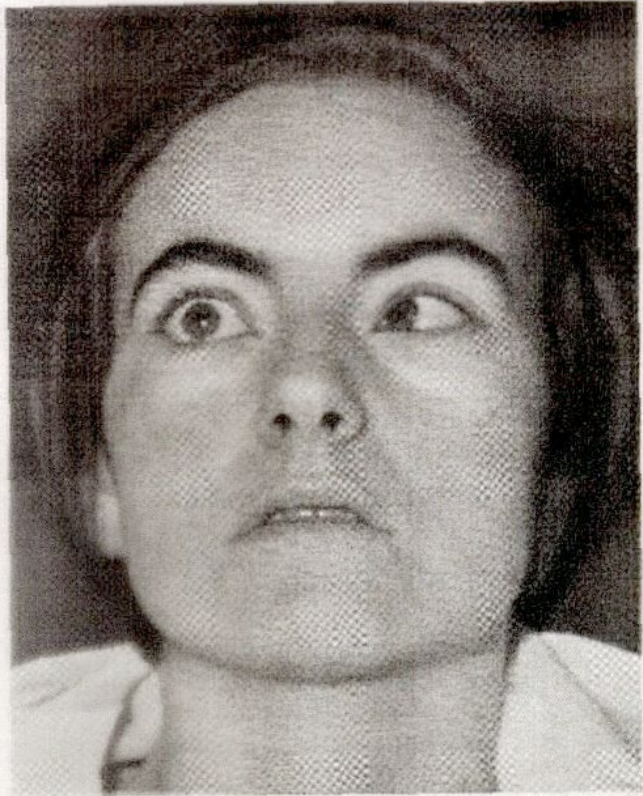


**ABDUCENS NERVE  
(CN VI) PALSY**



# ORBIT

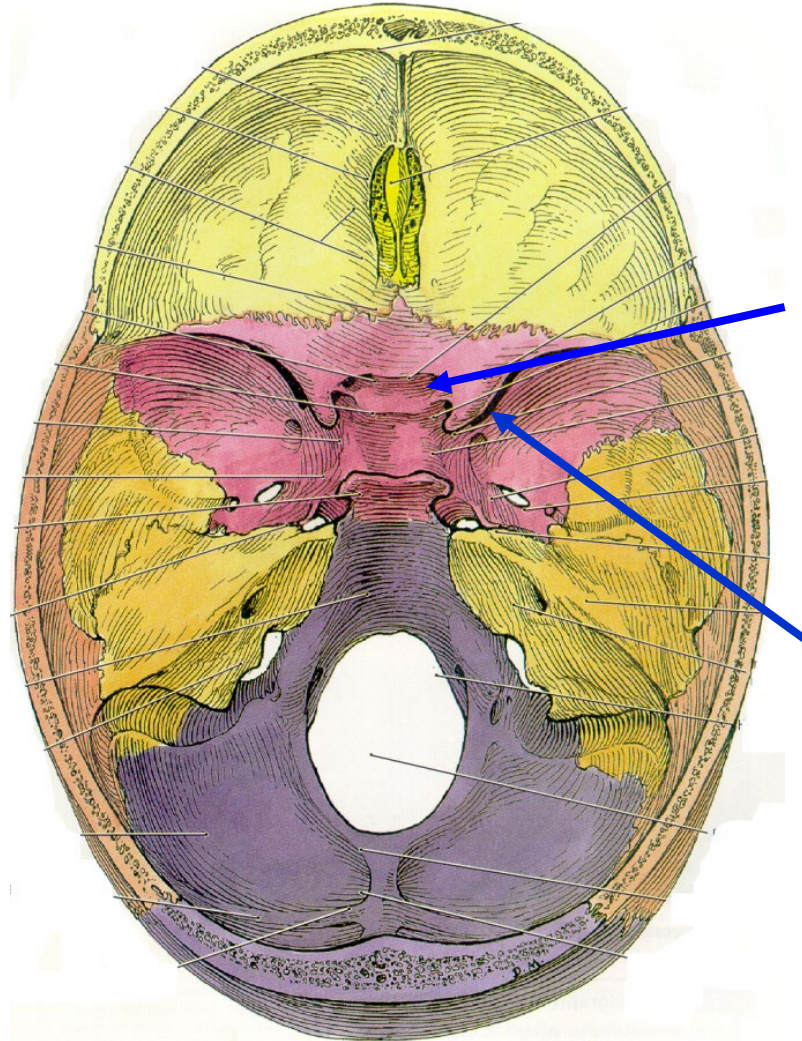
## OUTLINE

- I. FORAMINA (OPENINGS) OF ORBIT
- II. EYELIDS
- III. LACRIMAL APPARATUS
- IV. FASCIAL SHEATH  
OF EYEBALL
- V. STRUCTURE OF EYE
- VI. EXTRAOCULAR MUSCLES/  
EYE MOVEMENTS
- VII. CILIARY GANGLION
- VIII. NERVE DAMAGE

- **VISION REQUIRES COORDINATED MOVEMENTS  
OF TWO EYES**
- **EYES/EYE MOVEMENTS USED DIAGNOSTICALLY**

# I. FORAMINA OF ORBIT – structures entering orbit

## TWO MAJOR OPENINGS:

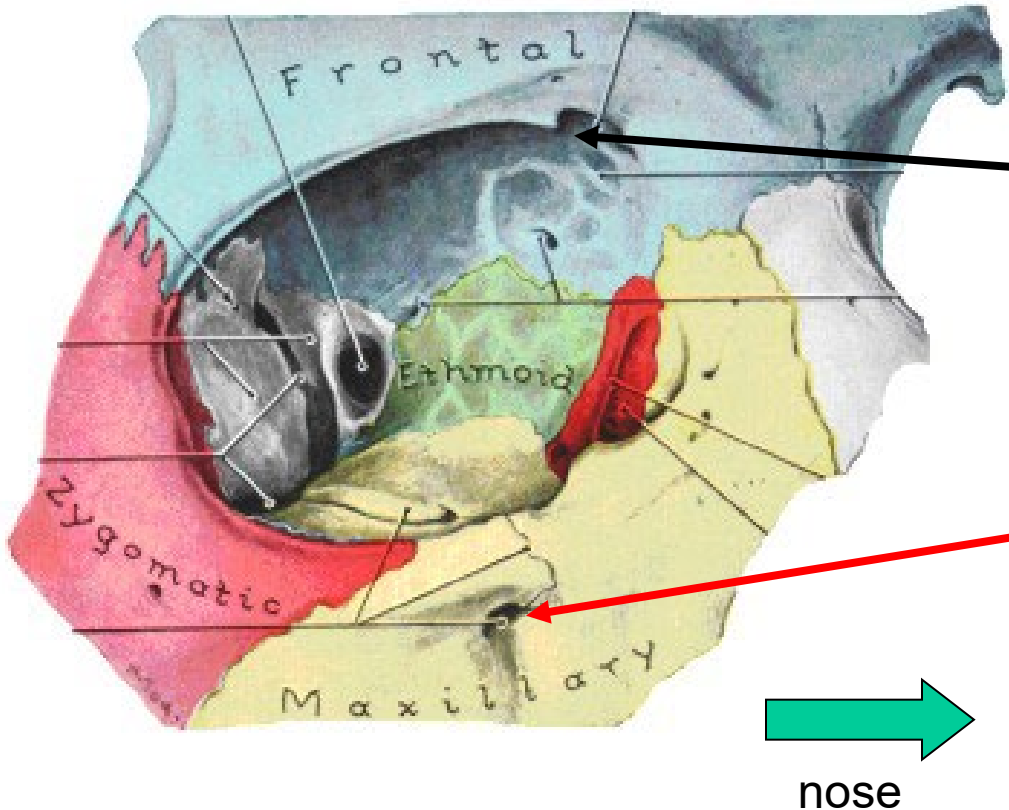


**FORAMINA- MOST STRUCTURES ENTER ORBIT FROM MIDDLE CRANIAL FOSSA**

1) **OPTIC CANAL**- IN BASE OF LESSER WING OF SPHENOID BONE, CONTAINS **OPTIC NERVE (II)** and **OPHTHALMIC ARTERY**

2) **SUPERIOR ORBITAL FISSURE** - BETWEEN GREATER AND LESSER WINGS OF SPHENOID, CONTAINS **III, IV, V1, VI, OPTHALMIC VEINS**

## B. FORAMINA OF ORBIT – pathways leaving orbit

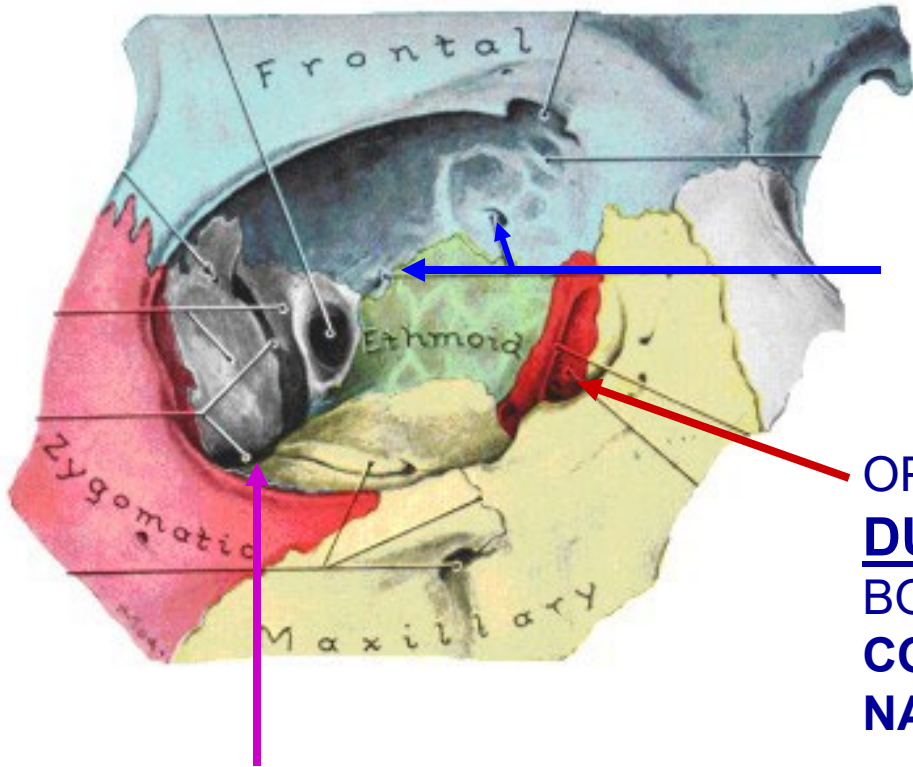


TO FACE, SCALP:

1) SUPRAORBITAL NOTCH OR FORAMEN - IN FRONTAL BONE CONTAINS SUPRAORBITAL N., A. and V. FROM V1, OPHTHALMIC artery and vein.

2) INFRAORBITAL FORAMEN - IN MAXILLARY BONE CONTAINS INFRAORBITAL N., A. and V. FROM V2 AND MAXILLARY artery.

## C. FORAMINA OF ORBIT - pathways to Nasal Cavity



**2) ANT. AND POST. ETHMOIDAL FORAMINA**- BETWEEN ETHMOID AND FRONTAL BONES; CONNECT ORBIT AND NASAL CAVITIES  
**CONTAINS: ANT. AND POST. ETHMOIDAL N., A. and V. (br. Of V1 and OPHTHALMIC artery, vein)**

OPENING OF **3) NASOLACRIMAL DUCT**- IN MAXILLARY, LACRIMAL BONES AND INF. NASAL CONCHA;  
**CONTAINS: MEMBRANEOUS NASOLACRIMAL DUCT AND TEARS**

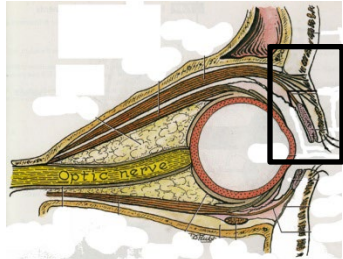
**NOTE: INFERIOR ORBITAL FISSURE - KNOW LATER**



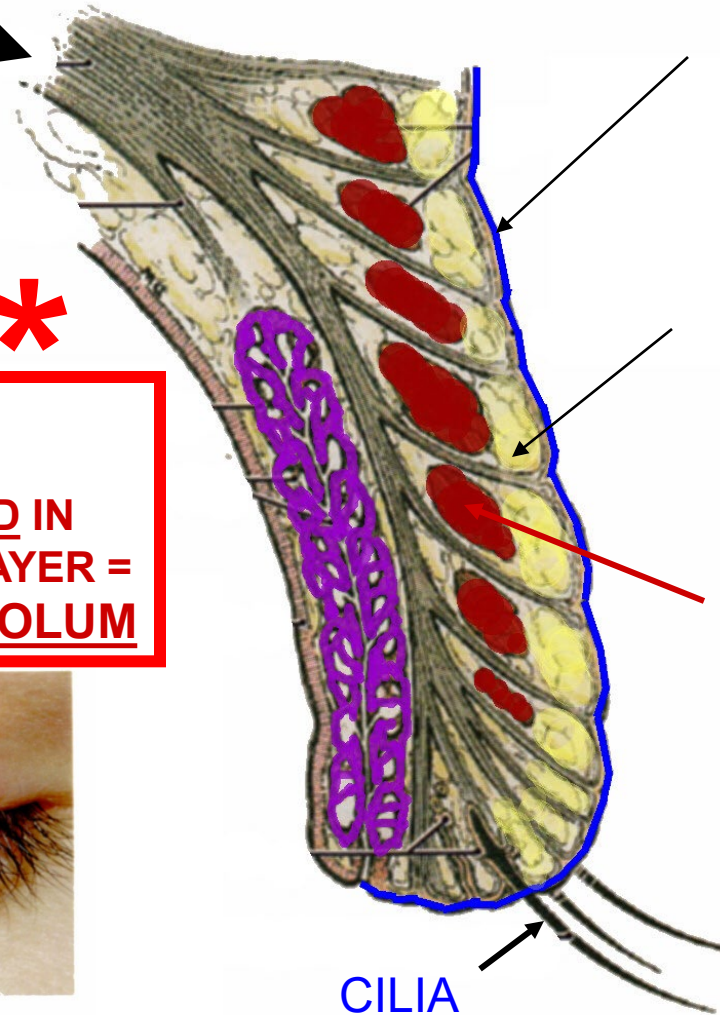


## II. EYELIDS = PALPEBRAE - LAYERED

EYELIDS PROTECT EYE, MOVEABLE, KEEP CORNEA MOIST



ORIENT - EYELID  
PARASAGITTAL  
SECTION



1. SKIN - CONTAINS EYELASHES (CILIA) AND OPENINGS OF SEBACEOUS, SWEAT GLANDS;

2. SUBCUTANEOUS LAYER - CONNECTIVE TISSUE CONTAINS SEBACEOUS GLANDS; OBSTRUCTION = STYE OR HORDE'OLUM

3. ORBICULARIS OCULI (PALPEBRAL PART) - SKELETAL MUSCLE CLOSES EYE, INNERVATED BY VII - PARALYZE ORBICULARIS OCULI - CAN DAMAGE CORNEA

### CLINICAL \*

**OBSTRUCTION or INFECTION OF SEBACEOUS GLAND IN SUBCUTANEOUS LAYER = STYE OR HORDE'OLUM**



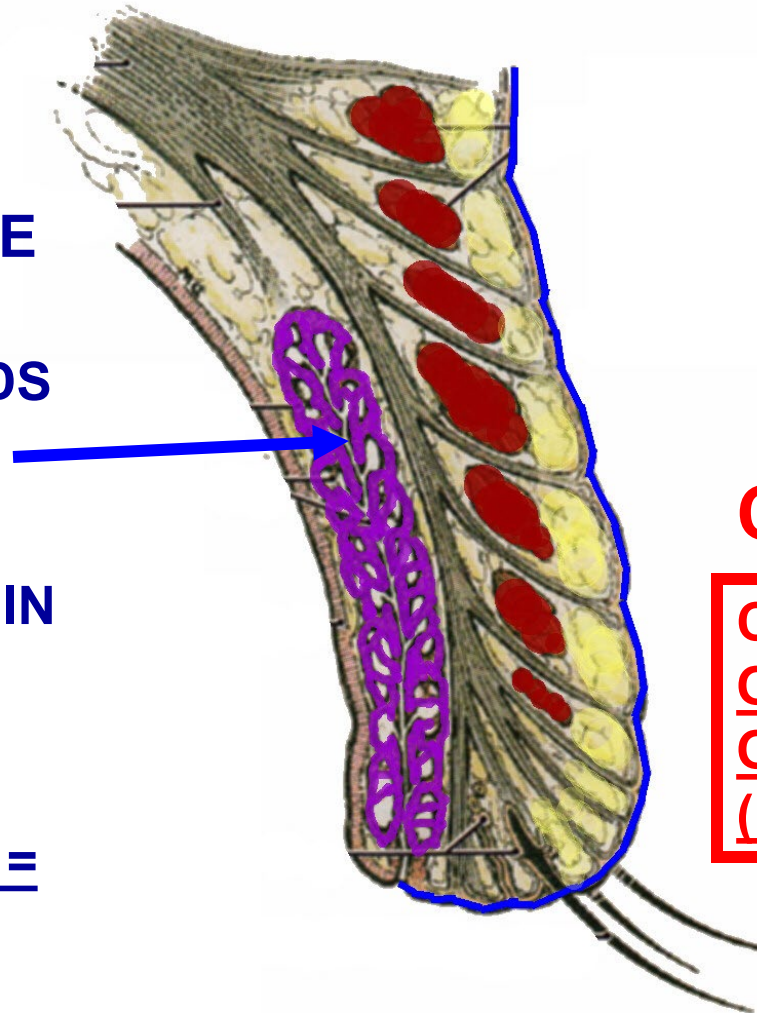
FIGURE 10-10  
Acute hordeolum of upper eyelid.  
From Palay, Krachmer, 1997.

# EYELIDS - LAYERS

4B. TARSAL PLATE - FIBROUS CT 'SKELETON' OF EYELID, DEEP TO ORBITAL SEPTUM

**TARSAL PLATE**  
- CONTAINS  
TARSAL GLANDS  
(Meibomian  
glands)

- KEEP TEARS IN  
EYE, PREVENT  
EVAPORATION  
OF TEARS -  
OBSTRUCTION =  
CHALAZION



**CHALAZION**



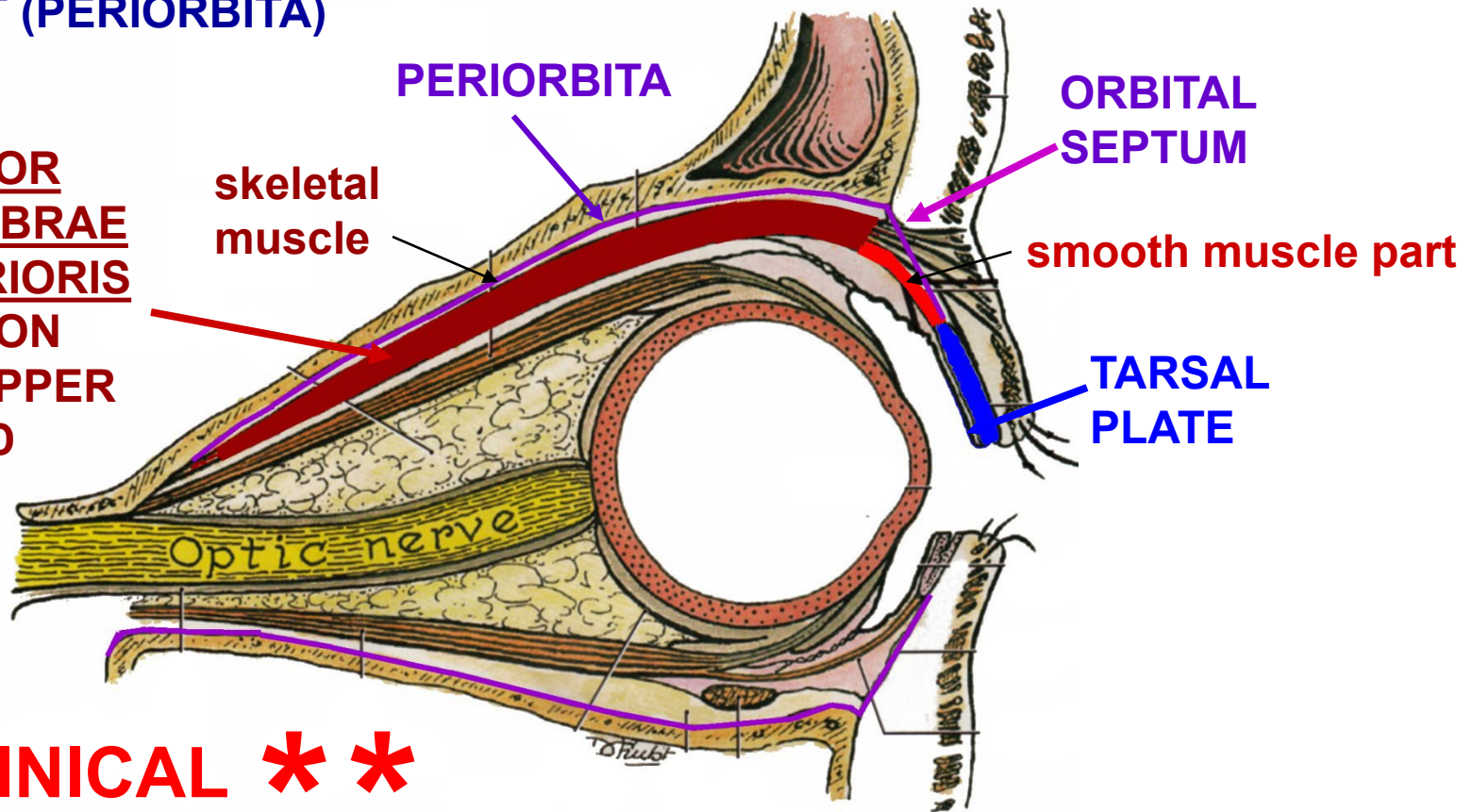
**CLINICAL \***

**CHALAZION:**  
OBSTRUCTION  
OF TARSAL  
(MEIBOMIAN) GLAND

# EYELIDS - LAYERS

4A. ORBITAL SEPTUM - CT LAYER CONTINUOUS WITH PERIOSTEUM OF ORBIT (PERIORBITA)

LEVATOR PALPEBRAE SUPERIORIS  
- ACTION  
LIFT UPPER EYELID



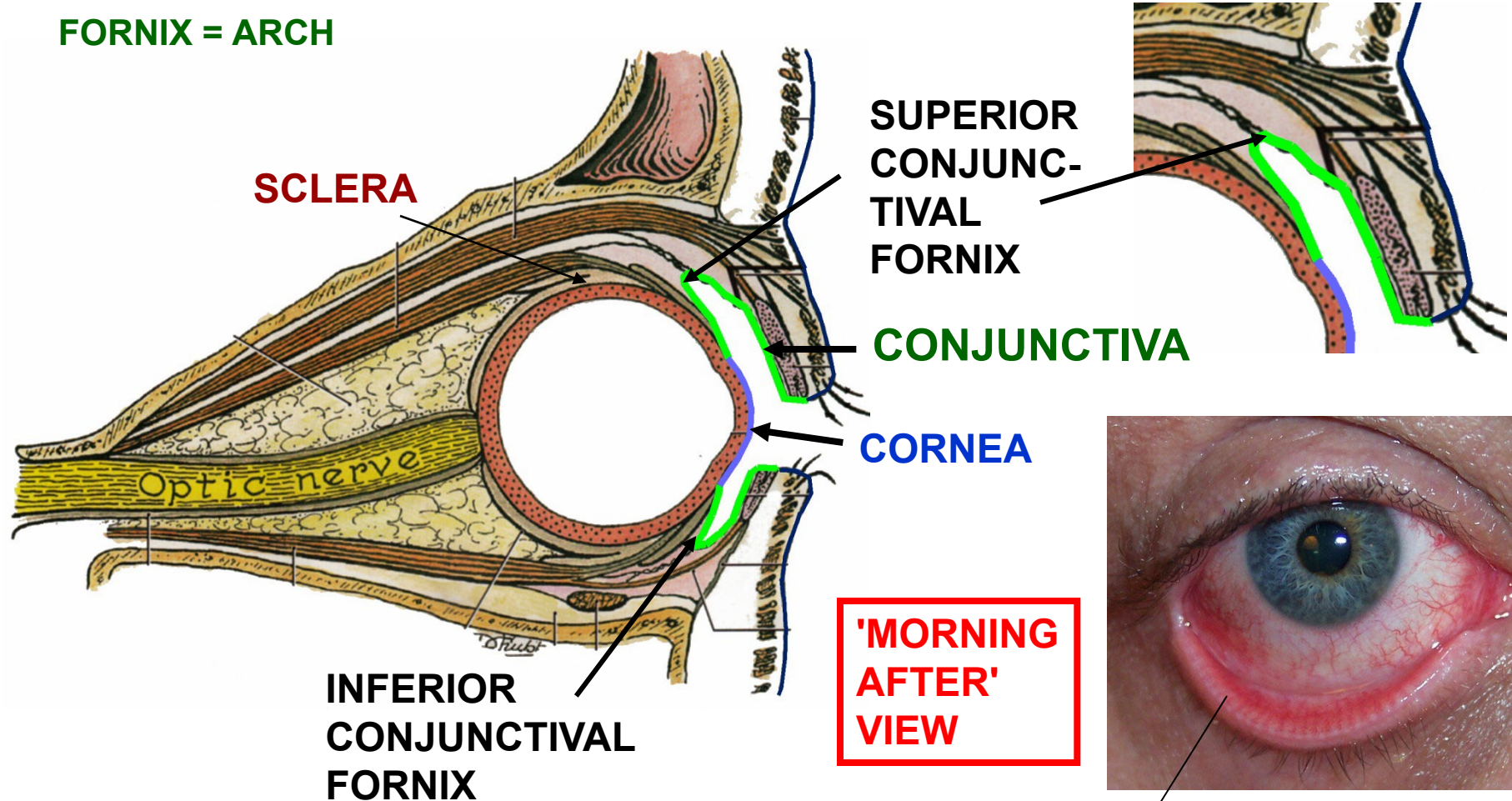
**CLINICAL \* \***

4C. LEVATOR PALPEBRAE SUPERIORIS MUSCLE - ORIGIN FROM TENDINOUS RING - COMPOSED OF SKELETAL (CN III) AND SMOOTH (SYMPATHETICS) MUSCLE PARTS - damage either part:  
**EYELID DROOP = PTOSIS- DAMAGE III OR SYMPATHETICS**



# 5) CONJUNCTIVA - CLEAR MEMBRANE COVERING INSIDE OF LID - FUSES TO SCLERA - REFLECTED TO CORNEA OF EYE AT FORNICES

FORNIX = ARCH



**'MORNING AFTER' VIEW**



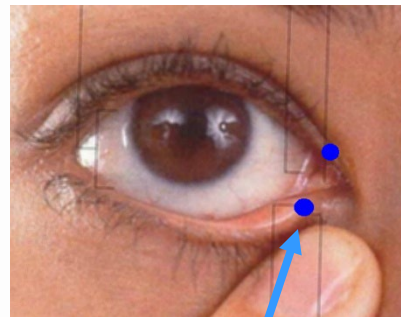
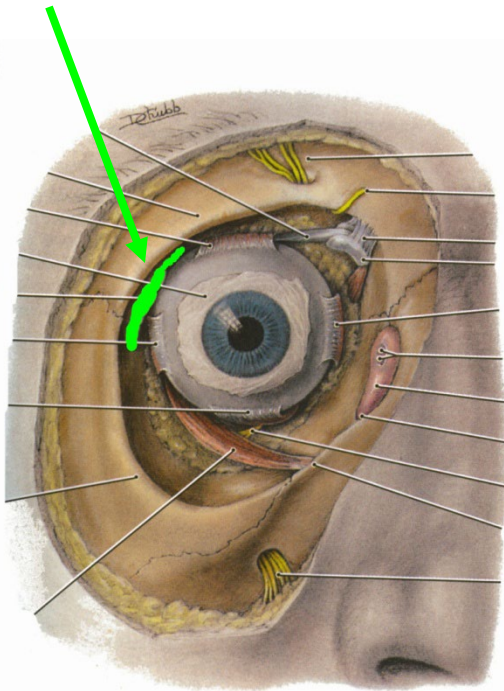
**FORNIX = LATIN FOR ARCH, VAULT**

**Conjunctivitis (Pinkeye) - inflammation of conjunctiva**

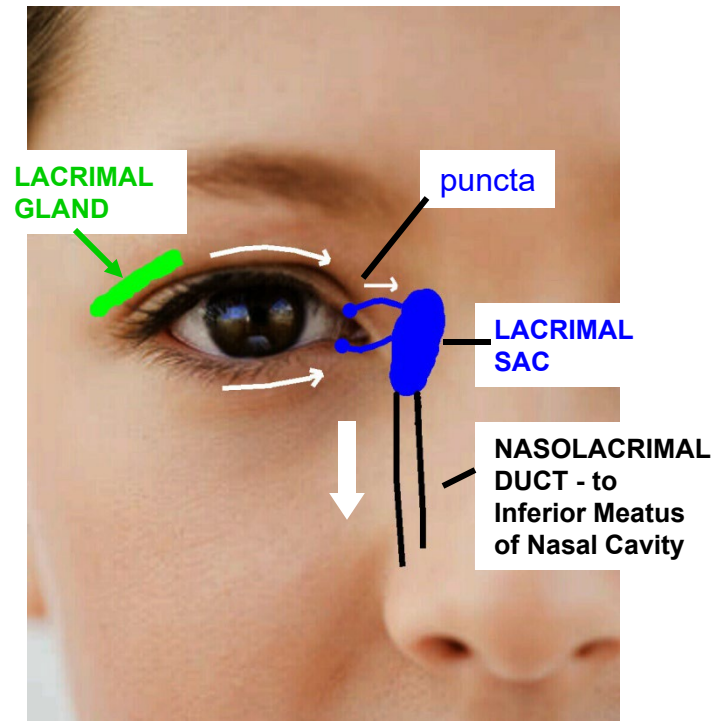


# III. LACRIMAL APPARATUS

**A. LACRIMAL GLAND - LOCATED IN SUPEROLATERAL ORBIT - OPENS BY DUCTS (~12) THROUGH CONJUNCTIVA TO SUPERIOR FORNIX - TEARS CONSTANTLY PRODUCED**

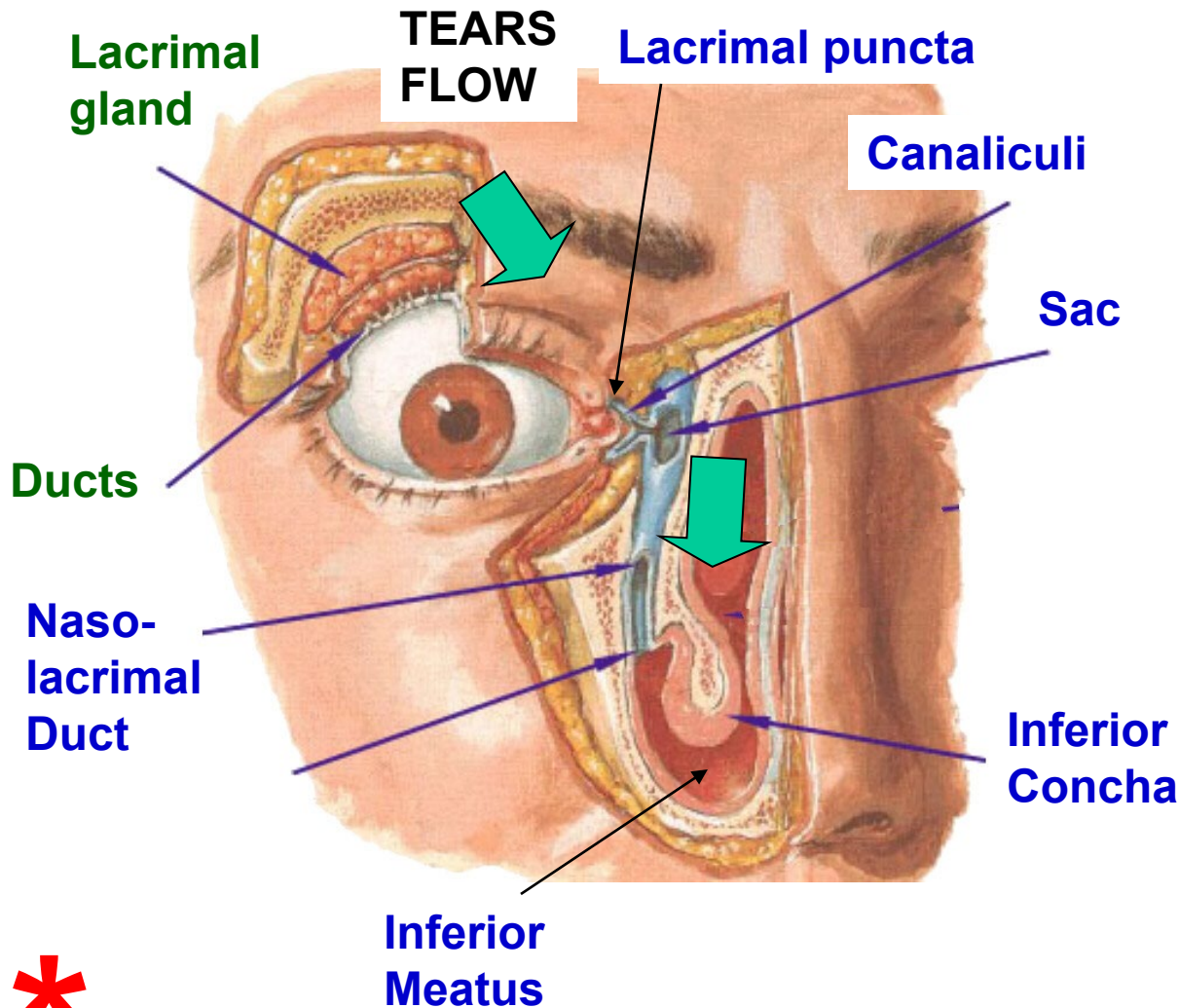


**LACRIMAL PUNCTA**



**- TEARS DRAIN THROUGH LACRIMAL PUNCTA TO LACRIMAL SAC TO NASOLACRIMAL DUCT TO INFERIOR MEATUS OF NASAL CAVITY** **B. LAC. GLAND INNERVATED BY VII - COMPLEX PATHWAY**

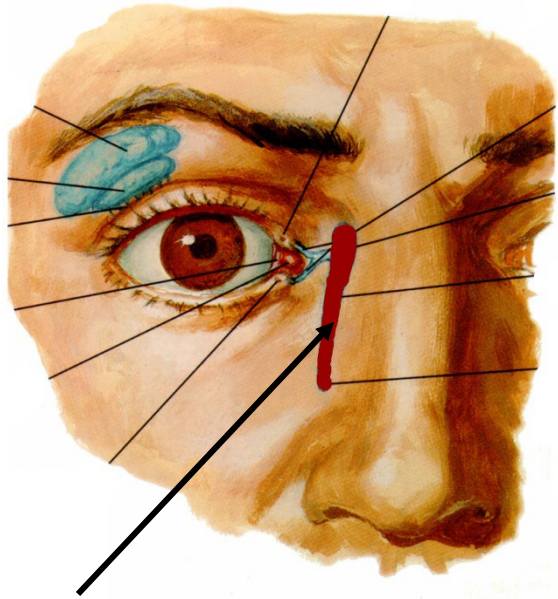
# DRAINAGE OF TEARS



- TEARS FLOW ACROSS EYE TO LACRIMAL PUNCTA ON MEDIAL END OF EYELIDS (eyelids meet at MEDIAL CANTHUS);
- TEARS THEN PASS THROUGH LACRIMAL CANALICULI TO LACRIMAL SAC;
- SAC CONNECTS TO NASOLACRIMAL DUCT WHICH DRAINS TO INFERIOR MEATUS OF NASAL CAVITY

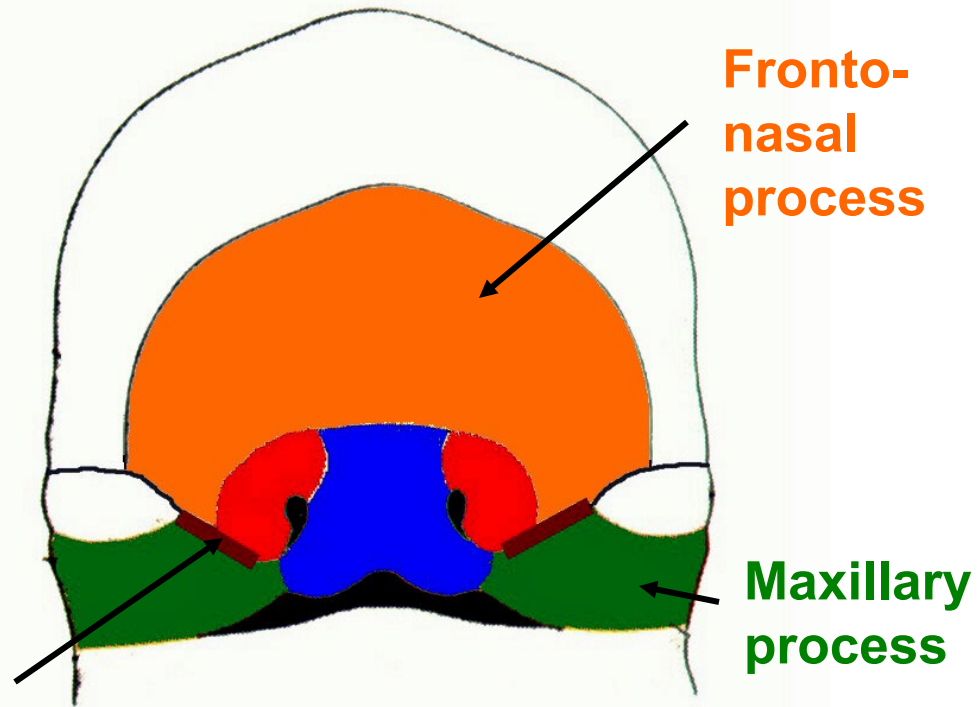
**\* LACRIMAL GLAND IS INNERVATED BY VII - FACIAL NERVE;  
BLOCK VII - DECREASE TEARS; PRESSURE/IRRITATION VII - EXCESSIVE TEARS**

# DEVELOPMENT: OBSTRUCTED NASOLACRIMAL DUCT



## NASOLACRIMAL DUCT

- extends from Medial Canthus of eye to Inferior Meatus of nasal cavity



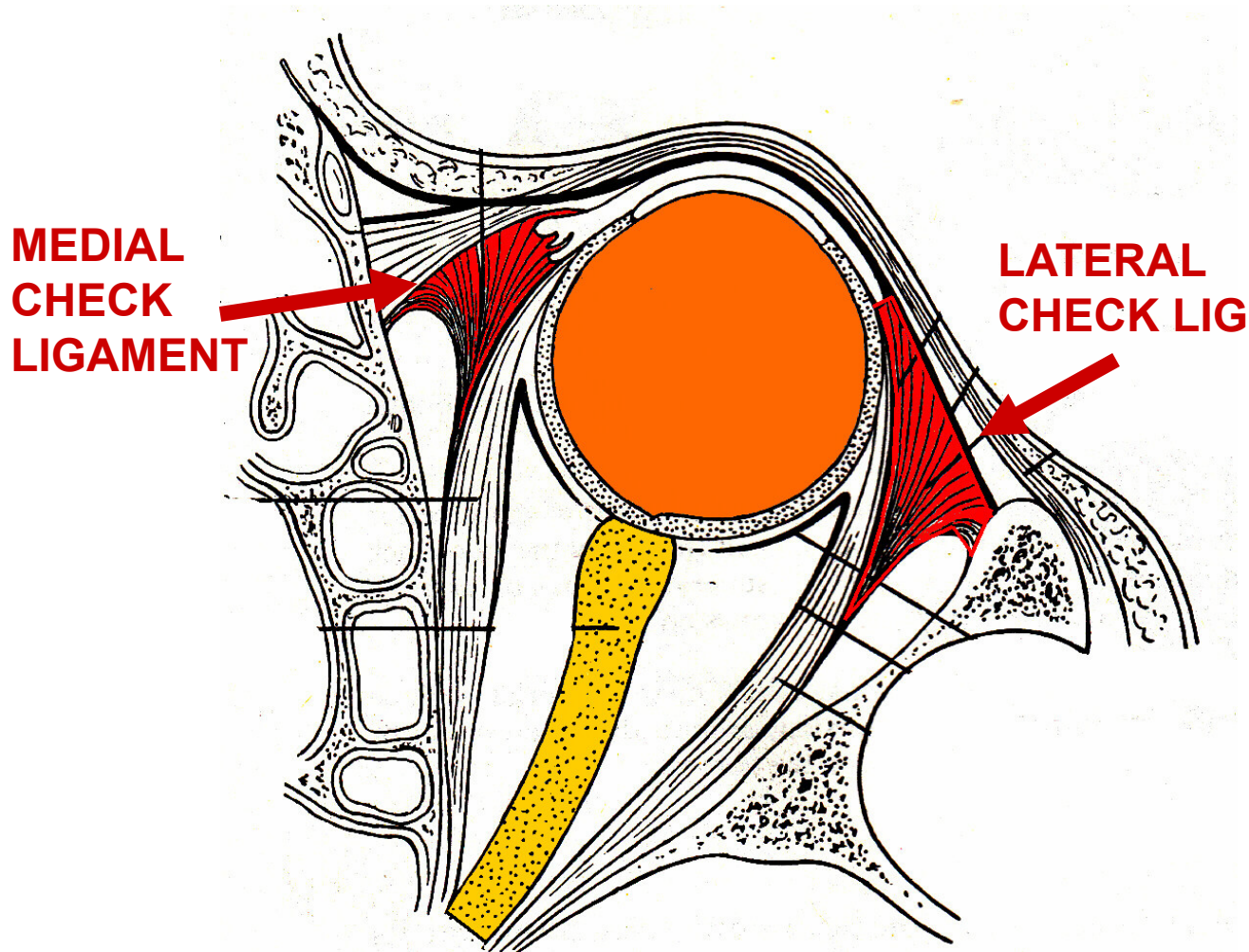
- Develops as a fold between maxillary process and frontonasal process  
- then forms a solid cord that becomes canalized.

**Obstructed Duct - failure of duct to canalize; tears drain over lower eyelid to face; opened surgically for tears to drain to nasal cavity**



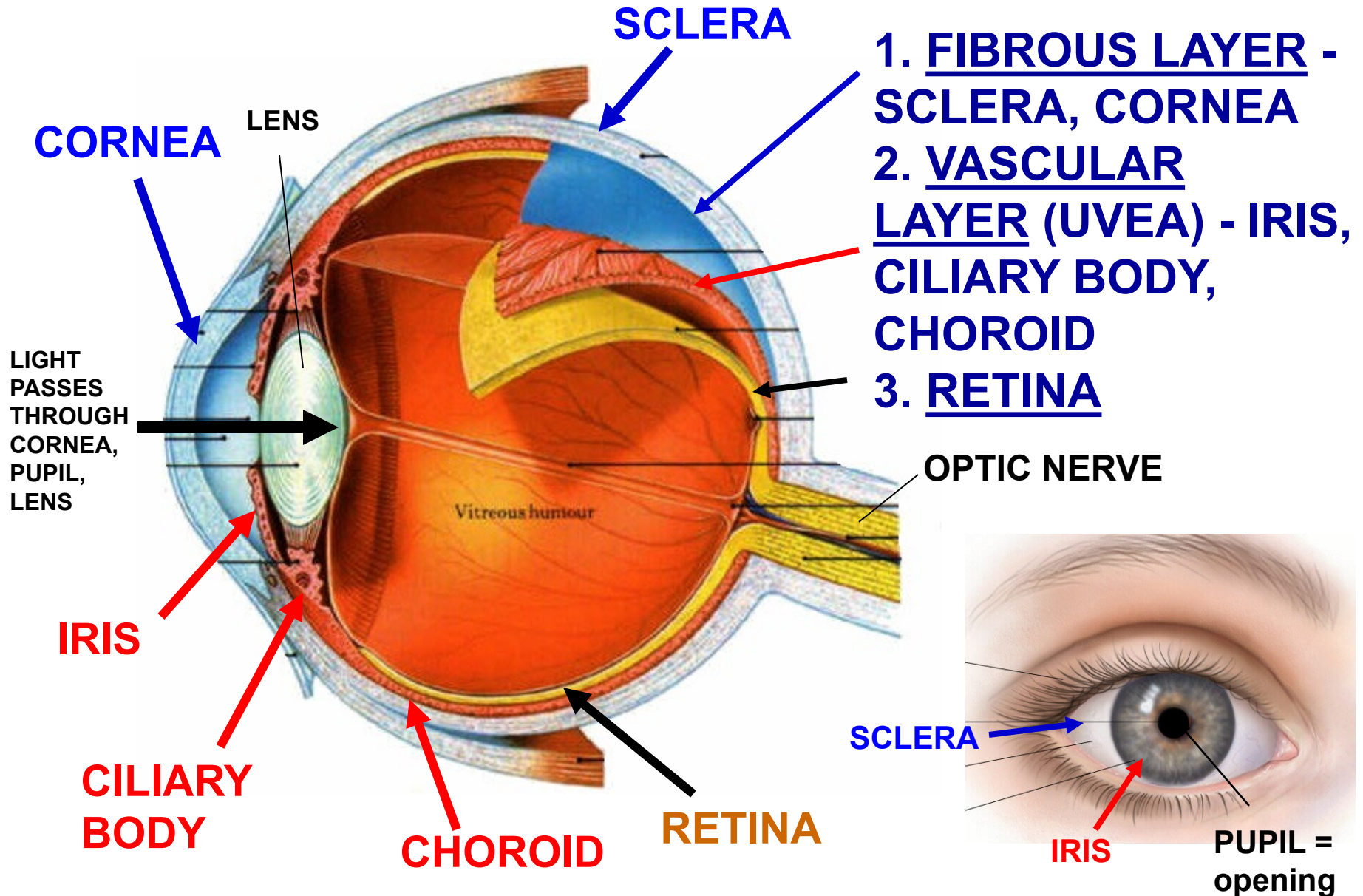
# IV. FASCIAL SHEATH OF EYE

NOSE



= TENON'S  
CAPSULE - THIN  
MEMBRANE  
SURROUNDS  
BACK OF EYE -  
THICKENINGS -  
MEDIAL AND  
LATERAL  
CHECK  
LIGAMENTS -  
PREVENT  
EXCESSIVE  
ROTATION

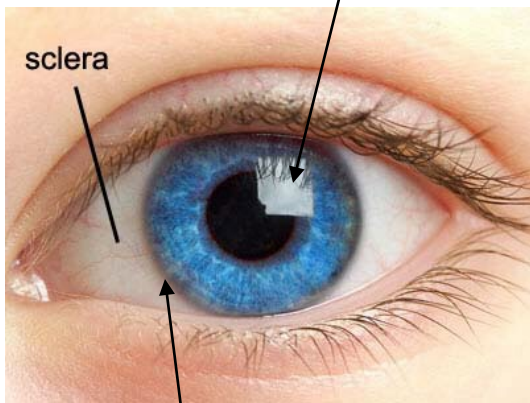
# V. STRUCTURE OF EYE - 3 LAYERS



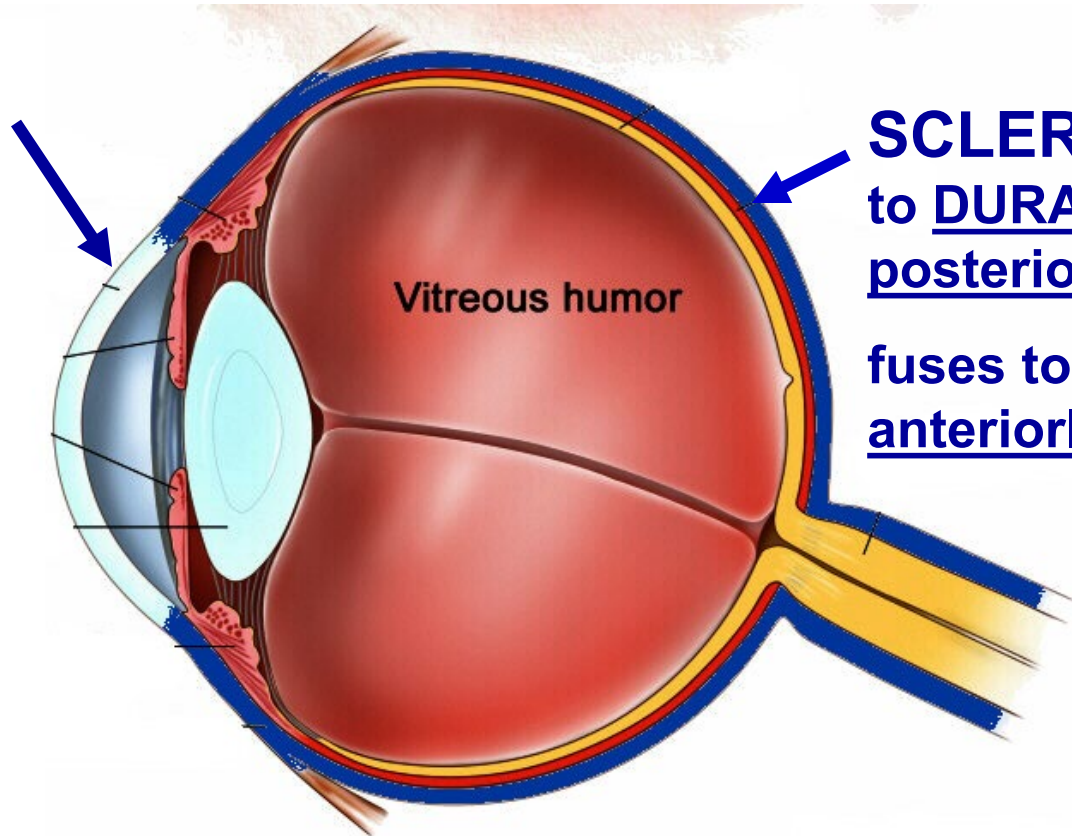
# EYE- STRUCTURE OF EYEBALL- FIBROUS LAYER

A) SCLERA - TOUGH, SMOOTH WHITE FIBROELASTIC CT LAYER; SURROUNDS EYE; PIERCED BY VESSELS AND NERVES; FUNCTIONS- MAINTAIN EYE SHAPE, ATTACHMENT OF MUSCLES

**CORNEA -  
clear layer**



**LIMBUS - junction of  
sclera and cornea**

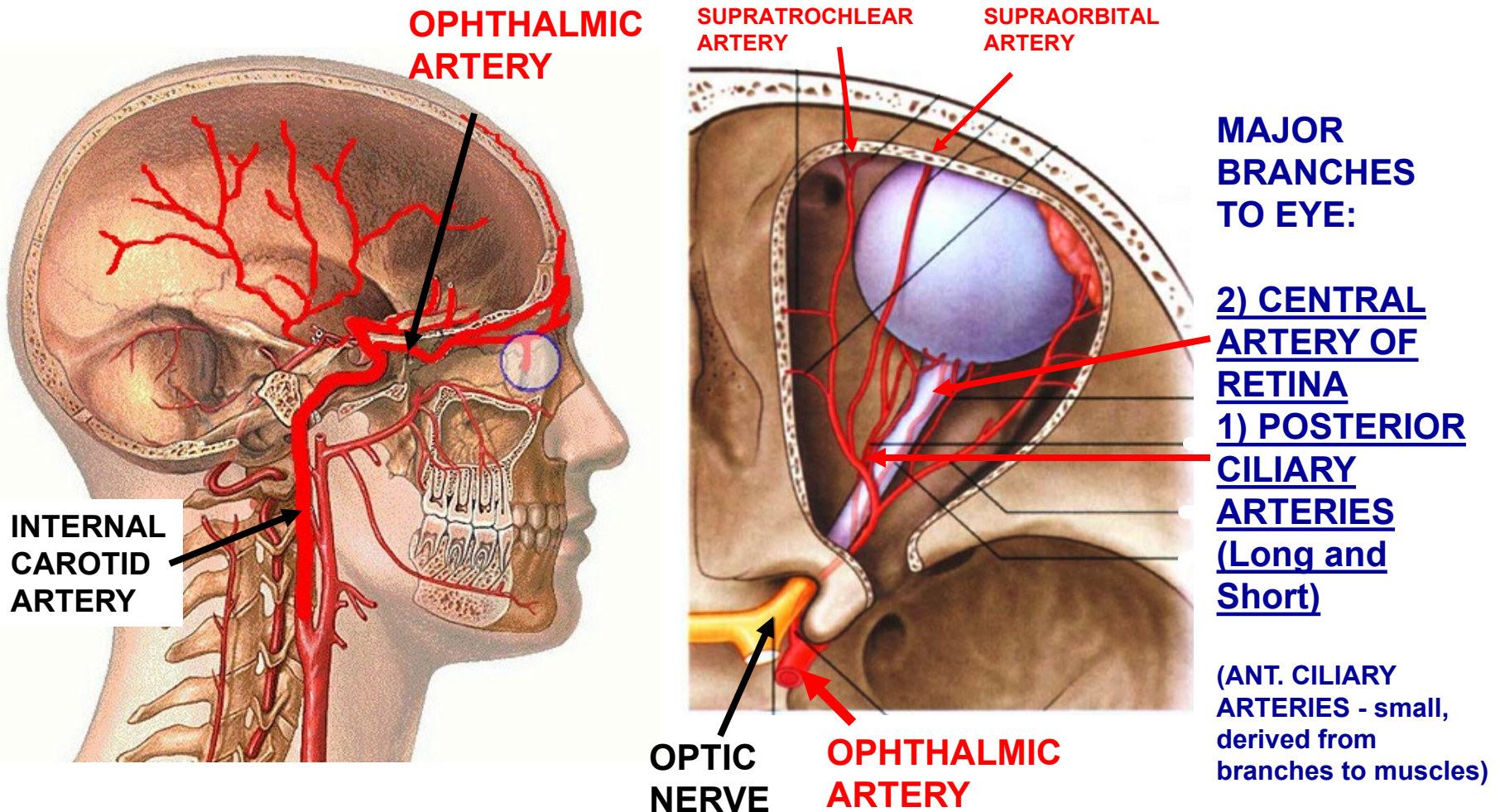


**SCLERA - fuses  
to DURA  
posteriorly,  
fuses to CORNEA  
anteriorly**

**B) CORNEA - AVASCULAR, TRANSPARENT LAYER OVER ANTERIOR  
EYE - AIDS IN FOCUSING LIGHT; IRREGULARITIES - ASTIGMATISM**



# BLOOD SUPPLY TO ORBIT: OPHTHALMIC ARTERY



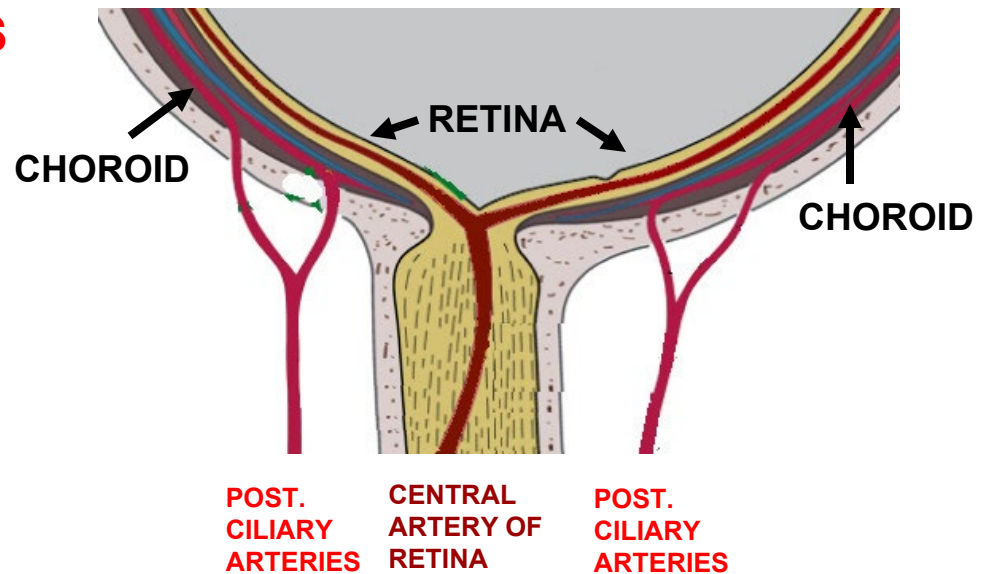
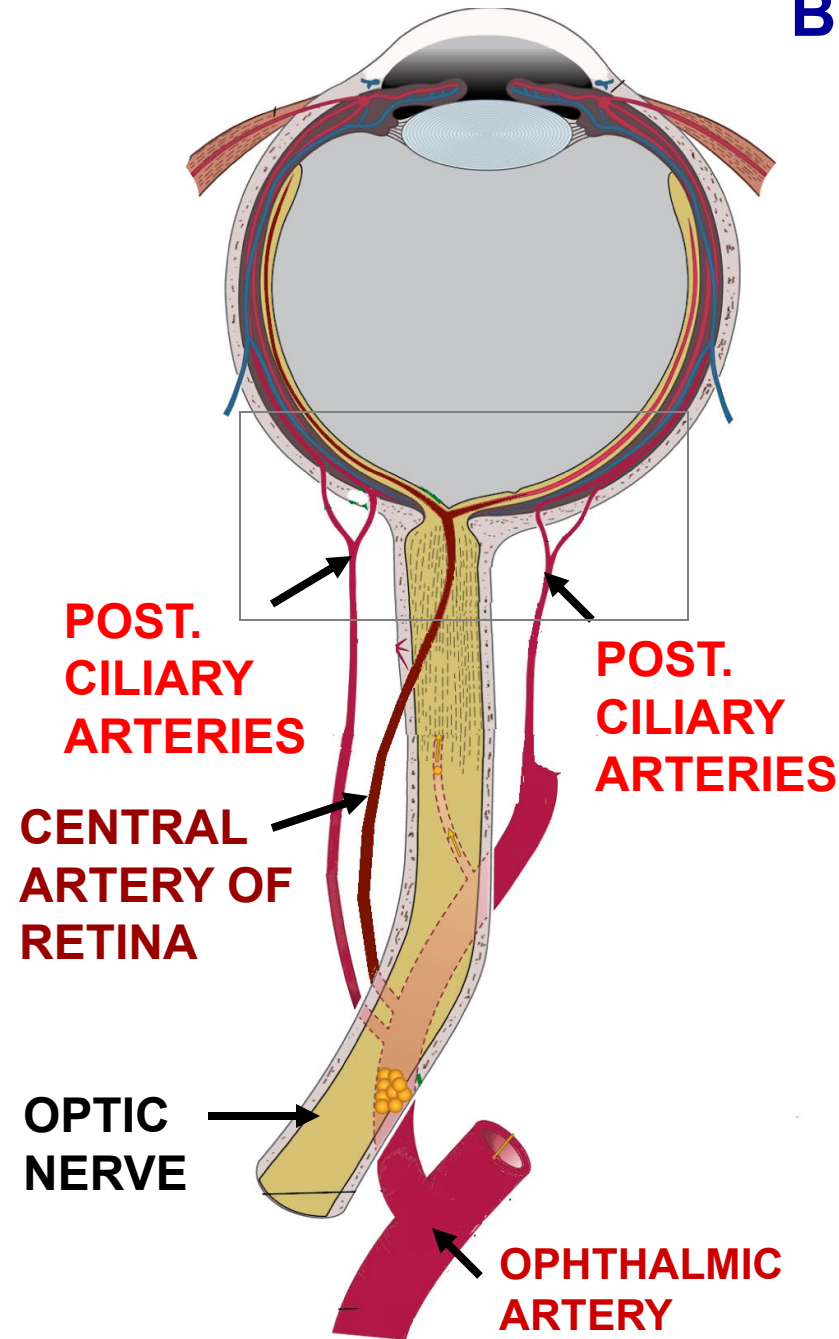
**Note: Branches of Ophthalmic Artery supply eye: Posterior Ciliary Arteries and Central Artery of Retina enter posterior side of Eyeball**

# BLOOD SUPPLY TO EYE

## BRANCHES TO EYE:

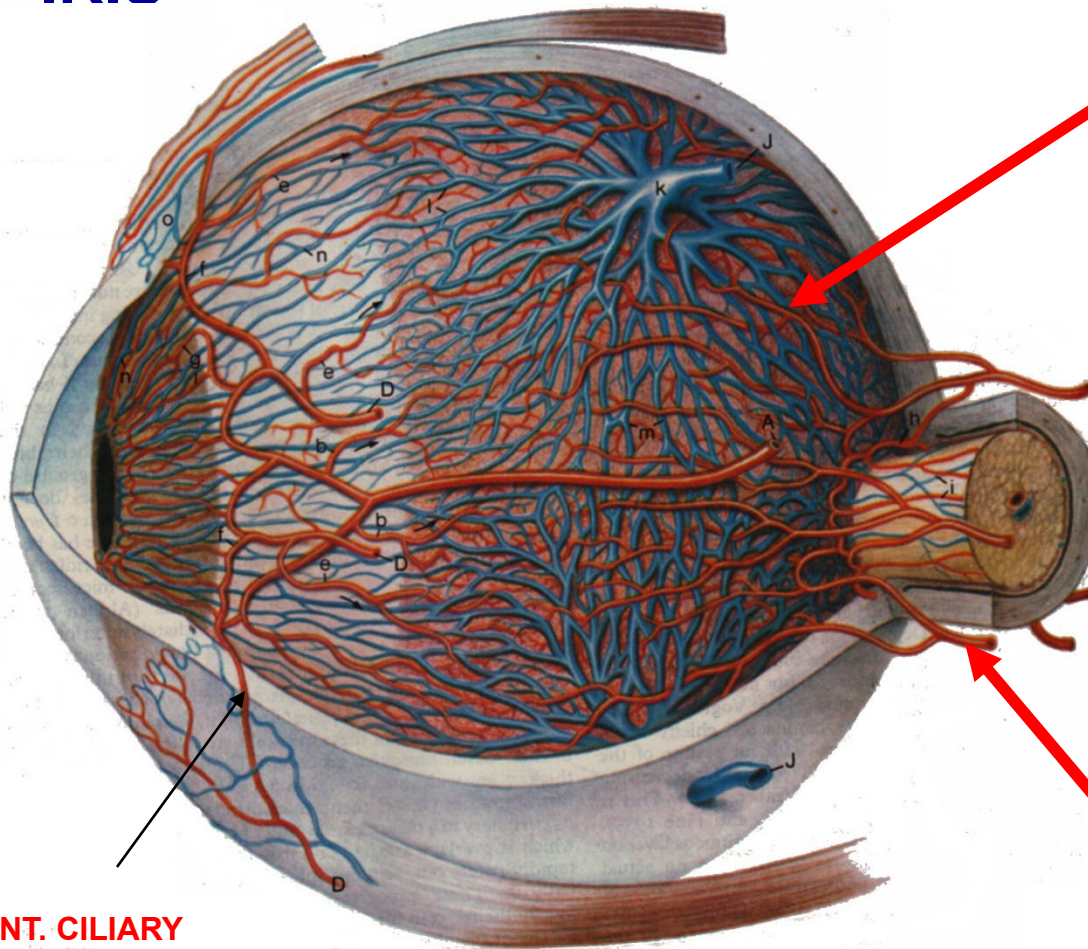
- 1) POSTERIOR CILIARY ARTERIES - pierce sclera; blood to choroid, photoreceptors
- 2) CENTRAL ARTERY OF RETINA - pierces Optic nerve; blood to neural retina

**CENTRAL ARTERY OF RETINA - end artery (no anastomosis)**





# EYE - STRUCTURE OF EYEBALL - VASCULAR LAYER = UVEAL TRACT (UVEA) = CHOROID, CILIARY BODY, IRIS



ANT. CILIARY  
ARTERIES - small

uva = L. grape

**A. CHOROID** -  
HIGHLY VASCULAR,  
PIGMENTED:  
FUNCTIONS:  
PROVIDE O<sub>2</sub>,  
NUTRIENTS TO  
PHOTORECEPTORS.

BUT NORMALLY  
DOES NOT SUPPLY  
GANGLION CELLS  
OF RETINA (THAT  
FORM OPTIC NERVE)

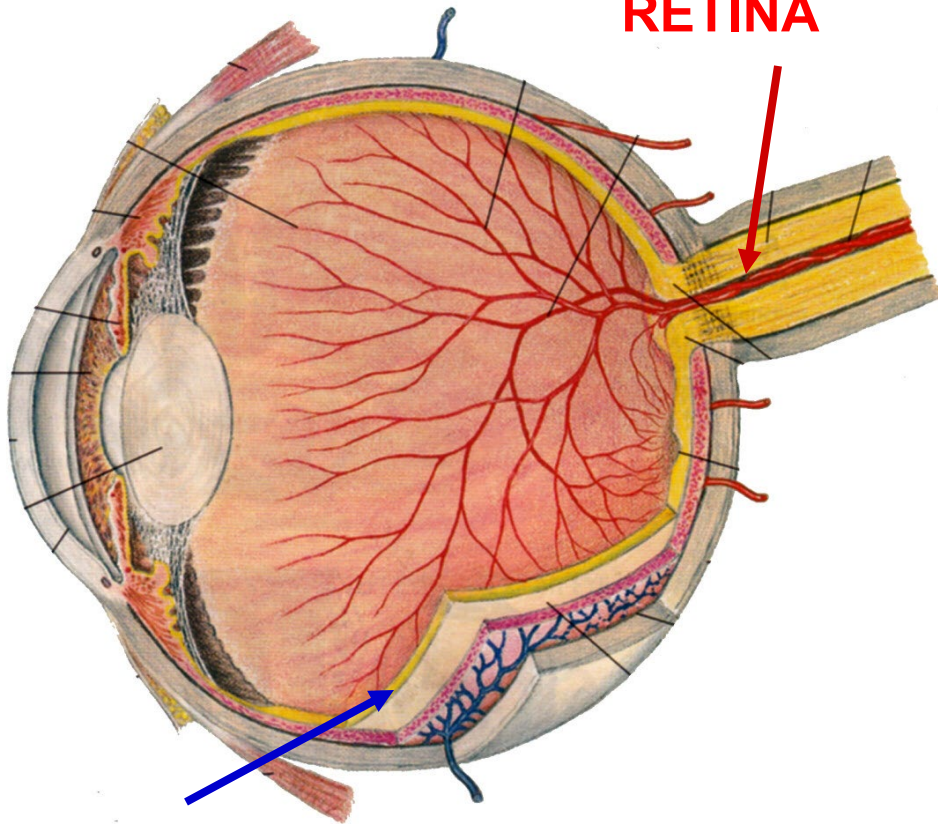
**POSTERIOR CILIARY  
ARTERIES (LONG AND  
SHORT) -  
branches of  
Ophthalmic Artery**



# EYE- STRUCTURE OF EYEBALL- RETINA

**CENTRAL ARTERY OF RETINA**

**CONTAINS RODS AND CONES (PHOTOSENSITIVE)**  
**CENTRAL ARTERY OF RETINA- BRANCH OF OPHTHALMIC ART.**  
**NO ANASTOMOSES;**  
**OCCLUSION**  
**RESULTS IN BLINDNESS**

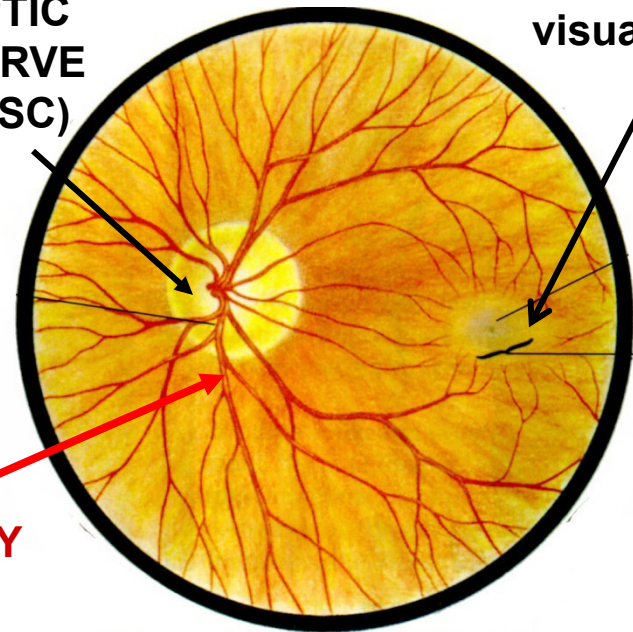


**RETINA**

**BRANCHES OF CENTRAL ARTERY AND VEIN OF RETINA**

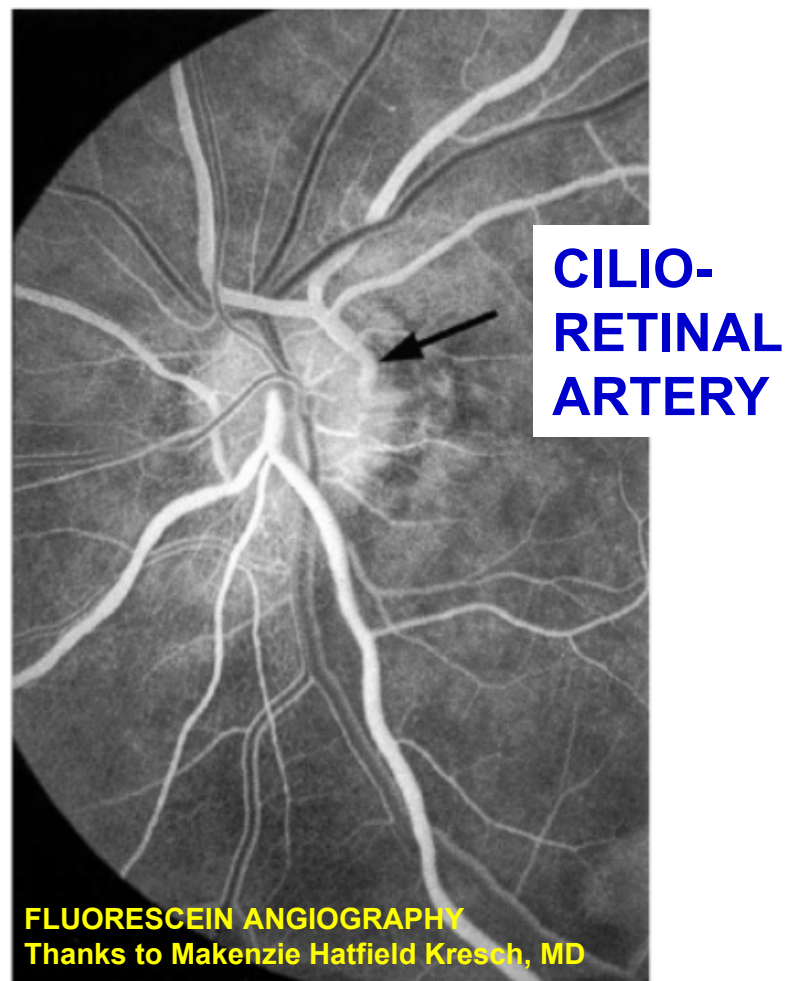
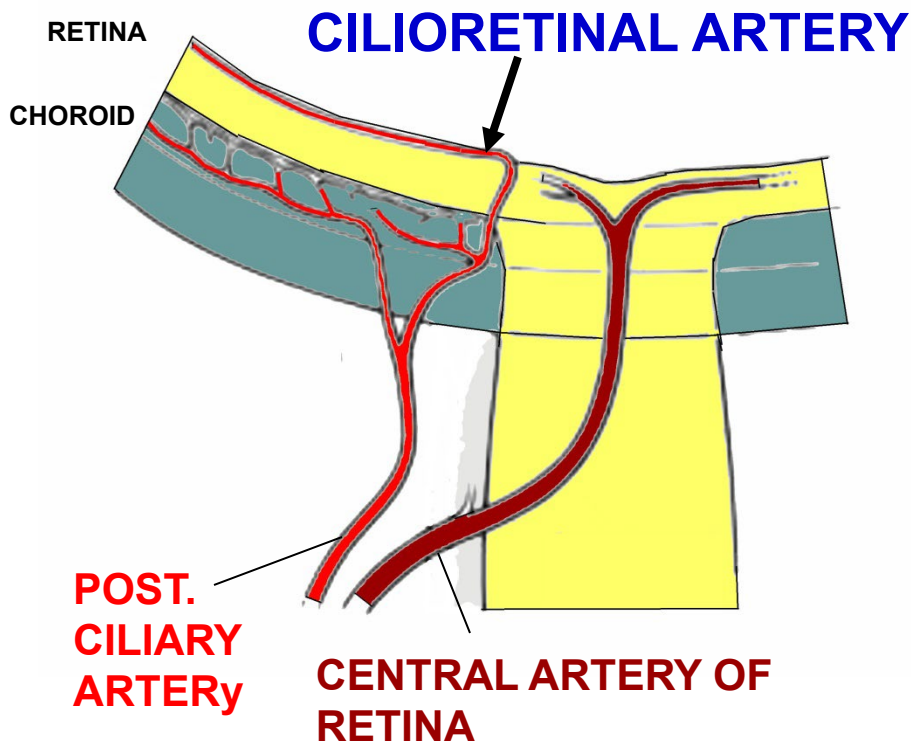
**OPTIC NERVE (DISC)**

**MACULA = visual acuity**



**OPHTHALMOSCOPE VIEW**

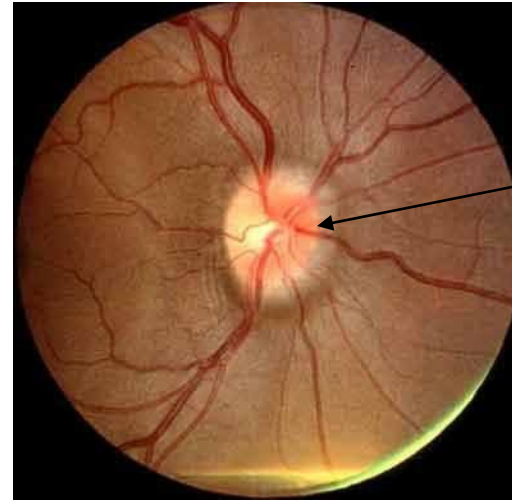
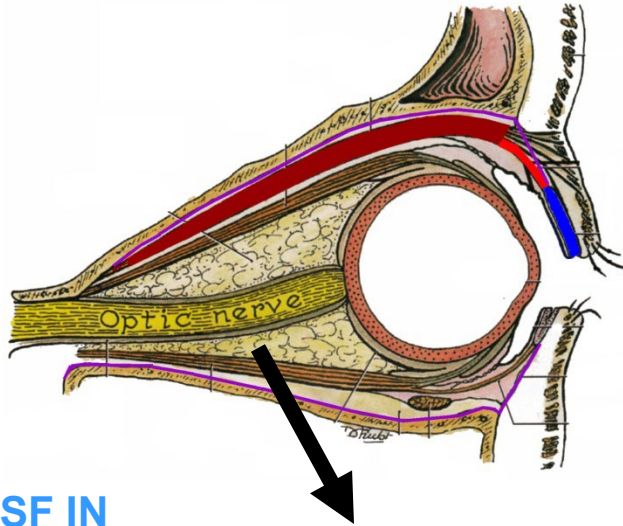
# CRAO - CENTRAL RETINAL ARTERY OCCLUSION - most common cause, Carotid Artery atherosclerosis; if complete: blind in one eye



New Anatomy: imaging has shown that branches of Ciliary Arteries (Cilio-arterial complex) can supply retina (20% of people); can provide partial sparing of retina in cases of Central Retinal Artery Occlusion

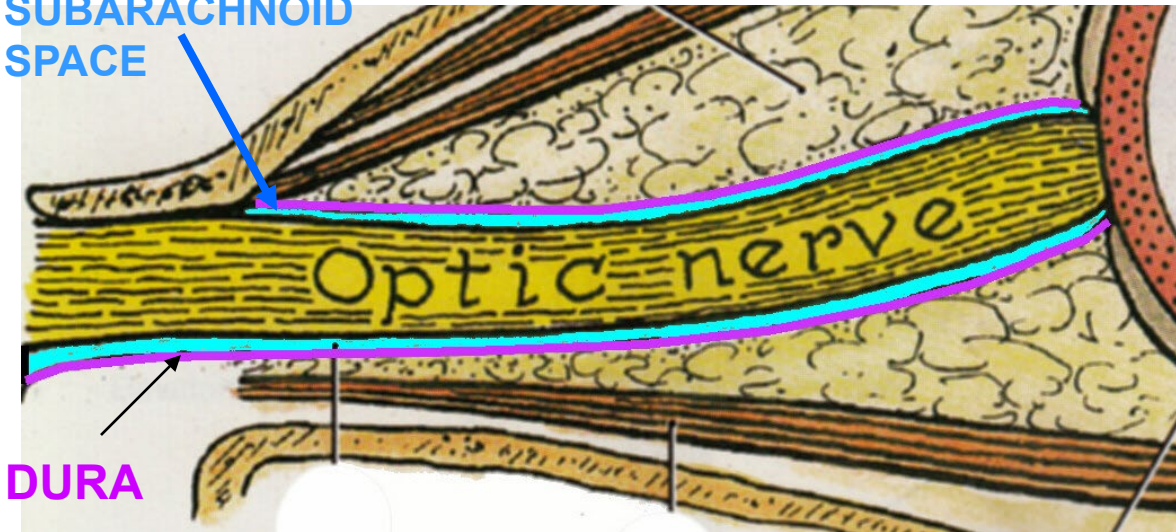


# SUBARACHNOID SPACE EXTENDS TO BACK OF EYEBALL



**PAPILLEDEMA**  
- engorgement of retinal veins (correspond to branches of central artery)

CSF IN SUBARACHNOID SPACE



DURA

**CLINICAL\*\***

**DURA AND SUBARACHNOID SPACE (CSF) EXTEND AROUND OPTIC NERVE; INCREASE IN CSF (PRESSURE) CAN AFFECT VISION**

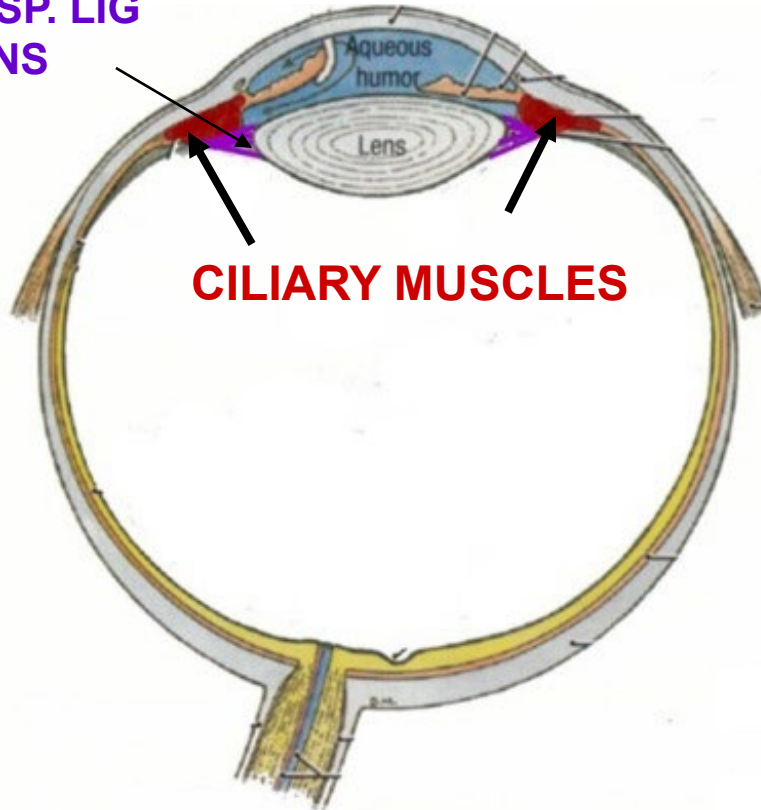
**PAPILLEDEMA = swelling of optic disc**

Clinical - slow onset; headaches



# EYE- STRUCTURE OF EYEBALL- VASCULAR LAYER

SUSP. LIG  
LENS

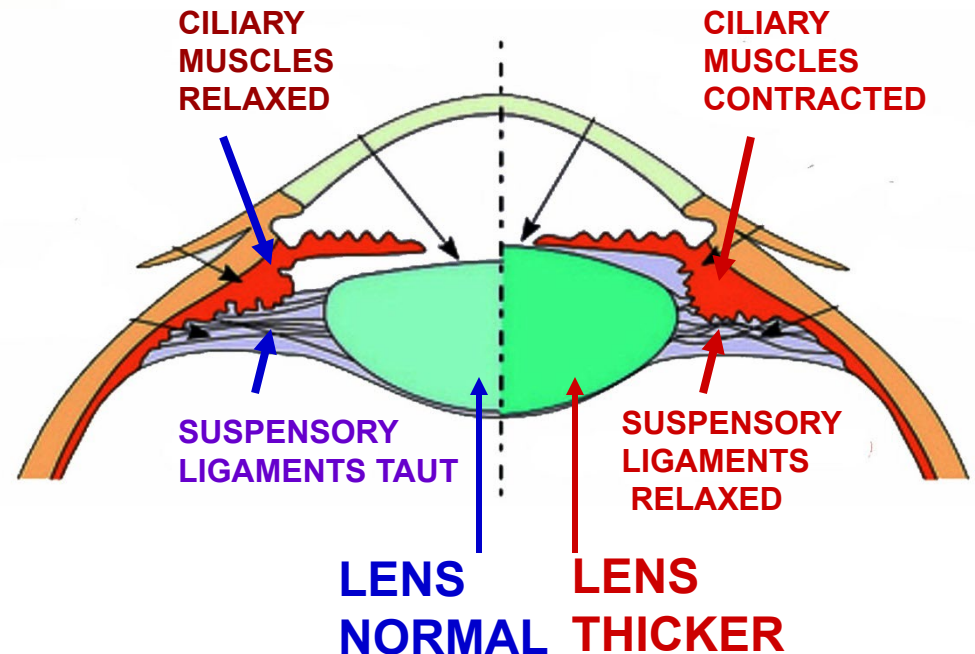


**CILIARY MUSCLES**

**B. CILIARY BODY- CILIARY MUSCLES- SMOOTH MUSCLES AT ATTACHMENTS OF SUSPENSORY LIGAMENTS OF LENS CONTROL THICKNESS OF LENS**

**NORMAL  
VISION**

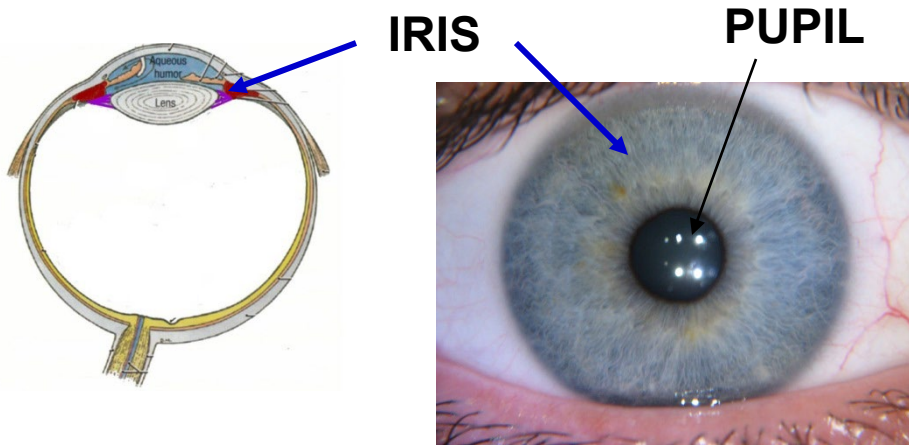
**NEAR  
VISION**



**ACCOMMODATION - THICKEN LENS FOR NEAR VISION (VIEWING OBJECTS CLOSE UP)**  
**PARASYMPATHETIC CONTROL- III (Short ciliary nerves)**

**CILIARY MUSCLES CONTRACT - LENS THICKER**

# EYE - STRUCTURE OF EYEBALL- VASCULAR LAYER



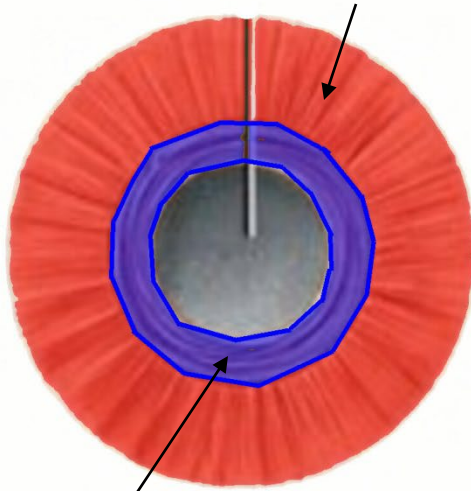
**C. IRIS - PIGMENTED, CONTRACTILE LAYER WITH SMOOTH MUSCLES SURROUNDING PUPIL**

**NORMAL**

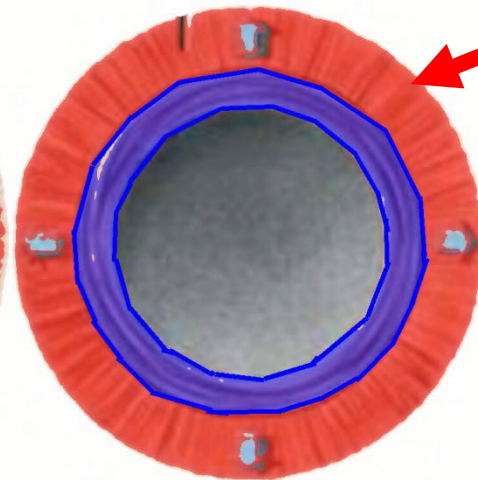
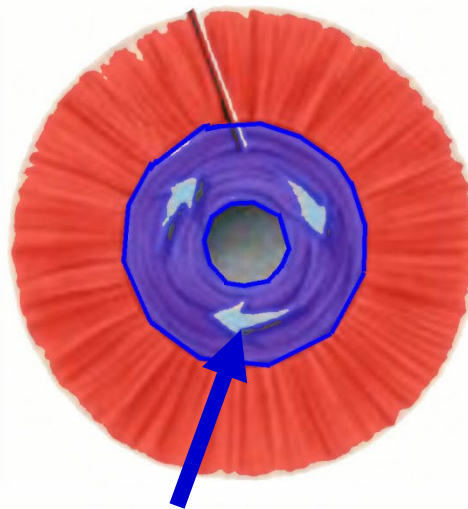
**DILATOR**

**BRIGHT LIGHT - PUPIL CONSTRICTED**

**DIM LIGHT - PUPIL DILATED**



**CONSTRUCTOR**



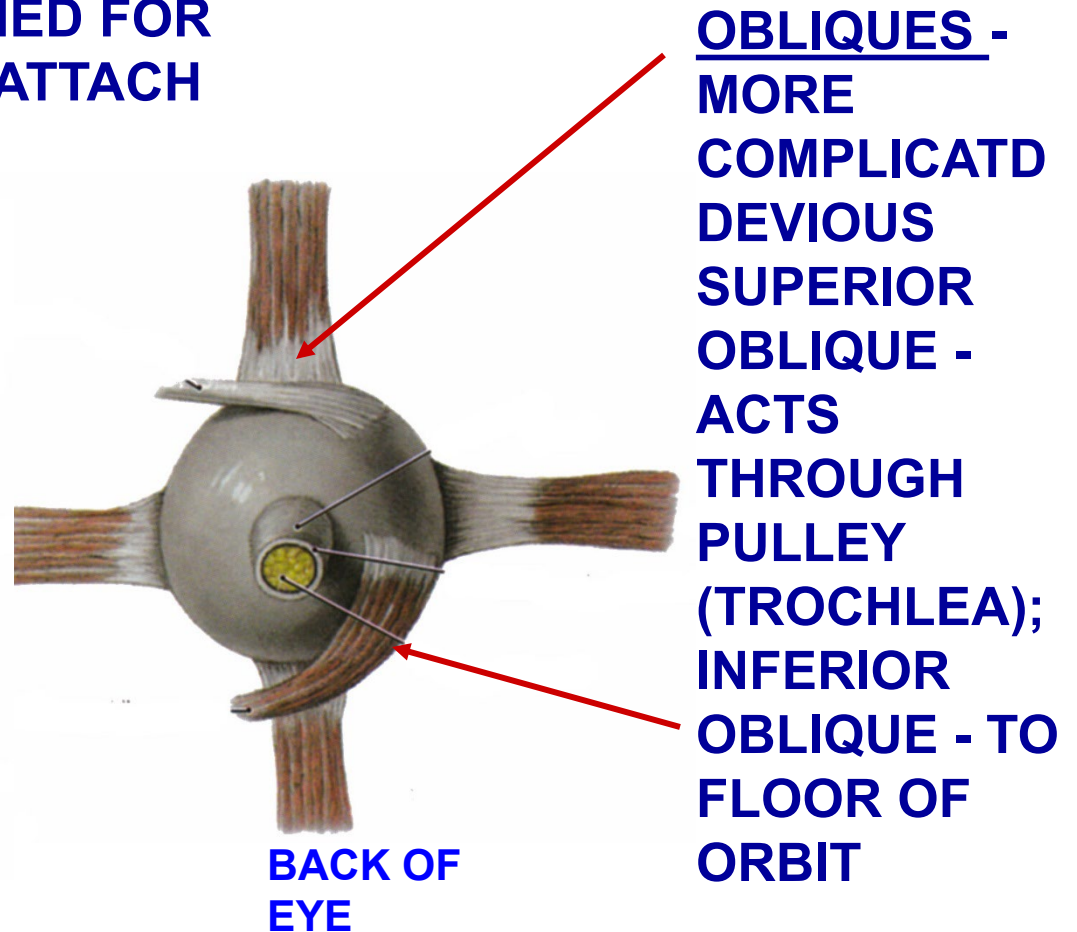
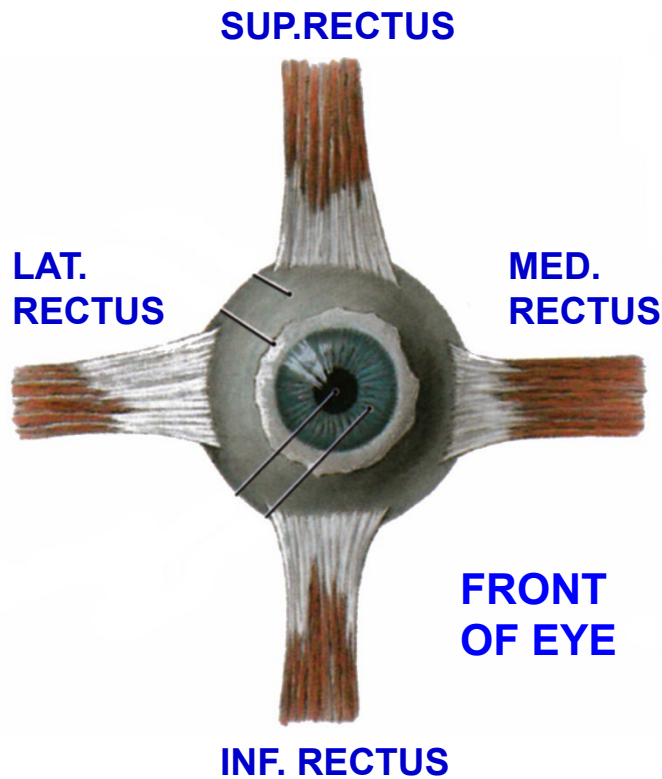
**DILATOR PUPIL- RADIAL SMOOTH MUSCLE; SYMPATHETICS**

**CONSTRUCTOR PUPIL- CIRCULAR SMOOTH MUSCLE; PARASYMPATHETICS (CN III)**

# V. EXTRAOCULAR MUSCLES

## - VOLUNTARY SKELETAL MUSCLES WHICH MOVE EYEBALL

RECTI = STRAIGHT, NAMED FOR SIDES ON WHICH THEY ATTACH



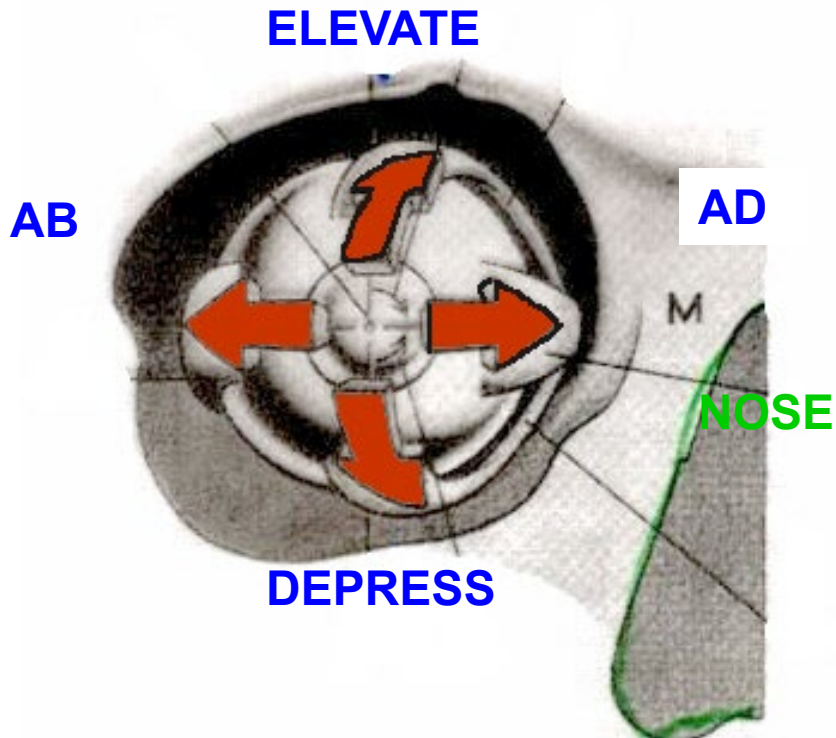
OBLIQUES - MORE COMPLICATED DEVIATED SUPERIOR OBLIQUE - ACTS THROUGH PULLEY (TROCHLEA); INFERIOR OBLIQUE - TO FLOOR OF ORBIT



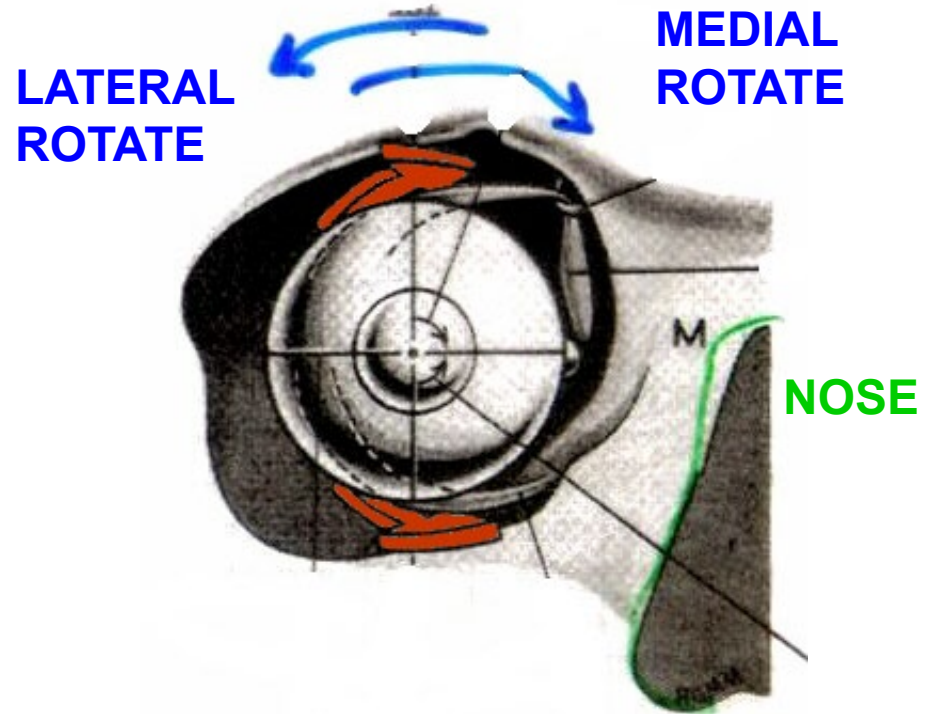
# EYE MOVEMENTS

## VOLUNTARY

ADDUCT - MOVE MEDIANLY  
ABDUCT - LATERALLY  
ELEVATE OR RAISE - SUPERIORLY  
DEPRESS OR LOWER - INFERIORLY

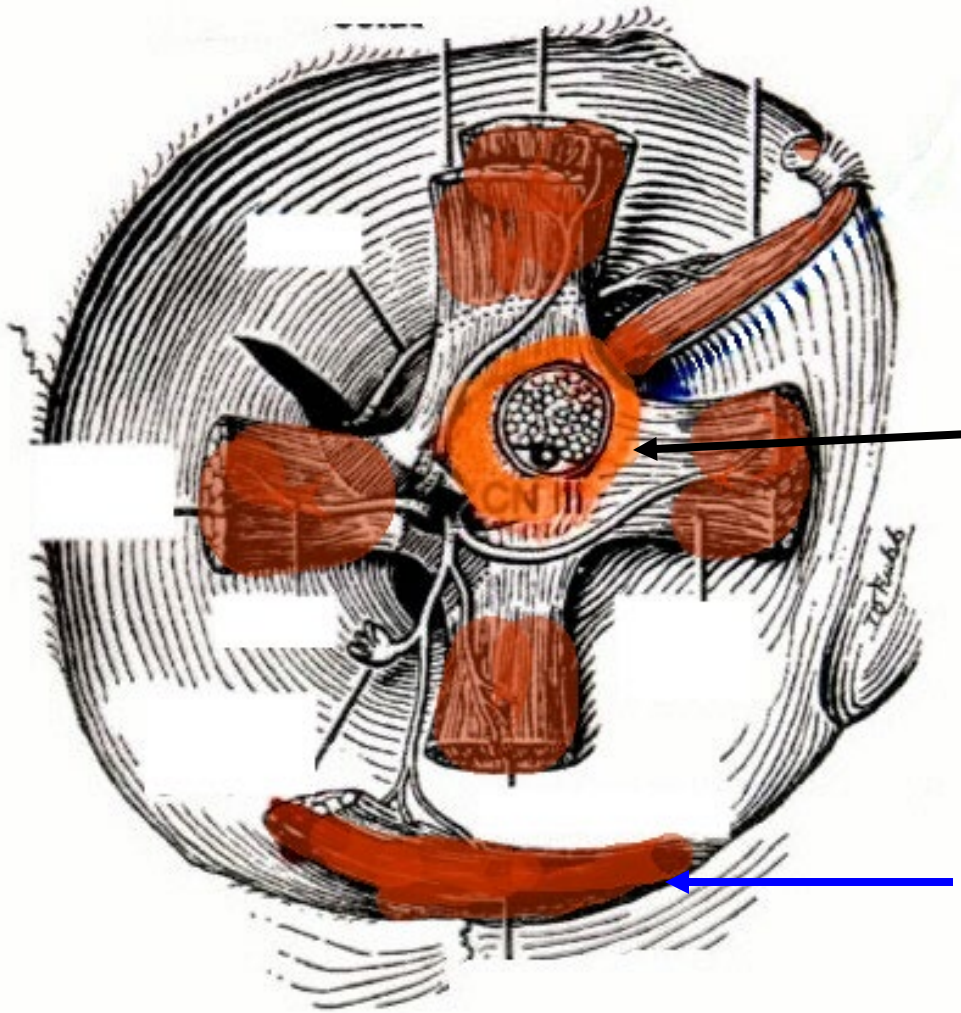


ROTATE- INVOLUNTARY WHEN TILT HEAD : MEDIAL ROTATE - INTORSION  
LATERAL ROTATE - EXTORSION



ROTATIONAL MOVEMENTS – COMPENSATE FOR HEAD TILT

# A. ORIGINS OF EXTRAOCULAR MUSCLES



VIEW OF ENUCLEATED ORBIT- EYEBALL REMOVED; MOST MUSCLES TAKE ORIGIN FROM

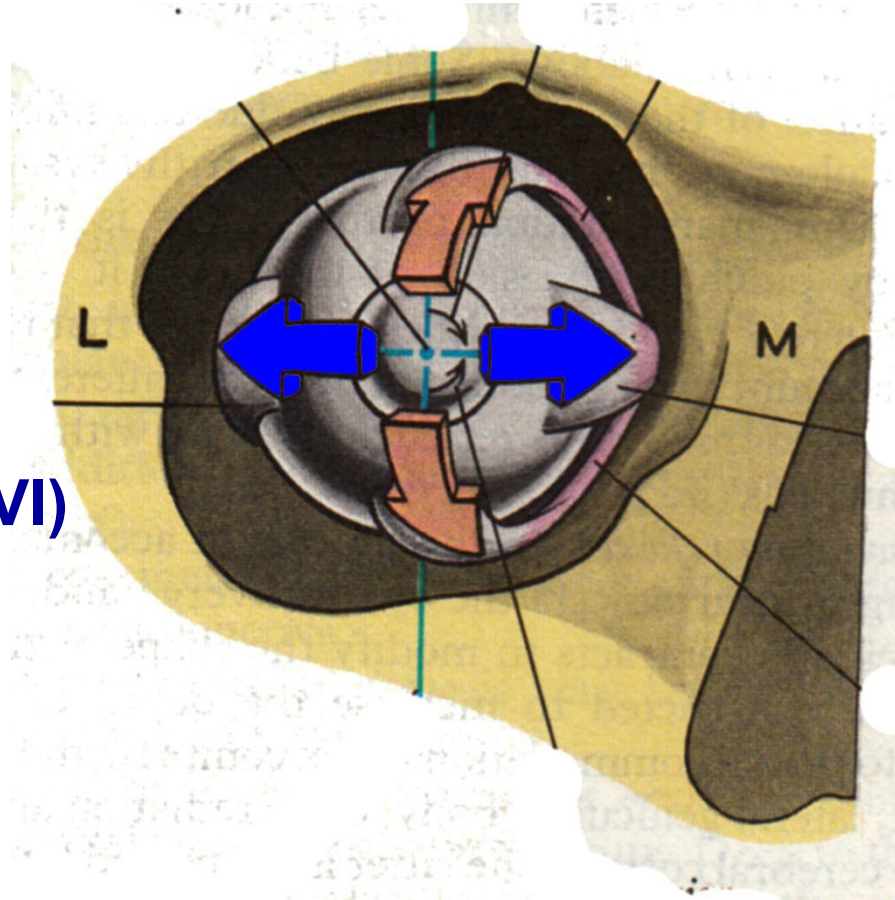
TENDINOUS RING- RING OF CT SURROUNDING OPTIC CANAL AND SUPERIOR ORBITAL FISSURE

NOTE: NOT INFERIOR OBLIQUE - FROM FLOOR OF ORBIT

## B. ACTIONS - EYE MOVEMENTS

### ACTIONS - MEDIAL RECTUS AND LATERAL RECTUS STRAIGHTFORWARD

LATERAL  
RECTUS  
ABDUCT (VI)

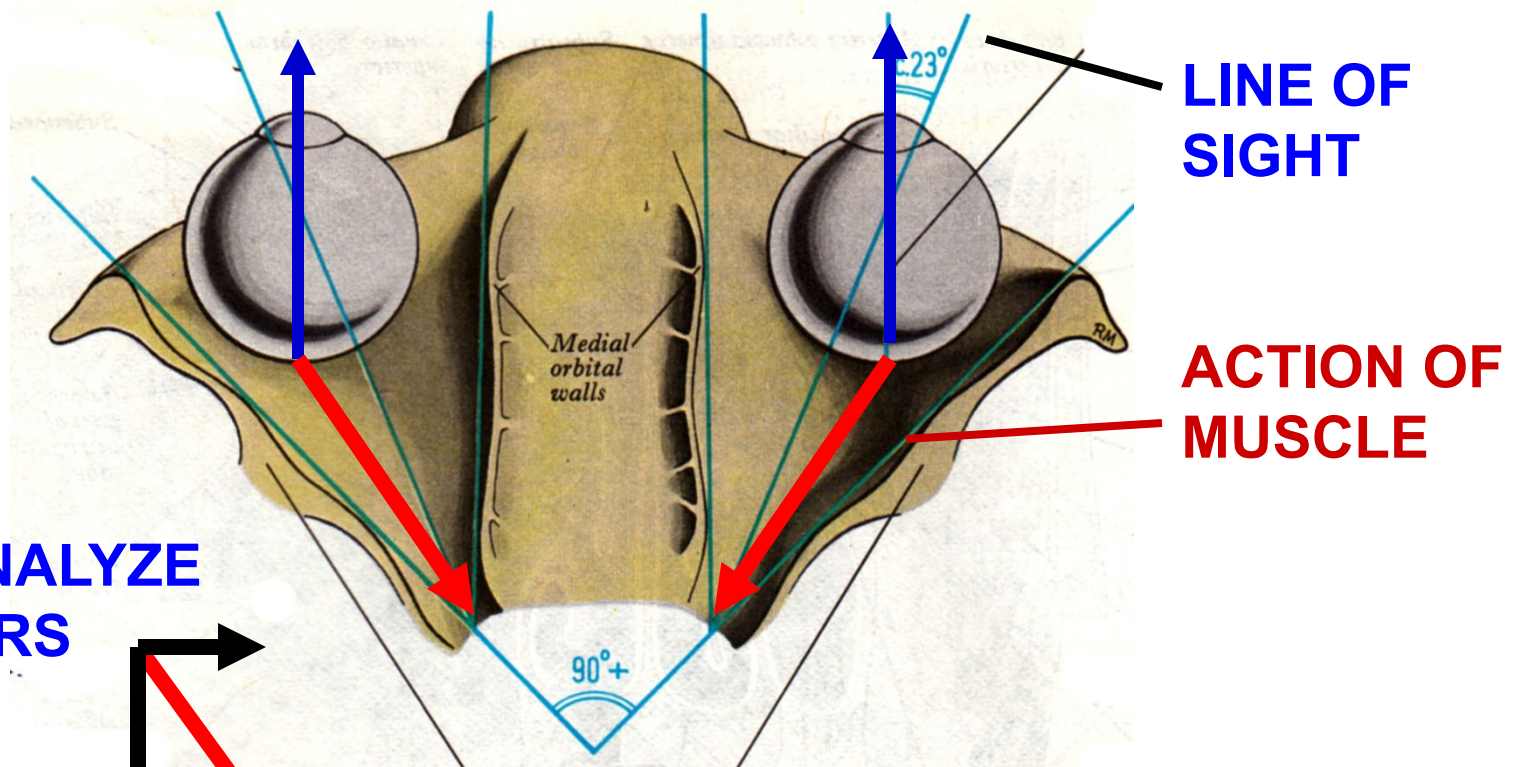


MEDIAL  
RECTUS-  
ADDUCT  
EYE (III)



# EYE MOVEMENTS

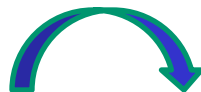
- ACTIONS OF OTHER MUSCLES COMPLEX
- PULL OF SUP. AND INF. RECTUS AT ANGLE WITH LINE OF SIGHT



CAN ANALYZE VECTORS



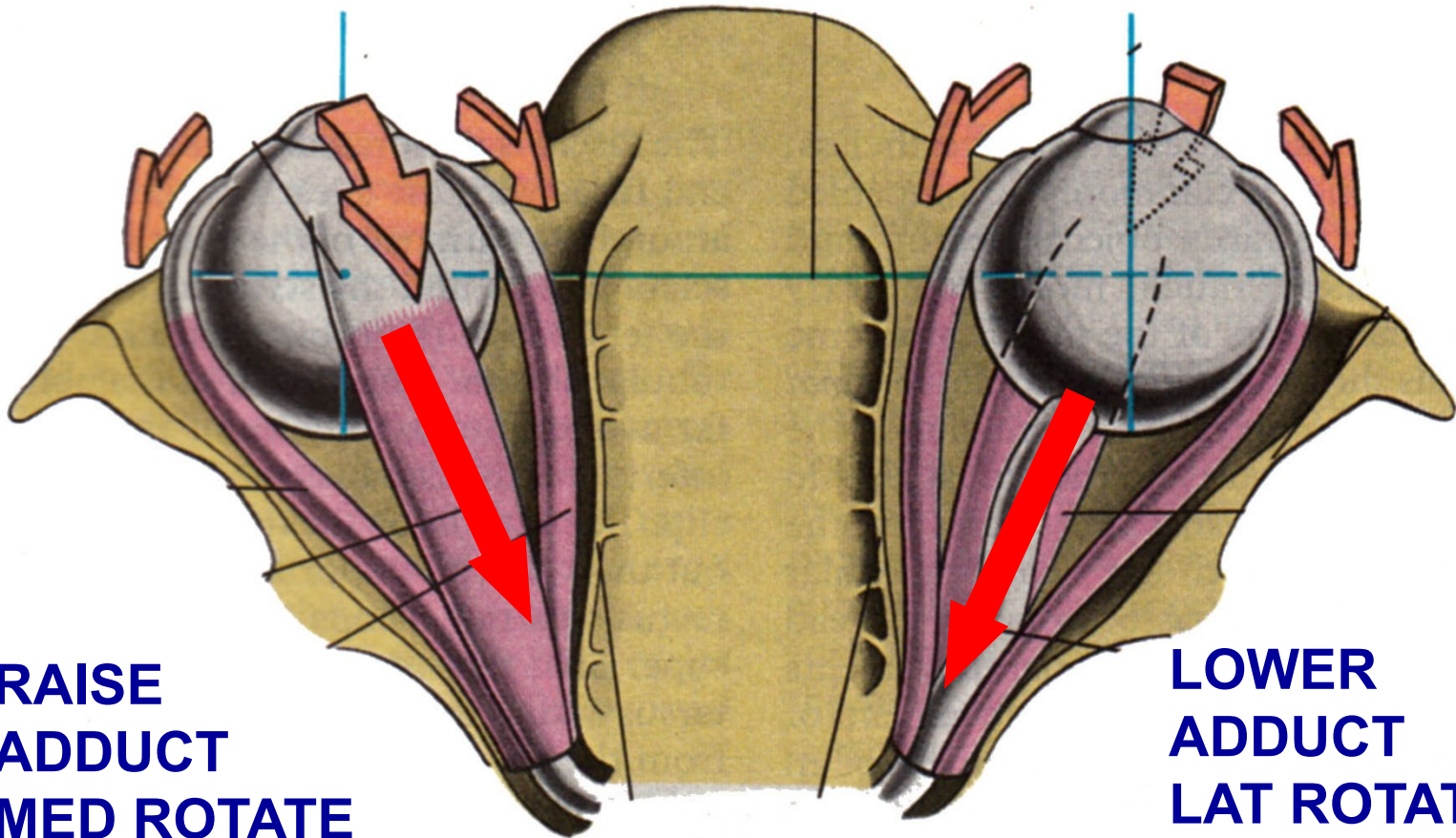
ALSO ROTATIONAL MOVEMENTS



# EYE MOVEMENTS

**SUP RECTUS (III)**

**INF RECTUS (III)**



**RAISE  
ADDUCT  
MED ROTATE**

**LOWER  
ADDUCT  
LAT ROTATE**

# EYE MOVEMENTS

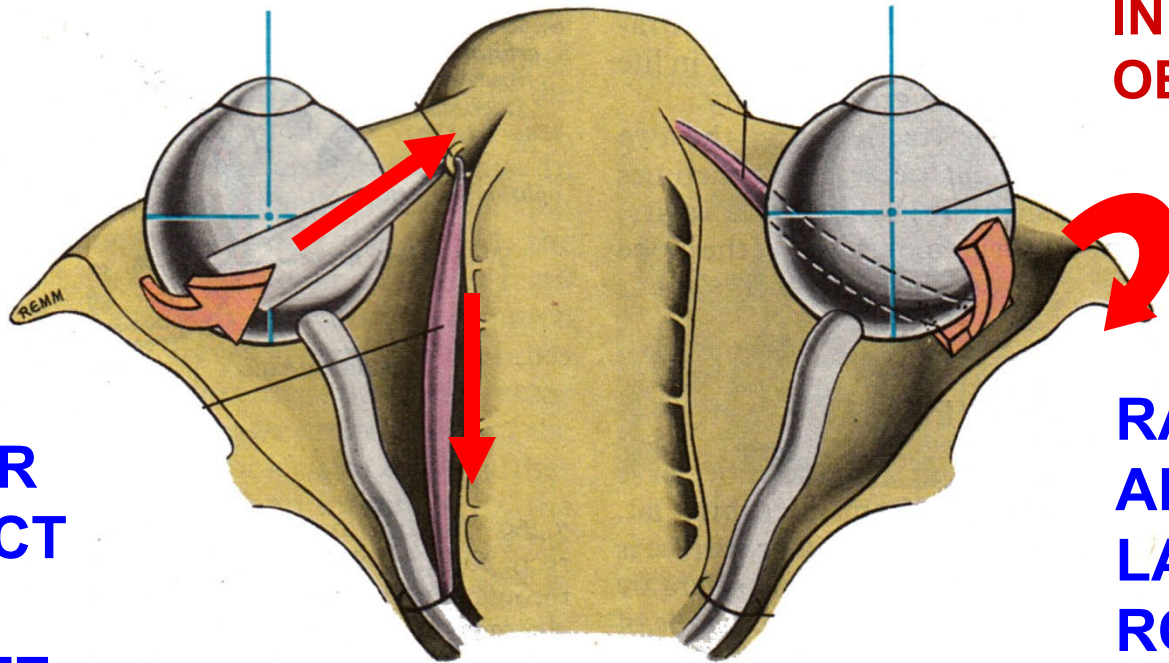
**ACTION OF OBLIQUE MUSCLES COMPLEX (COUNTERINTUITIVE)**

**SUP OBLIQUE (IV) - ACTS THROUGH PULLEY (TROCHLEA) LIKE MUSCLE ON NOSE**

**INF OBLIQUE (III) - ORIGIN FROM FLOOR OF ORBIT- LIKE MUSCLE ON EAR**

**SUP  
OBLIQUE**

**INF  
OBLIQUE**

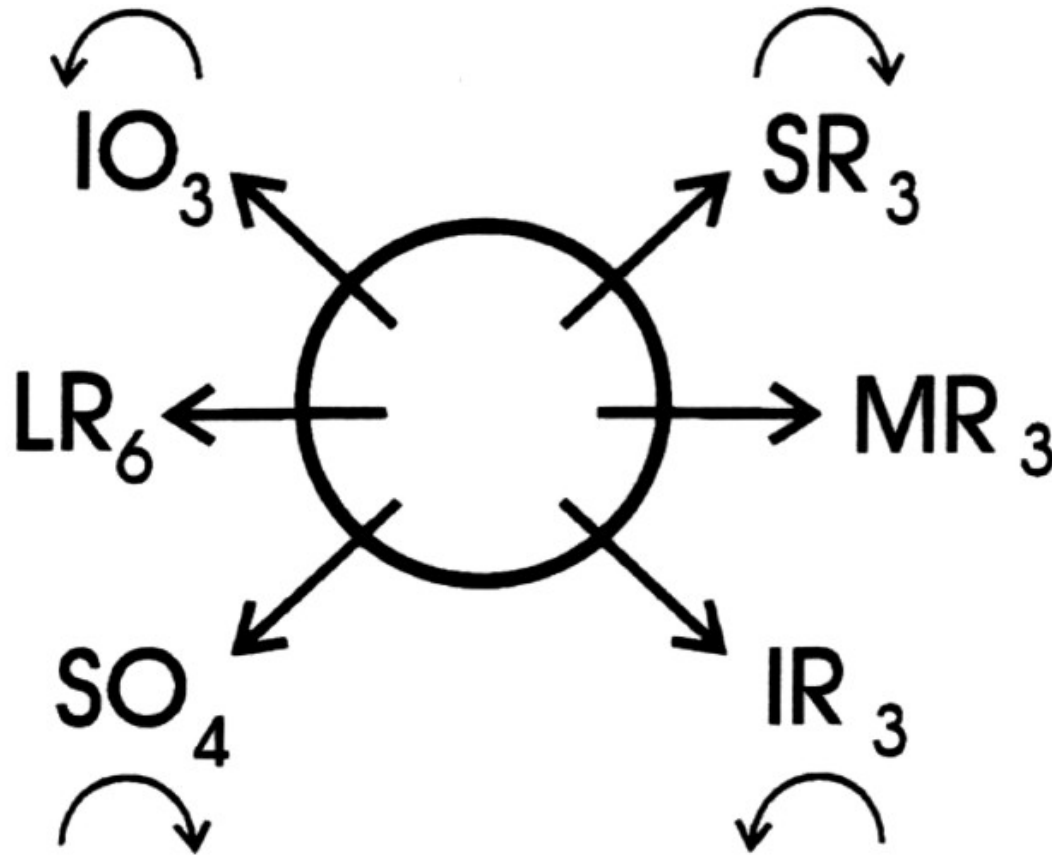


**LOWER  
ABDUCT  
MED  
ROTATE**

**RAISE  
ABDUCT  
LAT  
ROTATE**



# EYE MOVEMENTS DIAGRAM

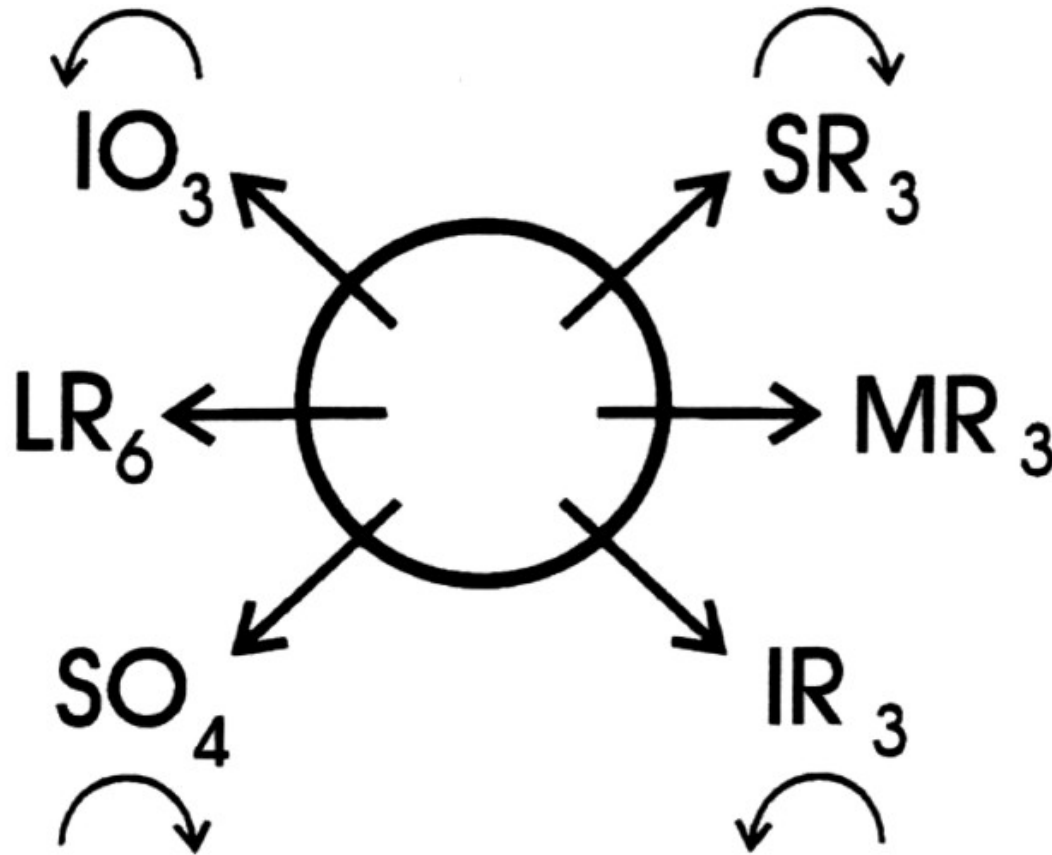


NOSE



- 1- Resting position of eye depends upon tonic activities in muscles.
- 2- Damage to any one muscle does not entirely eliminate abduction, adduction, elevation or depression; only get weakness.

# EYE MOVEMENTS DIAGRAM

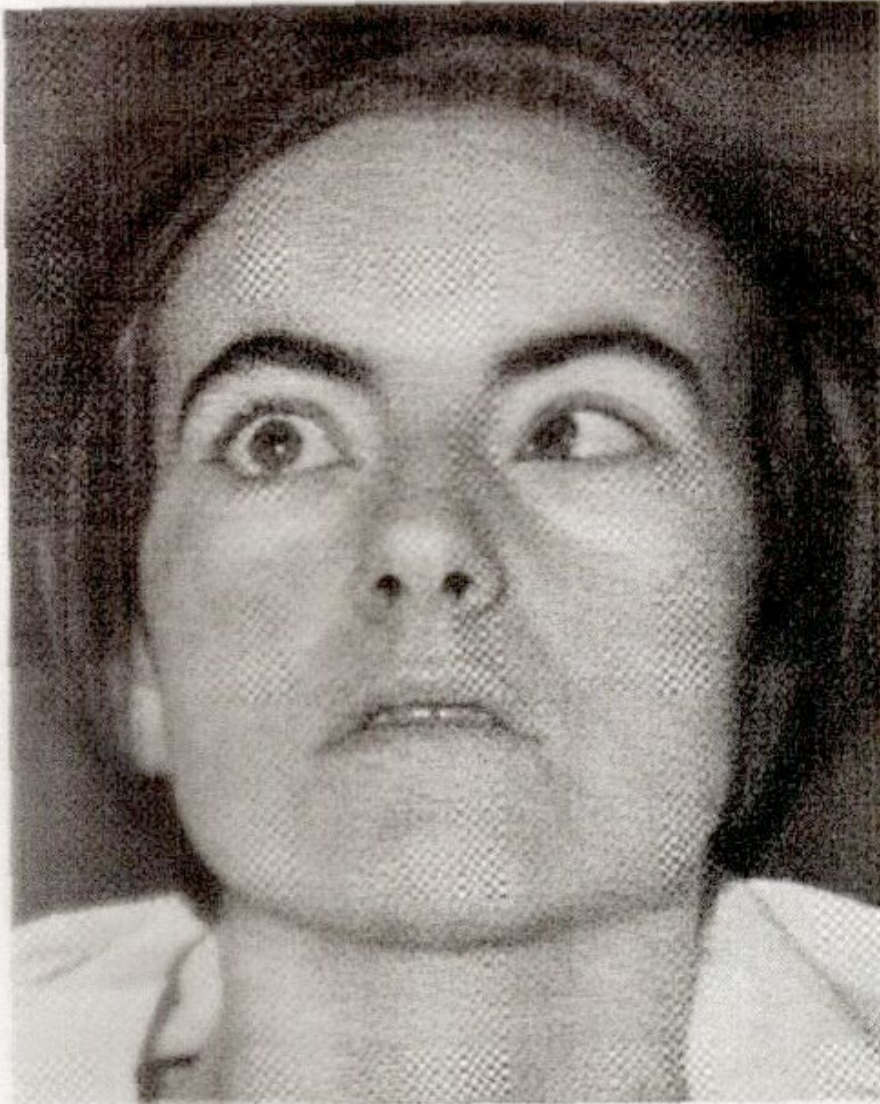


NOSE



**SAMPLE QUESTIONS: 1- WHAT ARE ACTIONS OF INFERIOR OBLIQUE?  
2- WHAT ARE ACTIONS OF SUPERIOR OBLIQUE?  
2- WHAT IS SYMPTOM OF DAMAGE TO ABDUCENS NERVE?**

# VIII. NERVE DAMAGE - all clinically important



## A. ABDUCENS (VI) NERVE DAMAGE

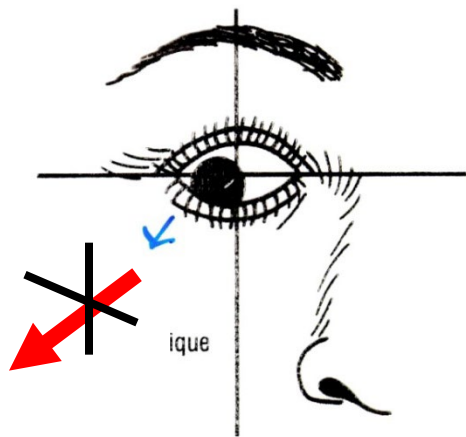


**WHEN PATIENT LOOKS  
STRAIGHT AHEAD:**

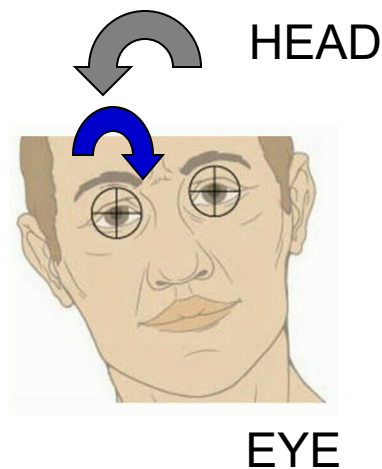
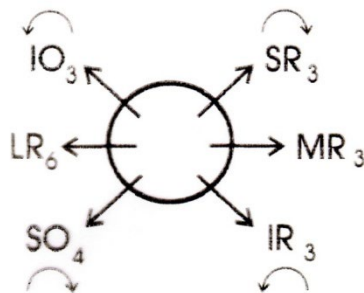
**MEDIAL STRABISMUS  
(CROSS-EYED) DUE TO  
DAMAGE/PARALYZE  
LATERAL RECTUS**



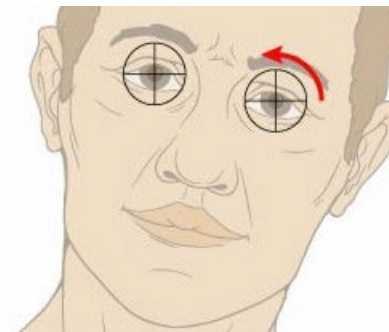
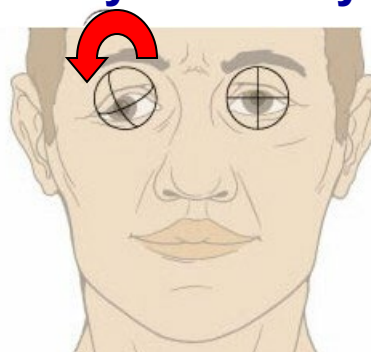
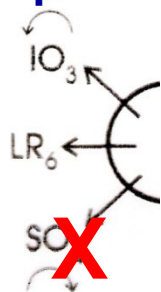
# B. TROCHLEAR (IV) NERVE DAMAGE: INABILITY TO TURN EYE DOWN AND OUT; ALSO HEAD TILT



NORMAL



**NORMAL** Rotation - occurs when tilt head; rotate ipsilateral eye medially when tilt head laterally



HEAD



**PATIENT CANNOT LOOK DOWN AND OUT**

**Symptoms - Difficulty walking down stairs; HEAD TILTED**

**\*\*\***

**AFTER IV DAMAGE - eye rotated laterally; PATIENT TILTS HEAD TO OPPOSITE SIDE so both eyes rotated**

## C. OCULOMOTOR (III) NERVE DAMAGE



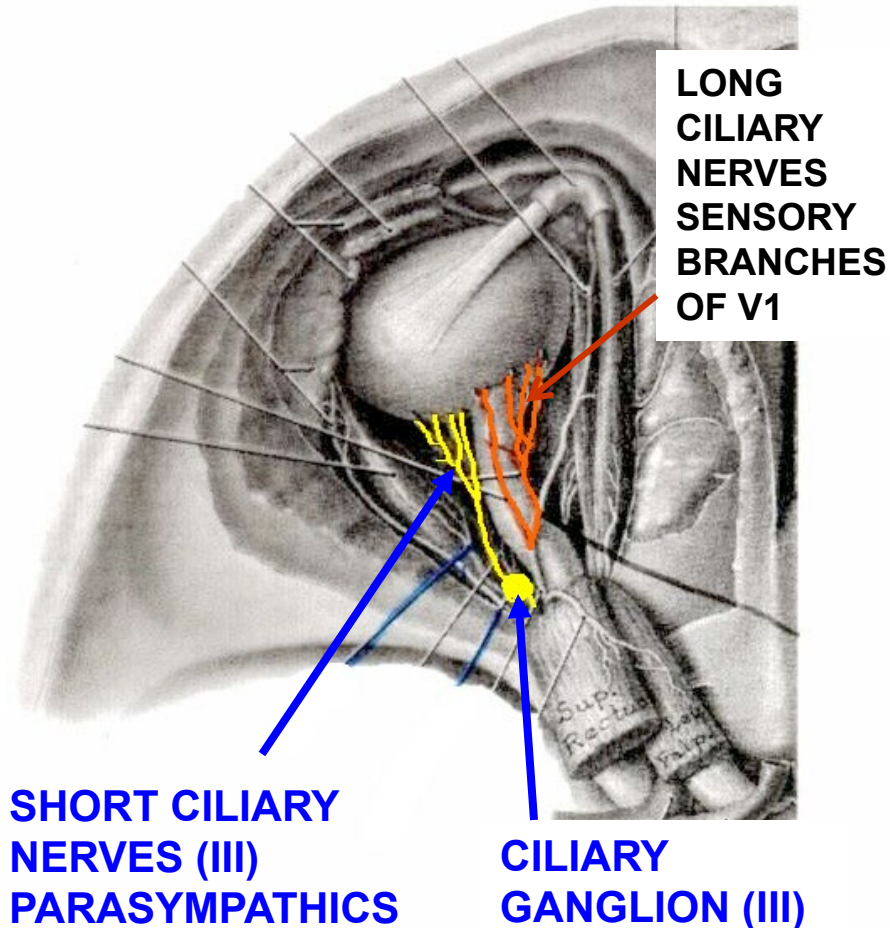
### AT REST

1) LATERAL STRABISMUS (WALL-EYED) DUE TO PARALYZE MEDIAL RECTUS

2) PTOSIS - DROOPING EYELID PARALYZE LEV. PALPEBRAE SUPERIORIS

3) DILATED PUPIL - (MYDRIASIS) PARALYZE PUPILLARY CONSTRICTOR

# VII. CILIARY GANGLION - PARASYMPATHETIC



CILIARY GANGLION-  
PARASYMPATHETICS OF  
OCULOMOTOR N (III); TRAVEL IN  
SHORT CILIARY NERVES - (FOUND  
LATERAL AND DORSAL TO OPTIC  
NERVE)

INNERVATE: 1) CILIARY MUSCLES  
2) SPHINCTER (CONSTRICTOR)  
PUPILLAE

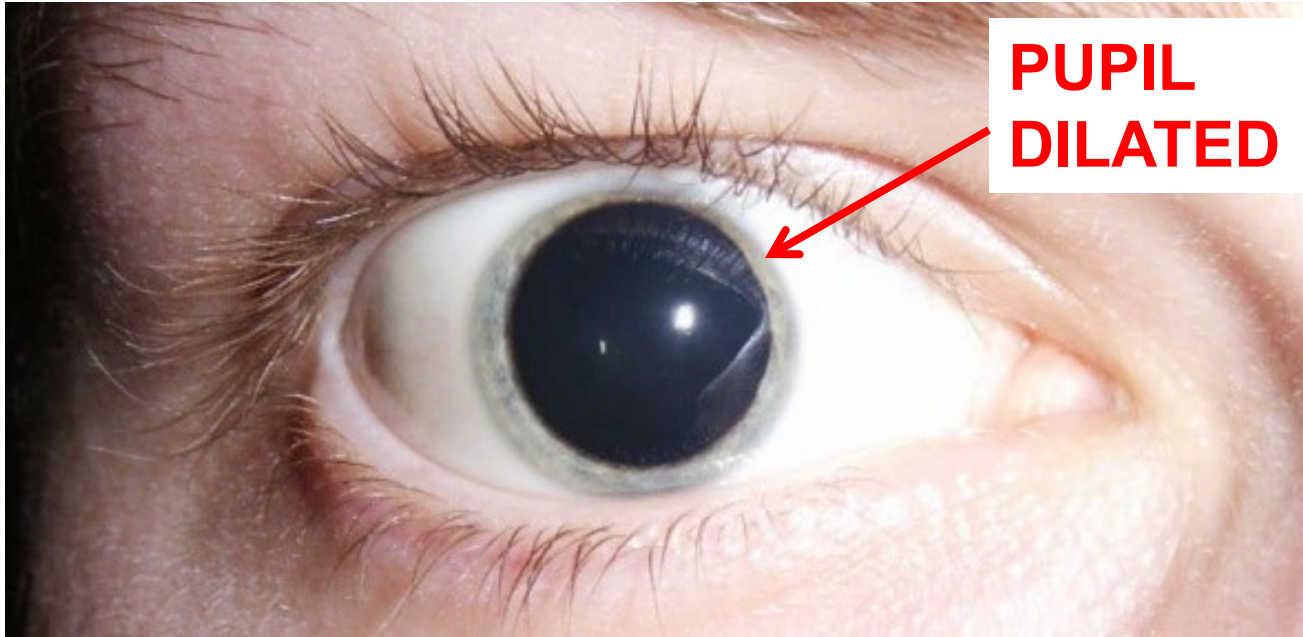
NOTE: LONG CILIARY NERVES  
BRANCHES OF V1 (OPHTHALMIC) -  
SENSORY TO CORNEA - (FOUND  
MEDIAL AND DORSAL TO OPTIC  
NERVE)

**CLINICAL \*\***

**DAMAGE SHORT CILIARY NERVES (ONLY) - MAIN  
SYMPTOM: PUPIL IS DILATED = MYDRIASIS**



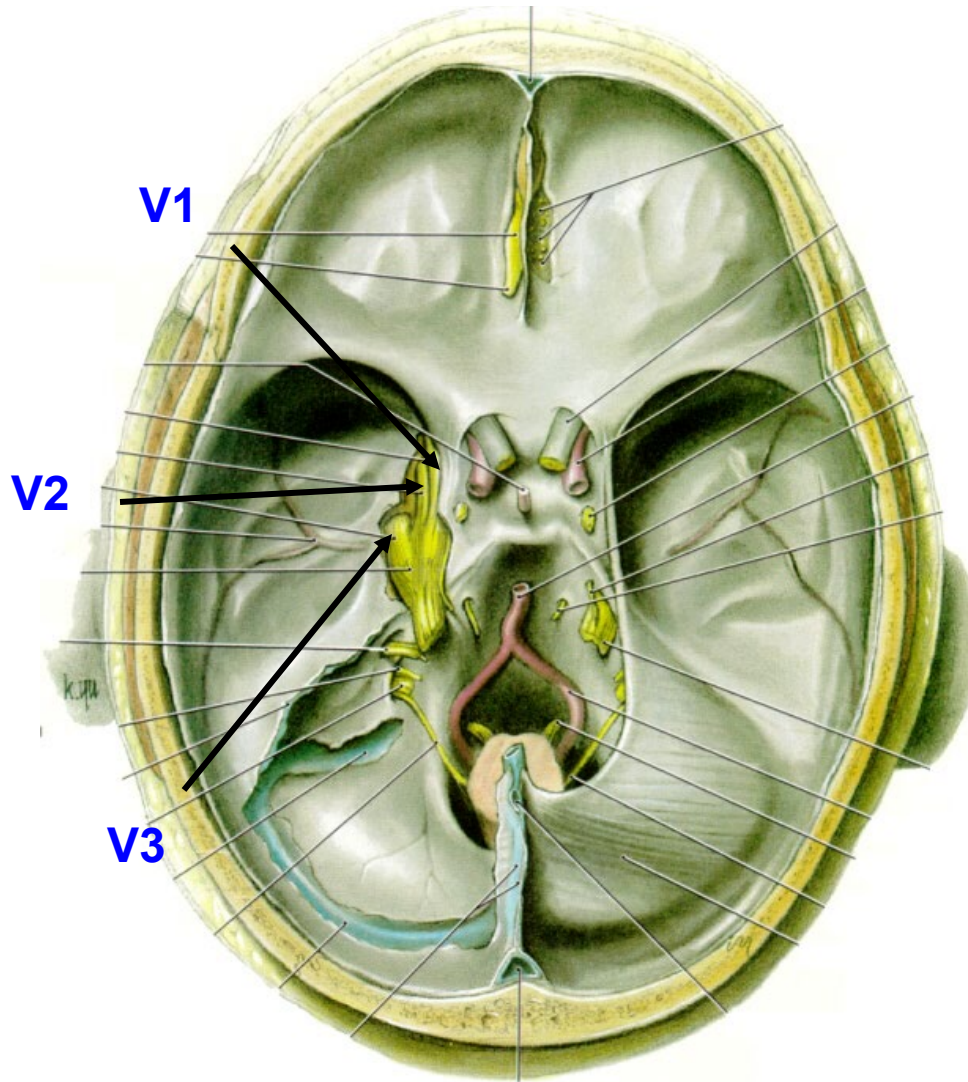
# 'BLOWN PUPIL' = MYDRIASIS (muh-dry'-a-sis)



**'BLOWN PUPIL' = MYDRIASIS - PUPIL DILATED, UNABLE TO CONSTRICT IN RESPONSE TO LIGHT - INDICATES CATASTROPHE - STROKE, HERNIATION, ETC.**

**Note; Anisocoria – pupils of unequal size (normal or abnormal)**

# TRIGEMINAL NERVE - V



**V1 – OPHTHALMIC -Sup.  
Orbital fissure – SOMATIC  
SENSORY**

**V2 - MAXILLARY - Foramen  
rotundum – SOMATIC  
SENSORY**

**V3 – MANDIBULAR - -  
Foramen ovale – SOMATIC  
SENSOR AND  
BRANCHIOMOTOR**