

----- Active space -----

Aqueous humour :

- Fluid secreted from ciliary processes
 - Rate of secretion : $2.3 \mu\text{L}/\text{minute}$
 - Function : exerts Intraocular pressure (IOP)
 - measured by Tonometry.
- Aqueous outflow : $0.25 \mu\text{L}/\text{min}/\text{mm Hg}$
 - via angle of AC \rightarrow
Depth : 3 mm (2.5 mm - 4.4 mm)
 - measured by tonography

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ANATOMY OF CORNEA, ANATOMY OF SCLERA AND ITS PATHOLOGIES

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Neurovascular Supply of Cornea

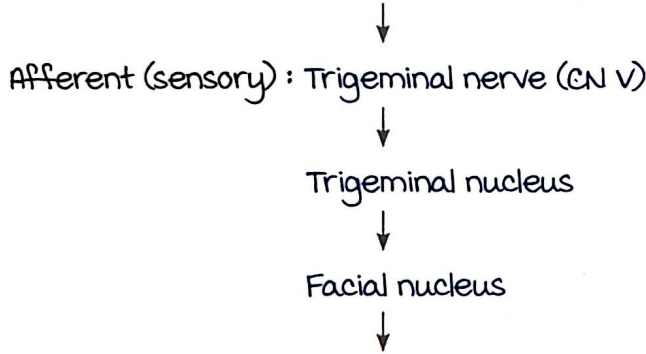
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Blood supply : Avascular \longrightarrow Cornea : Transparent
 Relative index : 1.376 \longrightarrow Refractive power : +43D to +48D
 (Converging power)

Nerve supply (Sensory) :

Trigeminal \longrightarrow Ophthalmic \longrightarrow Nasociliary \longrightarrow Cornea.

Corneal Blink Reflex : Test of corneal sensation.
 Stimulus : Touch cornea with cotton wisp.



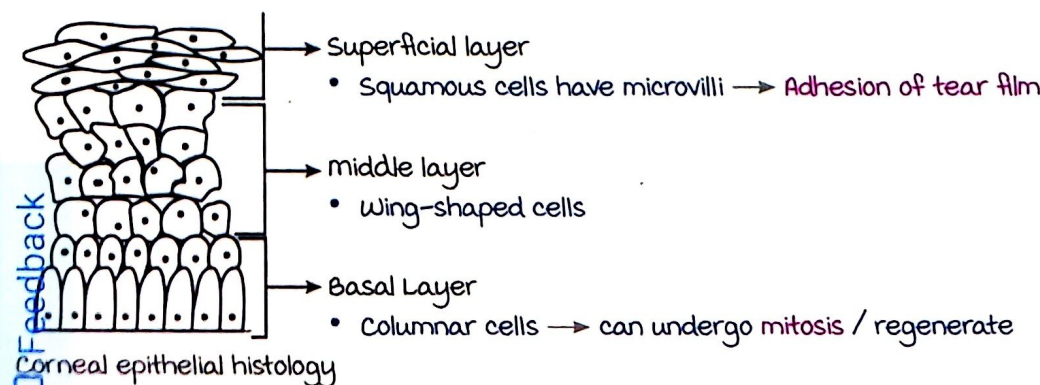
Efferent : Facial nerve (CN.VII) \times \longrightarrow Bell's palsy
 (motor) \longrightarrow Inability to close eye : Lagophthalmos

Effector : Orbicularis oculi \downarrow \longrightarrow No blinking \longrightarrow Corneal anaesthesia

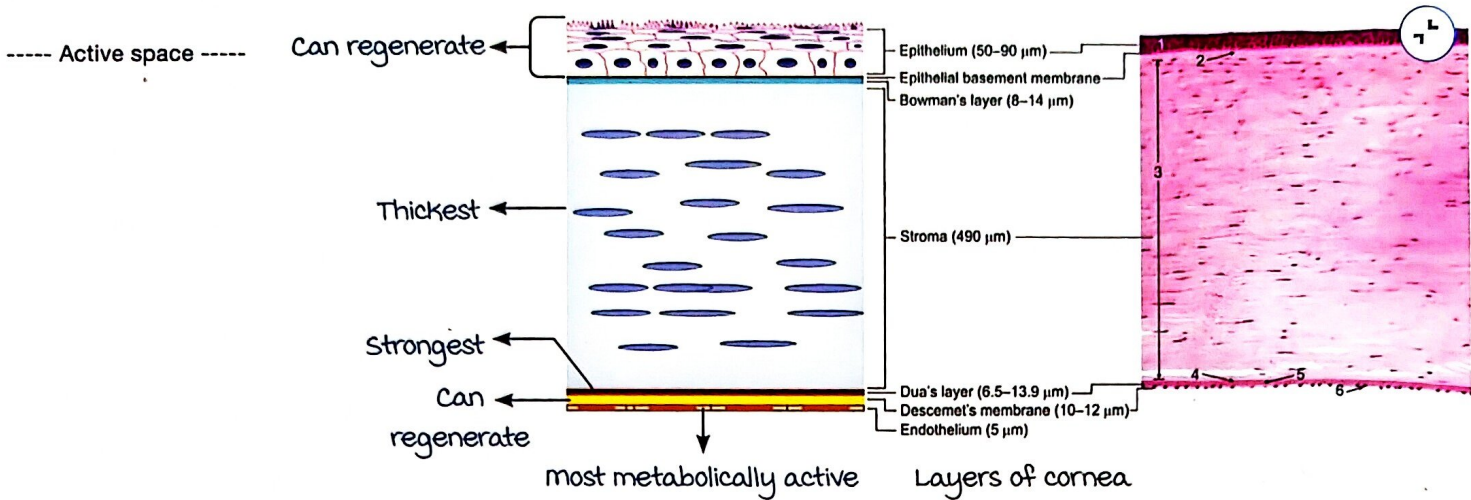
- Response : Blinking.
- Causes :
- Herpes Keratitis (m/c)
 - Acanthamoeba Keratitis
 - Diabetes
 - Contact lens wear
 - Leprosy
 - Surgical trauma
 - Topical medications (ex. Timolol)

Layers of the Cornea

00:15:00



Feedback



1. Anterior (Outermost) Layer - Epithelium :

Histology : **Non-Keratinized stratified squamous epithelium.**

Note : with respect to the centre of the eyeball.

	Outermost layer	Innermost layer
Cornea	Lies anteriorly	Lies posteriorly
Retina	Lies posteriorly	Lies anteriorly

2. Bowman's membrane :

- Not a true basement membrane → not stained by PAS (Periodic Acid Schiff reagent)
- Acellular → **Cannot regenerate** → Heal by scar formation → Corneal opacity → LOV (Loss of vision)

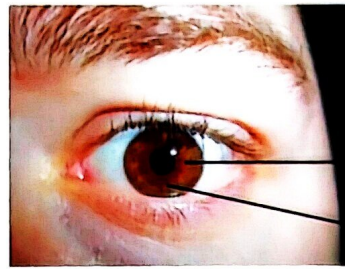
Corneal opacities :

Opacity	Pupillary margin behind Opacity (macroscopic)	Iris details behind opacity (microscopic)	Distribution of visible light
Nebular (faint)	visible	visible	Maximum
Macular	visible	Not visible	-
Leukomatous (most dense)	Not visible	Not visible	Minimum

3. Stroma :

- Thickest corneal layer (90% of corneal thickness)
- Composition :
 - Type I collagen fibres
 - Glycosaminoglycans (GAGs) : **Keratan Sulfate (m/c)**

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→ Pupillary margin
→ Iris details

Structures behind the cornea

4. Dua's layer / Pre-Descemet's membrane :
Strongest corneal layer

5. Descemet's membrane :

- Secreted continuously by underlying endothelial cells → Can regenerate
- Schwalbe's line** : Peripheral termination (at limbus) near anterior position of trabecular meshwork.

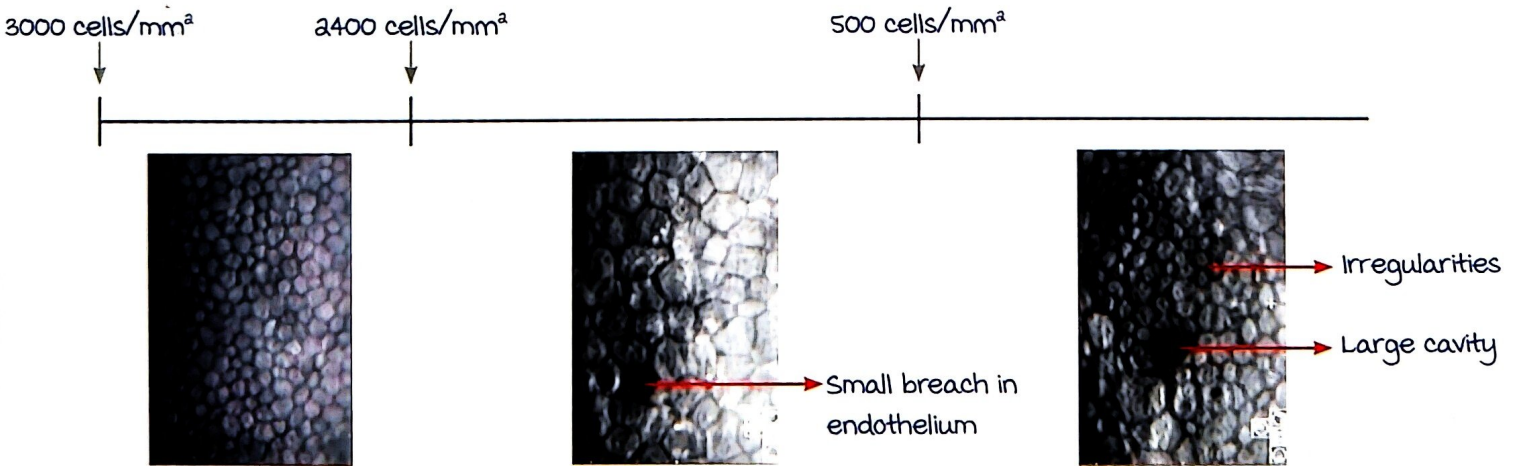
6. Posterior (Innermost) layer Endothelium :

- **most metabolically active layer**
- Endothelium with zona occludens → prevents entry of aqueous into cornea → **maintains transparency**



If injured/breached → Edema of cornea → Haze/opacity.

Specular microscopy : Findings depending upon cell count. khanirfan0392@gmail.com



Normal endothelium

- Hexagonal cells
- Normal borders

Corneal transparency maintained

Cornea compensates by:

- Polymegathism (↑ size)
- Polymorphism (Change in shape)

↓

maintain integrity of tight junction

↓

Corneal transparency maintained

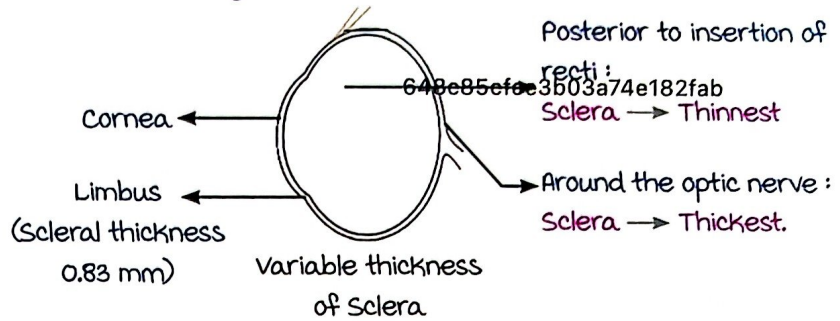
Corneal decompensation d/t extended contact lens wear : Hazy cornea

Sclera

Outermost covering of posterior 5/6th of eyeball

ANATOMY

Colour : White : d/t Irregular arrangement of collagen fibres.



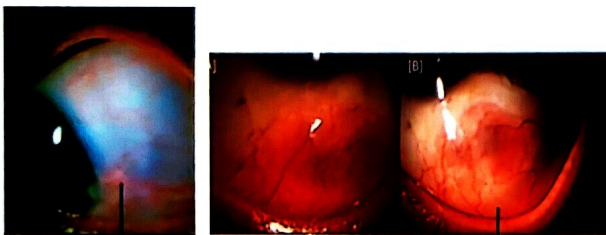
Layers

- Episclera :**
 - Outermost layer
 - Highly vascular: 2 plexuses
 - Superficial
 - Deep : near sclera proper
 - merges with Tenon's capsule : around 3 mm posterior to limbus.
- Sclera propria :**
 - Avascular
 - Collagen fibres
- Lamina fusca :**
 - Innermost layer.

PATHOLOGIES

Scleral pathologies

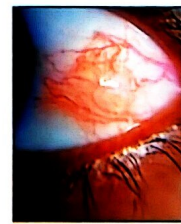
- 1. Scleritis (misnomer) :**
 - Inflammation of the Deep vascular plexus of the episclera
- 2. Episcleritis :**
 - Inflammation of the Superficial vascular plexus
 - Cause : Idiopathic (m/c)



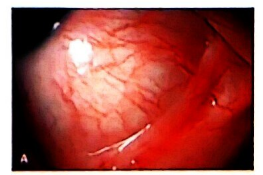
Bluish/violaceous hue (in severe cases)

- Redness remains : inflamed deep vessels do not constrict in response to vasoconstrictors

Vasoconstrictor test
 Principle : pharmacological reversal of inflammation induced vasodilation
 Reagent : 2.5% phenylephrine eye drops



Reddish hue



Before test

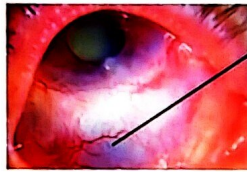
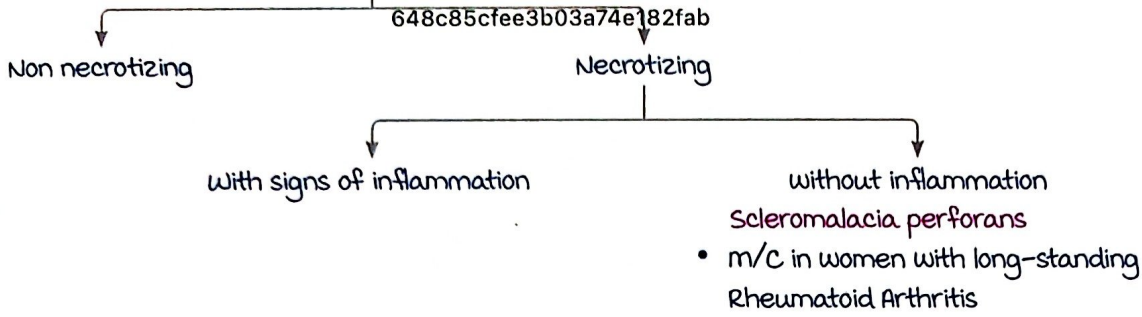


After test : Redness disappears blanching occurs (superficial vessels constrict)

- management :
 - Self resolving, resolves fast.
 - Supportive : NSAIDs, low dose steroids.



• Types of Scleritis



Scleromalacia perforans

Atrophy d/t inflammation

- Only deep (bluish) vessels seen
- No pain
- No congestion

Limbus

01:07:50

Corneo-scleral junction that contains stem cells

Limbal Stem Cells/pleuripotent cells (LSC) :

- Ability to **differentiate** (e.g., into conjunctival, corneal, scleral cells, etc.)
- universal marker of stem cell : **CD34**.
- Specific marker of limbal stem cell : **ABCG2**.

Site : Limbal basal epithelial cells forming **Palisades of Vogt** (elevations & crypts).

Deficiency of LSC : Pterygium

- Caused by environmental factors
- Rx: Excision and autograft with limbal stem cells

----- Active space -----

ANATOMY OF UVEA, ACCOMODATION WITH IT'S ANOMALIES

Components of uvea :

		Part of uvea	Inflammatory condition
Iris		Anterior uvea	Anterior uveitis
Ciliary body	Pars plicata		
	Pars plana	Intermediate uvea	Intermediate uveitis
Choroid		Posterior uvea	Posterior uveitis

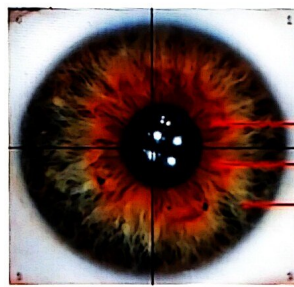
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Iris

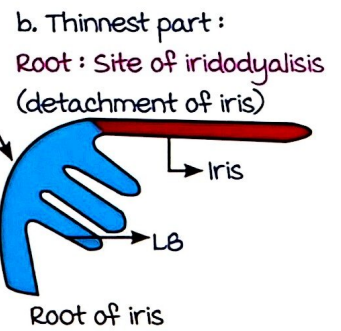
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ANATOMY

- ↑ Vascular.
- Pigmented (d/t melanocytes).
- Thickness : Variable.



a. Thickest part:
 ↓
 Collarette: Boundary b/w
 Pupillary zone of iris
 Ciliary zone of iris



muscles of Iris :

	Sphincter pupillar	Dilator pupillae
Function	miosis (constriction of pupil)	mydriasis (dilatation of pupil)
Autonomic Nerve Supply	Parasympathetic control (inhibitory)	Sympathetic (excitatory) control
Final nerve supply	Parasympathetic control (inhibitory) ↓ via Oculomotor nerve ↓ Infraorbital branch (to inferior oblique muscle) ↓ Short ciliary nerve (Post ganglion)	Hypothalamus ↓ 1° Spinal cord : Short ciliospinal budge (C8-T1) ↓ 2° Crossing lung parenchyma → Superior (SCG) Cervical ganglion ↓ 3° Along internal carotid → Long ciliary nerve
		Resection of Pancoast tumor : Risk of damage to SCG fibres ↓ Loss of sympathetic supply to eye

Feedback

Note :

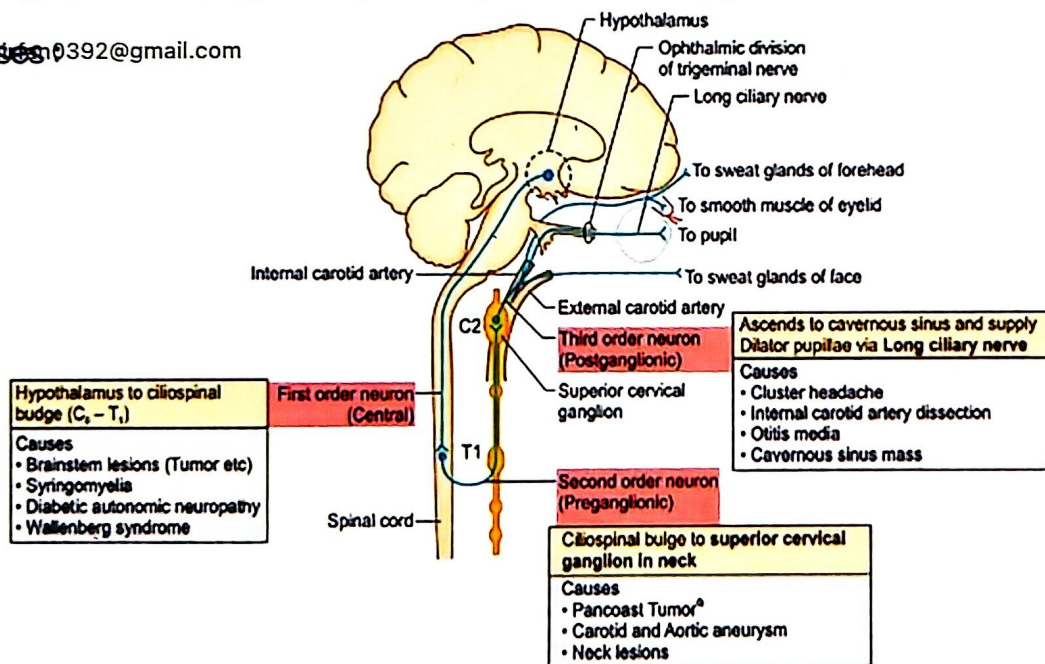
- Parasympathetic cranial nerves : III, VII, IX, X.
- Oculomotor nerve
 - Superior branch : Supplies
 - Superior rectus
 - Levator palpebrae superioris
 - Inferior branch : Supplies
 - Inferior rectus
 - Inferior oblique

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HORNER'S SINDROME (HS)

Oculosympathetic palsy (paralysis of sympathetic supply).

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Clinical features :

maemonic : **HI MAPLE**

- Heterochromia Iridis (HI) : I/L hypochromia - Only in Congenital Horner's.
- Inferior eyelid elevation : Paralysis of inferior tarsal muscle. (Analogous to muller's muscle in upper eyelid).
- miosis : Paralysis of dilator pupillae → constriction occurs.
- Anhydrosis : Absence of I/L sweating.



Heterochromia

could be

(R) eye hypochromic (L) eye hyperchromic
(Horner's confirmed clinically)

Feedback

Ptosis : Drooping of upper eyelid : D/t paralysis of muller's muscle.

Loss of cilio spinal reflex

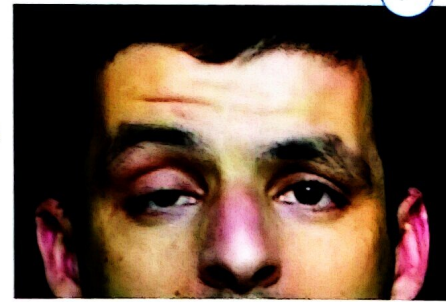
Relative enophthalmos (ptosis + inferior eyelid elevation) → sunken appearance of eyeball → not true exophthalmos).



----- Active space -----

Note :

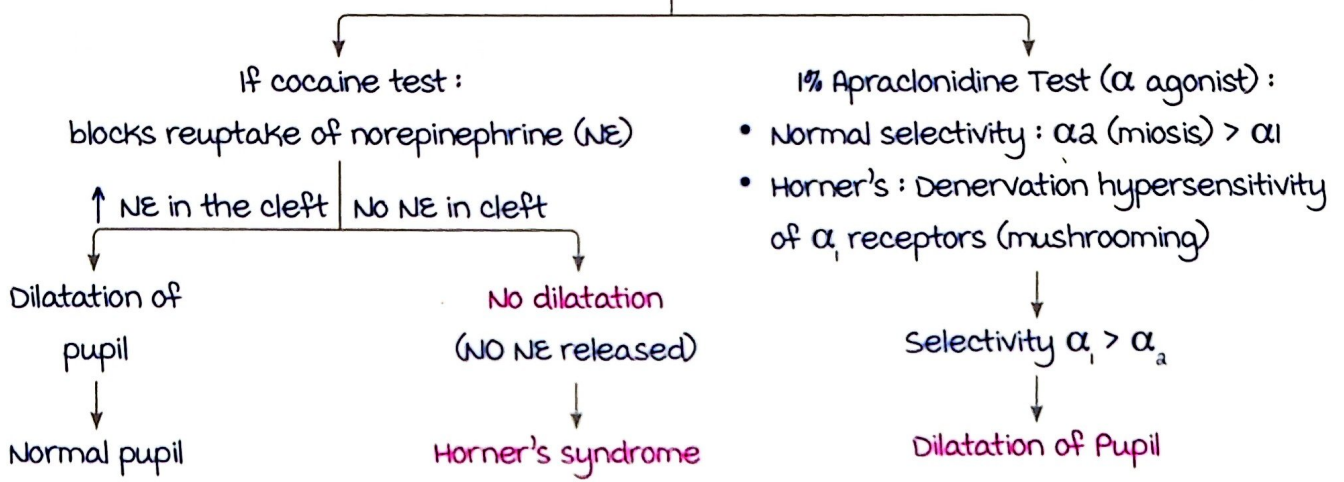
- Muller's muscle / superior tarsal muscle.
 - LPS (supplied by CN III).
- } Elevation of eyelid



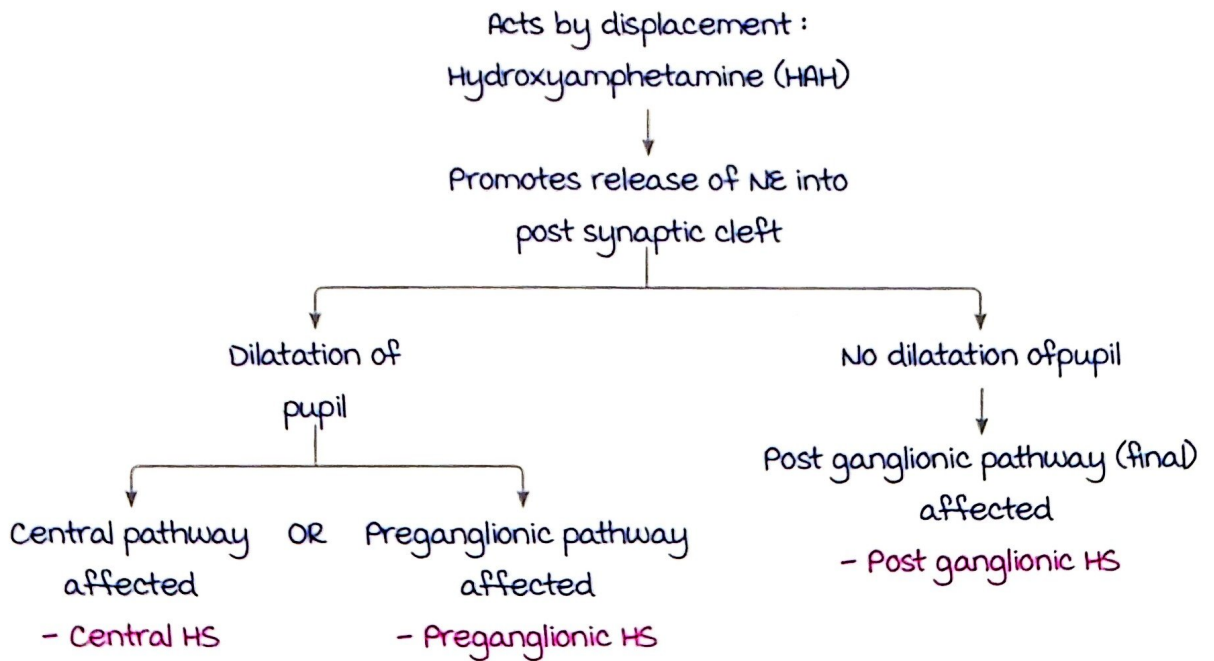
Relative enophthalmos with right eye ptosis

Diagnosis :

1. Detection of Horner's Syndrome



2. Localisation of lesion : 1% amphetamine test



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Note :

----- Active space -----

Causes of mydriasis : (ITS COMB)	Causes of miosis (HI COPS)
Internal ophthalmoplegia	H-Homer syndrome
Tonic pupil (Holmes adie pupil)	Hemorrhage (Pontine)
Sympathomimetics	I-Iridocyclitis (anterior uveitis)
Closure angle glaucoma	C-Clonidine
Oculomotor 3rd nerve palsy → pupil can not constrict	Carbolic acid
mydriatics (Atropine/homatropine/tropicamide)	O-Organophosphates Opioid (morphine)
Belladonna Poisoning	P-Parasympathomimetic drugs (Phenothiazine/pilocarpine)
	S-Sleep
	Sedatives (Barbiturates)

Ciliary Body

00:37:45

FUNCTIONS

- Secretion of aqueous through ciliary processes.
- Pars plana : Site of entry into vitreous cavity (Relative avascularity → ↓ chances of bleeding).
- Accommodation :
 - Contraction of ciliary muscles → ↑ power of lens → Helps in near vision.
 - Relaxation of zonules.

Note: Components of near reflex :

- Accommodation.
- Convergence (inward movement of both eyes).
- miosis.

