

# Contents of the Orbit

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## Introduction

- 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**.
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## 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.**
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### 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.
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### 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.**
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## 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.
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## 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**”

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## 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.
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## 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.
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## 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.
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## 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.
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## 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**.
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## 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**.
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## 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.
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## 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.
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## 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.

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## **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**.
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## 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.
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### 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**.

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## 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.
  - **Zygomatofacial 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.

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## 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.
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## 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.

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#### 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.
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## 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.

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## 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**.
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**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**.
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**Clinicoanatomical Problem 4 – Horner's Syndrome****Case:**

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

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### 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**.
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### 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.
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### 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**.
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- 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. Lacrimal
- 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.