & LL begins in phase
- LL opening much slower due to lack of direct muscle pull
- UL moves upward, while LL moves laterally
- Overshoot followed by recovery is frequently seen
- Voluntary efforts at great visual attention results in widening by 2 mm

# Closing movements

- Orbicularis muscle – 3 diff functional units
- Spontaneous blinking & tactile corneal reflex Pretarsal
- Voluntary blinking and sustained activity - Preseptal and Pretarsal
- Forceful closure – pretarsal, preseptal and orbital fibres

# Upper eyelid versus lower eyelid during closing

- UL moves downwards while LL moves medially
- Rate of movement similar b/w the two lids
- Lower lid movement is 10 – 20 m sec earlier
- Gravity - no role
- UL voluntary closing has a varying speed(max 14 cm/s)
- Small blinks -slowest while complete blinks -rapid



# Peering

- Act of looking at some object with great interest
- Degree of eye movements constant
- UL moves down by 2.5 mm, LL moves both down (2.5 mm) & medially (1mm)
- Similar to closing movement, the LL begins some 200 ms before UL
- Relaxation of peering, entails decreased tone of Orbicularis  
and a slow return of 2 lids to their normal position

# Blinking

- Co-ordinated opening and closing of lids
- Complete or incomplete
- Complete blink – both UL & LL meet for atleast half of length of their ciliary part
- Voluntary
- Involuntary
  - Spontaneous
  - Reflex

# Spontaneous blinking

- Without any obvious external stimulus or voluntary willed efforts
- At frequent intervals, also in blind – no retinal stimuli
- No or very infrequent in first few months
- Zipper like fashion - displaces tear towards puncta
- Functions
  - Reform and redistribute tear film
  - Protection against desiccation, Flying missiles or trauma
  - Perception – information processing procedure of brain
  - Rest – EOM – momentary upturning

# Reflex blinking

- Co-ordinated closing and opening movement of lids which occur reflexly in response to some direct stimulus
  - Tactile reflex blinking
  - Optical reflex blinking
  - Auditory reflex blinking
  - Stretch type stimulus

# Voluntary blinking & winking

- Co-ordinated closure & opening- both eyes
- One eye- winking
- Simultaneous contraction of palpebral & orbital portions of orbicularis
- Rate & degree of closure & opening can be varied as per will
- Voluntary maximal closure – 20 sec
- Maximal forceful closure : 50 – 70 mm Hg

# Blephrospasm

- Involuntary sustained and forceful closure
- Entails all portion of orbicularis oculi & eyebrow muscles
- Tonic – lids locked shut for a period of time
- Clonic – rapid fluttering of the lids
- **Essential** –
  - rare idiopathic, 45-65 yrs,
  - no apparent cause, no connection with visual system
  - Less apparent during heightened attention

- Reflex blephrospasm

- Reflex sensory stimulation – 5<sup>th</sup> nerve branches
- Keratitis, foreign body, corneal ulcers and iridocyclitis
- Dazzling light, stimulation of facial nerve and hysteresis

Prolonged blephrospasm-

persistent epiphora

lid oedema

visual disability is incapacitating

Treatment

Botulinum injection

Facial denervation

removal of the cause

# Bell's phenomenon

- Highly coordinated reflex b/w facial and oculomotor nuclei
- On closure, eyeball rolls upward & outward
- Protective mechanism
- Not present in 10% of normal population
- **Inverse bell's phenomenon**- globe rotates downward and outwards on attempted closure
- When inverse bell's associated with lagophthalmos – severe corneal drying and ulceration may result