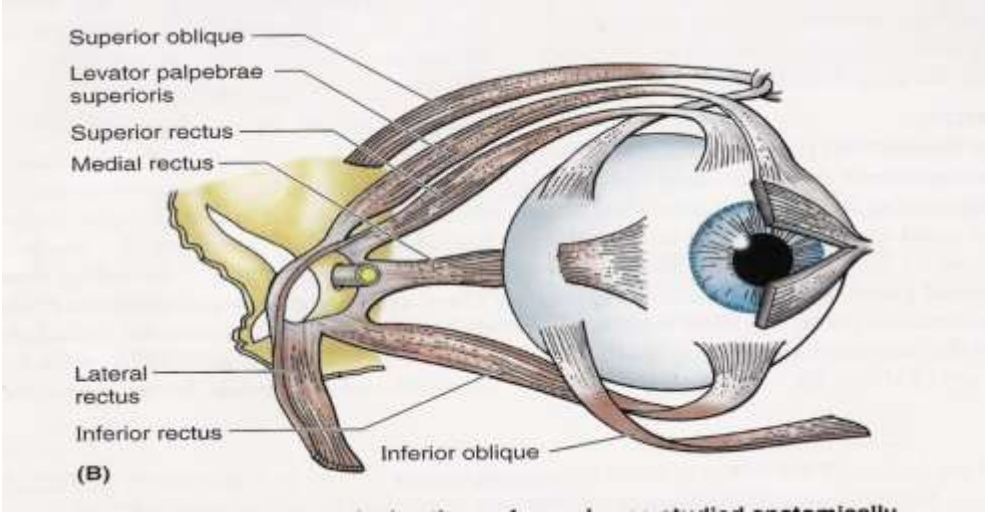
ANATOMY OF EYE



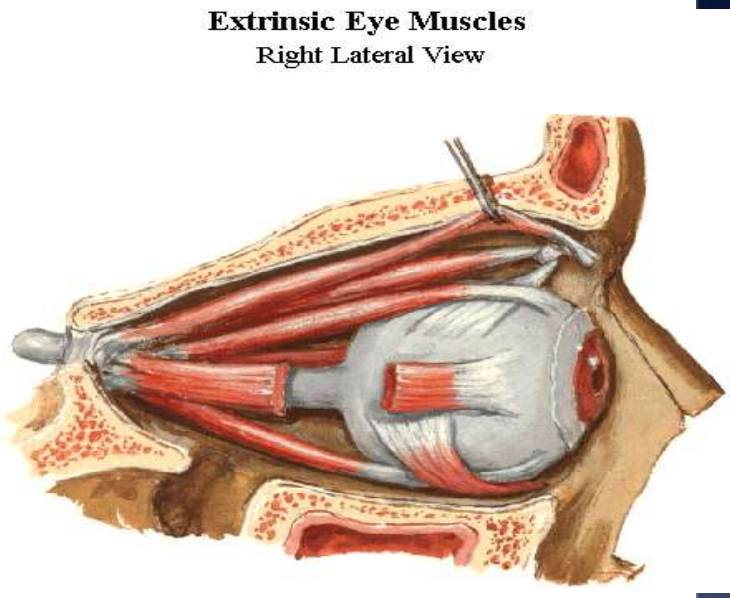
BY
Dr. Rajeev Mukhia
Associate Professor

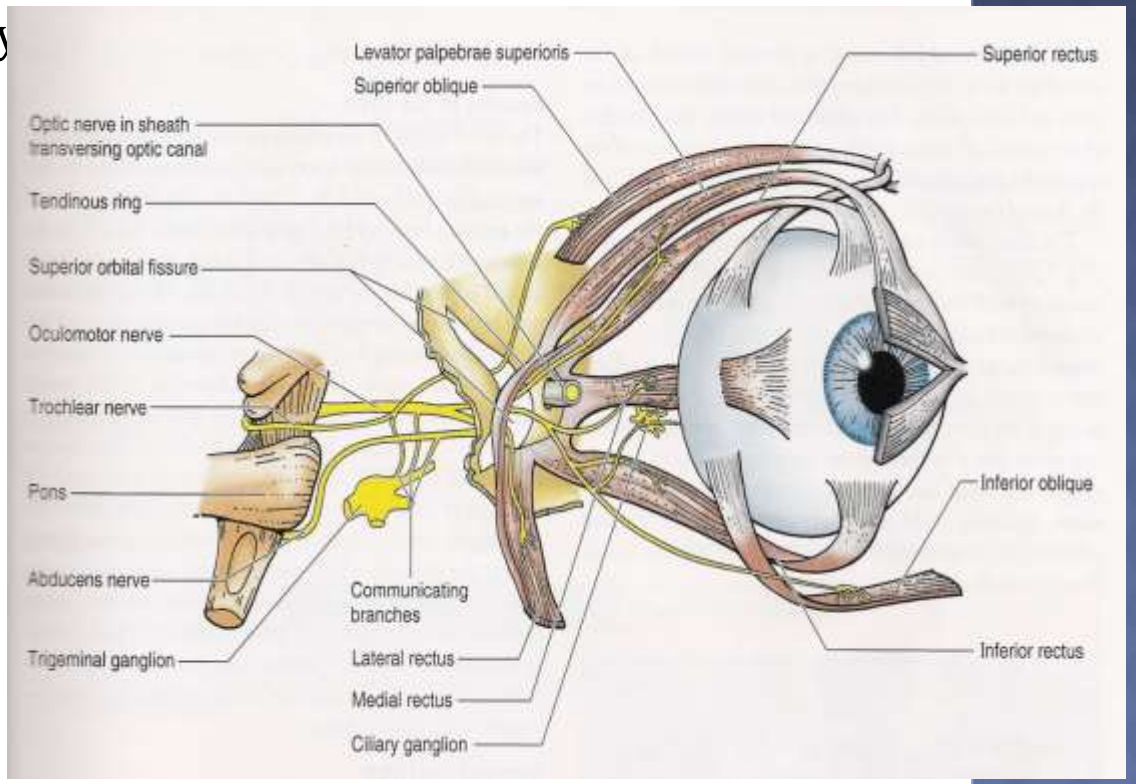
ORBIT

- The orbits are Pyramidal shaped bony cavities in the facial skeleton.
- Features
- Apex- is behind, directed towards the optic canal
- Base- orbital margin(F,Z,M)
- Roof – orbital plate of frontal bone, lesser wing of sphenoid bone.
- Floor – orbital surface of maxilla, zygomatic bone.
- Lateral wall(thickest)- zygomatic, greater wing of sphenoid.
- Medial wall(thinnest)- maxilla, lacrimal bone, plate of ethmoid bone.

CONTENTS

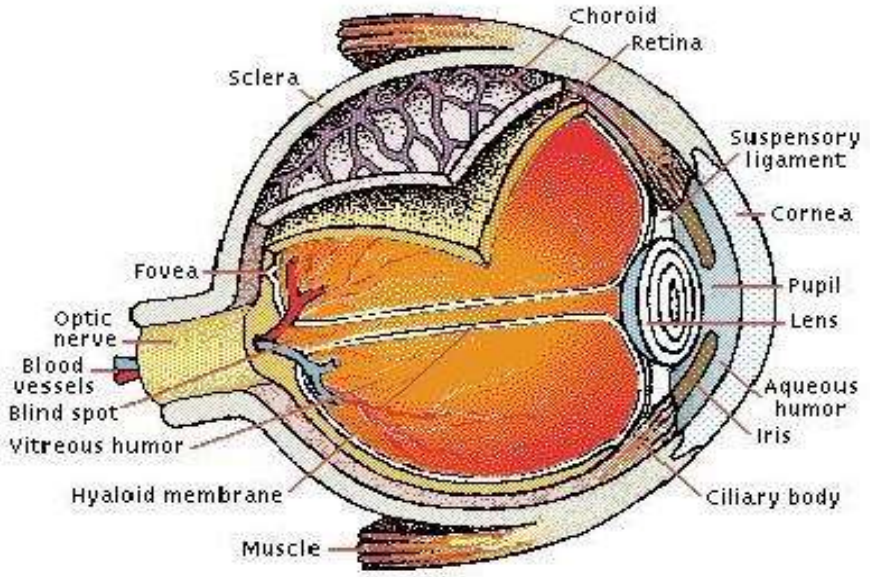
- Eye ball
- Muscles
- Nerves – 2,3,4,6
- Vessels – ophthalmic artery
- Lacrimal gland
- Orbital fat



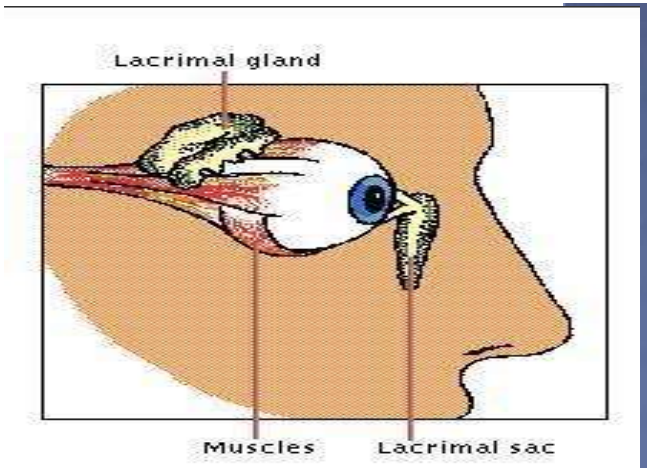


EYE

- The Eye is the organ of vision
- Located in the orbit.



- Composed of :
  1. The Eyeball.
  2. The Adnexa.



TERMINOLOGY OF THE EYE

- **Cornea** : the transparent part of the eyeball.
- **Sclera:** the opaque posterior part of the eyeball
- **Anterior pole**: the highest point on anterior surface of cornea .
- **Posterior pole** : the highest point on posterior surface of cornea.
- **Optic axis**: the straight line passing through both poles.
- **Equato**r :an imaginary line about the eyeball, which is the equidistant from the poles.
- **Limbus** – sclerocorneal junction.

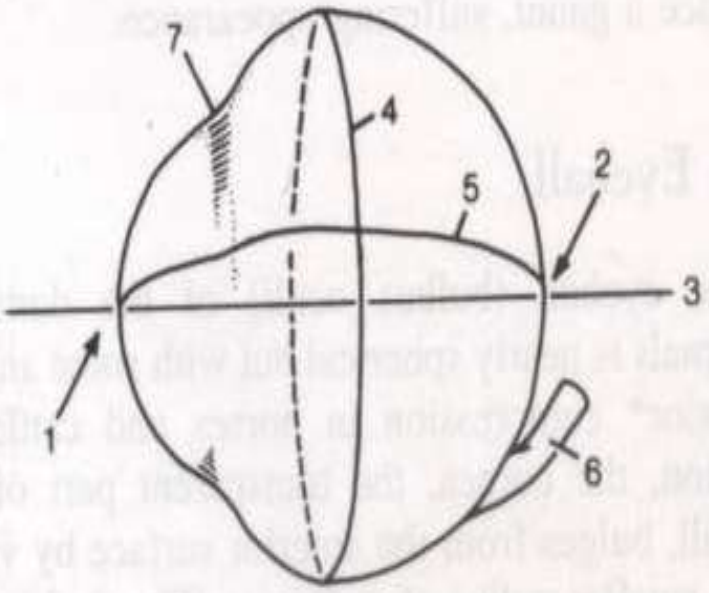


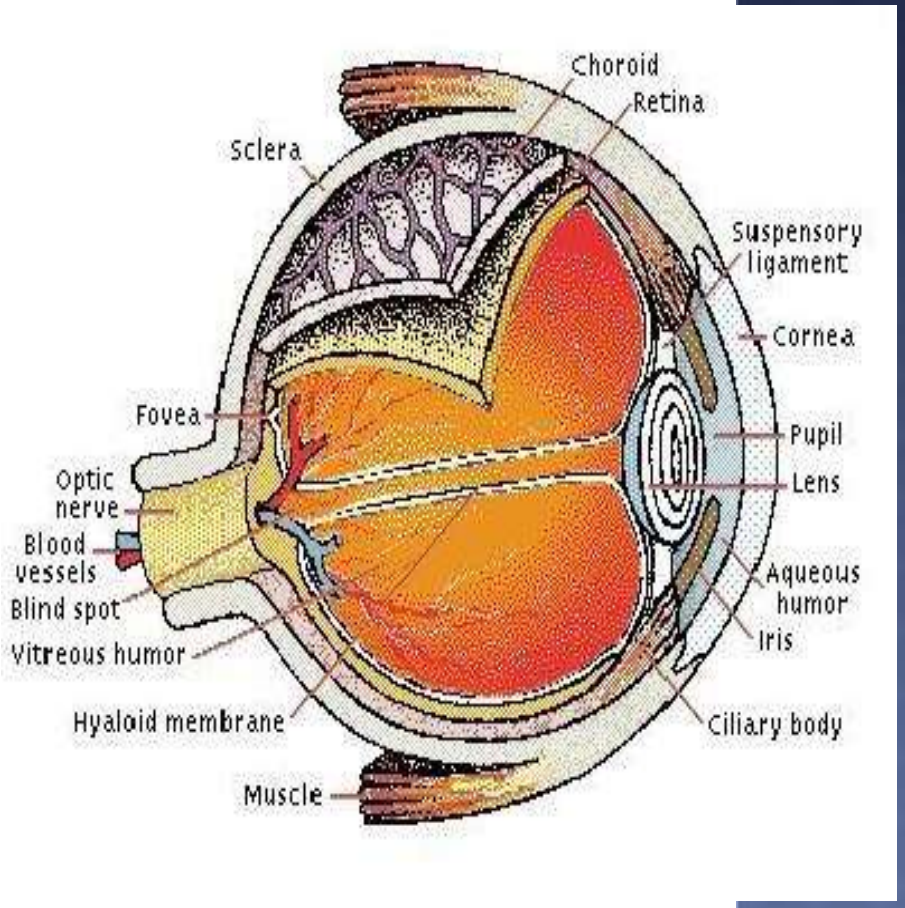
FIGURE -2. Medial view of right eyeball.

1, Anterior pole; 2, posterior pole; 3, optic axis; 4, equator; 5, a meridian; 6, optic nerve; 7, limbus.

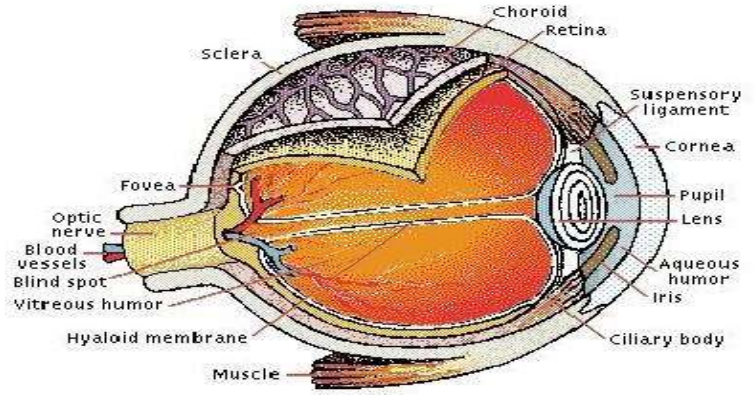
EYEBALL

- The eyeball is the organ of sight. The camera closely resembles the eyeball in its structure.
- It is almost spherical in shape and has a diameter of 2.5 cm.
- Light entering the eyeball passes through several refracting media.

- From before backward these are the cornea, aqueous humor, lens, and the vitreous body.



EYEBALL



The three tunics and their functions are:

- It is made up of 3 concentric coats.
- Outer or fibrous coat/tunic - sclera and cornea.
- Middle or vascular coat/tunic (uveal tract) – choroid, ciliary body and iris.
- Inner or nervous coat/tunic – retina.

I. **An external fibrous tunic:** that consist of fibrous tissue that maintains the shape of the eyeball and also protects the eyeball.

II. **A middle vascular tunic:** that consist of blood vessels and smooth muscle.

Also concerned with the nutrition of the eyeball and the regulation of the shape of the lens and size of pupil.

III. **An internal nervous tunic:** that consists largely of nervous tissue

- concerned with vision and translation of visual stimuli into nerve impulses for interpretation by the brain.

THE FIBROUS TUNIC

- It consists of the **sclera** and the **cornea.**

The sclera is the opaque posterior part of the eyeball and consists of a dense fibrous tissue which is firm.

It forms about 5/6th of the eyeball.

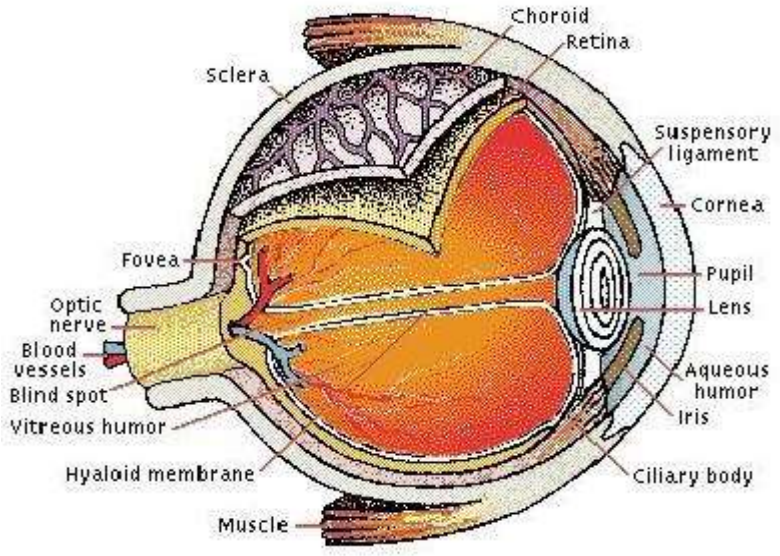
It is generally white but in some species it contain pigment cells.

The sclera is continuous anteriorly with the cornea at the sclerocorneal junction or the limbus and fuses posteriorly with the dural sheath of the optic nerve.

The cornea is transparent.

It forms the anterior 1/6th of the eyeball.

- It is separated from the iris by a space called the anterior chamber of the eye.
- The cornea doesn't contain blood vessels; and is nourished by the lymph which circulates in the numerous corneal spaces.



MIDDLE COAT \ THE VASCULAR TUNIC (UVEA)

- Deep to the sclera, which it composed of three zones .

1) The choroids: lies on the sclera from the optic nerve to the limbus and contains a dense network of blood vessels embedded in heavily pigmented connective tissue .

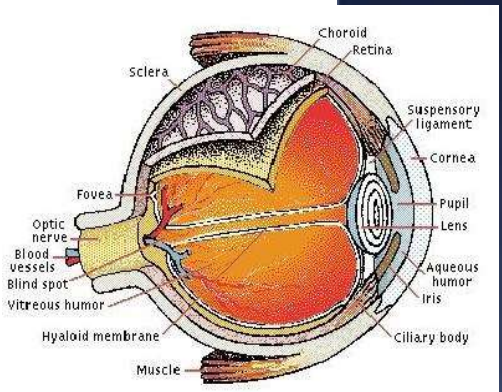
2) The ciliary body: it is a thickened part of the uveal tract lying just posterior to the limbus.

It is continuous anteriorly with the iris and posteriorly with the choroid.

It suspends the lens and helps it in accomodation for near vision.

3. The Iris: the smallest anterior part of the uveal tract, which extends from the cornea to the lens.

- It attached to sclera and ciliary body by pectinate ligament.
- It forms a circular curtain with an opening in the centre, called pupil. By adjusting the size of the pupil, it controls the amount of light entering the eye, and thus behaves like an adjustable diaphragm.



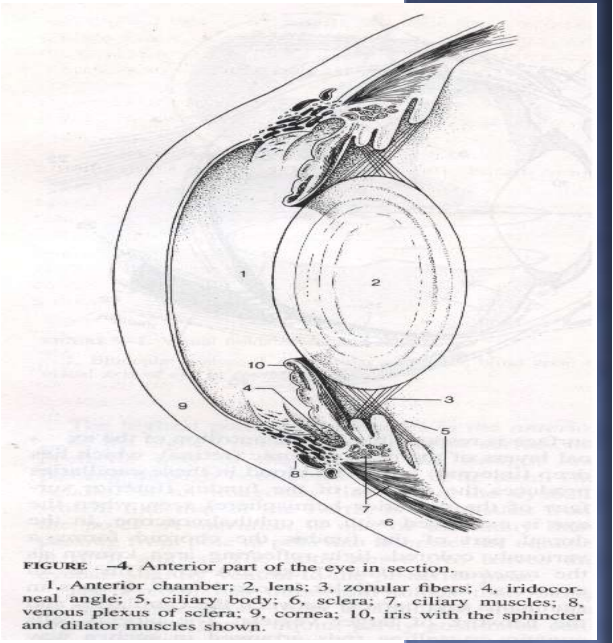


FIGURE –4. Anterior part of the eye in section.
1, Anterior chamber; 2, lens; 3, zonular fibers; 4, iridocorneal angle; 5, ciliary body; 6, sclera; 7, ciliary muscles; 8, venous plexus of sclera; 9, cornea; 10, iris with the sphincter and dilator muscles shown.

- The iris divided the space between the lens and cornea into anterior and posterior chambers that communicate through pupil and filled with, aqueous humor (a clear watery fluid).

INNER COAT\ THE INTERNAL TUNIC

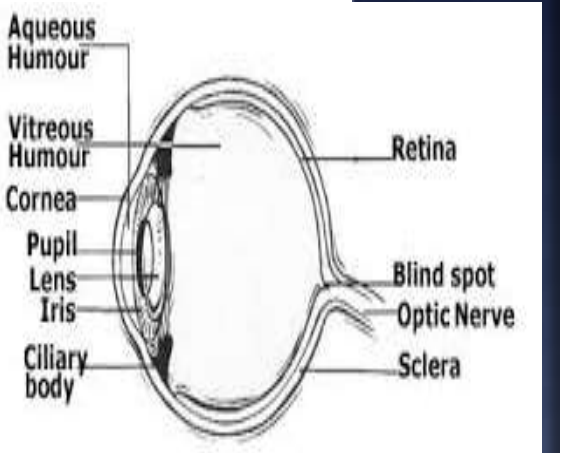
- It is thin, delicate inner layer of the eyeball contains the light-sensitive receptor cells known as retina.

The rods and cones are the light receptors of the eye.

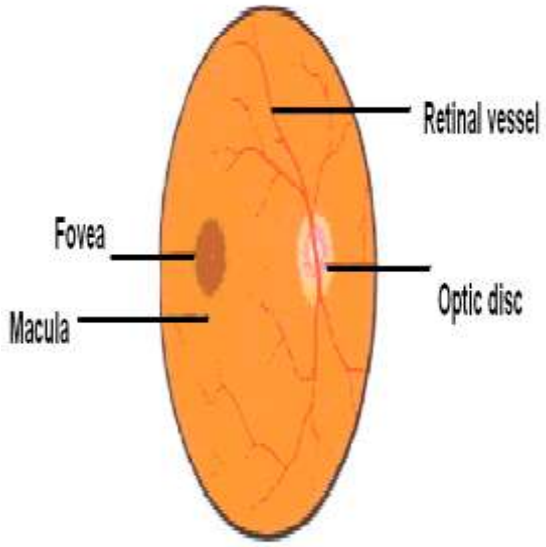
The periphery of the retina contains the rods only.

Rods are concerned with dim light and black and white vision (Scotopic vision).

Total no of rods in each retina is about 120 million.

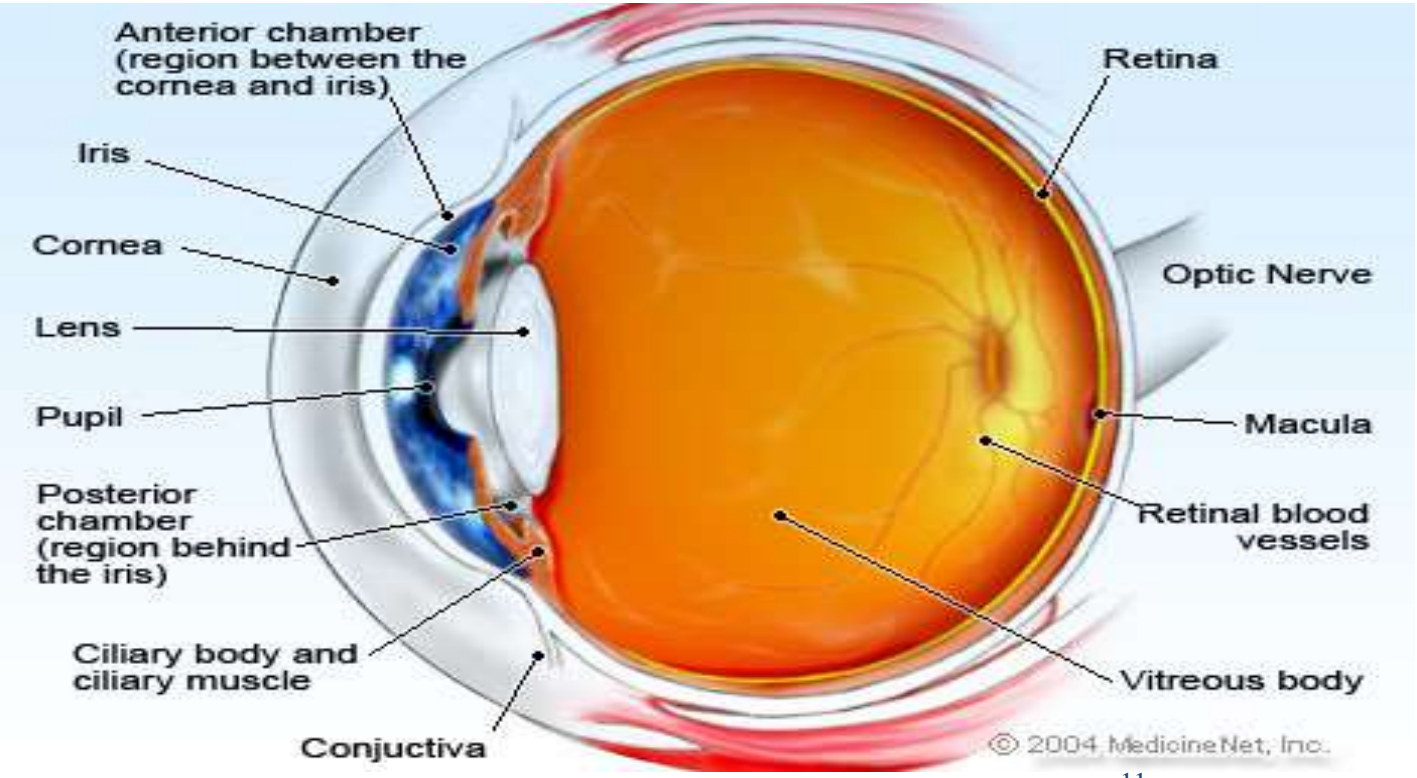


- Opposite the entrance of the optic nerve, there is a circular area know as optic disc. It is 1.5 mm in diameter.
- The depressed area of the optic disc is called physiological cup and it contains neither rods nor cones & is therefore insensitive to light.
- 3 mm lateral to the optic disc another depresion is there called macula. It is avascular and centre of the macula is further depressed to called fovea centralis which contains cones only.
- The cones collect information only from bright light and colour vision (photopic vision).
- Total no of cones in each eye is about 7 million.



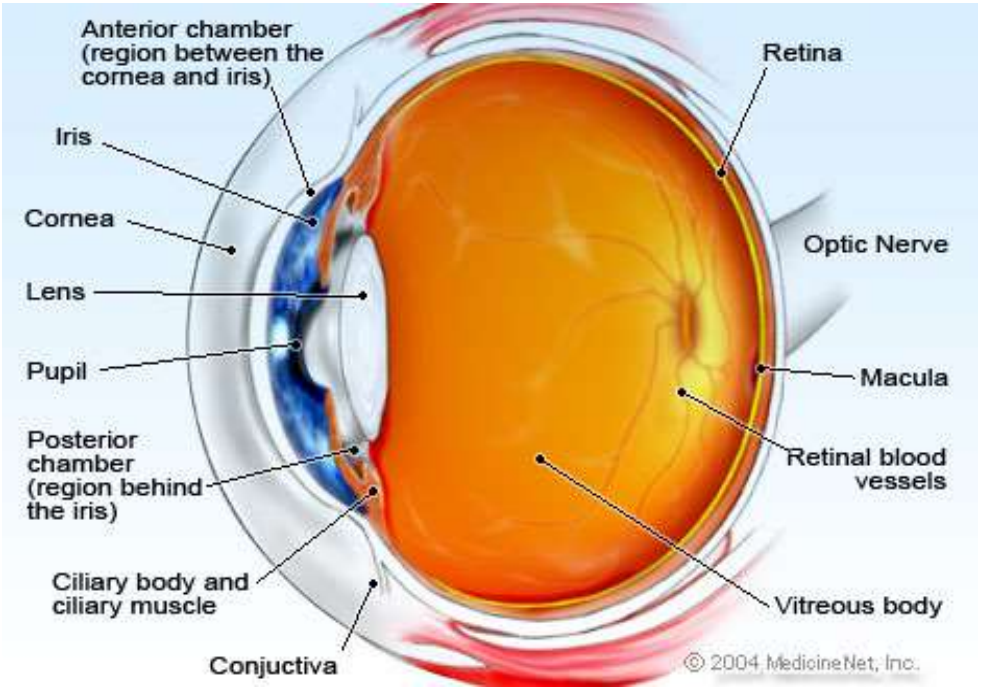
AQUEOUS HUMOUR

- This is a clear watery fluid which fills the space between the cornea in front and the lens..
- The space is divided by the iris into anterior and posterior chambers which freely communicate with each other through the pupil.



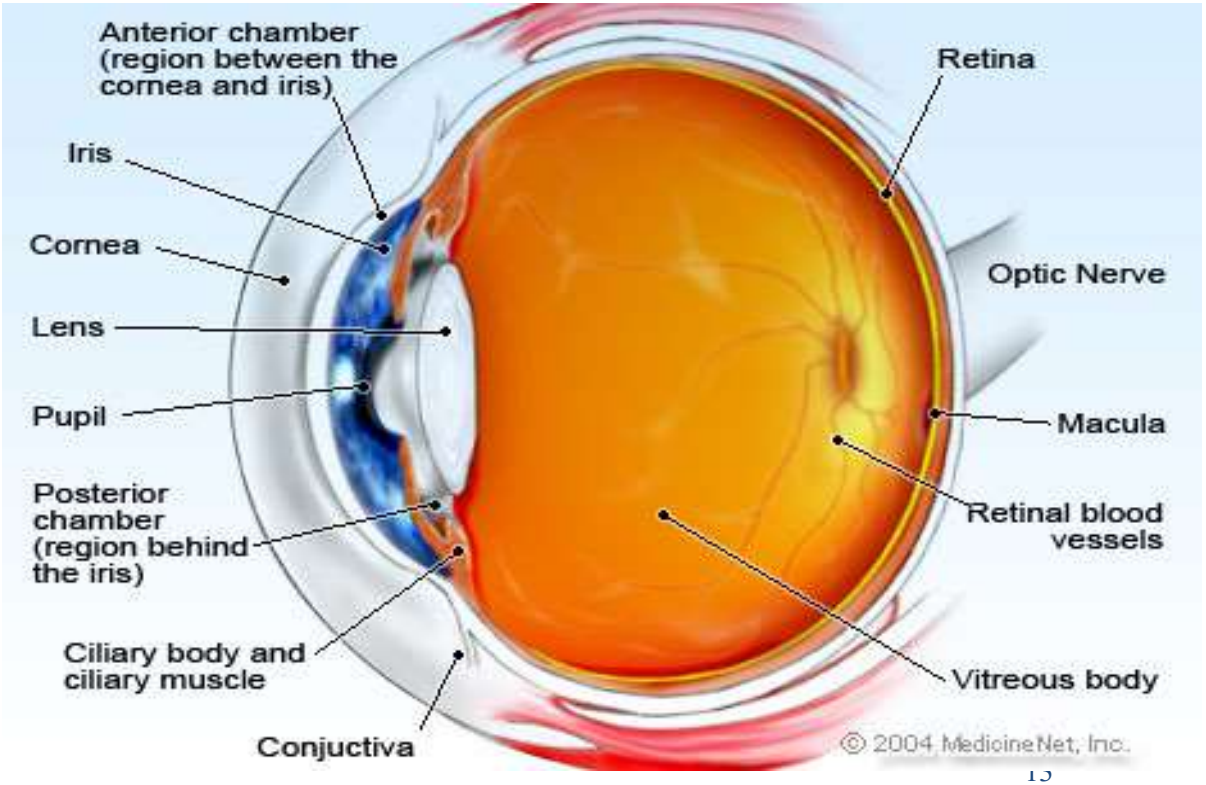
LENS

- The lens is a transparent biconvex structure which is placed between the anterior and posterior segments of the eye.
- It is circular in outline and has a diameter of 1 cm.



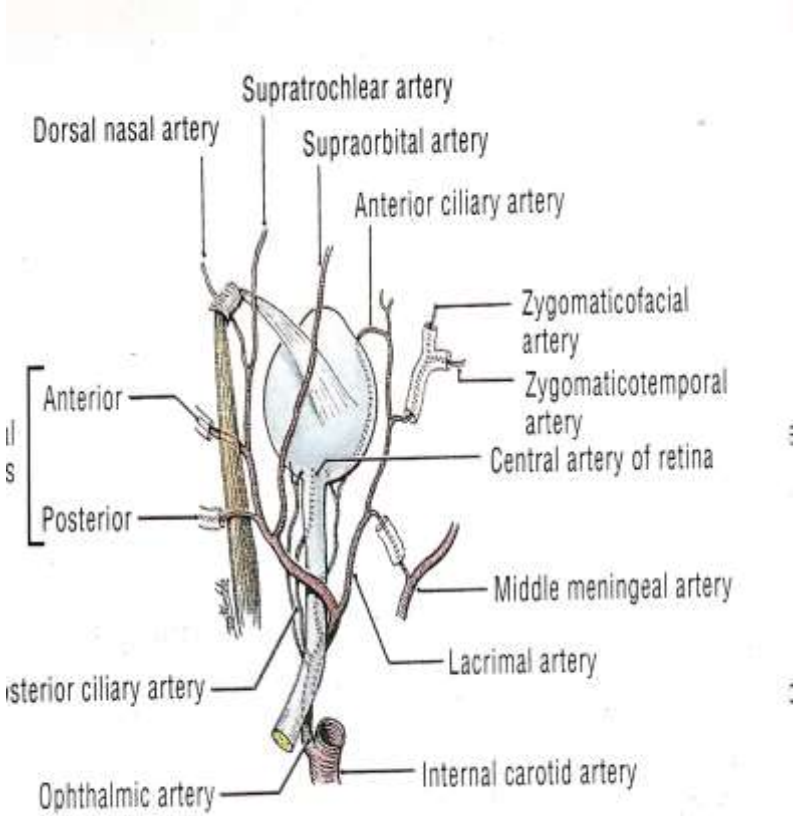
VITREOUS BODY

- It is a colourless, jelly-like transparent mass which fills the posterior segment of the eyeball.
- It is enclosed in a delicate homogenous hyaloid membrane.



✞ THE BLOOD SUPPLY OF THE EYE:

- Ophthalmic artery carries the principle supply of the blood to the eye.



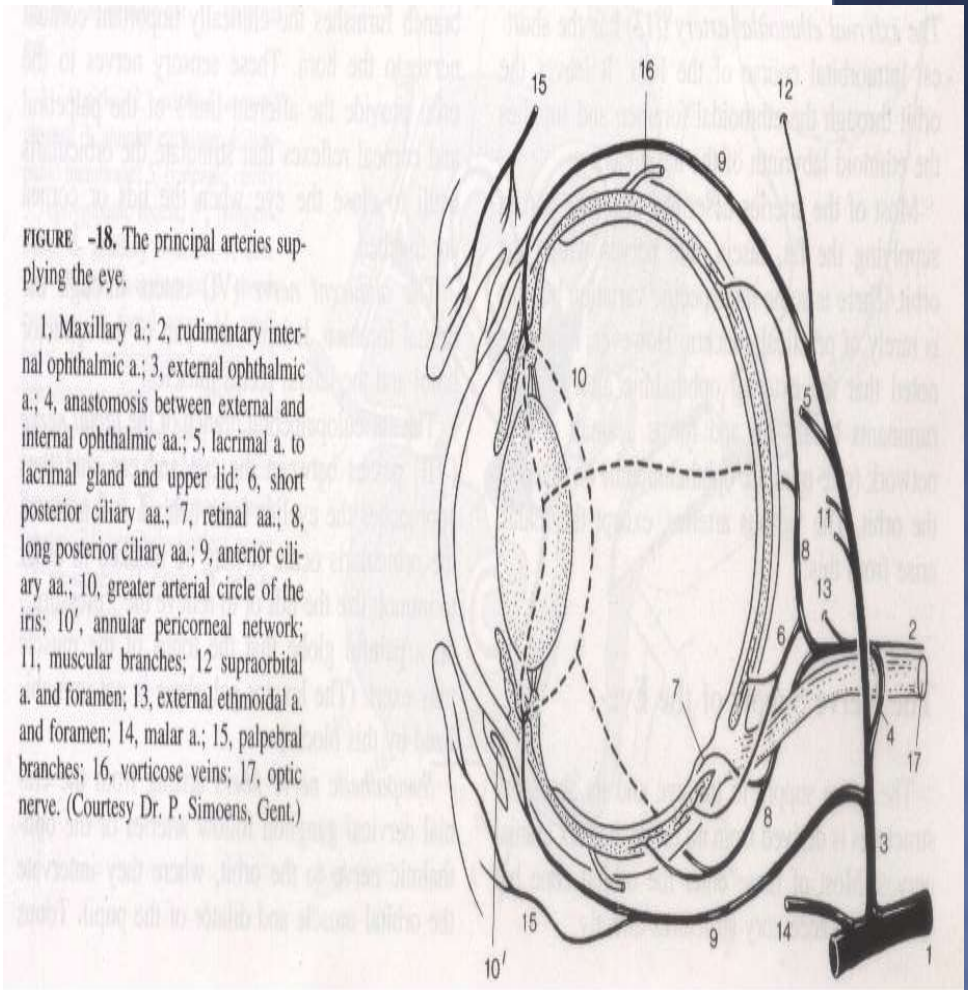


FIGURE -18. The principal arteries supplying the eye.

1, Maxillary a.; 2, rudimentary internal ophthalmic a.; 3, external ophthalmic a.; 4, anastomosis between external and internal ophthalmic aa.; 5, lacrimal a. to lacrimal gland and upper lid; 6, short posterior ciliary aa.; 7, retinal aa.; 8, long posterior ciliary aa.; 9, anterior ciliary aa.; 10, greater arterial circle of the iris; 10′, annular pericorneal network; 11, muscular branches; 12 supraorbital a. and foramen; 13, external ethmoidal a. and foramen; 14, malar a.; 15, palpebral branches; 16, vorticose veins; 17, optic nerve. (Courtesy Dr. P. Simoens, Gent.)

✞ THE NERVE SUPPLY OF THE EYE:

- **The optic nerve II:** enters the orbit through the optic foramen and passes to the light receptor cells in the retina.
- **The Oculomoter nerve III:** control the movement of the eyeball.
- **The abducent nerve VI:** innervates lateral rectus muscle.
- **The trochlear nerve IV:** innervate superior oblique muscle.
- **The trigeminal nerve V:** send branches to the eye, and supplies eyelids and conjunctiva.

APPLIED ANATOMY

- Lesion in retina leads to scotoma, ie, at certain points there may become blind spots.
- Optic nerve damage results in complete blindness of that eye.
- Complete destruction of optic tract, LGB, optic radiation, and visual cortex of one side results in loss of the opposite half of field of vision.
- Optic neuritis – lesion of optic nerve that results in decrease of visual acuity.

EXTRAOCCULAR MUSCLES

- **7 VOLUNTARY MUSCLES**

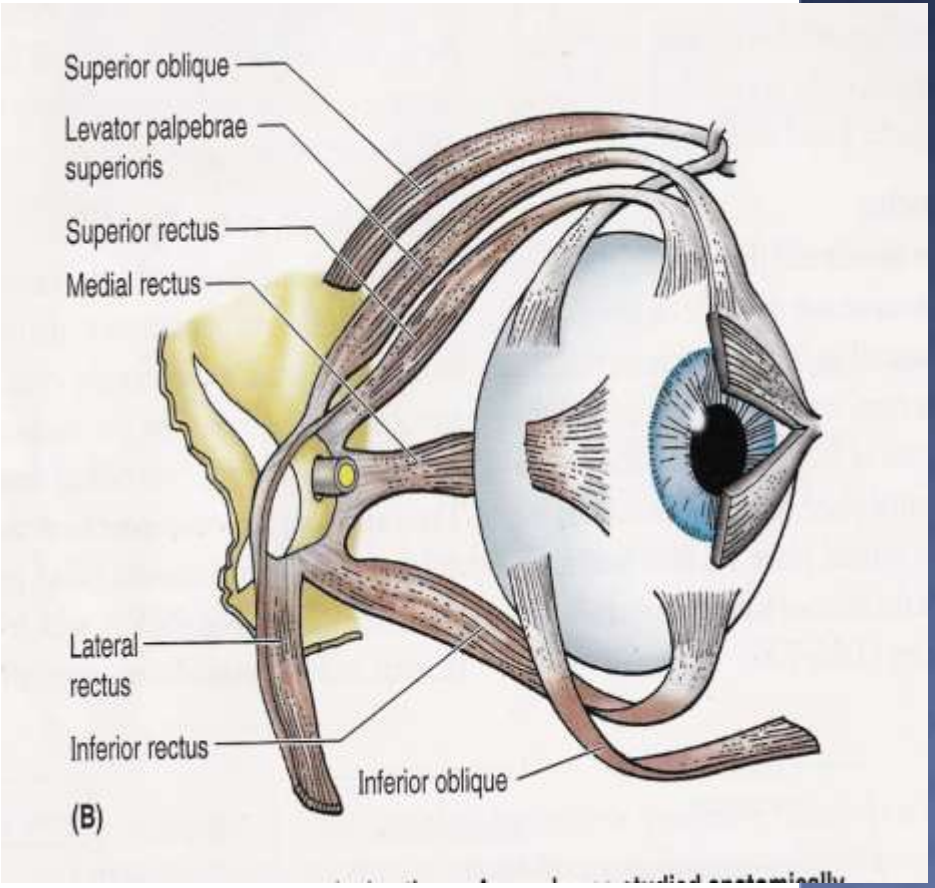
4 Recti

2 Oblique

1 Levator palpaberal superioris

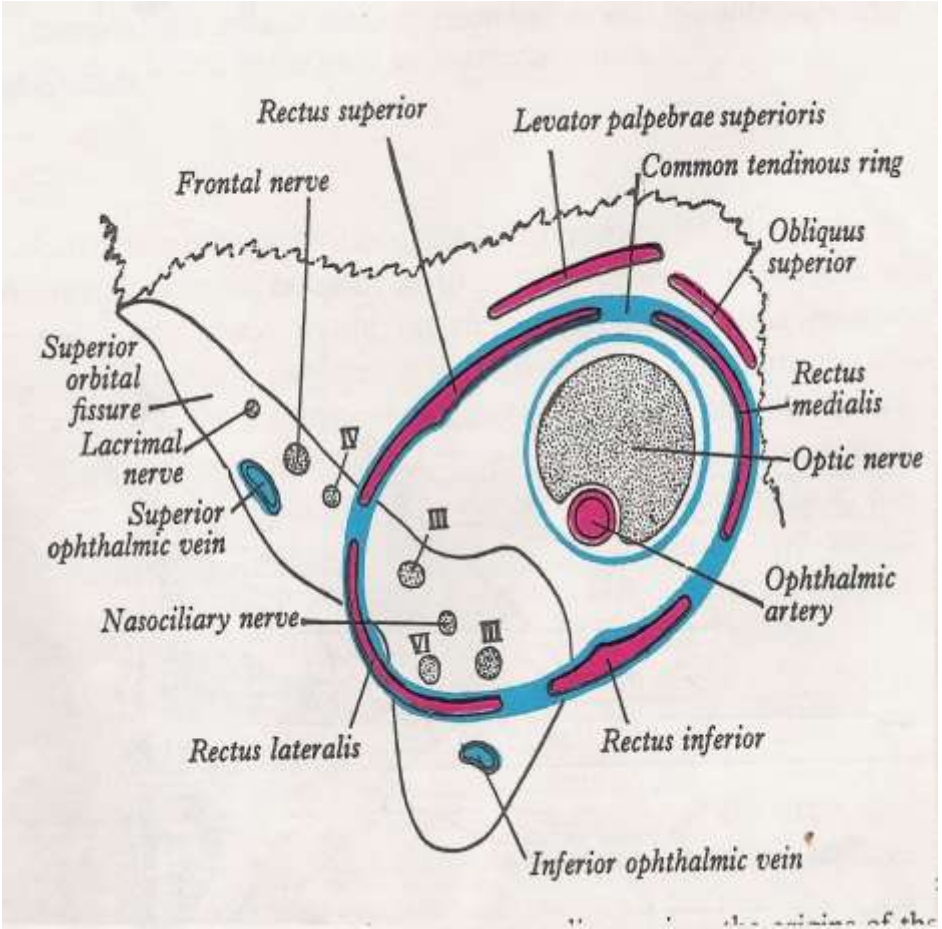
- **3 INVOUNTARY MUSCLES**

1. Superior tarsal
2. Inferior tarsal
3. Orbitalis



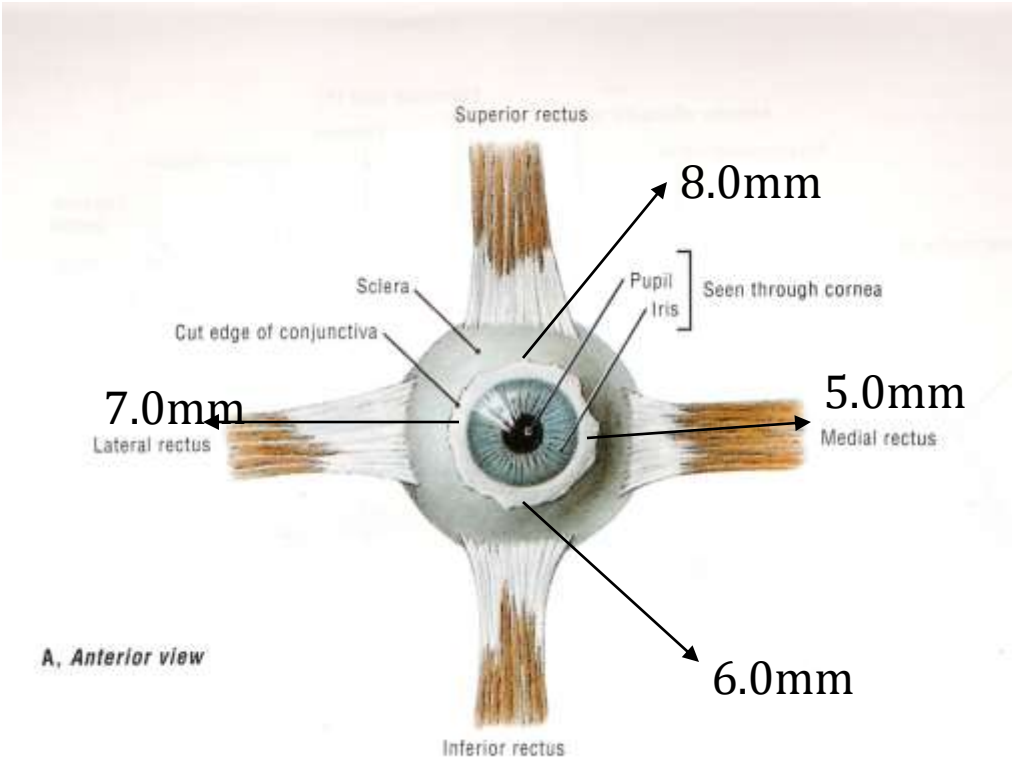
ORIGINS OF RECTI MUSCLES

The recti muscles arises from the respective positions of a commom tendinous ring. The ring is attached to the orbital surface of the apex of orbit.



INSERTIONS OF RECTI

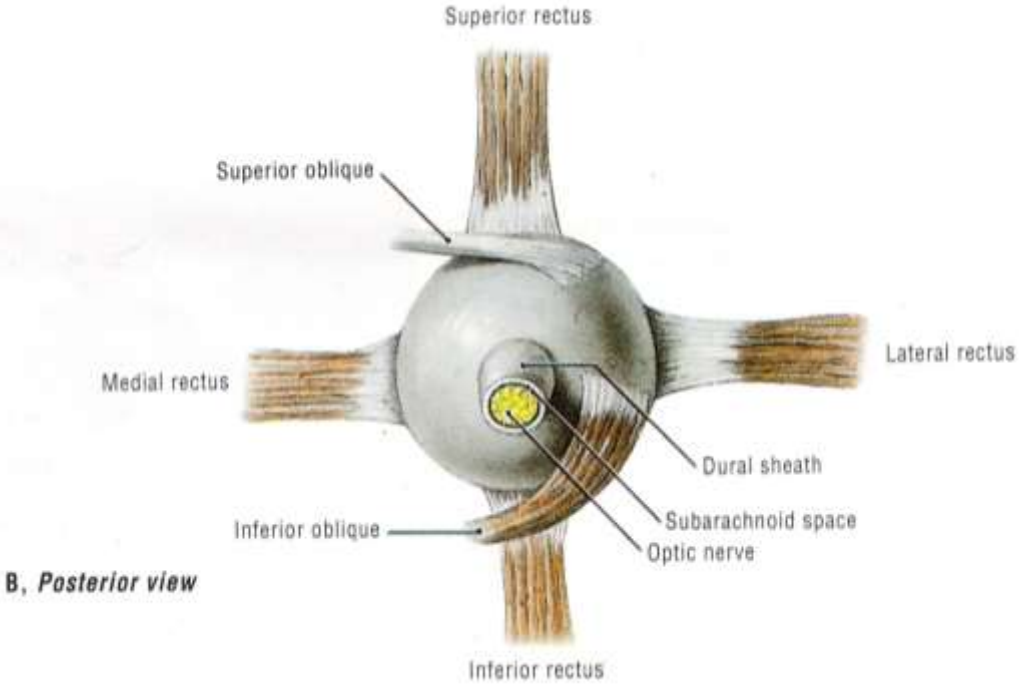
The recti are inserted into the sclera, a little posterior to the sclero corneal junction. The approximately distance of the insertion is shown in figure.



ORIGIN AND INSERTIONS OF OBLIQUE

Superior oblique arises from body of sphenoid bone and inserted into posterior superior lateral quadrent of sclera of the eyeball.

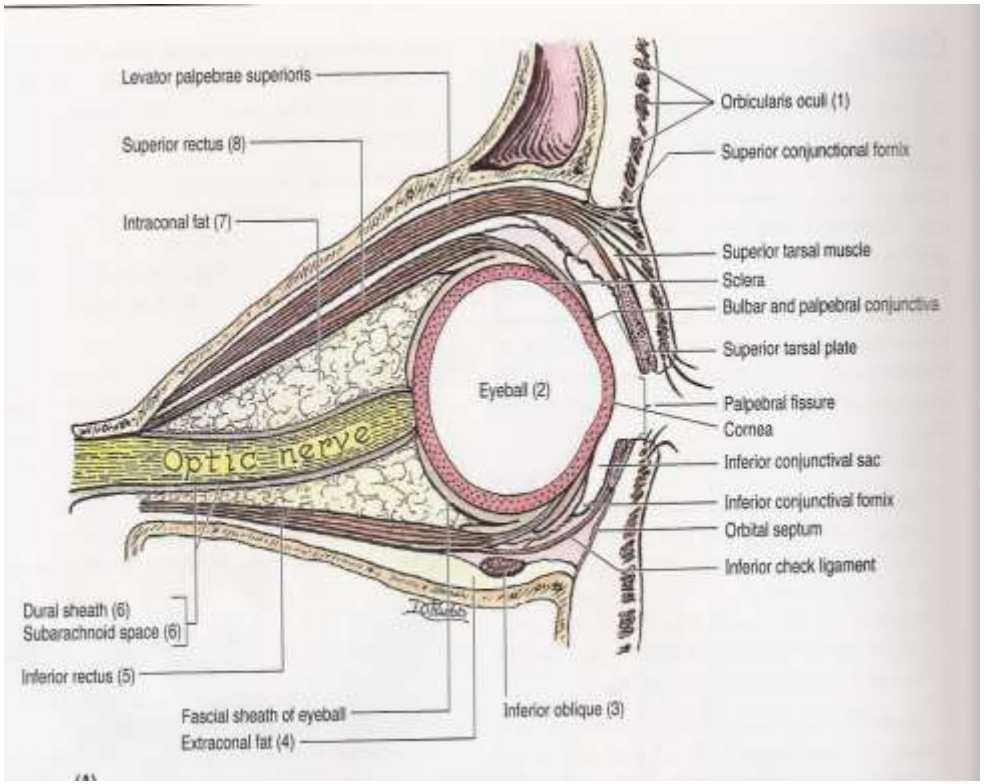
Inferior oblique arises from orbital surface of maxilla and inserted into posterior inferior lateral quadrent of sclera of the eyeball.

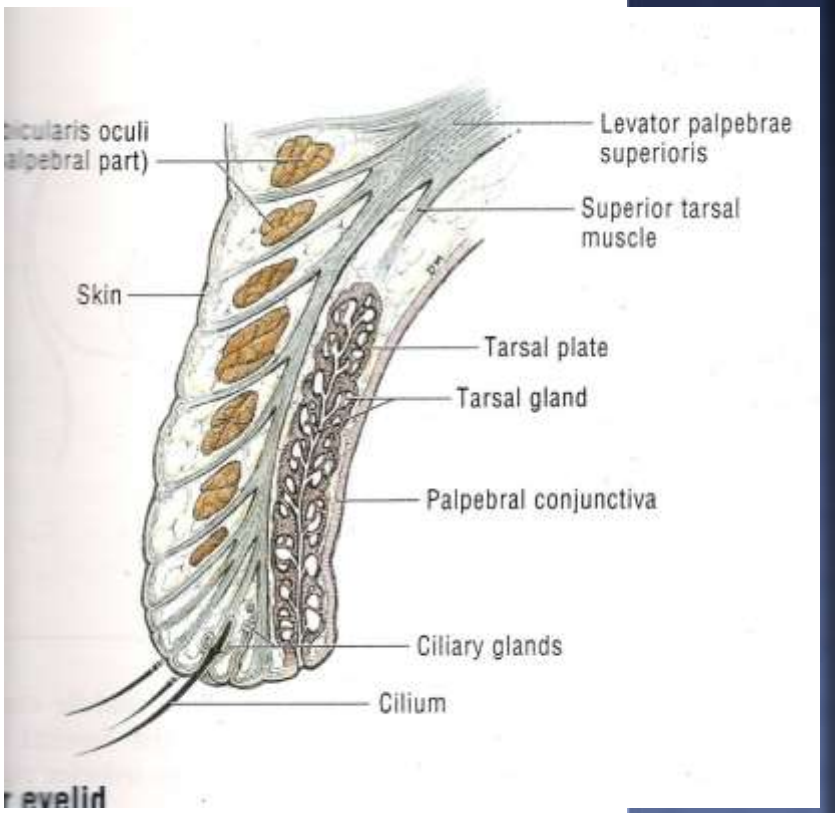


B, *Posterior view*

LEVATOR PALPEBRAE SUPERIORIS

It arises from orbital surface of lesser wing of sphenoid bone.

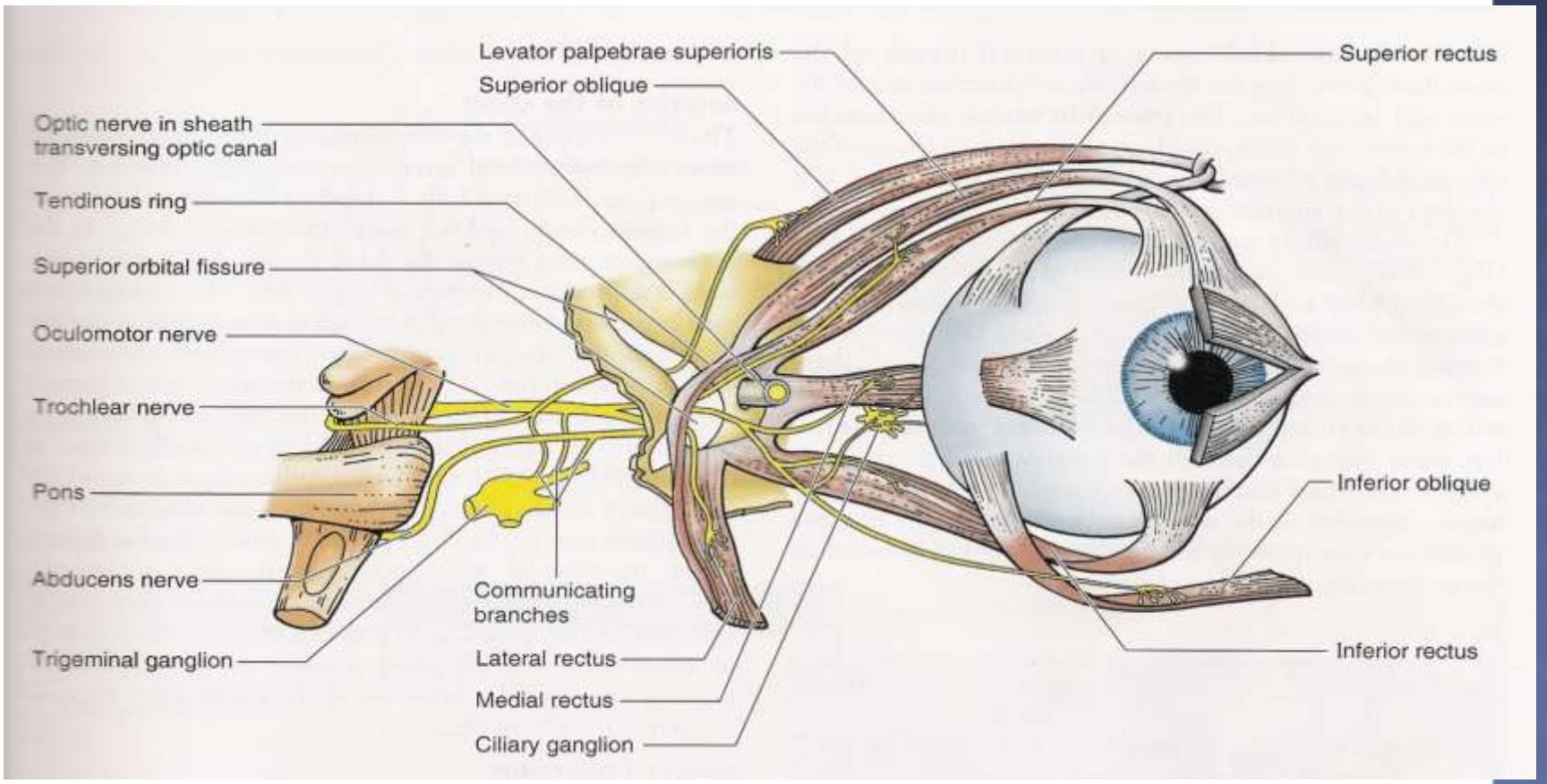




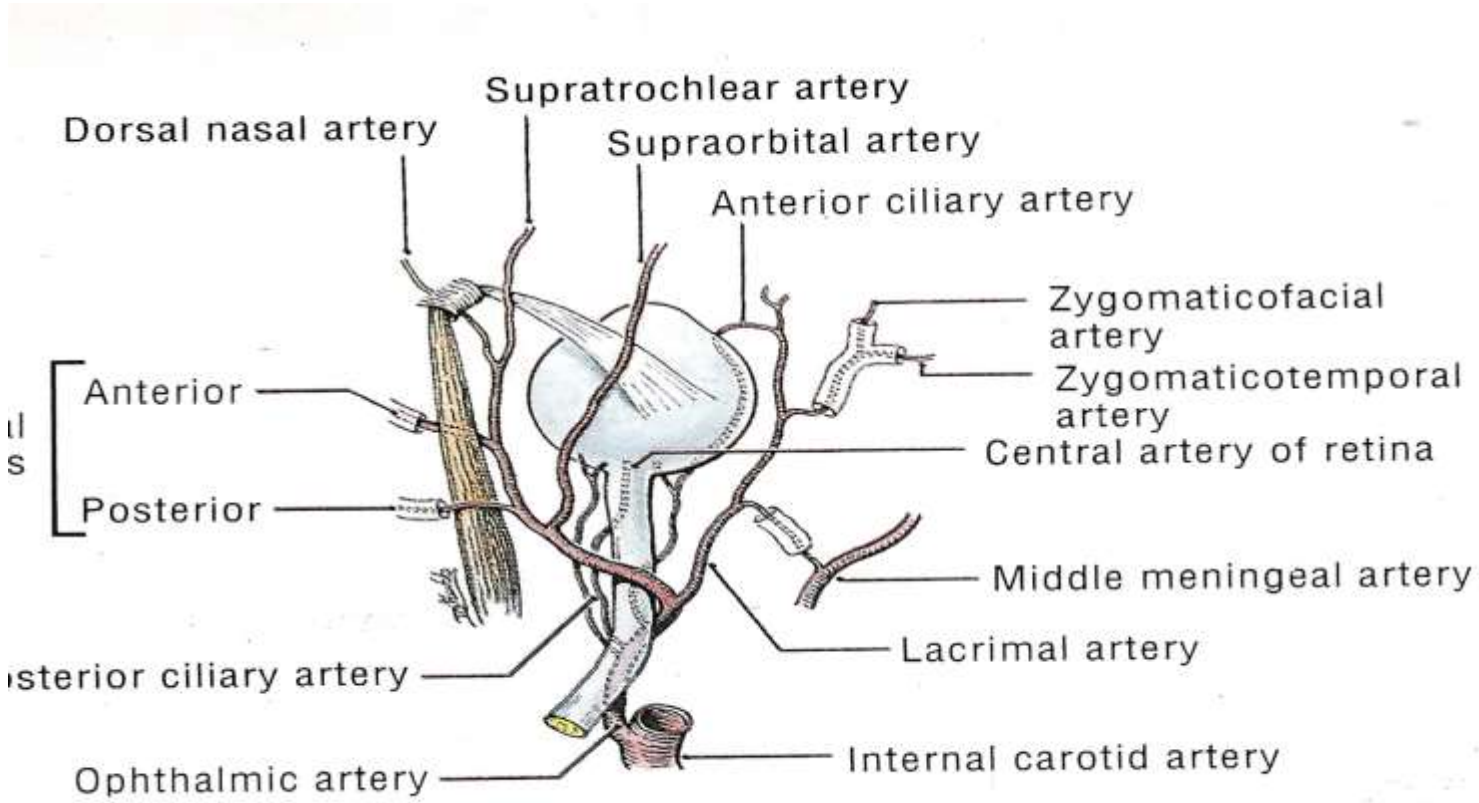
It inserts in superior tarsus and skin of upper eyelid.

NERVE SUPPLY OF MUSCLES

All the extra ocular muscles of the eyeball are supplied by oculomotor nerve except superior oblique by trochlear nerve and lateral rectus by abducent nerve.

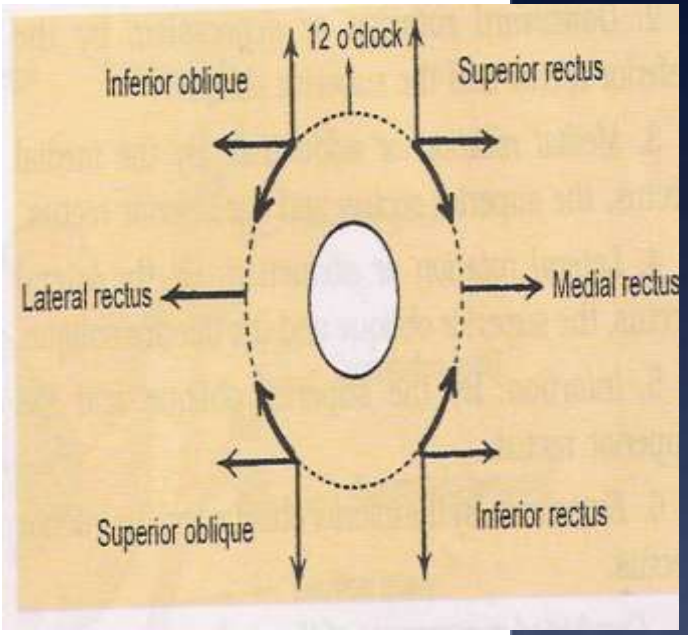


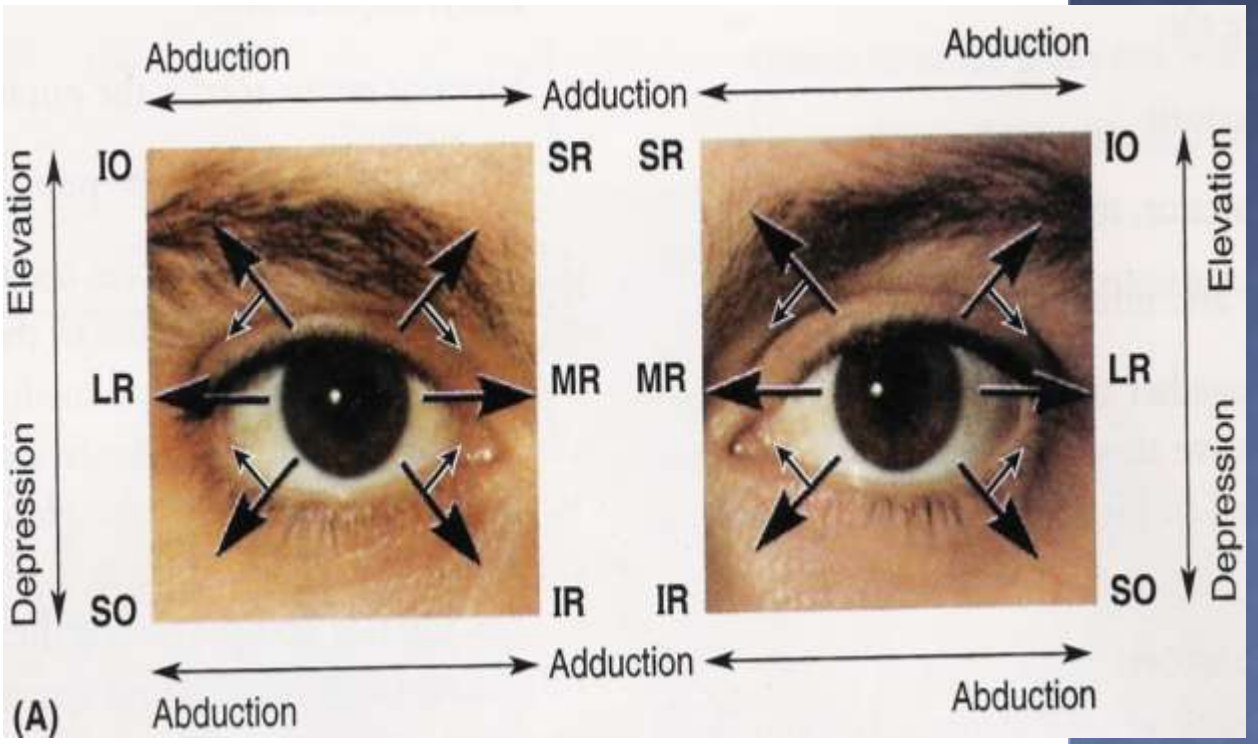
BLOOD SUPPLY: OPHTHALMIC ARTERY AND ITS BRANCHES



Actions of individual muscles

- Superior rectus: Elevation, Adduction, Intortion
- Inferior rectus: Depression, Adduction, Extortion
- Inferior oblique: Elevation, Abduction, Extortion
- Superior Oblique: Depresion, Abduction, Intortion
- Medial retus: Adduction
- Lateral Rectus: Abduction





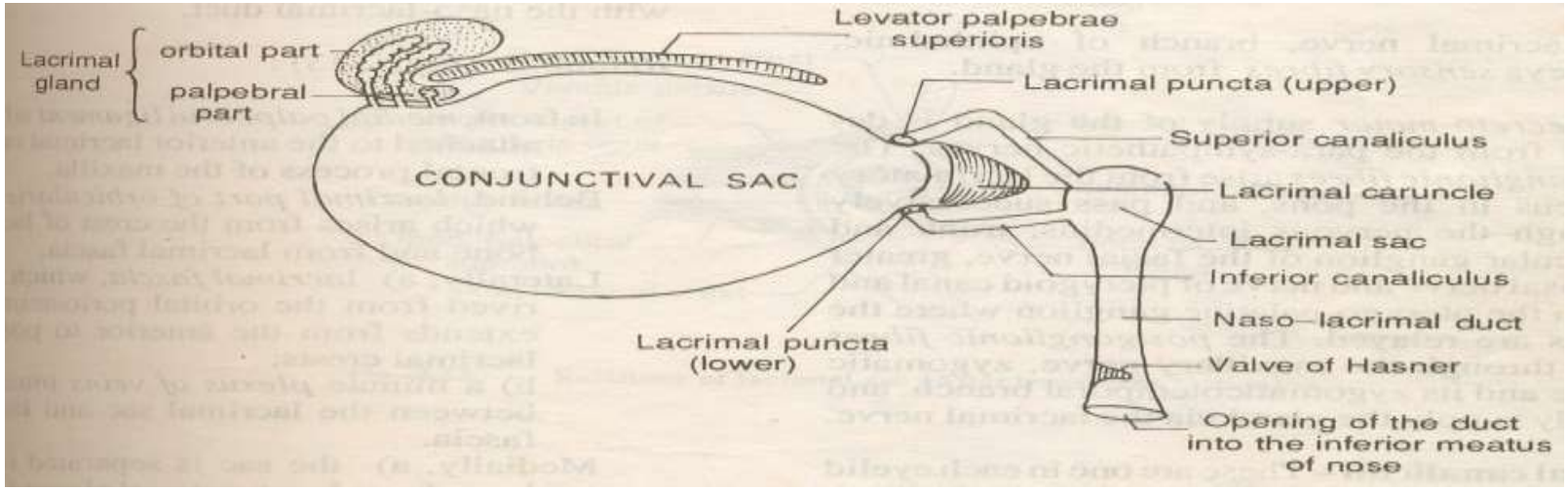
APPLIED ANATOMY

- The oculomotor nerve lesion produces lateral strabismus and nearly complete opthalmoplegia of the eyeball, ptosis of the eyelid.
- The trochlear nerve lesion produces diplopia (double vision) when looking downwards.
- The abducent nerve lesion produces medial strabismus (crossed eyes)

LACRIMAL APPARATUS

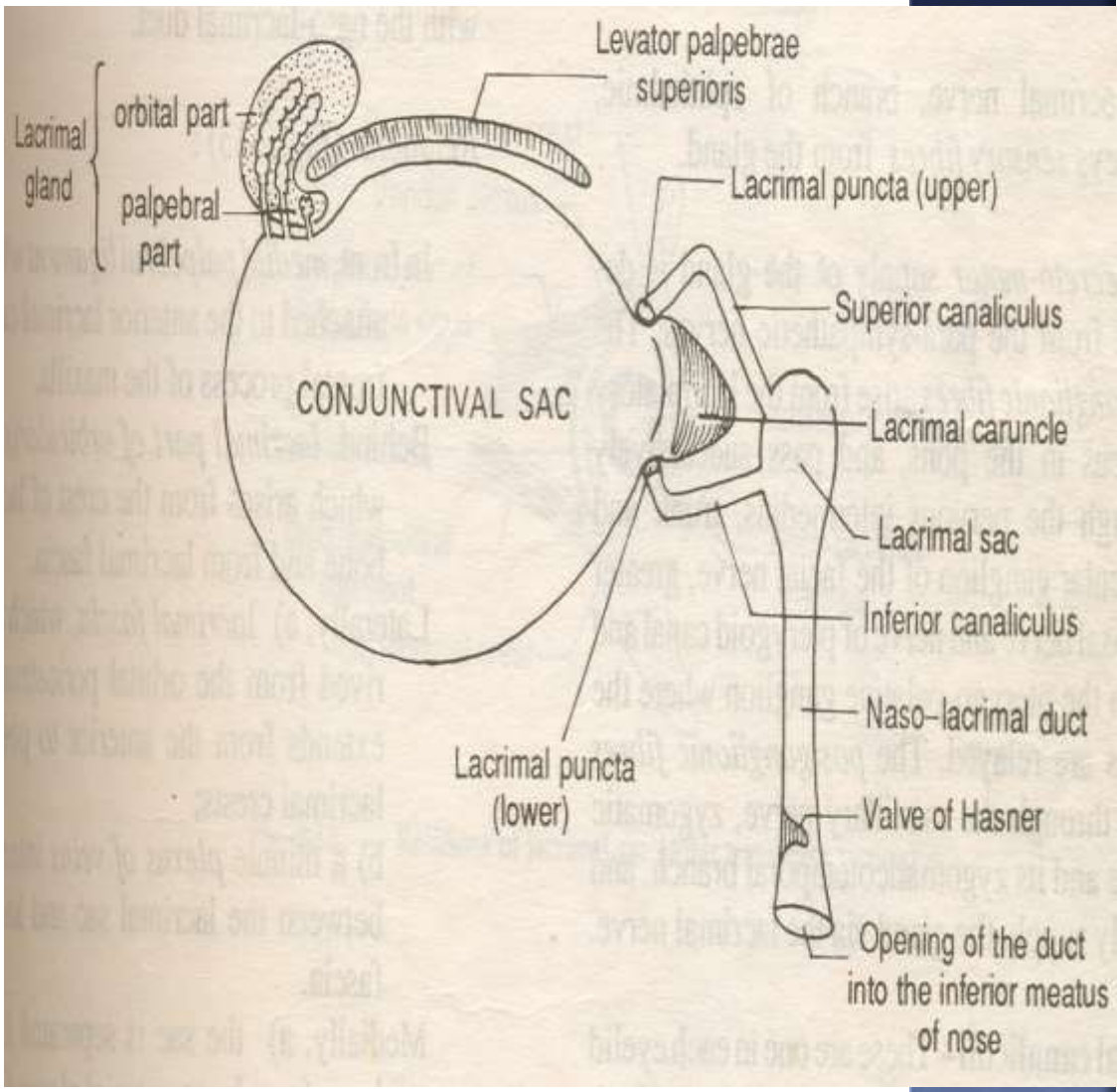
- It is concerned with the tear formation & transport.
- Lacrimal gland which secretes tears and its ducts conveying the fluid to the conjunctival sac and lacrimalia.
- Lacrimal passage which convey tears to the inferior meatus of nose.

Lacrimal gland → **Conjunctival sac** → **Lacrimal puncta** → **Lacrimal canaliculi** → **Lacrimal sac** → **Nasolacrimal duct**



LACRIMAL GLAND

- It consists of
  - ***Larger Orbital Part***
  - ***Smaller Palpebral Part***
- Lateral expansion of levator palpebral superioris separates the parts.

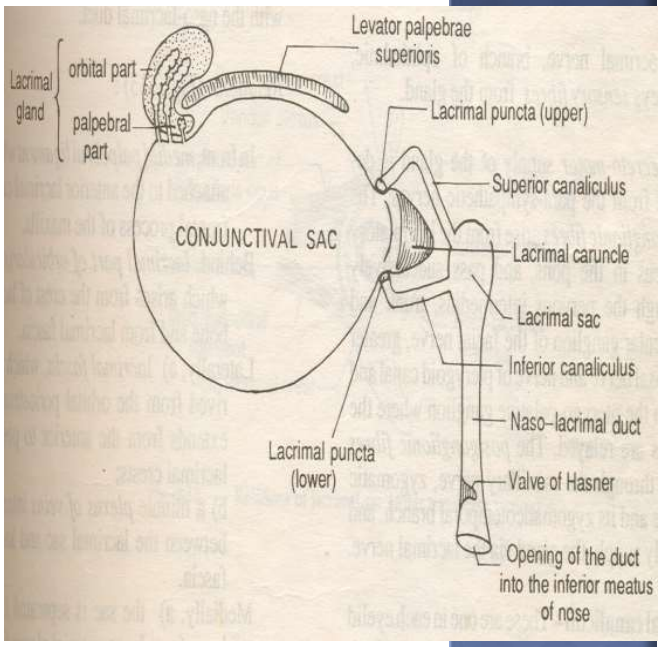


THE ORBITAL PART

- Almond-shaped glands.
- It is present in a fossa on the anterolateral part of the roof of the orbit.

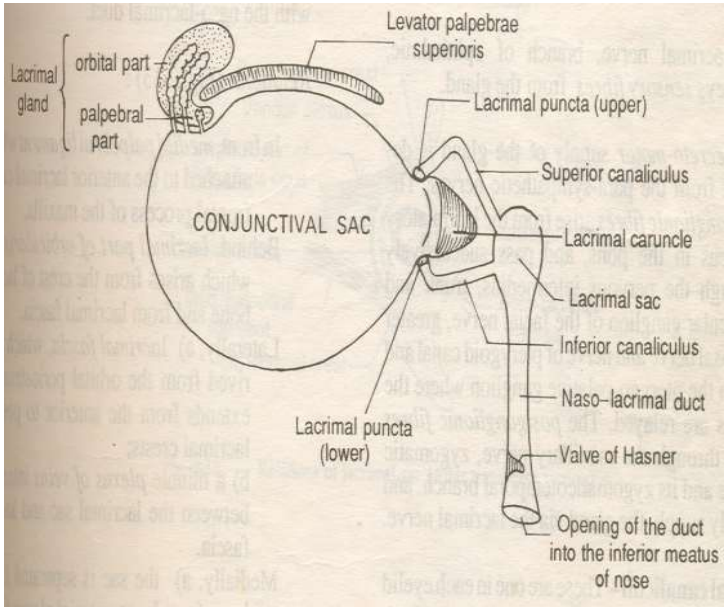
THE PALPEBRAL PART

It is flat and is 1/3rd size of the orbital part.
It is situated upon the course of ducts.



DUCTS OF LACRIMAL GLAND

- Ducts of the lacrimal gland are about 12 in no, 4-5 in the orbital part about 6-8 in the palpebral part.
- All ducts open into the lateral part of superior conjunctival fornix after passing through the palpebral part.



BLOOD SUPPLY

- Artery supply : Lacrimal artery, branch of ophthalmic artery.
- Venous drainages : Ophthalmic Vein.

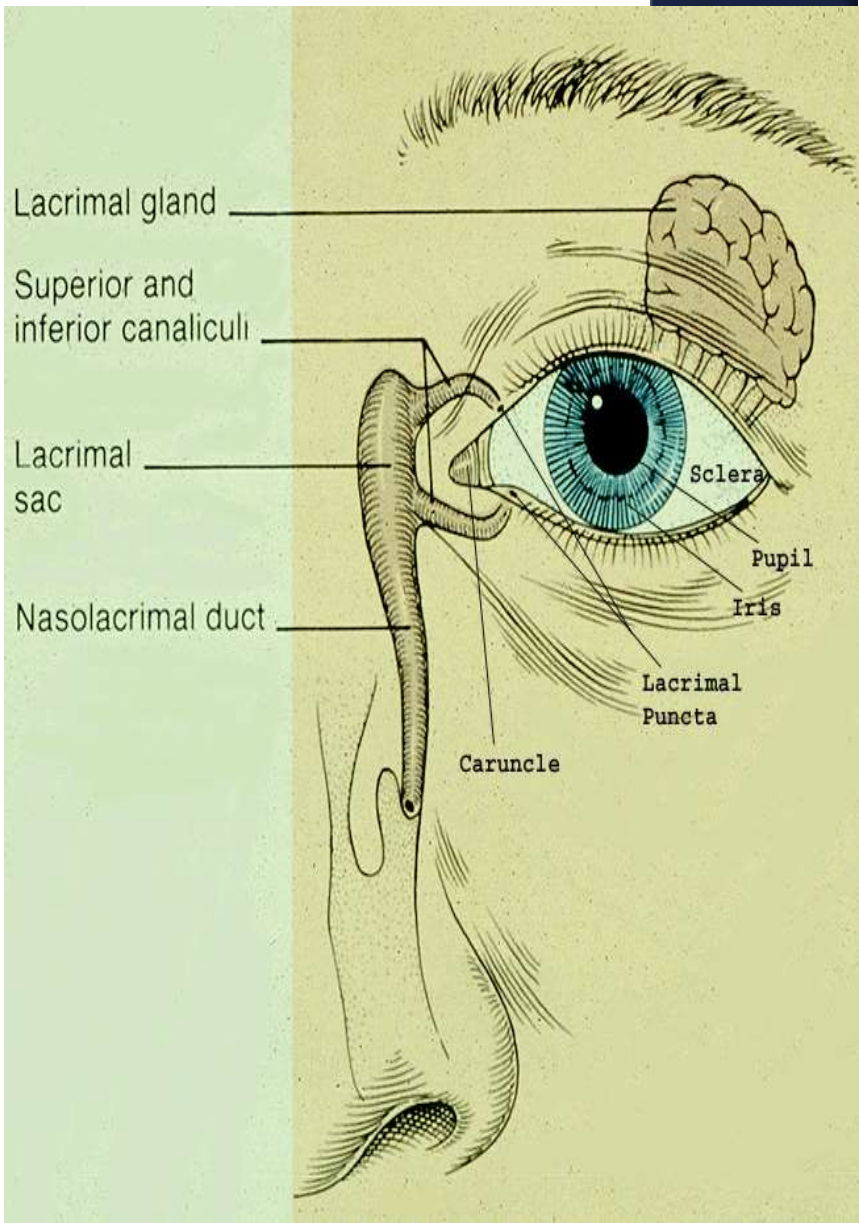
Nerve supply:

Lacrimal nerve, branch of ophthalmic division of Vth nerve

LACRIMAL PASSAGE/EXCRETORY SYSTEM

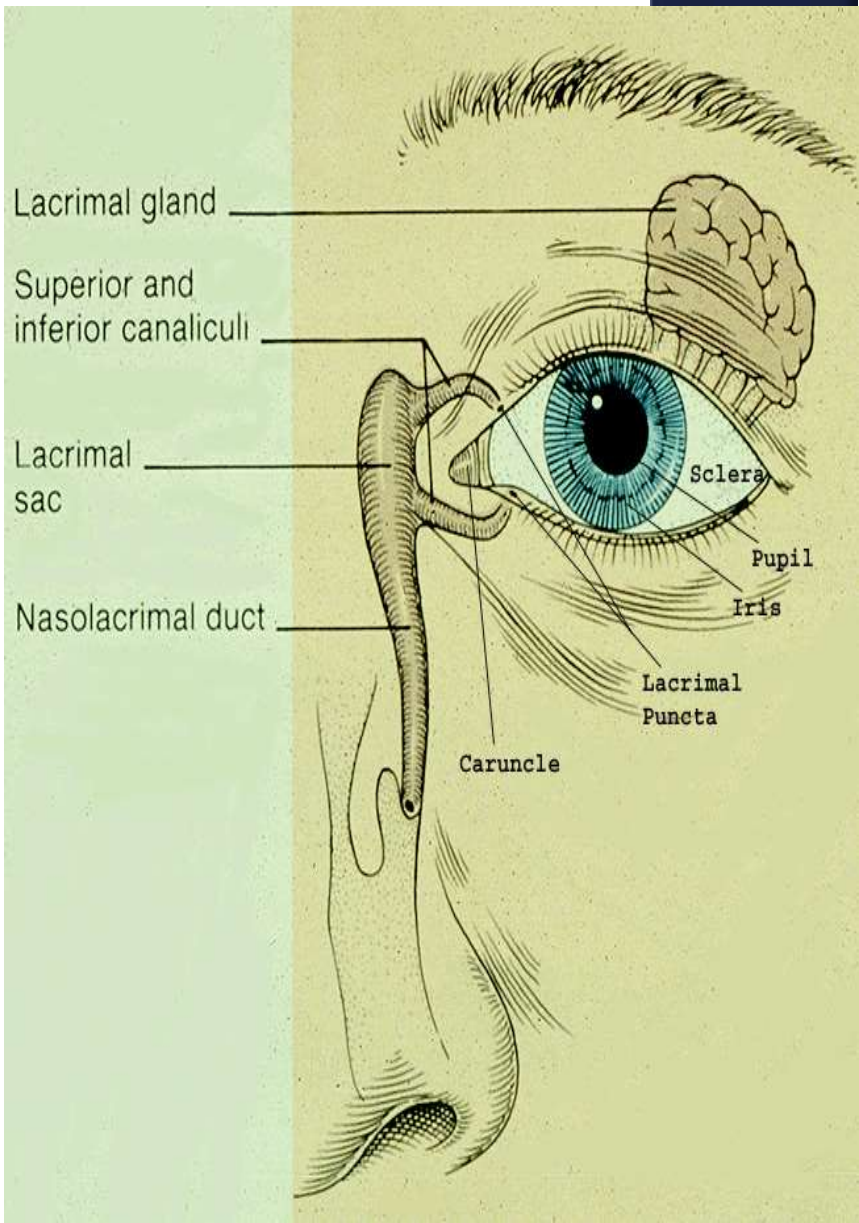
1. THE PUNCTA

- A small, round or oval orifice on the elevation, the papilla lacrimalis.



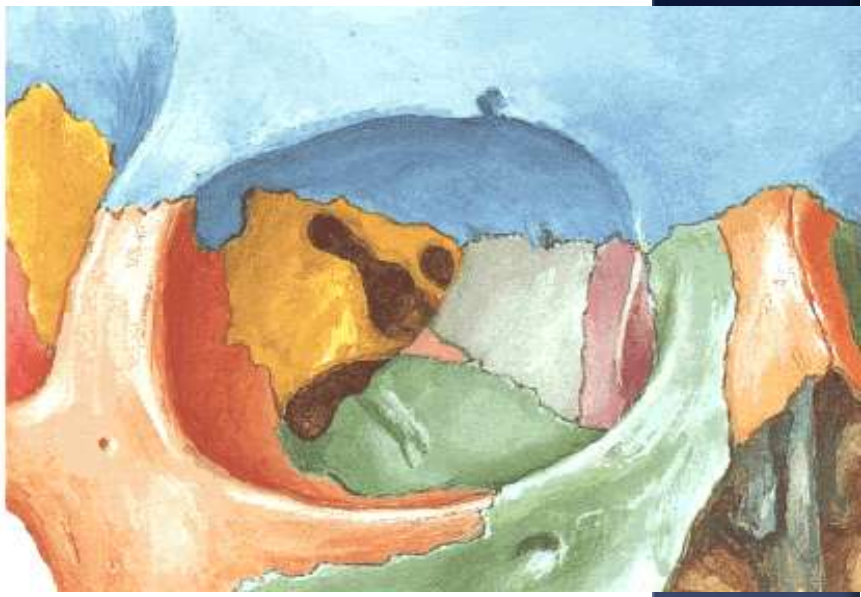
2. THE LACRIMAL CANALICULI

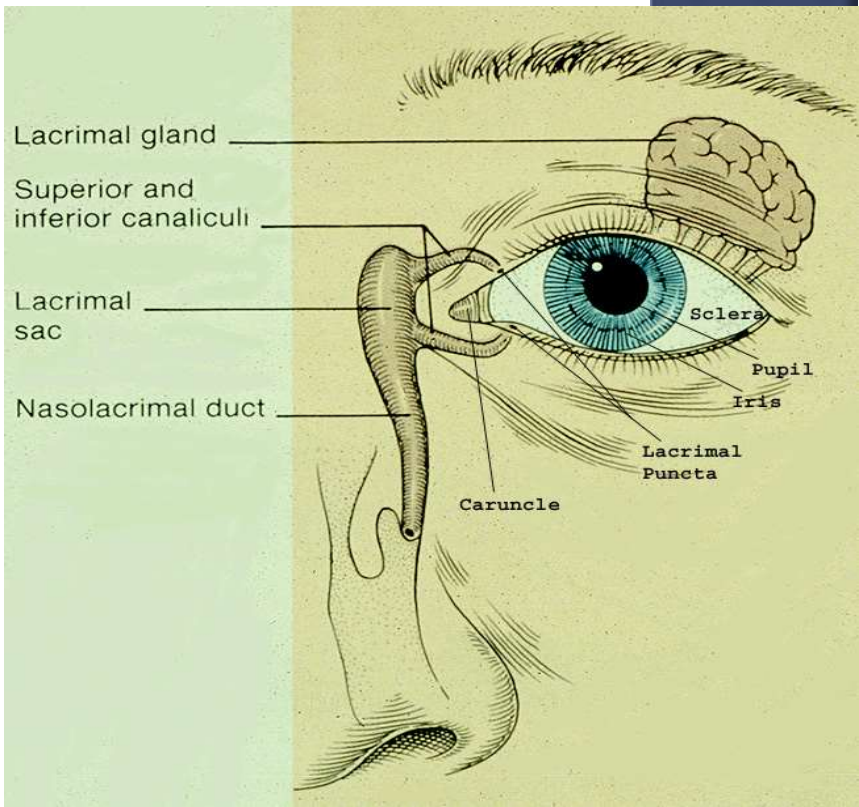
- These are one in each eyelid and measures about 10 mm in length.
- First vertical part and then horizontal part.
- Vertical part is 2 mm & turns medially at right-angle to become horizontal 8 mm
- Begins from lacrimal punctum and opens into lacrimal sac.



3. THE LACRIMAL SAC

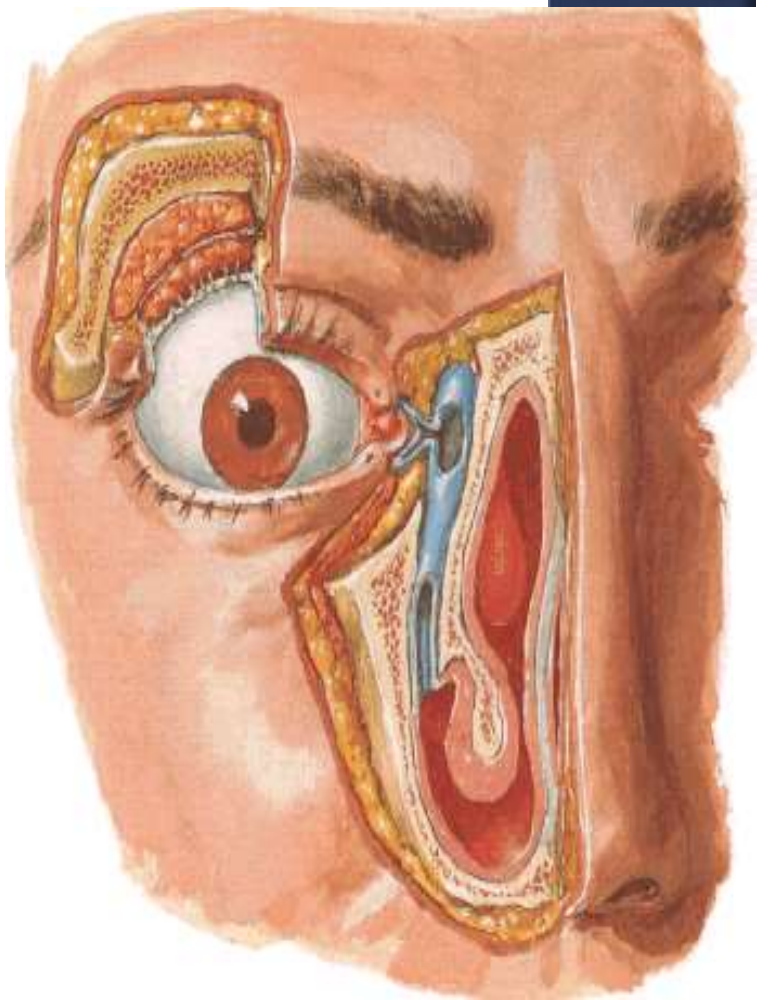
- It is upper blind end of the naso-lacrimal gland and is about 12mm long.
- Situated in the Lacrimal fossa, formed by lacrimal bone and frontal process of maxilla .
- The sac, closed above and open below, is continuous with the nasolacrimal duct.





4. THE NASOLACRIMAL DUCT

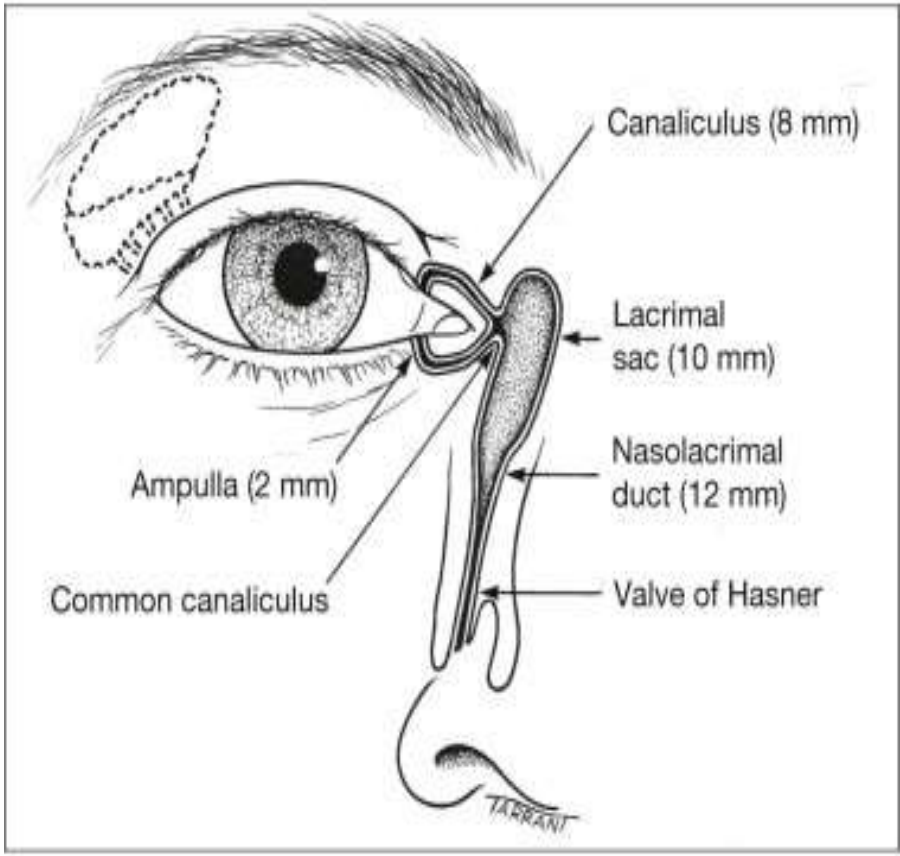
- The nasolacrimal duct, continuation of lacrimal sac to the inferior meatus.



- About 15 mm long.
- The duct is directed downwards.

The valves of naso-lacrimal duct

- They are folds of mucous membrane with no valvular function.
- The most important is the 'valve' of Hasner at the lower end.
- It prevents the backward flow of the fluid.



FUNCTIONS OF TEARS:

- Flushes the conjunctival sac & keeps the cornea moist and transparent.
- Provides nourishment of cornea.
- Bactericidal action.
- Express emotion with outbreak of tears.

APPLIED ANATOMY

- Dacryoadenitis- inflammation of lacrimal gland.
- Dacryocystitis- infalmmation of lacrimal sac.
- Dacryocystectomy- surgical removal of lacrimal sac.

THANK YOU