جامعة المستقبل

كلية التقنيات الصحية والطبية

قسم تقنيات البصريات

Fourth Stage 2024-2025

X-ray and Ultrasound of The Eye

Lecture Title

Orbital Anatomy

Lecture Number: 2

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OPTOMETRIST

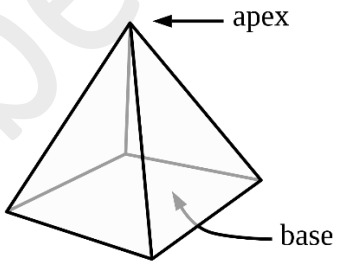
Orbital Anatomy

Introduction to Orbital Anatomy

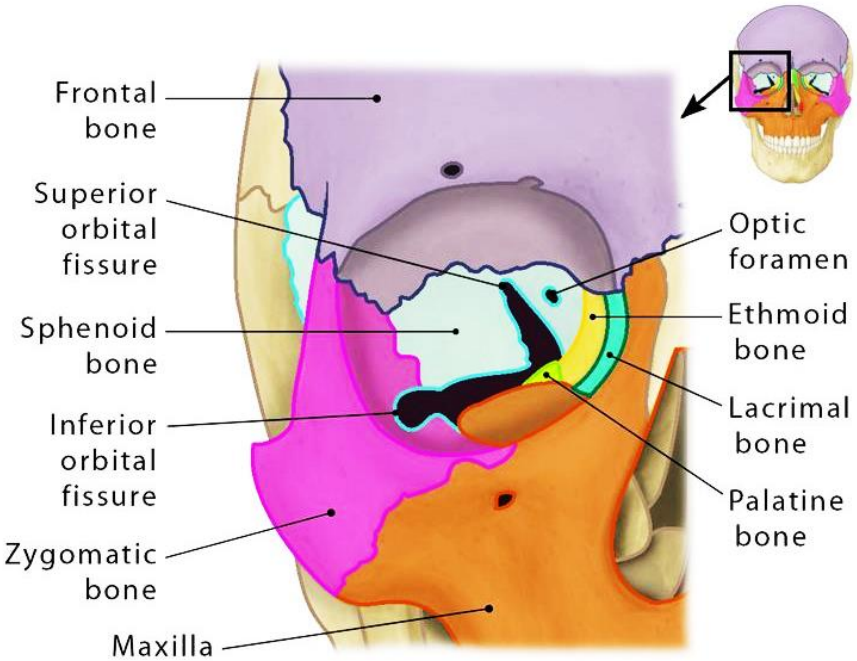
- ***Definition*:** The orbit is the bony cavity in the skull that houses the eye, muscles, nerves, and vessels.
- ***Function*:** Protects the eye, supports its movement, and contains important structures for vision.

Bony Structure of the Orbit

- ***Shape and Location***: A pyramid-shaped cavity with the apex pointing inward.
- ***Orbital Bones***:

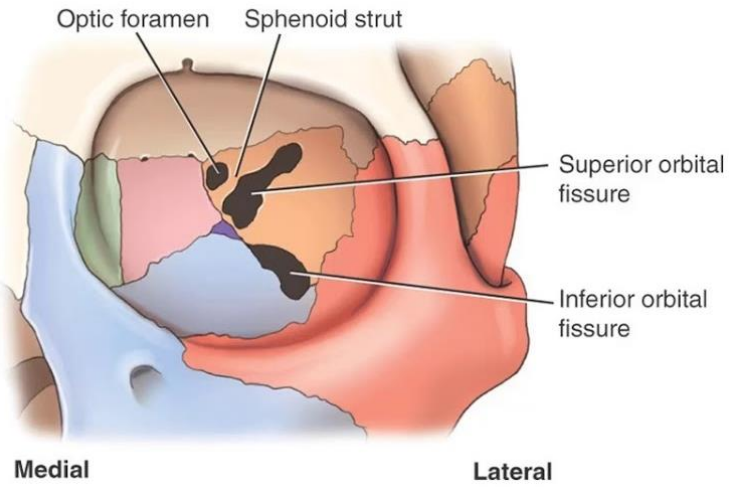


  - Frontal Bone (forms the roof)
  - Zygomatic Bone (forms the lateral wall)
  - Maxillary Bone (forms the floor)
  - Lacrimal Bone (part of the medial wall)
  - Ethmoid Bone (forms the medial wall)
  - Sphenoid Bone (forms the back of the orbit)
  - Palatine Bone (small contribution to the floor)



➢ ***Openings of the Orbit:***

- **Superior Orbital Fissure**: Allows passage of cranial nerves (III, IV, VI) and the ophthalmic vein.
- **Inferior Orbital Fissure**: Passage for the zygomatic nerve and blood vessels.
- **Optic Canal (foramen)**: Passage for the optic nerve (cranial nerve II) and ophthalmic artery.



➢ ***Orbital Contents:***

1. Eye ball

2. Extraocular muscles:

✓ Recti Muscles (superior, inferior, medial, lateral): control the eye's movement up, down, side-to-side.

✓ Oblique Muscles (superior, inferior): control the rotation of the eye.

3. Nerves:

✓ Optic Nerve (II): Carries visual information from the retina to the brain.

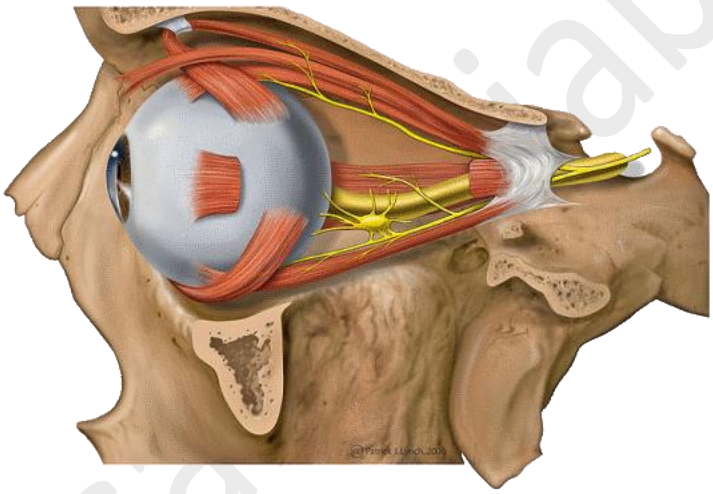
✓ Oculomotor Nerve (III): Controls most of the eye's movement and the pupil.

✓ Trochlear Nerve (IV): Controls the superior oblique muscle.

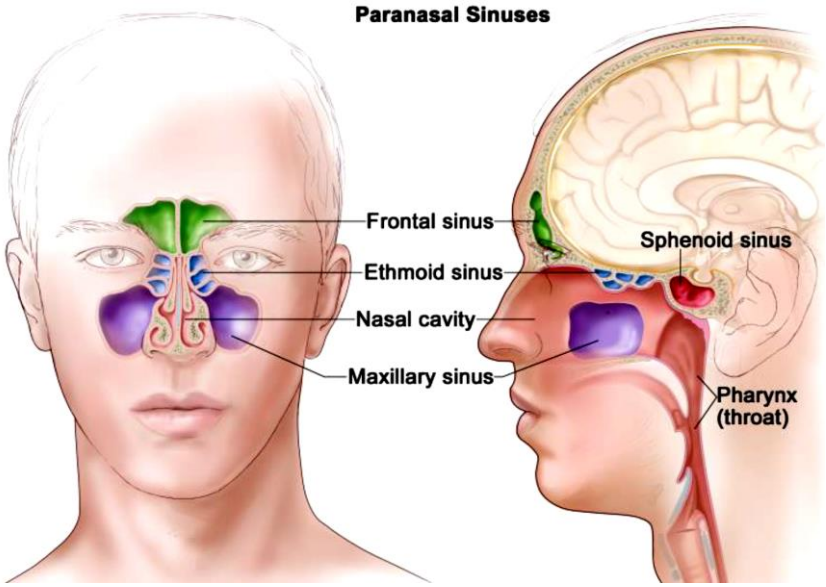
✓ Abducens Nerve (VI): Controls the lateral rectus muscle (moves the eye outward).

- ✓ Trigeminal Nerve (V): Provides sensory innervation to the eye and surrounding areas.

4. **Blood vessels:**
   - ✓ Ophthalmic Artery: Main blood supply to the eye and orbit.
   - ✓ Venous Drainage: Via the ophthalmic veins, draining into the cavernous sinus.
5. **Lacrimal gland:** Produces tears to lubricate the eye.
6. **Orbital fat:** Cushions and protects the eye.
7. **Connective tissue**



Paranasal Sinuses الجيوب الأنفية



Imaging Techniques in Orbital Anatomy

1. X-ray

- **Use**: X-ray imaging used for orbital trauma, especially to detect fractures of the orbital bones. It is less common now due to more advanced imaging methods.
- **Limitations**: Poor soft tissue contrast, meaning muscles, nerves, and blood vessels are not well visualized.

2. Computed Tomography (CT) Scan

- **Use**: CT scanning is excellent for evaluating bone structures and detecting fractures, masses, and infections. It also helps in assessing orbital trauma, intraorbital foreign bodies, certain tumors, excellent resolution for bone structures, and useful in trauma cases and in detecting calcifications.
- **Limitations**: Limited soft tissue contrast compared to MRI, and involves radiation exposure.

3. Magnetic Resonance Imaging (MRI)

- **Use**: MRI is the gold standard for imaging soft tissues in the orbit, such as muscles, optic nerves, and orbital fat. It is particularly useful for diagnosing tumors, inflammation, vascular conditions, optic nerve disorders, excellent soft tissue contrast, no ionizing radiation, and can provide multiplanar views of the orbit.
- **Limitations**: Longer scan time and higher cost compared to CT. It is less effective in detecting bone fractures and is contraindicated in patients with certain metallic implants.

4. Ultrasound (US)

- **Use**: Orbital ultrasound, particularly B-scan ultrasonography, is used to evaluate intraocular structures such as the retina, optic nerve, and vitreous body. It is commonly used in cases of opaque media (e.g., cataract or vitreous hemorrhage), no radiation, portable and relatively inexpensive, excellent for diagnosing ocular tumors, retinal detachment, and optic nerve pathology.
- **Limitations**: Limited in visualizing structures beyond the globe or posterior orbital structures.

5. Positron Emission Tomography (PET)

- **Use**: PET imaging is used less commonly in orbital imaging but is useful for detecting metastatic tumors or inflammatory conditions. It can be combined with CT (PET-CT) to provide detailed anatomical, functional information, shows metabolic activity of tissues, and useful for cancer staging.
- **Limitations**: Limited spatial resolution, and involves exposure to radioactive tracers.