The orbit-1

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The orbits are bilateral structures below the anterior cranial fossa and anterior to middle cranial fossa.

The bony orbit is pyramidal in shape, with its base opening anteriorly onto the face and its apex extending in a posteromedial direction.

Has medial, lateral, superior (roof), inferior (floor) walls.

The apex of the pyramid is the **optic foramen**, whereas the base is the orbital rim.
Contents of the orbit:
1. Eye ball
2. Extraocular muscles
3. Intraocular muscles
4. Nerves: Optic, branches of ophthalmic, maxillary nerve and its zygomatic branch, divisions of oculomotor, trochlear, abducent, sympathetic fibers and ciliary ganglion
5. Ophthalmic artery and veins
6. Lacrimal apparatus
7. Fat

The apex of the pyramid is the optic foramen
Roof:
Formed by:

1- The orbital plate of the frontal bone, which separates the orbital cavity from the anterior cranial fossa and the frontal lobe of the cerebral hemisphere

2- The lesser wing of the sphenoid
Lateral wall:
Formed by:

1- The orbital plate of zygomatic bone
2- The greater wing of the sphenoid
**Floor:**

**Formed by:**

1. *The orbital plate of the maxilla:* separates the orbital cavity from the maxillary sinus

2. *Palatine bone*
Medial wall:
Formed from before backward by:

1. The frontal process of the maxilla
2. The lacrimal bone
3. The orbital plate of the ethmoid

1. The frontal process of the maxilla
The frontal process of maxilla and the lacrimal bones participate in the formation of the lacrimal groove which contains the lacrimal sac.
The orbital plate of ethmoid separates the orbital cavity from the ethmoid sinuses.

It is a very thin wall.

3. The orbital plate of the ethmoid
Ethmoid bone
Ethmoid bone

- Orbital plate
- Cribiform plate
- Crista galli
- Perpendicular plate
- Lateral mass

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Openings Into the Orbital Cavity

1- Supraorbital notch (Foramen): It transmits the supraorbital nerve and blood vessels
Openings Into the Orbital Cavity

2-Infraorbital groove and canal: Situated on the floor of the orbit. Transmit the infraorbital nerve (a continuation of the maxillary nerve) and blood vessels.
Openings Into the Orbital Cavity

3-Infraorbital foramen:
transmits the infraorbital nerve (a continuation of the maxillary nerve) and blood vessels
Openings Into the Orbital Cavity

5- Anterior and posterior ethmoidal foramina: transmit anterior and posterior ethmoidal nerves and vessels

Note: Anterior and posterior ethmoidal foramina are located between the roof and the medial wall
Openings Into the Orbital Cavity

6-Inferior orbital fissure:
Located posteriorly between the maxilla and the greater wing of the sphenoid, it communicates with the pterygopalatine fossa and infratemporal fossa.

It transmits
1- Maxillary nerve and its zygomatic branch
2- Infraorbital vessels
3- Inferior ophthalmic vein (or a vein communicating with pterygoid plexus of veins)

Note: inferior orbital fissure is located between the floor and the lateral wall.
Openings Into the Orbital Cavity

7- **Superior orbital fissure:**
- Located between the greater and lesser wings of the sphenoid
- It communicates with the middle cranial fossa.
- It transmits
  - Lacrimal nerve
  - Frontal nerve
  - Trochlear nerve
  - Oculomotor nerve (upper and lower divisions)
  - Abducent nerve
  - Nasociliary nerve
  - Superior ophthalmic vein

*Note: superior orbital fissure* is located between the roof and the lateral wall
Note the **superior orbital fissure** opens anteriorly into orbit and posteriorly into middle cranial fossa.

Note the **inferior orbital fissure** opens anteriorly into orbit and posteriorly into two fossae: one big (infratemporal fossa) and one small (Pterygo-palatine fossa).

Use the wire within each of the skull fissures to determine precisely the communications of superior and inferior orbital fissures.
Openings Into the Orbital Cavity

8-Optic canal:
- Located in the lesser wing of the sphenoid
- It communicates with the middle cranial fossa.
- It transmits the optic nerve and the ophthalmic artery

9-Nasolacrimal canal:
Located anteriorly on the medial wall; it communicates with the nose. It transmits the nasolacrimal duct.
MUSCLES OF THE EYE

There are two groups of muscles within the orbit:

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

2-Intrinsic muscles within the eyeball, which control the shape of the lens and size of the pupil.

The extrinsic muscles include:

1. SUPERIOR RECTUS
2. INFERIOR RECTUS
3. MEDIAL RECTUS
4. LATERAL RECTUS
5. SUPERIOR OBLIQUE
6. INFERIOR OBLIQUE
7. LEVATOR PALPEBRAE SUPERIORIS

The intrinsic muscles include:
1- Ciliary muscle
2- Sphincter pupillae
3- Dilator pupillae
Movements of the eyeball

**Elevation** - moving the pupil/cornea superiorly

**Depression** - moving the pupil/cornea inferiorly

**Abduction** - moving the pupil/cornea laterally

**Adduction** - moving the pupil/cornea medially

**Internal rotation** - rotating the upper part of the pupil/cornea medially (or towards the nose)

**Intorsion**

**External rotation** - rotating the upper part of the pupil/cornea laterally (or towards the temple)

**Extorsion**
Orbital region, anterior

- Iris
- Pupil
- Sclera
Common tendinous ring is a fibrous ring which surrounds the optic canal and part of the superior orbital fissure at the apex of the orbit. It is the common origin of the four recti muscles.
1-Superior rectus

**Origin:** Superior part of common tendinous ring  
**Insertion:** Anterior half of eyeball superiorly  
**Nerve supply:** Oculomotor nerve/superior division  
**Action:** Elevation, adduction (Raises cornea upward and medially)

2-Inferior rectus

**Origin:** Inferior part of common tendinous ring  
**Insertion:** Anterior half of eyeball inferiorly  
**Nerve supply:** Oculomotor nerve/inferior division  
**Action:** Depression, adduction (Depresses cornea downward and medially)
3-**Medial rectus**

**Origin:** Medial part of common tendinous ring  
**Insertion:** Anterior half of eyeball medially  
**Nerve supply:** Oculomotor nerve/ inferior division  
**Action:** Adduction (Rotates eyeball so that cornea looks medially)

4-**Lateral rectus**

**Origin:** Lateral part of common tendinous ring  
**Insertion:** Anterior half of eyeball laterally  
**Nerve supply:** Abducent nerve [VI]  
**Action:** Abduction (Rotates eyeball so that cornea looks laterally)
5-Superior oblique

**Origin:** Posterior part of the roof

**Insertion:** Passes through pulley (trochlea) and is attached to lateral posterior half of eyeball (*behind the equator*)

**Nerve supply:** Trochlear nerve [IV]

**Action:** Depression, abduction, intorsion
(Rotates eyeball so that cornea looks downward and laterally)
5-Superior oblique

(Rotates eyeball so that cornea looks downward and laterally) **AS IF YOU ARE LOOKING TO YOUR SHOULDER**
6-Inferior oblique

**Origin:** medial part of the floor (anteriorly)

**Insertion:** lateral posterior half of eyeball (**behind the equator**)

**Nerve supply:** Oculomotor nerve/ inferior division

**Action:** Elevation, abduction, extorsion
(Rotates eyeball so that cornea looks upward and laterally)
The extraocular muscles do not act in isolation. They work as teams of muscles in the coordinated movement of the eyeball to position the pupil as needed.

*For example, although the lateral rectus is the muscle primarily responsible for moving the eyeball laterally, it is assisted in this action by the superior and inferior oblique muscles.*
The origins of the superior and inferior recti are situated about 23° medial to their insertions, and, therefore, when the patient is asked to turn the cornea laterally, these muscles are placed in the optimum position to raise (superior rectus) or lower (inferior rectus) the cornea.

The superior and inferior oblique muscles can be tested. The pulley of the superior oblique and the origin of the inferior oblique muscles lie medial and anterior to their insertions. The physician tests the action of these muscles by asking the patient first to look medially, thus placing these muscles in the optimum position to lower (superior oblique) or raise (inferior oblique) the cornea.

Because the lateral and medial recti are simply placed relative to the eyeball, asking the patient to turn his or her cornea directly laterally tests the lateral rectus and turning the cornea directly medially tests the medial rectus.
Superior and inferior recti

Medial

Axis of eyeball

Axis of orbit
Superior and inferior oblique
Inferior muscles--------------Extorsion
Superior muscles------------- Intorsion
Figure 11.24  The cardinal positions of the right and left eyes and the actions of the recti and oblique muscles principally responsible for the movements of the eyes.  

A. Right eye, superior rectus muscle; left eye, inferior oblique muscle.  
B. Both eyes, superior recti and inferior oblique muscles.  
C. Right eye, inferior oblique muscle; left eye, superior rectus muscle.  
D. Right eye, lateral rectus muscle; left eye, medial rectus muscle.  
E. Primary position, with the eyes fixed on a distant fixation point.  
F. Right eye, medial rectus muscle; left eye, lateral rectus muscle.  
G. Right eye, inferior rectus muscle; left eye, superior oblique muscle.  
H. Both eyes, inferior recti and superior oblique muscles.  
I. Right eye, superior oblique muscle; left eye, inferior rectus muscle.
**LEVATOR PALPEBRAE SUPERIORIS**

**Origin:** Posterior part of the roof

**Insertion:** Anterior surface and upper margin of superior tarsal plate, skin of upper eyelid

**Nerve supply:** Oculomotor nerve/superior branch

**Action:** Elevation of upper eyelid
Nerves of orbit

Motor
1. Oculomotor
2. Trochlear
3. Abducent

Sensory
1. Ophthalmic
   (General sensations)
2. Optic
   (Special sensations)

- Lacrimal
- Frontal
- Nasociliary

SO4LR6
The tendinous ring surround the optic canal and the medial part of superior orbital fissure.
LEVATOR PALPEBRAE SUPERIORIS

1-Superior rectus
2-Inferior rectus
3-Medial rectus
4-Lateral rectus
5-Superior oblique
Nerves of orbit

- Live
- Free
- To
- See
- No
- Insult
- At All

- Lacrimal nerve
- Frontal nerve
- Trochlear nerve
- Superior division of the oculomotor
- Nasociliary nerve
- Inferior division of the oculomotor
- Abducens nerve
Optic nerve and Ophthalmic artery enter the orbit via the optic canal, and so lie within the common tendinous ring.

Superior and inferior divisions of the oculomotor nerve, Nasociliary nerve, and Abducens nerve also enter the orbit within the common tendinous ring, but they do so via the superior orbital fissure.
Lie outside the common tendinous ring

Trochlear nerve
Frontal branch of ophthalmic nerve
Lacrimal branch of ophthalmic nerve
Superior ophthalmic vein

all enter the orbit through the **superior orbital fissure** but lie **outside** the common tendinous ring
Structures which enter the orbit through the **inferior orbital fissure** lie outside the common tendinous ring.

The close anatomical relationship of the optic nerve and other cranial nerves at the orbital apex means that lesions in this region may lead to a combination of visual loss from optic neuropathy and ophthalmoplegia from multiple cranial nerve involvement.
The intrinsic muscles include
THE CILIARY MUSCLE
THE SPHINCTER PUPILLAE
THE DILATOR PUPILLAE

**Ciliary muscle:** Controls shape of lens; in accommodation, makes lens more globular
Supplied by Parasympathetic via oculomotor nerve

**Parasympathetic +**

- Sphincter pupillae
  - Constricts pupil

**Iris (two muscles)**
- Sphincter pupillae
- Dilator pupillae

**Sympathetic +**

- Dilator pupillae
  - Dilates pupil
Intrinsic Eye Muscles and their response to light

- **Circular muscles contract** in bright light.
- The **pupil** is normally in the middle of the eye.
- **Radial muscles contract** in dim light.
At the point where the two borders cross, the third and fourth cranial nerves pass forward to enter the lateral wall of the cavernous sinus.
Epidural Hemorrhage May Cause Temporal Lobe Herniation
Remember that the dura is a tough structure and its tentorium as well, thus one should think about it as a real septa.

Any intracranial mass inside the skull (tumor, bleeding…) may force its neighboring structures to herniate.

Compression of oculomotor nerve (III) is the first clinical sign:

ipsilateral pupil dilation

since the parasympathetic fibers that supply the constrictor pupil are located on the outside of the nerve and are inactivated first by compression.
Superior rectus
Lateral rectus
Superior oblique
Inferior oblique
Medial rectus
Inferior oblique