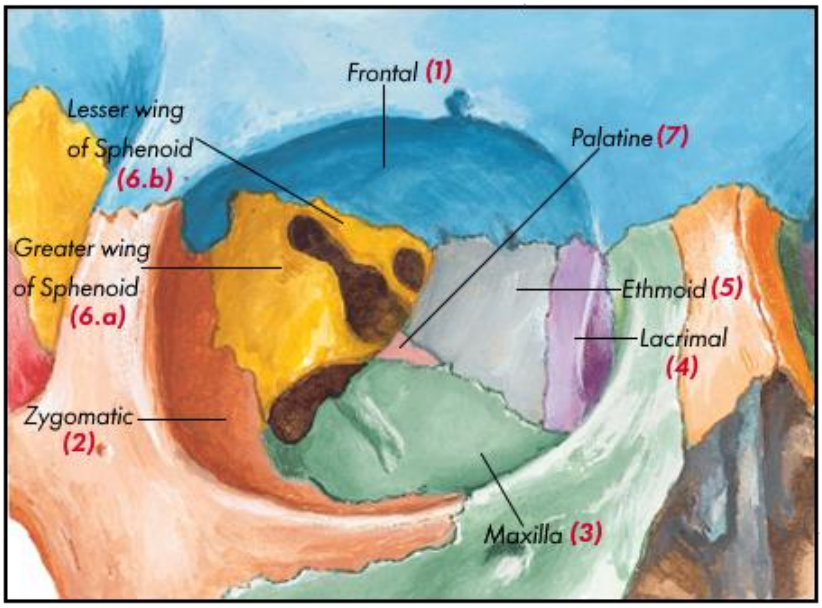
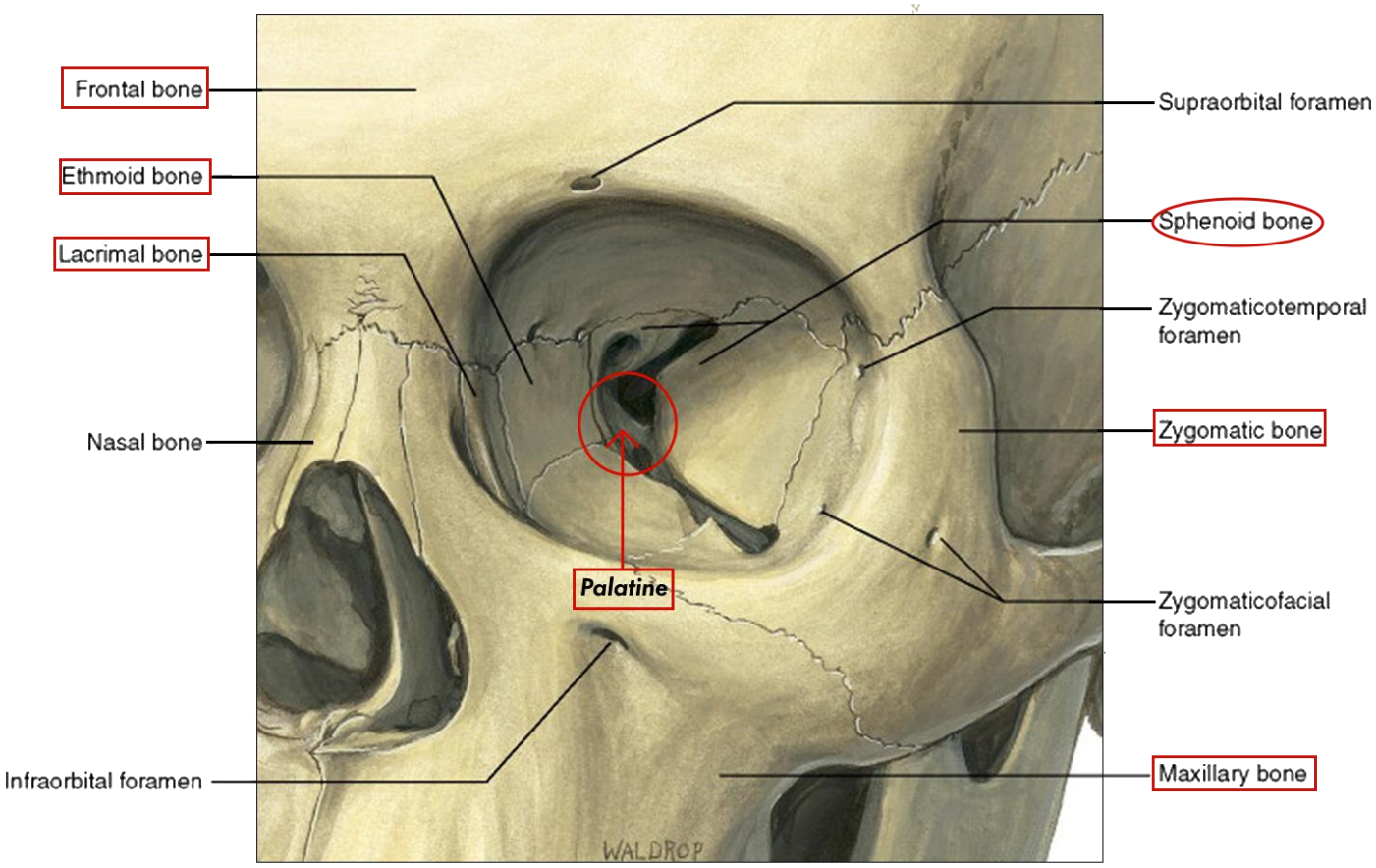
Anatomy of the orbit

1) Boundaries of bony orbit

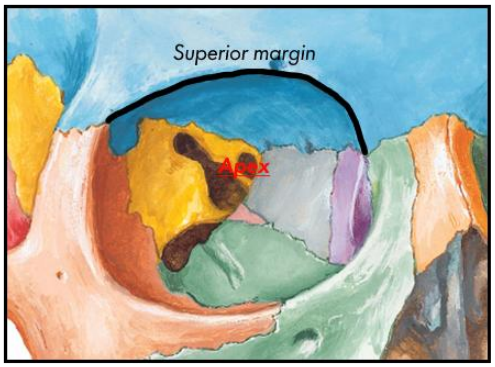
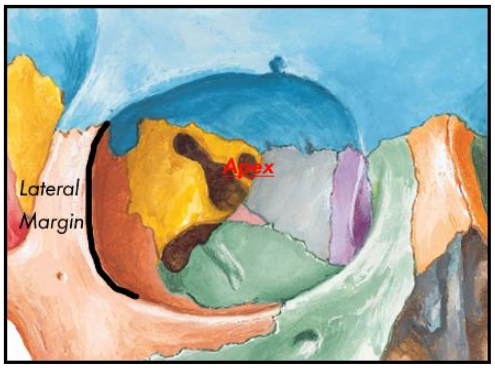
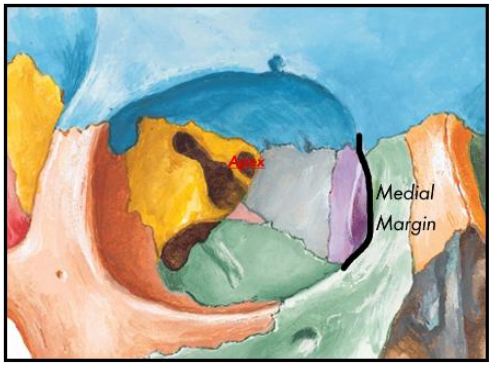
- *The bony orbit is made by <u>7 bones</u>:*

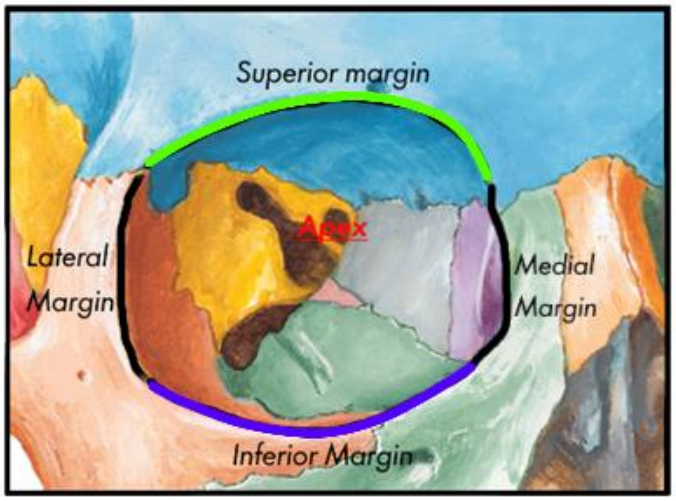
1. *Frontal*
2. *Zygomatic*
3. *Maxilla*
4. *Lacrimal*
5. *Ethmoid*
6. *Sphenoid*
7. *Palatine*



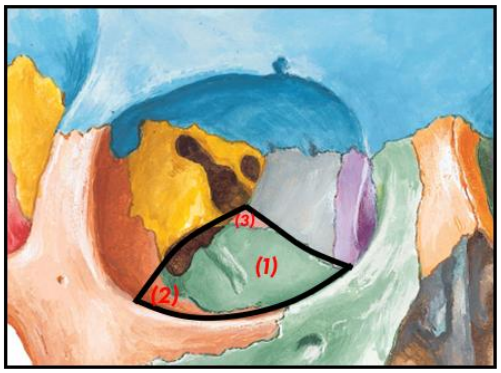
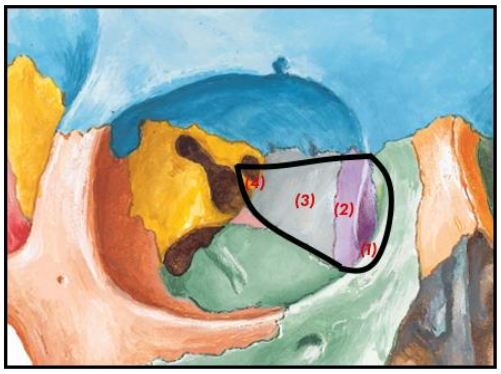


Bony margins of the orbit:

Superior Margin	Frontal Bone.	
Lateral Margin	Frontal & Zygomatic.	
Inferior Margin	Maxilla & Zygomatic.	
Medial Margin	Frontal, Lacrimal & Maxilla.	



Walls of the orbit:

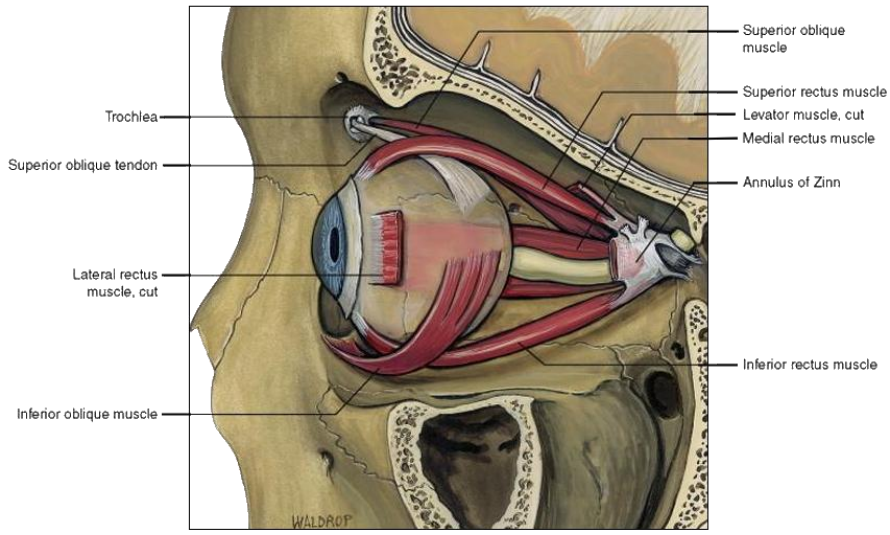
Roof	1. Orbital Plate of **Frontal** Bone. 2. Lesser Wing of The **Sphenoid**.	
Lateral Wall	1. **Zygomatic** Bone. 2. Greater wing of **sphenoid**.	
Floor	1. **Maxilla**. 2. **Zygomatic** Bone. 3. **Palatine** bone.	
Medial Wall	1. **Maxilla** (frontal process). 2. **Lacrimal** bone. 3. **Ethmoid**. 4. **Sphenoid** (part of body).	

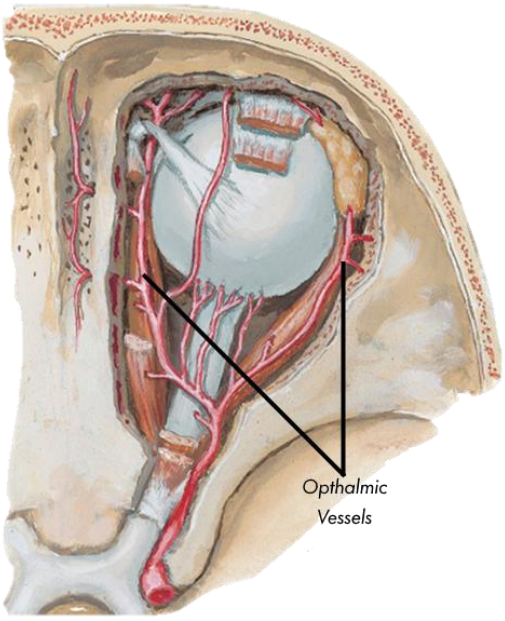
N.B.

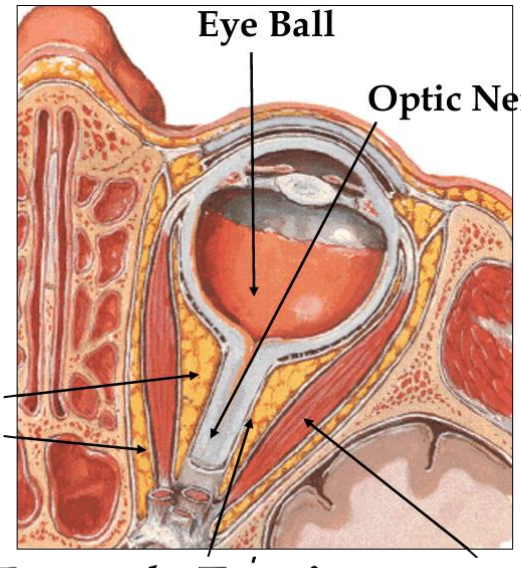
- **The Apex** → **Optic canal** (Optic Nerve runs through it).
- The bone containing the Apex → **Sphenoid bone**.
- **Smallest bone** contributing to the orbit → **Palatine bone**.
- **Largest bone** contributing to the orbit → **Sphenoid bone** (Sphenoid doesn't form Floor)

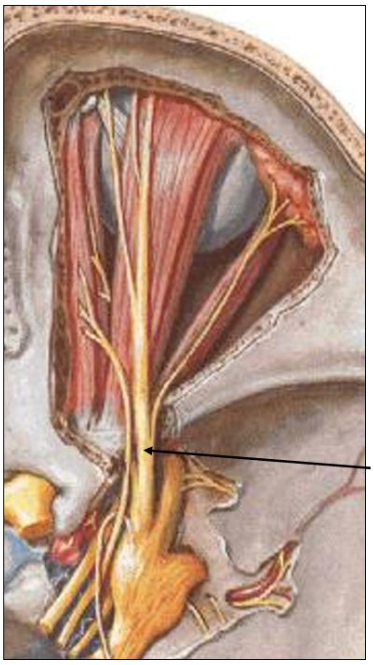
2) Contents of bony orbit

1. Eyeball	6. Suspensory ligament of the eyeball	11. Extraocular Fat
2. Fascia (Orbital & Bulbar)	7. Conjunctiva	12. Lacrimal gland, Lacrimal sac & Nasolacrimal duct
3. Extraocular muscles	8. Trochlea of superior oblique	13. Eyelids
4. Nerves (II, III, IV, VI & VI [Ophthalmic])	9. Orbital septum	14. Medial palpebral ligament and Lateral palpebral ligament
5. Ophthalmic Vessels	10. Ciliary ganglion and short ciliary nerves	15. Medial and Lateral Check ligaments



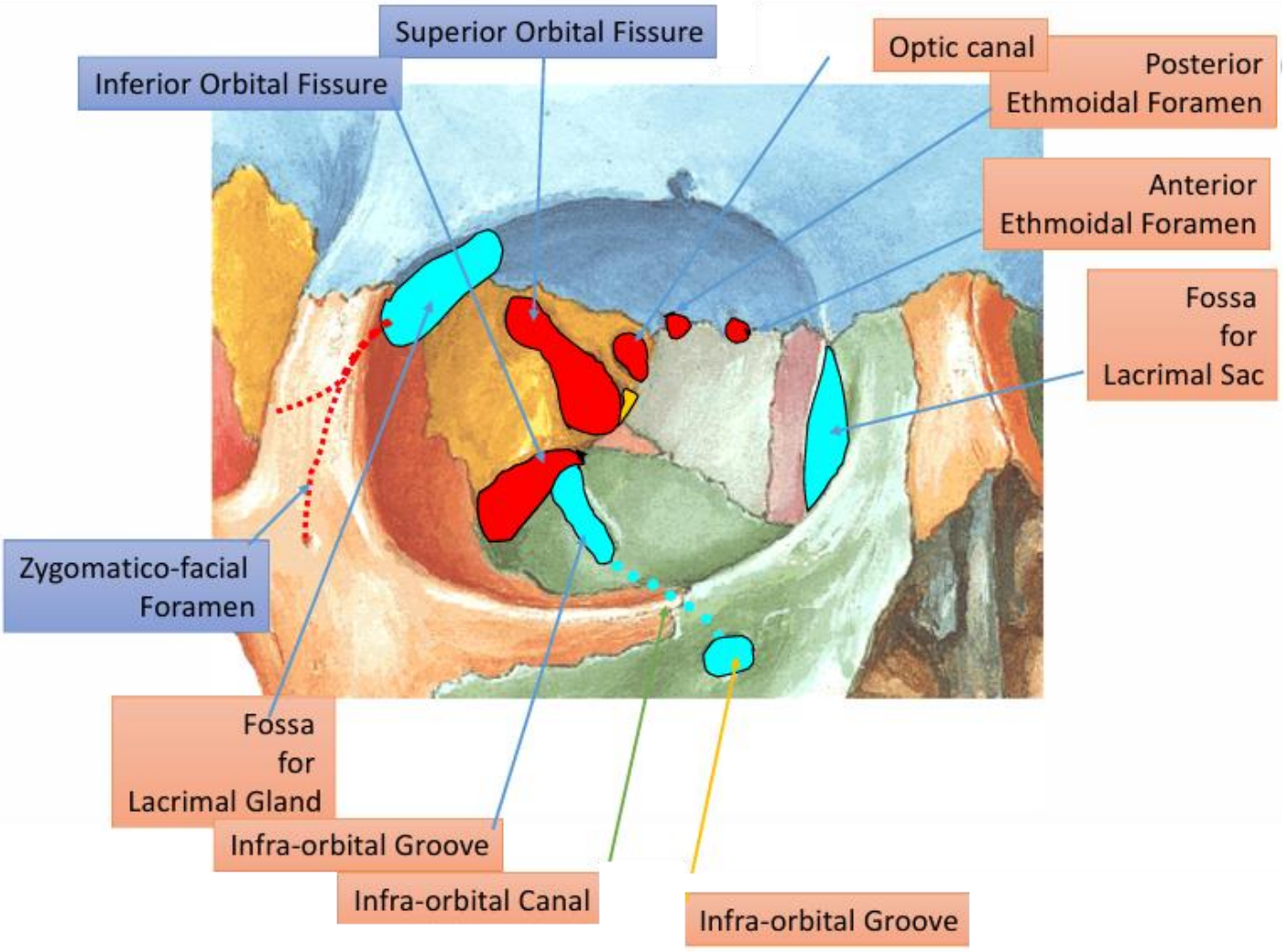






3) Foramina of bony orbit

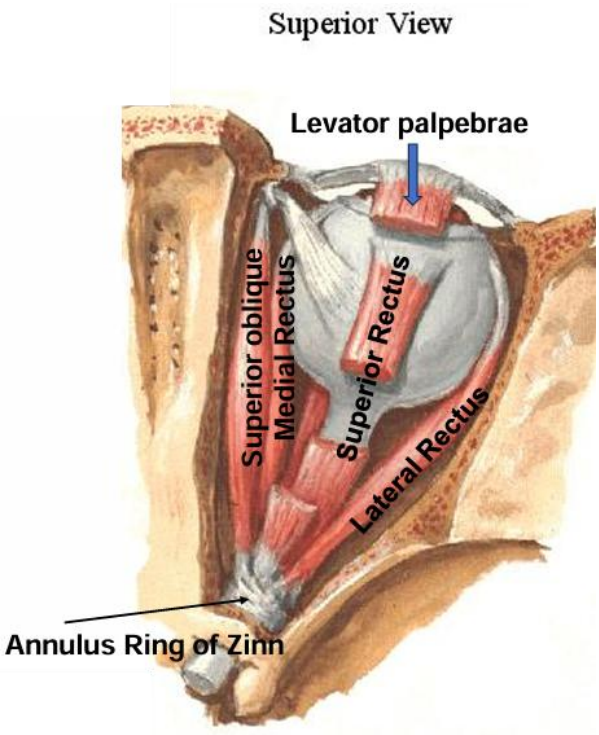
- Optic Canal (Apex) → Passage for Optic nerve (CN II).
- Superior orbital fissure → Passage for CN III, CN IV, CN VI & V1 (ophthalmic branch of trigeminal).
- Inferior orbital fissure → Passage for Infraorbital N. (continuation of Maxillary N.).
- Anterior ethmoidal foramen → Nerves & Vessels of same name.
- Posterior ethmoidal foramen → Nerves & Vessels of same name.
- Infraorbital foramen → Passage for Infraorbital N. (continuation of Maxillary N.).
- Supraorbital foramen.
- Naso-lacrimal canal opening → Opens in Inferior meatus of the nose.
- Zygomatic orbital foramen.

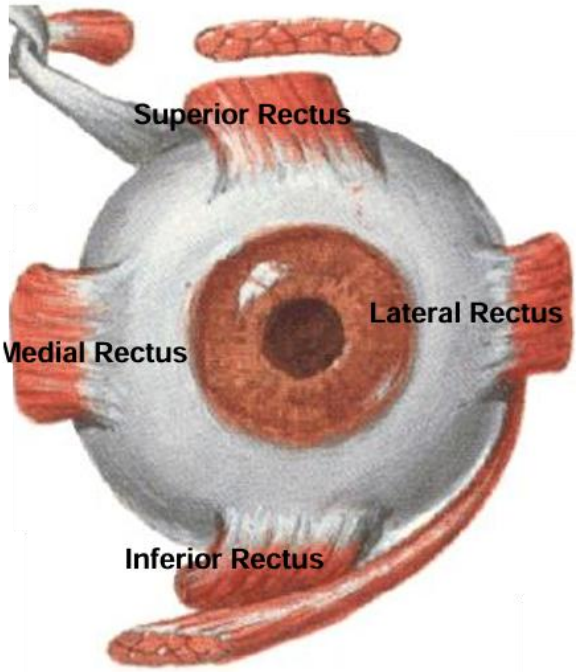


4) Muscles of the orbit (extra-ocular muscles)

a) Recti Muscles

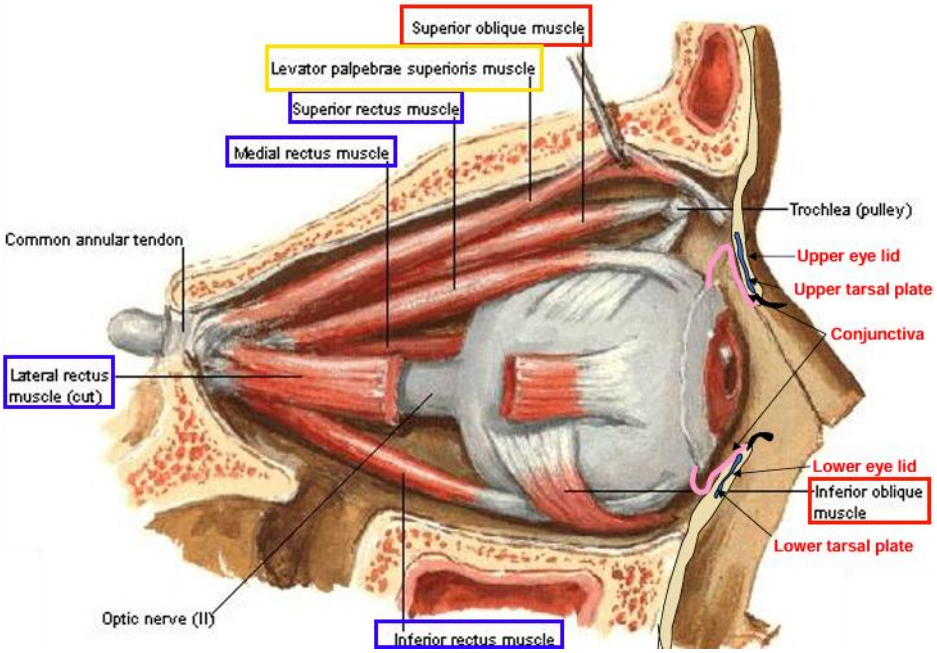
Muscle	Origin	Insertion (Sclera)	Nerve supply	Function
Superior	Annulus of Zinn	superior to the corneal limbus	Oculomotor N. (CN III)	Elevates, adducts, and rotates medially the eye
Inferior		Inferior to the corneal limbus		Depression & Adduction
Medial		Medial to the corneal limbus		Adducts the eyeball
Lateral		Temporal to the corneal limbus	Abducent N. (CN VI)	Abducts the eyeball





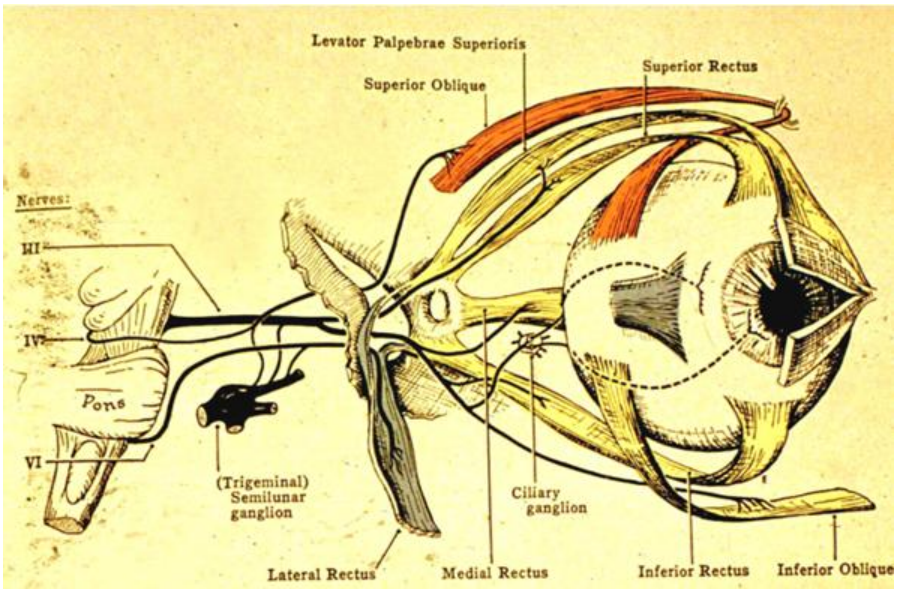
b) Oblique Muscles

Muscle	Origin	Insertion (Sclera)	Nerve supply	Function
Superior	Annulus of Zinn	Outer posterior quadrant of the eyeball	Trochlear N. (CN IV)	Intorsion, abduct and depress the eyeball
Inferior	Maxilla, lateral to the lacrimal groove	Laterally onto the eyeball, deep to the lateral rectus.	Oculomotor N. (CN III)	Extorsion, Elevation, Abduction



3) Levator Palpebrae Superioris

- Nerve supply → Oculomotor Nerve (CN III).
- Action → Raises the eyelid.



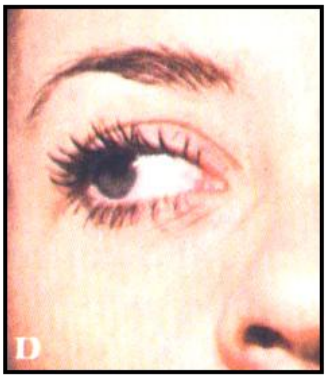
Primary Position

Superior Rectus

Inferior Rectus

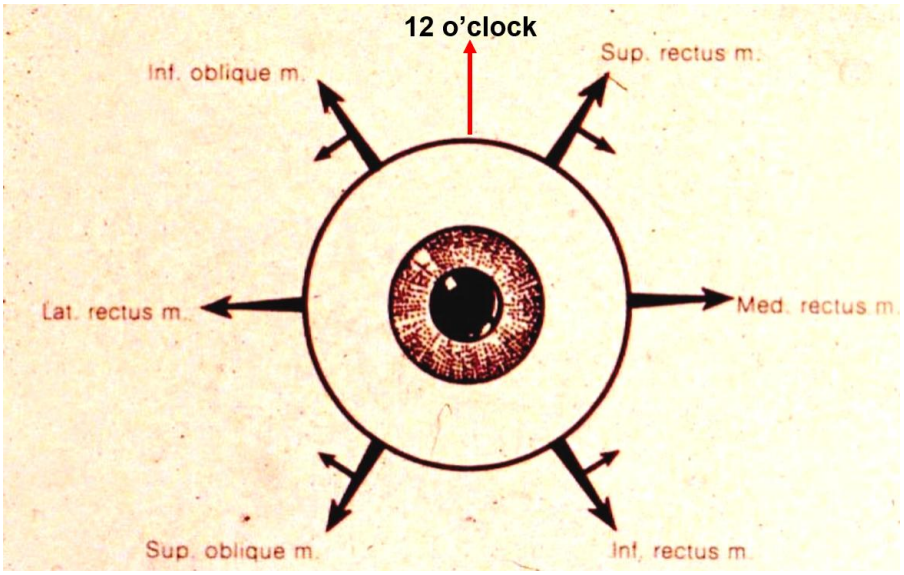
Medial Rectus

Lateral Rectus



Superior Oblique

Inferior Oblique

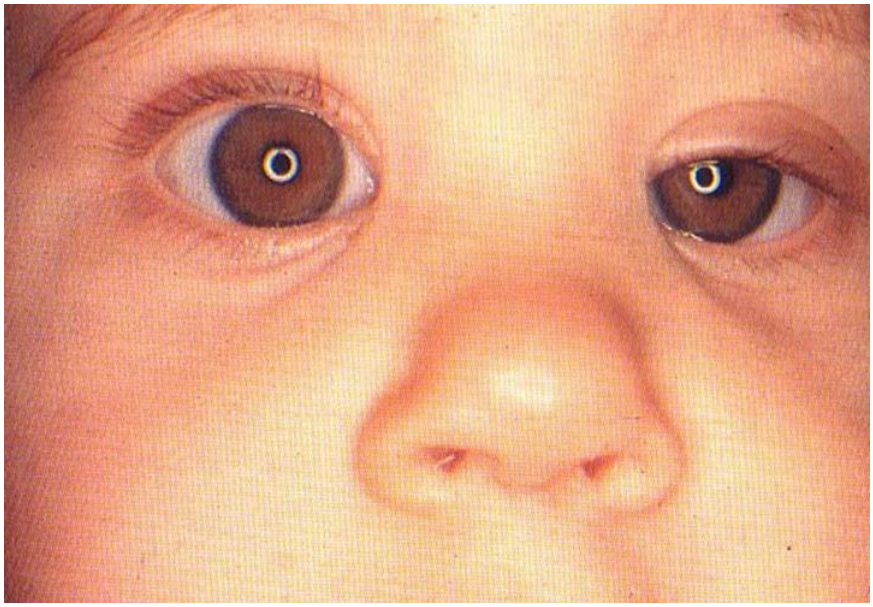


Medial squint

Cause → *Lateral rectus paralysis*

Ptosis

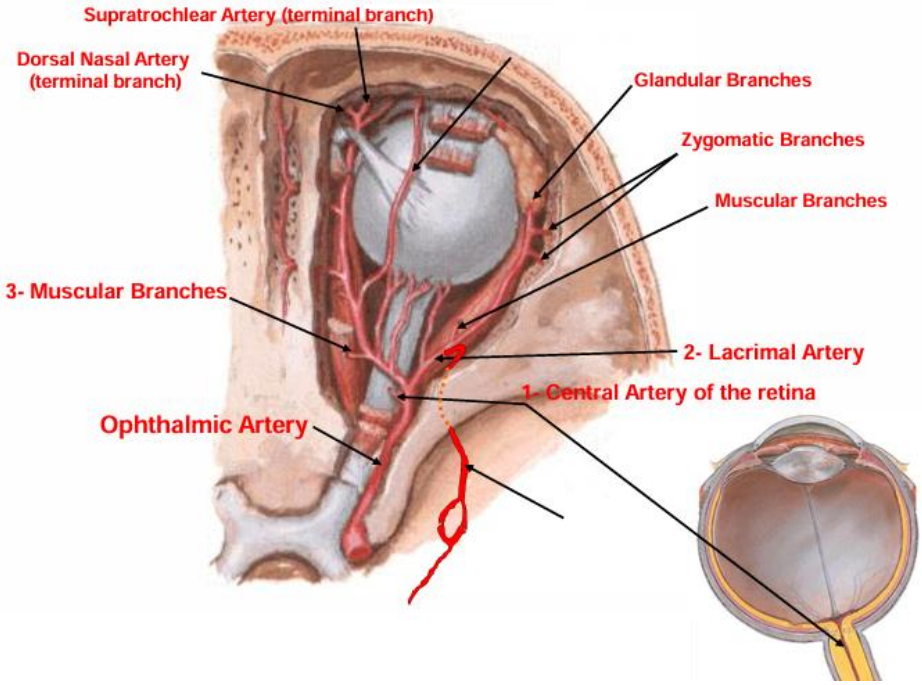
Cause → *Levator Palpebrae Superioris paralysis*



5) Vessels of the Orbit (Ophthalmic vessels)

a) Ophthalmic Artery:

Origin	Internal Carotid Artery.	
Termination	Supratrochlear & Dorsal Nasal branches.	
Branches	Central Artery of Retinal (Inside optic n.)	Frontal a.
	Lacrimal a.	Supraorbital a.
	Glandular a.	Muscular a.
	Zygomatic a.	Supratrochlear & Dorsal nasal (Termination)



b) Ophthalmic Vein:

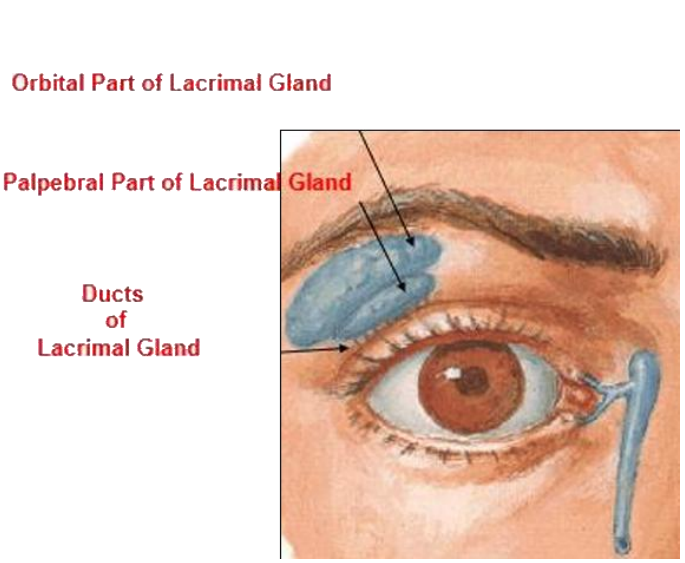
Superior Ophthalmic Vein	- Connected to Anterior Facial Vein. - **Infection** in Anterior Facial Vein can transmit to it; causing cavernous sinus thrombosis.
Inferior Ophthalmic Vein	- Connected to Pterygoid Plexus of Veins.

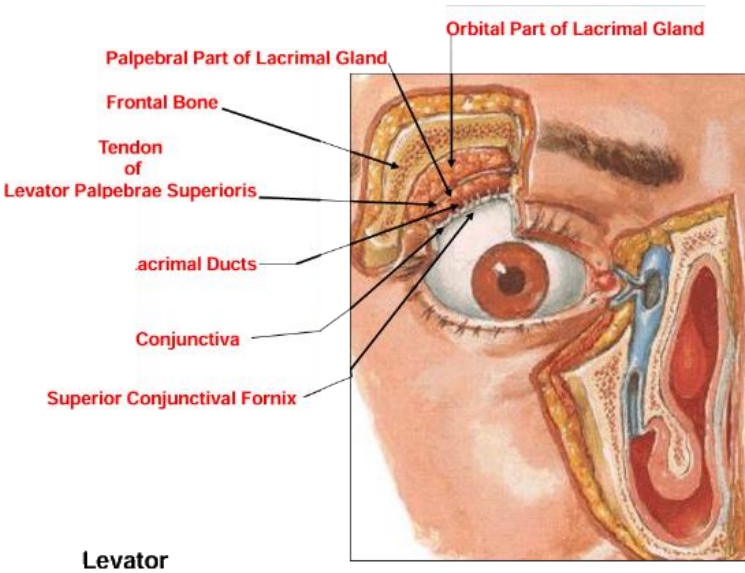
6) Innervation of the orbit

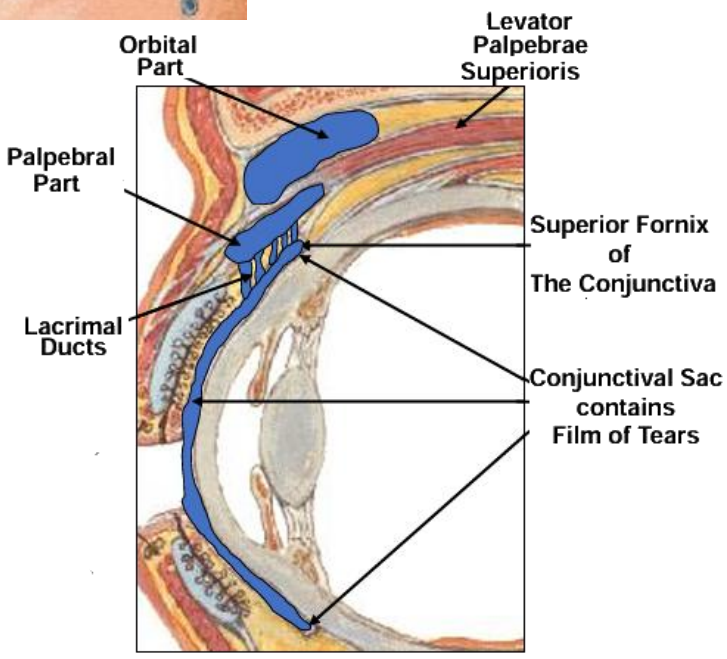
Motor nerves	CN III (oculomotor)	All extraocular muscles except lateral rectus & superior oblique.
	CN IV (Trochlear)	Superior Oblique (SO4).
	CN VI (Abducens)	Lateral Rectus (LR6).
Sensory nerves	General Sensations	Ophthalmic division of CN V [V1].
	Special Sensations (Vision)	Optic nerve (CN II).
Autonomic (para-sympathetic)	Ciliary Ganglion	- Controls sphincter & ciliary muscles - Innervated by CN III.
	Sphenopalatine Ganglion (SPG)	- Controls lacrimal gland - Innervated by CN VII

7) Lacrimal Apparatus

- The lacrimal glands are paired almond-shaped glands, one for each eye, that secrete the aqueous layer of the tear film.
- They are situated in the upper, outer portion of each orbit, in the lacrimal fossa of the orbit formed by the frontal bone.
- Parts: Orbital portion & smaller palpebral portion.
- Pathway of tears: Fornix (conjunctiva of the upper lid) → Lacrimal puncta → Lacrimal sac → Nasolacrimal duct.
- Parasympathetic supply → Facial nerve through lacrimal branch of ophthalmic nerve



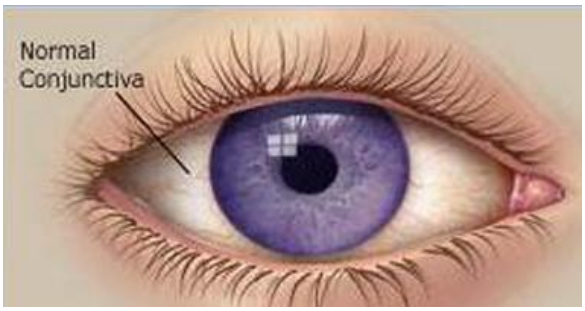




8) Structures of the eyeball

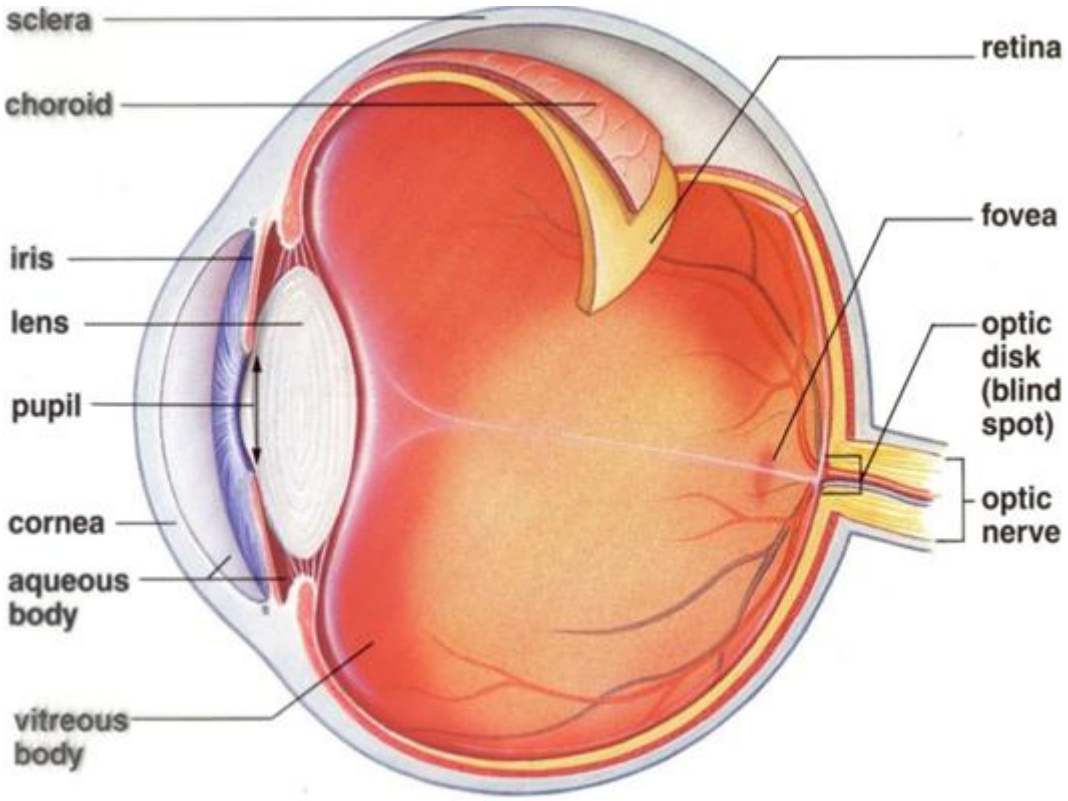
a) Conjunctiva

- *Conjunctiva: The lining on the underside of each eyelid and the mucous membrane over the eyeball, providing a protective covering for the exposed surface.*



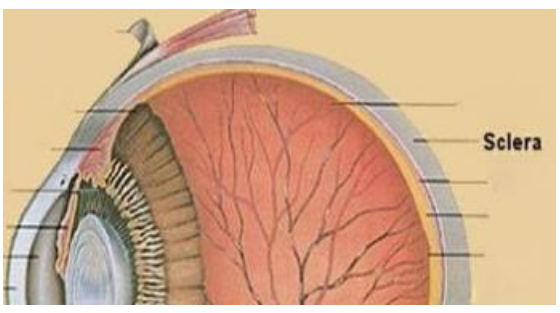
b) The coats of the eye:

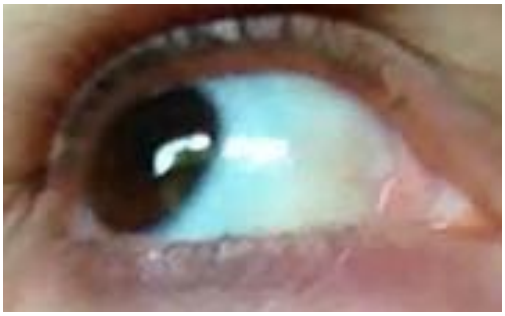
Outer Layer	*Inelastic coat*	- *Transparent* **Cornea** - *Opaque* **Sclera**
Middle Layer	*Vascular coat*	*Uvea:* **choroid**, **ciliary body** *and* **iris**
Inner Layer	*Nervous coat*	*The* **retina**

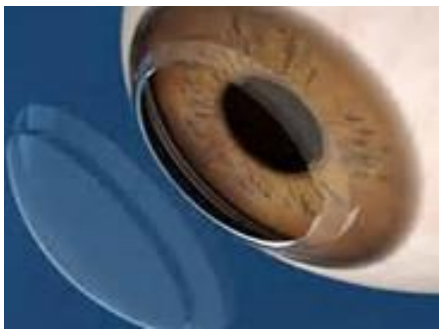


i) Outer layer of the eye:

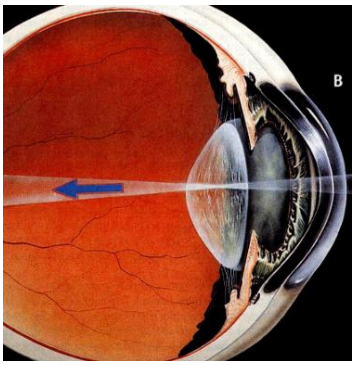
Sclera	*the* **white of the eye**.
Cornea	*the* **transparent outer surface** *(clear lens in front of eye).*

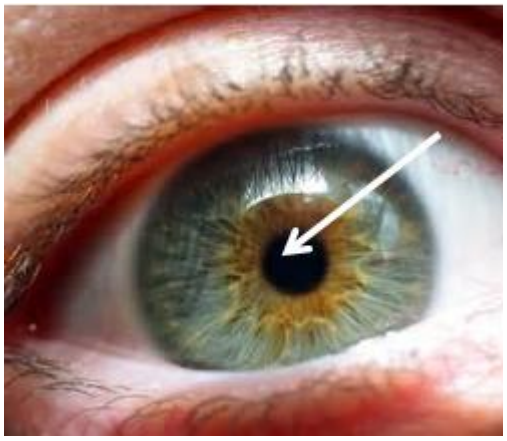


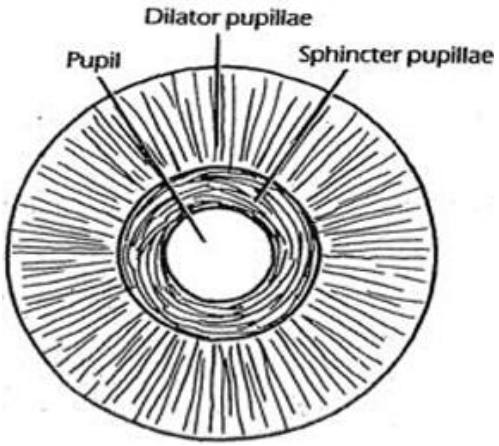


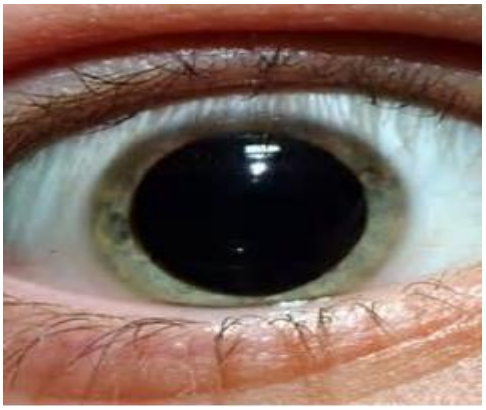


ii) Middle layer of the eye:

<table>
<tr><td>Iris</td><td colspan="3">- colored part of eye
- controls light entering the eye</td></tr>
<tr><td rowspan="2">Pupil
(Size controlled by iris ms)</td><td rowspan="2">- black hole in iris
- where light enters</td><td>Gets larger</td><td>In dark places
(more light enters)</td></tr>
<tr><td>Gets smaller</td><td>In bright places
(less light enters)</td></tr>
<tr><td>Lens</td><td colspan="3">- Lies behind pupil
- The crystalline lens is the only structure continuously growing throughout the life.
- Changeable refractive media
- Allows us to see objects near and far
  </td></tr>
<tr><td>Ciliary body</td><td colspan="3"></td></tr>
<tr><td>Choroid</td><td colspan="3"></td></tr>
</table>



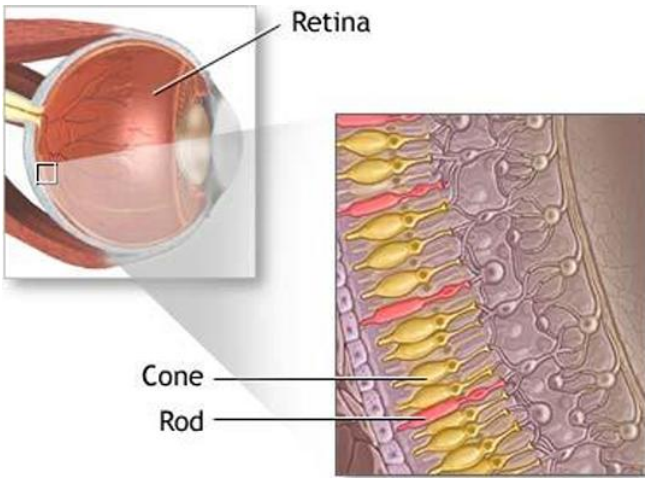


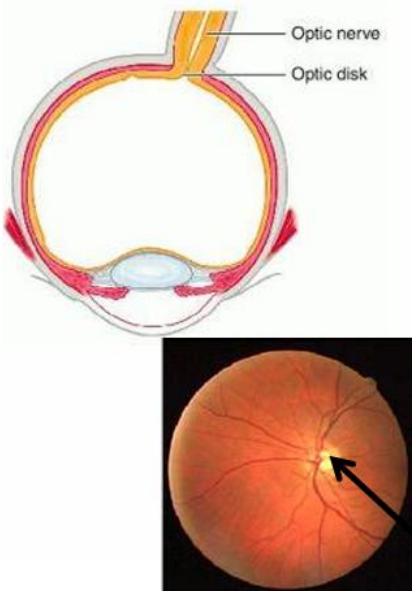


iii) Inner layer of the eye:

- The innermost layer of the eye is **the retina**, which is full of **photoreceptive cells** called **rods and cones**.
- The **rods** are sensitive to **dim light** → **night vision**.
- The **cones** are sensitive to **bright light** → **color vision**.

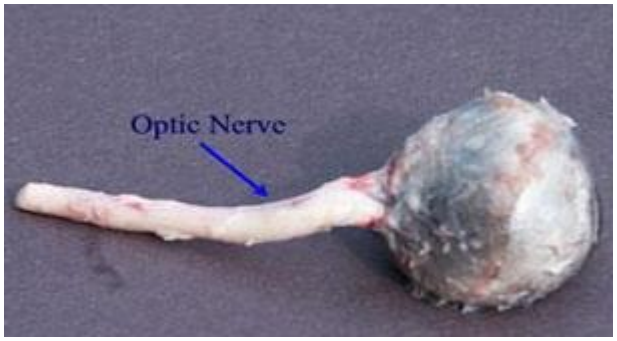
- Nerve fibers from the retina all **converge to form the optic nerve** at a spot on the inner layer known as the **optic disc**.
- The optic nerve goes directly to the **vision center** of the brain.
- There are **no rods or cones in the area of the optic disk**, so it is insensitive to light and a **blind spot** is created.

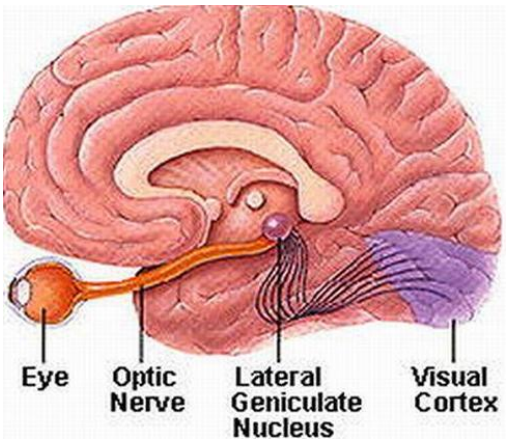




c) The Optic Nerve (CN II):

- Transmits electrical impulses from retina to the brain.
- Brain takes inverted image and flips it so we can see.





- *Quiz.*

1. Lateral squint and ptosis of left eye is caused by lesion of which cranial nerve?

A. Left 3rd

B. Left 6th

Answer: A

C. Right 3rd

D. Right 6th

E. Left 4th

2. Medial squint of left eye is caused by lesion of which cranial nerve?

A. Left 3rd

B. Left 6th

Answer: B

C. Right 3rd

D. Right 6th

E. Left 4th