

Anatomy

The orbit

It is pyramidal shaped cavity with its base anterior and its apex posterior, situated on each side of the root of the nose.

Orbital margins:

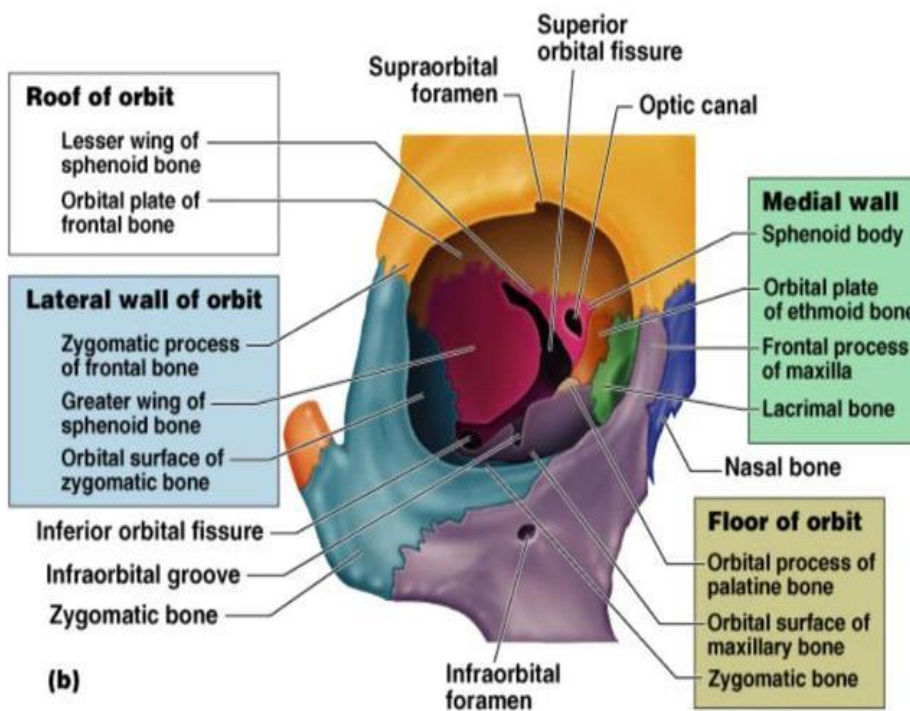
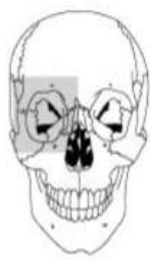
1. Superior margin: is formed by the frontal bone which is notched by the supra-orbital notch.
2. Inferior margin: is formed by the zygomatic bone and the maxilla.
3. Lateral margin: is formed by processes of the frontal and zygomatic bones.
4. Medial margin: is formed by the processes of the frontal and the maxillary bones.

Orbital walls:

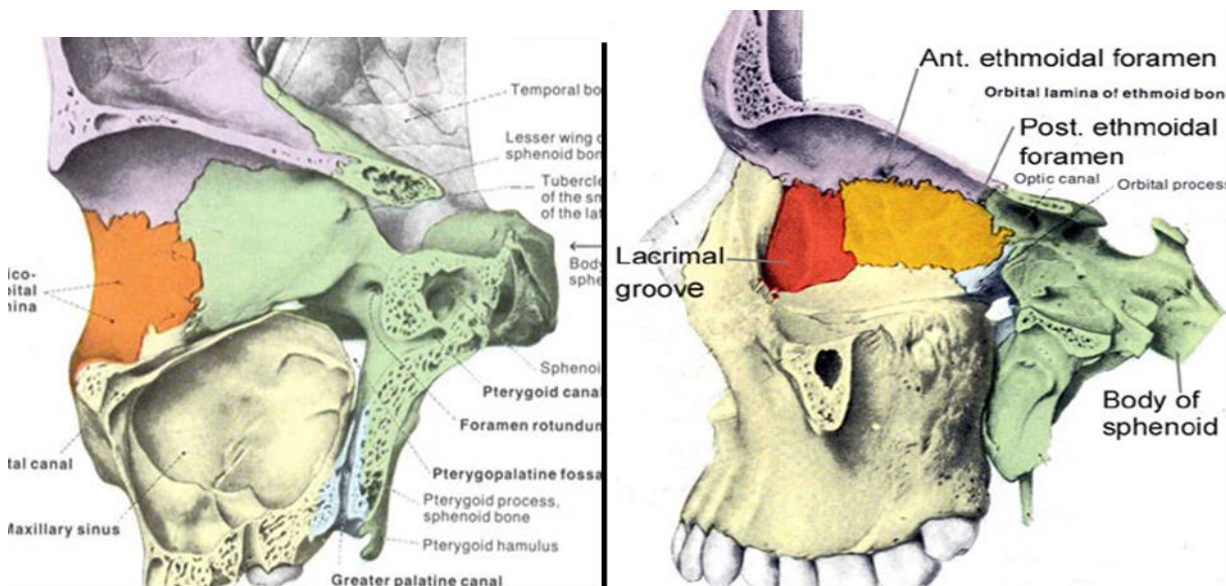
- The roof: is formed by the orbital plate of the frontal bone and the lesser wing of the sphenoid. It separates the orbit from the anterior cranial fossa.
- The floor: is formed by the orbital plate of the maxilla and orbital process of palatine bone. It separates the orbit from the maxillary sinus.
- Lateral wall: is formed by the greater wing of sphenoid and the zygomatic bone.
- medial wall: is formed by:
 - The frontal process of the maxilla.
 - The lacrimal bone.
 - Orbital plate of the ethmoidal labyrinth which separates the orbit from the ethmoid air sinus.
 - The body of the sphenoid.

The contents of the orbit:

1. Eyeball
2. Fascia: orbital fascia and the bulbar fascia
3. Muscles: the extraocular muscles
4. Vessels: ophthalmic artery, superior ophthalmic vein, and inferior ophthalmic vein.
5. Gland: the lacrimal gland.
6. Nerves: optic nerve, oculomotor nerve, trochlear nerve, abducent nerve, sympathetic nerves and branches of the ophthalmic nerve [frontal nerve, lacrimal nerve and nasociliary nerve].
7. Fat
8. Parasympathetic ganglion: the ciliary ganglion.



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Openings in the orbital cavity:

1. supra-orbital notch: it lies in the superior margin and through it passes the supra-orbital nerve and vessels.
2. infra-orbital groove and canal: are situated on the floor of the orbit, and transmit the infra-orbital nerve and vessels.
3. Optic canal: is located posterior, in the lesser wing of the sphenoid. It transmits the optic nerve and the ophthalmic artery.

4. zygomaticotemporal and zygomaticofacial foramina: they are located on the lateral wall of the orbit, and transmit the zygomaticotemporal and zygomaticofacial nerves.

5. Anterior and posterior ethmoidal foramina; they are located on the medial wall of the orbit [along the upper margin of ethmoidal bone]. they transmit the anterior and posterior ethmoidal nerves and vessels.

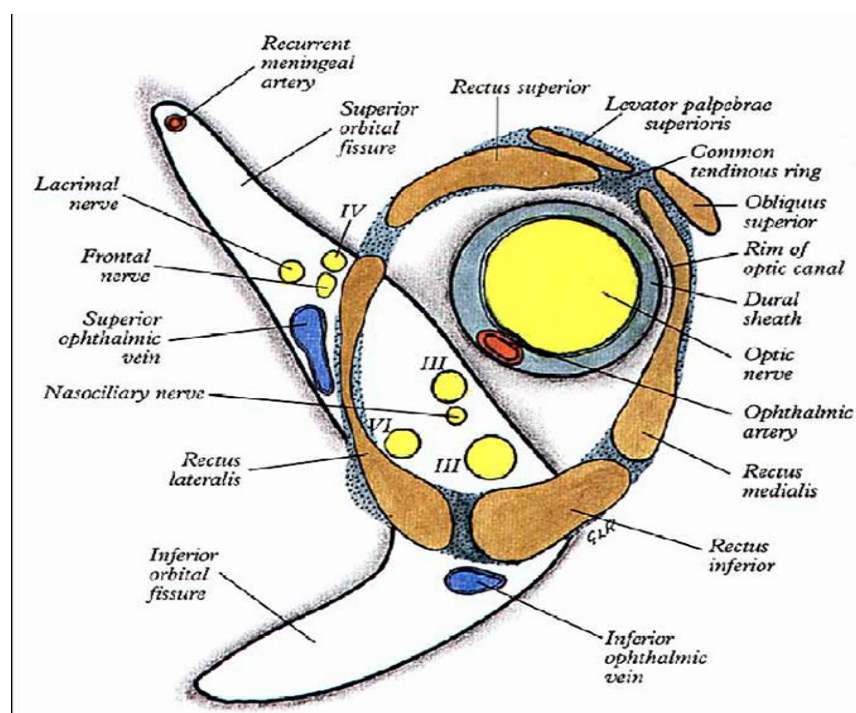
6. Superior orbital fissure: is located posteriorly between the greater and lesser wing of the sphenoid, and communicates the middle cranial fossa with the orbit. The common tendinous ring divides this fissure into three parts which transmits the following structures:

- Lateral part: transmits the lacrimal nerve, frontal nerve, trochlear nerve and the superior ophthalmic vein.
- Middle part: transmits the nasociliary nerve, oculomotor nerve [the superior and inferior division] and the abducent nerve.
- Medial part: transmits the inferior ophthalmic vein and sympathetic nerves from the internal carotid plexus.

7. Inferior orbital fissure: it is located posteriorly between the maxilla and the greater wing of the sphenoid. It communicates the infratemporal fossa and the pterygopalatine fossa with the orbit, and transmits the following structures:

- The maxillary nerve and its zygomatic branch.
- Infra-orbital vessels.
- Communication between the inferior ophthalmic vein and the pterygoid venous plexus.

8. Nasolacrimal canal: is located anteriorly on the medial wall, and it transmits the nasolacrimal duct.



Orbital fascia(Periorbita):

It is the periosteum of the bones that form the walls of the orbit. It is loosely attached to the bones and is continuous with the periosteum covering the outer surface of the bones through the foramina and the fissures. It encloses all the contents of the orbit except the zygomatic nerve and the infra-orbital nerve and vessels. In the posterior part of the orbit, the periorbita thickens around the optic canal and the central part of the superior orbital fissure. This is the point of origin of the four rectus muscles and is the **common tendinous ring**.

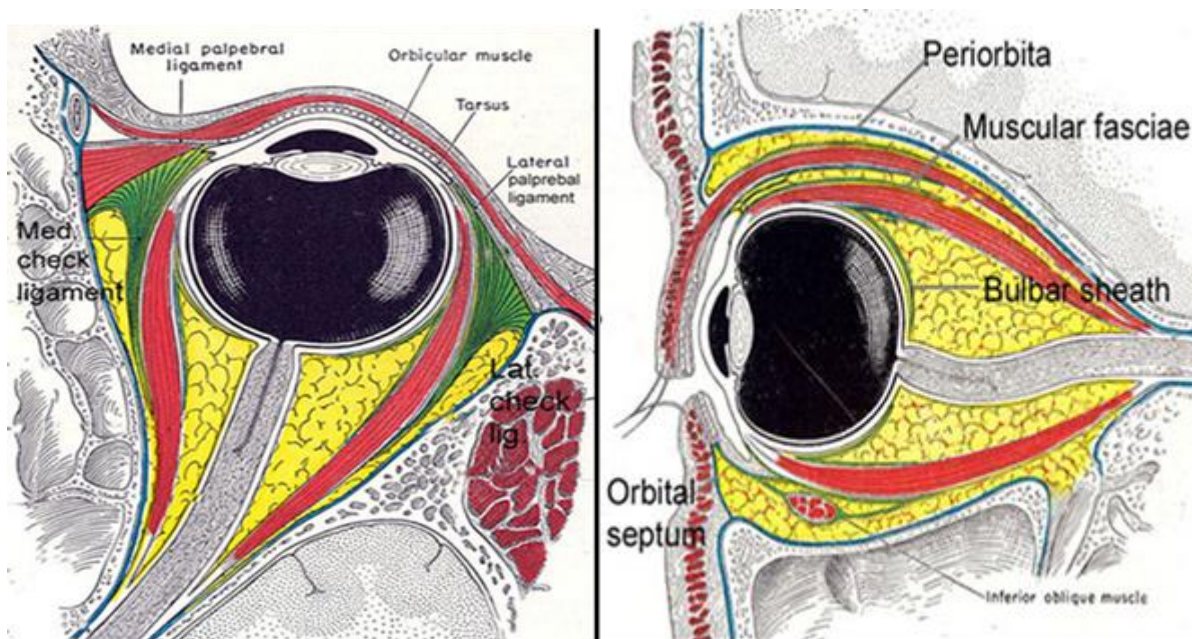
Bulbar fascia [fascial sheath of the eyeball]:

It forms a thin membranous socket around the eyeball [but is deficient in front over the cornea]. It is separated from the eyeball by soft, semifluid tissue which allows the eyeball to slide freely in the sheath. The free anterior margin fuses with the conjunctiva close to the margin of the cornea, while the posterior margin fuses with the dural sheath of the optic nerve.

This fascia separates the eyeball from the orbital fat and form a tubular sheaths covering each orbital muscle. Each of the extraocular muscles pierces the fascial sheath at the equator of the eyeball and receives covering sleeve with it. These sleeves prevent the muscles compressing the eyeball when it contracts.

The facial sheath is connected to the orbital walls by:

1. Lateral and medial check ligaments: these are strong bands pass from the sheaths around the lateral and medial rectus to the medial and lateral walls.
2. The suspensory ligament: it is a sling stretched across the anterior part of the orbit between the lateral and medial check ligaments.



Extraocular muscles

extrinsic muscles of eyeball (extra-ocular muscles) involved in movements of the eyeball or raising upper eyelids.

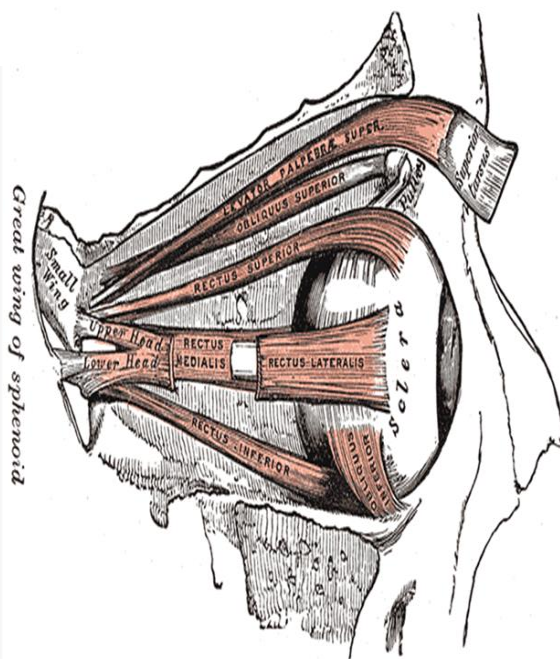
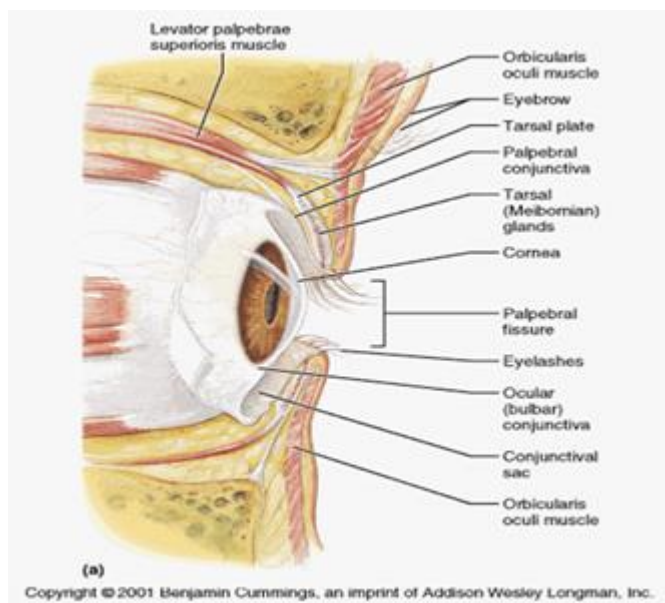
1. levator palpebrae superioris

Origin: under surface of the lesser wing of the sphenoid [anterosuperior to the optic canal].

Insertion: it is a flat muscle that widens as it passes forward [above the superior rectus] and ends anteriorly in a wide aponeurosis that splits into two lamellae [superior and inferior]. The superior lamella is inserted into the anterior surface of the superior tarsal plate, superior conjunctival fornix and the skin of the upper eyelid. The inferior lamella [contains smooth muscle fibers] is inserted to the upper margin of the superior tarsal plate.

Nerve supply: superior lamella by the oculomotor nerve and the inferior lamella by the superior cervical sympathetic ganglion [via the internal carotid plexus].

Action: raising the upper eyelid.



2. recti muscles:

We have four recti [superior, inferior, medial and lateral].

Origin: The four recti are arising from a fibrous ring called the common tendinous ring [it is a thickening of the periosteum, surrounds the optic canal and the middle part of the superior orbital fissure].

Superior rectus arises from the upper part of the ring

Inferior rectus arises from the lower part of the ring

Medial rectus arises from the medial part of the ring

Lateral rectus arises by two heads. One head from the lateral part of the ring, and the other from the greater wing of the sphenoid lateral to the ring. Between the two heads pass the oculomotor nerve, abducent nerve and the nasociliary nerve.

Insertion: the four recti pass forward; they become wider and separate from each other. Together they form a muscular cone that encloses the optic nerve and the posterior part of the eyeball. The tendon of each muscle pierces the fascial sheath of the eyeball and is inserted into the sclera about 6 mm behind the cornea.

Nerve supply: superior rectus, inferior rectus and medial rectus by the oculomotor nerve. The lateral rectus by the abducent nerve.

Action: lateral rectus: lateral rotation.

Medial rectus: medial rotation

Superior rectus: raises the eyeball upward.

Inferior rectus: depresses the eyeball downward.

Because the inferior and superior recti are inserted on the medial side of the vertical axis of the eyeball, so they rotate the eyeball medially.

3. Superior oblique

Origin: body of the sphenoid [anteromedial to the optic canal].

Insertion: its rounded belly passes forward along the upper part of medial wall of the orbit. Anteriorly, it ends in a slender tendon which enters the trochlea [fibrocartilaginous pulley attached to the frontal bone]. The tendon then turns posterolateral between the eyeball and the superior rectus to be inserted into the sclera [behind the coronal equator of the eyeball].

Nerve supply: trochlear nerve

Action: rotate the eyeball, so the cornea looks downward and laterally

4. inferior oblique

Origin: anterior part of the floor of orbit

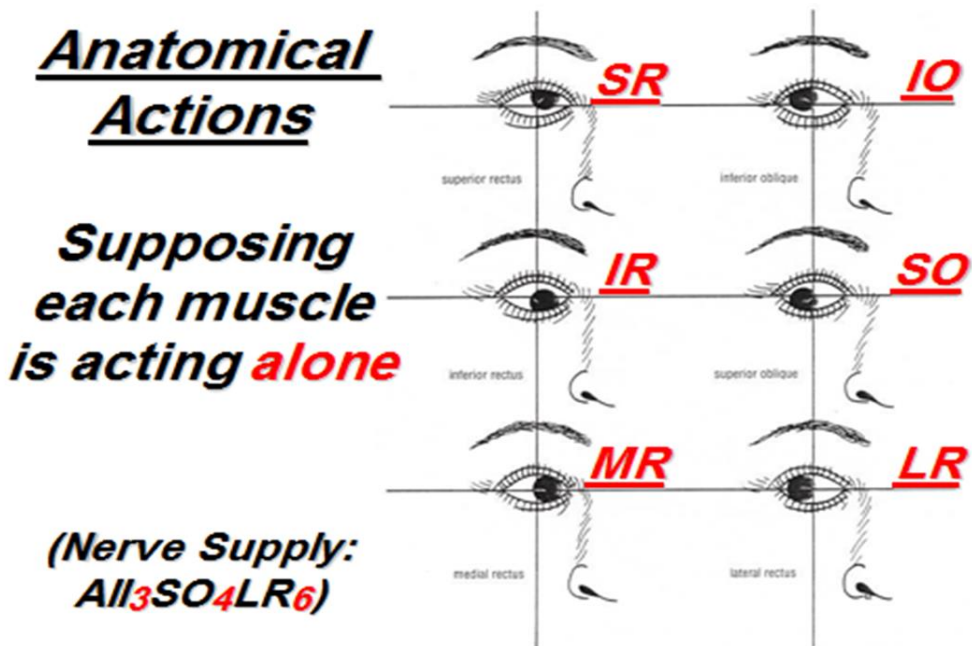
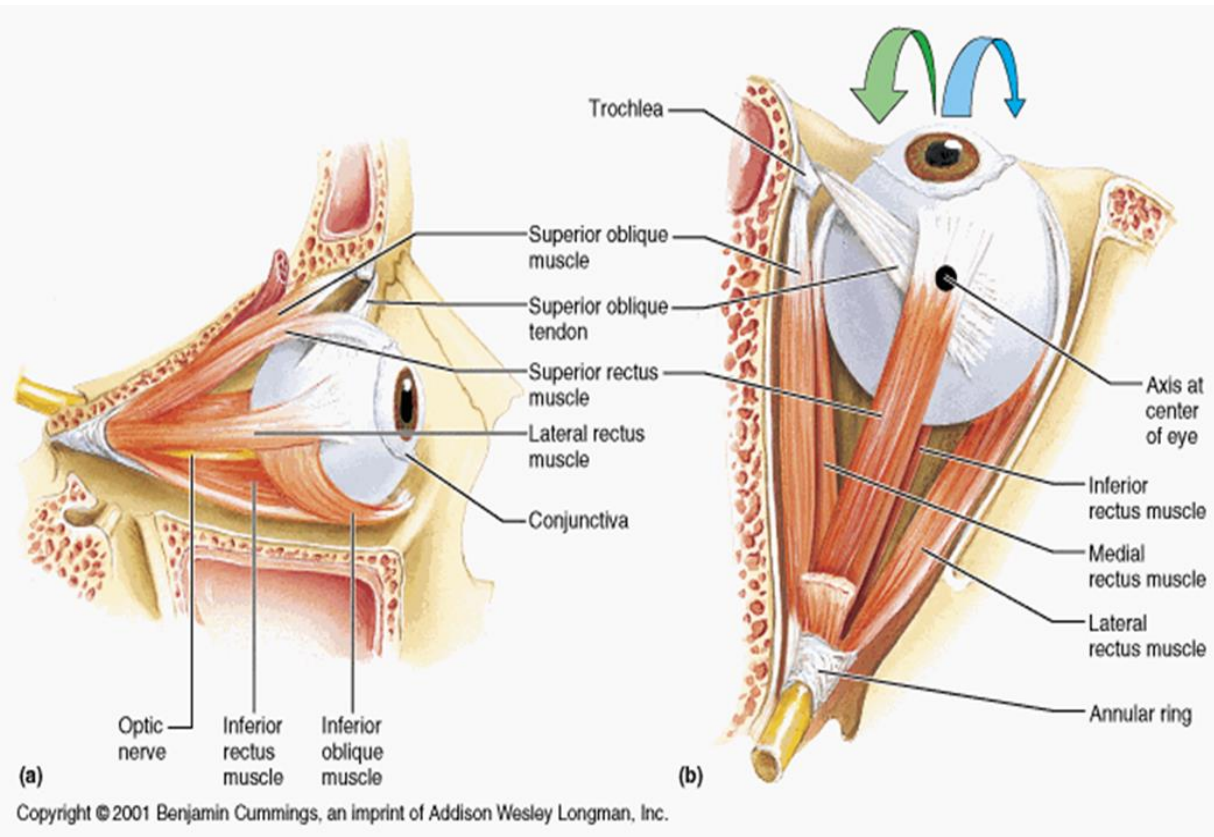
Insertion: it passes backward and laterally, below the inferior rectus .then it curve upward to be inserted into lateral side of sclera, beneath the lateral rectus

Nerve supply: oculomotor nerve

Action: it rotate the eyeball, so the cornea looks upward and laterally.

Nerve supply of the extraocular muscles:

LR6SO4 / ALL BY 3[LR6=lateral rectus by the abducent, SO4=superior oblique by the trochlear nerve,ALL BY 3=all the other muscles by the oculomotor nerve].



Ophthalmic artery:

It is a branch from the internal carotid artery as it emerges from the cavernous sinus [medial to the anterior clinoid process].

It passes forward and enters the orbit through the optic canal below the optic nerve [within the arachnoid sheath of the optic nerve].

In the orbit, at first it lies below the optic nerve then pierces the arachnoid and the dural sheaths and winding round the lateral side of the optic nerve, then it crosses above the nerve with the nasociliary nerve to reach the medial side of the orbit.

It runs forwards along the medial wall of the orbit between the medial rectus and the superior oblique, and terminates near the medial angle of the eye by dividing into the supratrochlear artery and the dorsal nasal artery.

Branches:

1. Branches to the eyeball

- central artery of the retina.
- posterior ciliary branches [2 long and 7 short].

2. Branches to the orbital muscles: muscular branches

3. Branch along the lateral wall of the orbit: lacrimal artery to the lacrimal gland

4. Branches along the medial wall of the orbit:

- Posterior ethmoidal artery.
- Anterior ethmoidal artery.
- Supraorbital artery.
- Supratrochlear artery.
- Dorsal nasal artery.
- Medial palpebral artery.

Ophthalmic veins

1. Superior ophthalmic vein: it begins in the anterior part of the orbit close to the ophthalmic artery, and then it runs with this artery. It communicates with supra-orbital tributaries of the facial vein.
2. Inferior ophthalmic vein: is smaller than superior ophthalmic vein and lies below the optic nerve. It communicates with pterygoid venous plexus by small vein through the inferior orbital fissure.

Both veins pass through the superior orbital fissure [S.O.F.] and drain into the cavernous sinus.

