MEDICAL EDUCATION RESOURCE

Contents of the Orbit

ntroduction

- The **orbit** is a **bony cavity** that houses the **eyeball**, **extraocular muscles**, **nerves**, **blood vessels**, and the **lacrimal gland**.
- Out of the 12 pairs of cranial nerves, **II, III, IV, VI**, and part of **V** (trigeminal), along with **sympathetic fibers**, are dedicated to orbital structures.
- The orbit serves primarily to **protect and support the eyeball**.

Orbits – Features

- Each orbit is a **pyramidal cavity**, one on each side of the nose.
- They allow **rotatory movements of the eyeball**.
- The **long axis** of each orbit passes **backward and medially**.
- The **medial walls** of both orbits are **parallel** (2.5 cm apart).
- The **lateral walls** are **at right angles** to each other.

Contents of the Orbit

1. Eyeball (anterior one-third of orbit).
2. Fasciae – **Orbital** and **Bulbar** fasciae.

3. **Muscles** – Extraocular and intraocular.
4. **Vessels** – Ophthalmic artery, superior and inferior ophthalmic veins, and lymphatics.
5. **Nerves** – Optic, oculomotor, trochlear, abducent, and branches of ophthalmic and maxillary nerves.
6. **Lacrimal gland**.
7. **Orbital fat**.

Visual and Orbital Axes

- **Visual axis:** Line through the **anterior and posterior poles of the eyeball**.
- **Orbital axis:** Line passing through the **optic canal and center of orbital base**.
- The two axes form an **angle of 20–25°** with each other.

Orbital Fascia (Periorbita)

- The **periorbita** is the **periosteum of the bony orbit**.
- It is **loosely attached** to the bone and easily stripped off.
- **Posteriorly:** Continuous with **dura mater** and the **optic nerve sheath**.
- **Anteriorly:** Continuous with periosteum at the **orbital margin**.
- **Inferior orbital fissure:** Covered by connective tissue containing smooth muscle fibers forming the **orbitalis muscle**.

Extensions of Orbital Fascia

a. At upper and lower orbital margins ? forms **orbital septa** for eyelids.

b. Sends a process to hold the **fibrous pulley** of the **superior oblique muscle**.

c. Another process forms the **lacrimal fascia** bridging the lacrimal groove.

Fascial Sheath of Eyeball (Bulbar Fascia / Tenon's Capsule)

- A **thin, loose membranous sheath** surrounding the eyeball from the **optic nerve** to the **sclerocorneal junction**.
- Separated from the sclera by the **episcleral space** filled with delicate fibrous bands ? allows **free movement of the eyeball**.

Pierced by:

- **Tendons of extraocular muscles.**
- **Ciliary vessels and nerves** near the optic nerve.

Expansions from the Sheath

a. **Tubular sheaths** for each extraocular muscle.

b. **Medial check ligament:** Expansion from medial rectus sheath ? attached to **lacrimal bone**.

c. **Lateral check ligament:** Expansion from lateral rectus sheath ? attached to **zygomatic bone**.

Suspensory Ligament of the Eye (Lockwood's ligament)

- Formed by the union of the sheaths of **inferior rectus** and **inferior oblique muscles** with medial and lateral check ligaments.
- Acts like a **hammock** supporting the eyeball from below.

Extraocular Muscles

- **Total**: 7 muscles (6 act on the eyeball + 1 elevates the upper eyelid).
- **Origin:** From the **common tendinous ring (annulus of Zinn)** at the apex of the orbit.
- **Insertion:** Onto the sclera of the eyeball.

Recti Muscles

1. **Superior rectus**
2. **Inferior rectus**
3. **Medial rectus**
4. **Lateral rectus**

Oblique Muscles

5. **Superior oblique** (passes through trochlea pulley)
6. **Inferior oblique** (arises from maxilla, below the lacrimal fossa)

Eyelid Muscle

7. **Levator palpebrae superioris** — raises upper eyelid.

Nerve Supply

- **Oculomotor nerve (III):** all except LR6, SO4
- **Trochlear nerve (IV):** superior oblique
- **Abducent nerve (VI):** lateral rectus
  Mnemonic ? **“LR6 SO4, rest by 3”**

Actions of the Extraocular Muscles

AXIS	MOVEMENTS
Transverse	Elevation (up) and depression (down)
Vertical	Adduction (medial) and abduction (lateral)
Anteroposterior	Intorsion (inward rotation) and extorsion (outward rotation)

Individual Muscle Actions

- **Superior rectus** ? Elevation + Adduction + Intorsion
- **Inferior rectus** ? Depression + Adduction + Extorsion
- **Superior oblique** ? Depression + Abduction + Intorsion
- **Inferior oblique** ? Elevation + Abduction + Extorsion
- **Medial rectus** ? Adduction
- **Lateral rectus** ? Abduction

Combined Actions

- Elevation: Superior rectus + Inferior oblique
- Depression: Inferior rectus + Superior oblique
- Adduction: Medial, Superior, and Inferior recti
- Abduction: Lateral rectus + Both obliques
- Intorsion: Superior rectus + Superior oblique

- Extorsion: Inferior rectus + Inferior oblique

Conjugate Movements

- Coordinated movement of both eyes in the same direction.
  Example:
    - **Right gaze** ? right lateral rectus + left medial rectus.
    - **Left gaze** ? left lateral rectus + right medial rectus.

Involuntary Muscles of the Orbit

1. **Orbitalis Muscle (Müller's muscle)**
    - Smooth muscle bridging the inferior orbital fissure.
    - Innervated by **sympathetic fibers**.
    - Keeps the eyeball slightly protruded; its paralysis causes **sunken eyeball (enophthalmos)**.
2. **Superior Tarsal Muscle (Müller's of eyelid)**
    - Smooth muscle aiding levator palpebrae superioris.
    - Sympathetic nerve supply.
    - Paralysis ? **partial ptosis** (drooping of upper eyelid).
3. **Inferior Tarsal Muscle**

- Weak smooth muscle aiding lower eyelid retraction.
- Sympathetic fibers.

Clinical Anatomy

- **Paralysis of Oculomotor Nerve (III):**
  - Ptosis (levator paralysis)
  - Eye deviated down and out (LR & SO unopposed)
  - Dilated pupil and loss of accommodation.
- **Trochlear Nerve (IV) Palsy:**
  - Difficulty looking down and in (e.g., reading, descending stairs).
- **Abducent Nerve (VI) Palsy:**
  - Failure to abduct the eye ? **Medial squint** (convergent strabismus).
- **Nystagmus:**
  - Involuntary rhythmic eye movements due to cerebellar or vestibular disturbance.

Vessels of the Orbit

Ophthalmic Artery

- **Origin:** Cerebral part of the internal carotid artery (near anterior clinoid process).

- **Entry:** Through **optic canal** with the **optic nerve** (below and lateral to it).
- **Course:**
  - Pierces dura ? ascends lateral to optic nerve ? crosses above it to medial side ? runs forward with **nasociliary nerve** between superior oblique and medial rectus.
  - Ends at medial angle of eye ? divides into **supratrochlear** and **dorsal nasal arteries**.

Dissection

- Identify artery crossing above the optic nerve with nasociliary nerve and superior ophthalmic vein.
- Locate the **central artery of the retina** — a vital end artery.

Branches of the Ophthalmic Artery

Within Dural Sheath

- **Central artery of retina** — supplies retina; occlusion ? sudden blindness.

In the Orbit

1. **Lacrimal artery** ? lacrimal gland, eyelids, zygomatic branches, recurrent meningeal branch.
2. **Posterior ciliary arteries (long & short)** ? choroid and iris.
3. **Supraorbital and Supratrochlear arteries** ? forehead and scalp.
4. **Ethmoidal arteries (anterior & posterior)** ? ethmoidal sinuses and nasal cavity.

5. **Medial and Lateral Palpebral arteries** ? eyelids.
6. **Dorsal nasal artery** ? bridge of nose.
7. **Muscular branches** ? supply extraocular muscles; give rise to **anterior ciliary arteries**.

Clinical Anatomy of Ophthalmic Artery

- **Central artery of retina occlusion** ? sudden, permanent blindness.
- **Ophthalmic vein thrombosis** may spread infection to the cavernous sinus.
- **Anastomosis** between ophthalmic artery and facial artery (via dorsal nasal branch) maintains collateral circulation between internal and external carotid systems.

Ophthalmic Veins

Superior Ophthalmic Vein

- Accompanies the ophthalmic artery.
- Lies **above the optic nerve**.
- Receives tributaries corresponding to the branches of the ophthalmic artery.
- Passes through the **superior orbital fissure** to drain into the **cavernous sinus**.
- Communicates anteriorly with **supraorbital and angular veins**, forming a link between **facial and intracranial veins** (important clinical pathway).

Inferior Ophthalmic Vein

- Lies **below the optic nerve**.
- Receives tributaries from **lacrimal sac**, **lower orbital muscles**, and **eyelids**.
- Drains either into the **superior ophthalmic vein** or directly into the **cavernous sinus**.
- Also communicates with the **pterygoid venous plexus** via the **inferior orbital fissure**.

Lymphatic Drainage

- Lymphatics of the orbit drain into **preauricular (parotid) lymph nodes**.

Optic Nerve

Origin and Nature

- Composed of **axons of ganglion cells of the retina** (second-order neurons).
- Structurally, it is a **tract of the brain** rather than a true peripheral nerve — lacks a neurilemma and cannot regenerate.

Relations

- Crossed **superiorly** by the ophthalmic artery, nasociliary nerve, and superior ophthalmic vein.
- Crossed **inferiorly** by the nerve to medial rectus.
- Surrounded near the eyeball by orbital fat containing **ciliary vessels and nerves**.

Structure

- Contains around **1.2 million myelinated fibers**, 53% of which cross in the **optic chiasma**.
- Covered by **three meningeal layers** continuous with those of the brain.

Clinical Anatomy of Optic Nerve

- **Infection Spread:** Facial and ophthalmic venous connections can transmit infection ? **cavernous sinus thrombosis**.
- **Optic Neuritis:** Pain with eye movement and loss of vision; optic disc may appear normal (retrobulbar neuritis).
- **Optic Atrophy:** Degeneration of the optic nerve, primary or secondary to inflammation or raised intracranial pressure.
- **Non-regenerative Nature:** Due to absence of neurilemma, regeneration is impossible after injury.

Ciliary Ganglion

Location

- Small parasympathetic ganglion near the **apex of the orbit**, between the **optic nerve** and **lateral rectus tendon**.

Roots

1. **Parasympathetic (motor) root:**
    - From the **nerve to inferior oblique** (branch of oculomotor).

    - Preganglionic fibers originate in the **Edinger–Westphal nucleus**.
    - Postganglionic fibers travel through **short ciliary nerves** to the **sphincter pupillae** and **ciliaris muscle** (for accommodation).
2. **Sensory root:**
    - From **nasociliary nerve**; conveys sensory fibers from the eyeball.
    - Fibers **do not relay** in the ganglion.
3. **Sympathetic root:**
    - From **internal carotid plexus** (postganglionic fibers from superior cervical ganglion).
    - Pass through ganglion without relay ? supply **dilator pupillae** and **blood vessels** of the eye.

Branches

- 8–10 **short ciliary nerves** divide into multiple filaments to pierce the sclera near the optic nerve, carrying all three types of fibers.

Oculomotor Nerve (III Cranial Nerve)

Course

- Arises from the **midbrain** (interpeduncular fossa).
- Passes through the **cavernous sinus**, divides into **superior and inferior divisions**, and enters the orbit through the **superior orbital fissure**.

Branches

- **Superior division:**
  - Supplies **superior rectus** and **levator palpebrae superioris**.
- **Inferior division:**
  - Supplies **medial rectus**, **inferior rectus**, and **inferior oblique**.
  - Gives a **branch to ciliary ganglion** (parasympathetic).

Functional Components

- Somatic motor ? all extraocular muscles except lateral rectus & superior oblique.
- Parasympathetic ? to sphincter pupillae and ciliaris via ciliary ganglion.

Clinical Correlation

- Lesion ? **complete ptosis**, **pupil dilation**, **eye deviation down and out**, and **loss of accommodation**.

Trochlear Nerve (IV Cranial Nerve)

Course

- The **smallest cranial nerve**; the only one emerging from the **dorsal aspect of the brainstem**.
- Passes around the midbrain, through the **cavernous sinus**, and enters the orbit through the **superior orbital fissure**.

- Supplies the **superior oblique muscle**.

Functional Component

- Somatic motor — controls **depression, abduction, and intorsion** of the eyeball.

Clinical Correlation

- **Trochlear nerve palsy** ? Diplopia (double vision), especially while looking **downward and medially**, difficulty descending stairs or reading.

Abducent Nerve (VI Cranial Nerve)

Functional Type:

- **Somatic motor nerve** to the **lateral rectus muscle** of the eye (responsible for abduction).

Nucleus:

- Located in the **floor of the 4th ventricle** in the **lower pons**, beneath the **facial colliculus**.

- Closely related to the **medial longitudinal fasciculus**, coordinating conjugate gaze.

Course:

1. Emerges from **lower border of pons**, between the pons and medulla.

2. Ascends upward and forward through the **pontine cistern**, usually above the **anterior inferior cerebellar artery**.

3. Pierces the **dura** lateral to the **dorsum sellae** and passes under the **petrosphenoidal ligament**.

4. Enters the **cavernous sinus**, running **lateral and then inferolateral** to the **internal carotid artery**.

5. Enters the **orbit through the superior orbital fissure**, lying **inferolateral to the oculomotor nerve**, to supply the **lateral rectus muscle**.

Clinical Anatomy:

- **Abducent nerve palsy** ? paralysis of lateral rectus ? **failure of abduction** of the affected eye.

- The eye deviates medially (medial squint), and **diplopia (double vision)** occurs when looking toward the affected side.

- Vulnerable to **raised intracranial pressure** because of its long intracranial course and sharp bend over the petrous apex.

Branches of Ophthalmic Division of Trigeminal Nerve (V1)

Nature:

- Purely **sensory**; supplies structures in the **orbit, forehead, and scalp**.

Divisions and Branches:

1. **Frontal Nerve** (largest branch)

    - **Supratrochlear nerve** ? upper eyelid, conjunctiva, and lower forehead.

- **Supraorbital nerve** ? frontal air sinus, upper eyelid, forehead, and scalp up to the vertex.

2. **Nasociliary Nerve**
   - **Long ciliary nerves** ? sensory fibers to eyeball and sympathetic fibers to dilator pupillae.
   - **Branch to ciliary ganglion** ? sensory root.
   - **Posterior ethmoidal nerve** ? sphenoidal and posterior ethmoidal air sinuses.
   - **Anterior ethmoidal nerve** ? middle and anterior ethmoidal sinuses; divides into:
     - Medial and lateral internal nasal branches (nasal septum and lateral wall).
     - External nasal branch (skin of ala and tip of nose).
   - **Infratrochlear nerve** ? both eyelids, side of nose, and lacrimal sac.
3. **Lacrimal Nerve**
   - Supplies the **lateral part of upper eyelid** and **conjunctiva**.
   - Carries **secretomotor fibers** from the zygomatic nerve (V2) to the **lacrimal gland**.

Some Branches of Maxillary Division of Trigeminal Nerve (V2)

Nature:

- Purely **sensory**; supplies midfacial region, upper teeth, and nasal cavity.

Important Branches:

1. **Infraorbital Nerve** (continuation of maxillary nerve)
    - Enters orbit via **inferior orbital fissure**, runs through **infraorbital groove and canal**, and emerges via **infraorbital foramen**.
    - **Branches:**
        - **Middle superior alveolar nerve** ? upper premolar teeth.
        - **Anterior superior alveolar nerve** ? upper incisor and canine teeth, anterior nasal cavity, and maxillary sinus.
        - **Terminal branches:** palpebral, nasal, and labial — supply skin of eyelid, cheek, and upper lip.
2. **Zygomatic Nerve**
    - Branch of maxillary nerve in **pterygopalatine fossa**.
    - Enters orbit through **lateral part of inferior orbital fissure**; divides into:
        - **Zygomaticotemporal nerve** ? anterior temple skin; gives branch to **lacrimal nerve** carrying secretomotor fibers to lacrimal gland.
        - **Zygomaticofacial nerve** ? skin over the prominence of the cheek.
3. **Posterior Superior Alveolar Nerve**
    - Arises in **pterygopalatine fossa**; supplies **molar teeth** and **maxillary sinus**.

Sympathetic Nerves of the Orbit

Origin

- Arise from the **internal carotid plexus**, which is derived from the **superior cervical sympathetic ganglion**.

Course and Distribution

1. **To the Dilator Pupillae**
    - Fibers pass through the **ophthalmic nerve (V1)** ? **nasociliary nerve** ? **long ciliary nerves**.
    - Supply the **dilator pupillae muscle** of the iris, responsible for **pupil dilation (mydriasis)**.
2. **Other Sympathetic Pathways to the Orbit**
   a. **Perivascular plexus** — surrounds the **ophthalmic artery** and its branches, providing **vasomotor fibers** to orbital vessels.
   b. **Branch via Superior Orbital Fissure** — from the internal carotid plexus ? joins the **ciliary ganglion** (passes through without relay).
   c. **Other Filaments** — travel along **oculomotor (III)**, **trochlear (IV)**, **abducent (VI)**, and **ophthalmic nerves (V1)**.
    - These fibers are **vasomotor**, supplying blood vessels within the orbit and ocular muscles.

Functions

- **Pupil Dilation (Mydriasis)** — via dilator pupillae.
- **Vasomotor control** — constriction of blood vessels in the orbit and eye.
- **Assists levator palpebrae superioris** (through superior tarsal muscle) in elevating the upper eyelid.

Clinical Anatomy

- **Horner's Syndrome** results from interruption of sympathetic fibers:
    - **Ptosis** — drooping of upper eyelid (loss of tone in superior tarsal muscle).
    - **Miosis** — constricted pupil (unopposed sphincter pupillae).
    - **Anhidrosis** — loss of sweating on the affected side of the face.
    - **Enophthalmos** — slight sinking of the eyeball due to paralysis of orbitalis muscle.

Mnemonics

For Nerve Supply of Extraocular Muscles
? **"LR6 SO4 rest 3"**

- **Lateral rectus (LR)** ? supplied by **6th nerve (Abducent)**
- **Superior oblique (SO)** ? supplied by **4th nerve (Trochlear)**
- **Rest of the muscles** (Superior rectus, Inferior rectus, Medial rectus, Inferior oblique, Levator palpebrae superioris) ? supplied by **3rd nerve (Oculomotor)**

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Facts to Remember

- **Levator palpebrae superioris** is **supplied partly by the oculomotor nerve (III)** and **partly by sympathetic fibers**.

- **Central artery of retina** is an **end artery** — its blockage causes **sudden irreversible blindness**.
- **Nerve supply of extraocular muscles:** LR6, SO4, and the rest by III nerve.
- **Edinger–Westphal nucleus** provides parasympathetic fibers to **ciliaris** and **constrictor pupillae muscles** after relay in the **ciliary ganglion**.
- **Elevation and depression of the eyeball** occur around a **transverse axis**.
- **Adduction and abduction** occur around a **vertical axis**.
- **Intorsion and extorsion** occur around an **anteroposterior axis**

Clinicoanatomical Problem

A **hypertensive and diabetic woman** with high cholesterol and lipid levels suddenly develops **blindness in her right eye**.

Question:
What is the likely cause of blindness in this case?
Name other end arteries in the body.

Answer:

- In hypertension, **atheromatous (fatty) changes** develop in arteries, leading to narrowing and hardening of the vessel wall.
- The **retina** receives its main blood supply from the **central artery of the retina**, which is an **end artery** (i.e., it has no significant anastomoses with neighboring vessels).
- Occlusion or blockage of this artery causes **sudden irreversible blindness** in that eye, as there is **no alternate blood supply** to the inner retinal layers.

Other End Arteries in the Body

- **Labyrinthine artery** ? supplies the inner ear.
- **Coronary arteries** ? functionally end arteries, despite minor anastomoses.
- **Central branches of cerebral arteries** ? supply deep brain structures.
- **Segmental arteries of kidney and spleen** ? end arteries supplying independent vascular segments.

Clinicoanatomical Problem 1 – Cavernous Sinus Thrombosis

Case:
A patient presents with **fever, periorbital swelling, chemosis (conjunctival edema)**, and **paralysis of ocular movements** on one side.

Explanation:

- Infection from the **danger area of face** (upper lip, nose) can spread through **facial ? angular ? ophthalmic veins** into the **cavernous sinus**.
- Inflammation leads to **thrombosis of the cavernous sinus**, affecting the **III, IV, VI, V1, and V2 cranial nerves** that pass through or in its wall.
- Results in **ophthalmoplegia**, **proptosis**, and **loss of corneal reflex**.

Key Anatomy:

- Ophthalmic veins are **valveless**, allowing **retrograde spread** of infection.

Clinicoanatomical Problem 2 – Oculomotor Nerve Palsy

Case:
A middle-aged person develops **ptosis**, the **eye deviated down and out**, and **dilated pupil**.

Explanation:

- Indicates **oculomotor nerve (III) paralysis**.
- Muscles affected: superior, inferior, medial recti, inferior oblique, and levator palpebrae superioris.
- Unopposed action of **lateral rectus (VI)** and **superior oblique (IV)** causes downward and outward deviation.
- Parasympathetic fibers to **sphincter pupillae** and **ciliaris** are also paralyzed ? **pupil dilates** and **accommodation is lost**.

Clinicoanatomical Problem 3 – Abducent Nerve Palsy

Case:
A patient with head injury complains of **double vision** when looking sideways.

Explanation:

- Indicates **abducent (VI) nerve lesion**.
- **Lateral rectus** paralyzed ? failure of abduction ? affected eye turns medially (due to medial rectus).
- Commonly affected by **raised intracranial pressure**, as the nerve has a long intracranial course and a sharp bend over the **petrous apex**.

Clinicoanatomical Problem 4 – Horner's Syndrome

Case:
A patient presents with **ptosis**, **miosis**, **anhidrosis**, and **slight enophthalmos**.

Explanation:

- Caused by interruption of **sympathetic supply** to the orbit.
- Affects **superior tarsal muscle** (ptosis), **dilator pupillae** (miosis), and **orbitalis muscle** (enophthalmos).
- Often due to lesions of the **cervical sympathetic chain** or **superior cervical ganglion**.

Clinicoanatomical Problem 5 – Blow-Out Fracture of the Orbit

Case:
After a blunt injury to the eye, a person shows **swelling, diplopia, and infraorbital numbness** .

Explanation:

- **Inferior wall of the orbit (maxilla)** is thin ? may fracture (blow-out fracture).
- **Inferior rectus and inferior oblique muscles** may get trapped ? restricted upward gaze.
- **Infraorbital nerve** injury ? sensory loss over cheek and upper lip.

Clinicoanatomical Problem 6 – Retrobulbar Neuritis

Case:
A young adult complains of **pain during eye movement** and **sudden visual loss**.

Explanation:

- **Inflammation of the optic nerve behind the eyeball** (retrobulbar region).
- Commonly seen in **multiple sclerosis**.

- The optic disc appears normal initially, but later shows **optic atrophy**.

Frequently Asked Questions

1. Name the contents of the orbit.
? Eyeball, extraocular muscles, nerves, vessels, lacrimal gland, fascial sheaths, and orbital fat.

2. Which are the extraocular muscles?
? Superior, inferior, medial, and lateral recti; superior and inferior oblique; and levator palpebrae superioris.

3. Name the involuntary muscles of the orbit.
? Orbitalis, superior tarsal (of eyelid), and inferior tarsal muscles.

4. What is the nerve supply of the extraocular muscles?
?

- **Oculomotor (III):** All except LR & SO.
- **Trochlear (IV):** Superior oblique.
- **Abducent (VI):** Lateral rectus.
  Mnemonic — **LR6 SO4 rest 3**.

5. What is Tenon's capsule?
? Fascial sheath of the eyeball that surrounds it from optic nerve to sclerocorneal junction; allows free movement of the eyeball.

6. Name the branches of the ophthalmic artery.
? Central artery of retina, lacrimal, supraorbital, supratrochlear, ethmoidal, dorsal nasal, posterior ciliary, palpebral, and muscular branches.

7. Which vein connects the facial vein with the cavernous sinus?
? Superior ophthalmic vein.

8. Name the layers covering the optic nerve.
? Dura mater, arachnoid mater, and pia mater (continuous with brain coverings).

9. Name the roots of the ciliary ganglion.
?

- **Parasympathetic:** From oculomotor nerve.
- **Sympathetic:** From internal carotid plexus.
- **Sensory:** From nasociliary nerve.

10. Name the branches of the ciliary ganglion.
? 8–10 short ciliary nerves.

11. What are the parts of the oculomotor nerve?
? Superior and inferior divisions.

- Superior ? superior rectus and levator palpebrae superioris.
- Inferior ? medial, inferior recti, and inferior oblique muscles.

12. Which muscle is supplied by the trochlear nerve?
? Superior oblique muscle.

13. Which muscle is supplied by the abducent nerve?
? Lateral rectus muscle.

14. What are the branches of the ophthalmic division of the trigeminal nerve?
? Frontal, lacrimal, and nasociliary nerves.

15. Which nerves pass through the superior orbital fissure?
? Oculomotor, trochlear, abducent, ophthalmic division of trigeminal (V1), and sympathetic filaments.

16. What is the function of the sympathetic nerves of the orbit?
? Pupil dilation (dilator pupillae), vasomotor control, and assistance in eyelid elevation (superior

tarsal muscle).

17. What are the effects of injury to the oculomotor nerve?

? Ptosis, dilated pupil, eye deviated down and out, and loss of accommodation.

18. What are the effects of Horner's syndrome?

? Ptosis, miosis, anhidrosis, and enophthalmos due to sympathetic interruption.

19. Which artery is called the end artery of the orbit?

? Central artery of the retina.

20. Name the bones forming the orbit.

? Frontal, sphenoid, zygomatic, maxilla, lacrimal, ethmoid, and palatine bones.

Multiple Choice Questions

1. Which nucleus is related to the ciliary ganglion?

a. Superior salivatory

b. Lacrimatory

c. Inferior salivatory

d. Edinger–Westphal

? **Answer:** d. Edinger–Westphal

2. Ophthalmic artery is a branch of which of the following arteries?

a. Internal carotid

b. External carotid

c. Maxillary

d. Vertebral

? **Answer:** a. Internal carotid

3. Supraorbital artery is a branch of:

a. Maxillary

b. External carotid

c. Ophthalmic

d. Internal carotid

? **Answer:** c.

4. Which of the following is true about ocular muscles?
a. Medial rectus is supplied by III nerve
b. Superior oblique turns the cornea upward and laterally
c. Inferior oblique arises from medial wall of the orbit
d. Lateral rectus is supplied by IV nerve
? **Answer:** a. Medial rectus is supplied by III nerve

5. Which nerve does not traverse the middle part of the superior orbital fissure?
a. Two divisions of III nerve
b. Frontal nerve
c. VI nerve
d. Nasociliary nerve
? **Answer:** b. Frontal nerve

6. Which of the following arteries is an end artery?
a. Lacrimal artery
b. Zygomaticotemporal artery
c. Central artery of retina
d. Anterior ethmoidal artery
? **Answer:** c. Central artery of retina

Viva Voce

1. Name the bones forming the orbit.
? Frontal, sphenoid, zygomatic, maxilla, lacrimal, ethmoid, and palatine.

2. What is the shape of the orbit?
? Pyramidal cavity with its apex directed posteriorly and medially.

3. Which structure passes through the optic canal?
? Optic nerve and ophthalmic artery.

4. Name the contents of the superior orbital fissure.
? Oculomotor, trochlear, abducent, ophthalmic (V?) nerves, and sympathetic filaments.

5. What are the extraocular muscles and their nerve supply?
?

- Lateral rectus ? abducent (VI).
- Superior oblique ? trochlear (IV).
- Rest (superior, inferior, medial recti; inferior oblique; levator palpebrae) ? oculomotor (III). Mnemonic: **LR6 SO4, rest 3**.

6. What is the fascial sheath of the eyeball?
? Tenon’s capsule — a fibrous sheath around the eyeball allowing free movement.

7. What is the suspensory ligament of the eyeball?
? Lockwood’s ligament — formed by inferior rectus and inferior oblique sheaths; supports the eyeball from below.

8. Name the branches of the ophthalmic artery.
? Central artery of retina, lacrimal, supraorbital, supratrochlear, ethmoidal, dorsal nasal, and palpebral arteries.

9. Which vein connects facial and intracranial venous systems?
? Superior ophthalmic vein.

10. What are the roots of the ciliary ganglion?
? Sensory (nasociliary), parasympathetic (oculomotor), and sympathetic (from internal carotid plexus).

11. What is the function of the short ciliary nerves?
? Carry sensory, parasympathetic, and sympathetic fibers to the eyeball.

12. Which muscle causes abduction of the eye?
? Lateral rectus.

13. Which muscle depresses and intorts the eye?
? Superior oblique.

14. What is the function of the orbitalis muscle?

? Maintains slight protrusion of eyeball; supplied by sympathetic nerves.

15. What happens in Horner’s syndrome?

? Ptosis, miosis, anhidrosis, and enophthalmos due to sympathetic interruption.

16. What are the effects of oculomotor nerve palsy?

? Ptosis, eye turned down and out, dilated pupil, and loss of accommodation.

17. What is the cause of sudden blindness in hypertension?

? Occlusion of the central artery of the retina (end artery).

18. Which nerve carries secretomotor fibers to the lacrimal gland?

? Zygomatic branch of maxillary nerve ? lacrimal nerve.

19. Which cranial nerves are related to the orbit?

? II (optic), III (oculomotor), IV (trochlear), V? (ophthalmic division), and VI (abducent).

20. Name the involuntary muscles in the orbit.

? Orbitalis, superior tarsal, and inferior tarsal muscles.