HANDWRITTEN NOTES

DAMS

OPHTHALMOLOGY

CRISP, CONCISE, CONCEPTUAL

Integrated Edition

Student first @DAMS

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Delhi Academy of Medical Sciences (P.) Ltd.
House No.: 3, Green Park,
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Phone : 011-4009 4009, 9899664533
http://www.damsdelhi.com
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HOW TO MAKE BEST USE OF NOTES?

A Message by Mentor Duo Specially for you,

- *Read the notes thoroughly, they are absolutely concise, crisp & conceptual and hence it is best advised not to add a lot of extra information to them as that will dilute the quality.*
- *Images have been provided alongside to aid in better understanding and also help you solve image-based questions, these images have been specially picked by the faculty so have a high probability of being asked in exams.*
- *Notes are handwritten in a way to help make them easier to retain, a lot of tables, graphs and algorithms have been used to simplify the learning.*
- *While reading notes try and use the CFAQ technique —*
  - *A. Use the C to denote concept part in the notes and ensure you are clear with this part in the first go if not then it's advisable to listen to this part of the video from your course.*
  - *B. Use the F To denotes facts in your notes, it is okay if you can't remember them in first go but will need repeat reading. But these facts are important for exams as they could be integrated to clinical questions.*
  - *C. Use A to denote applied parts, this is how concepts and facts are asked indirectly in exams. This will also help you develop MCQ solving skill.*
  - *D. Use Q to denote areas where faculty has said it's a direct question or a PYQ or a potential question.*
- *This technique will help you summarize your notes In way that your second reading will become easy and faster.*
- *Active space has been provided with these notes to make your own annotations alongside and this will help you maintain one single notebook for one subject.*
- *Try and solve MCQs with every topic from DQB. Your goal should be to start with at least 30 MCQs every day and then increase to at least 50 MCQs every day. Also, when you do a topic wrong write it alongside the notes that this topic needs to be read again but mark only the specific area that you have done wrong not the whole topic.*
- *After the topic is covered then in the active space try and summarize the topic in the form of mind map. This will help in active recall and make your revision easier.*

Best Wishes & Happy Learning!!!!!

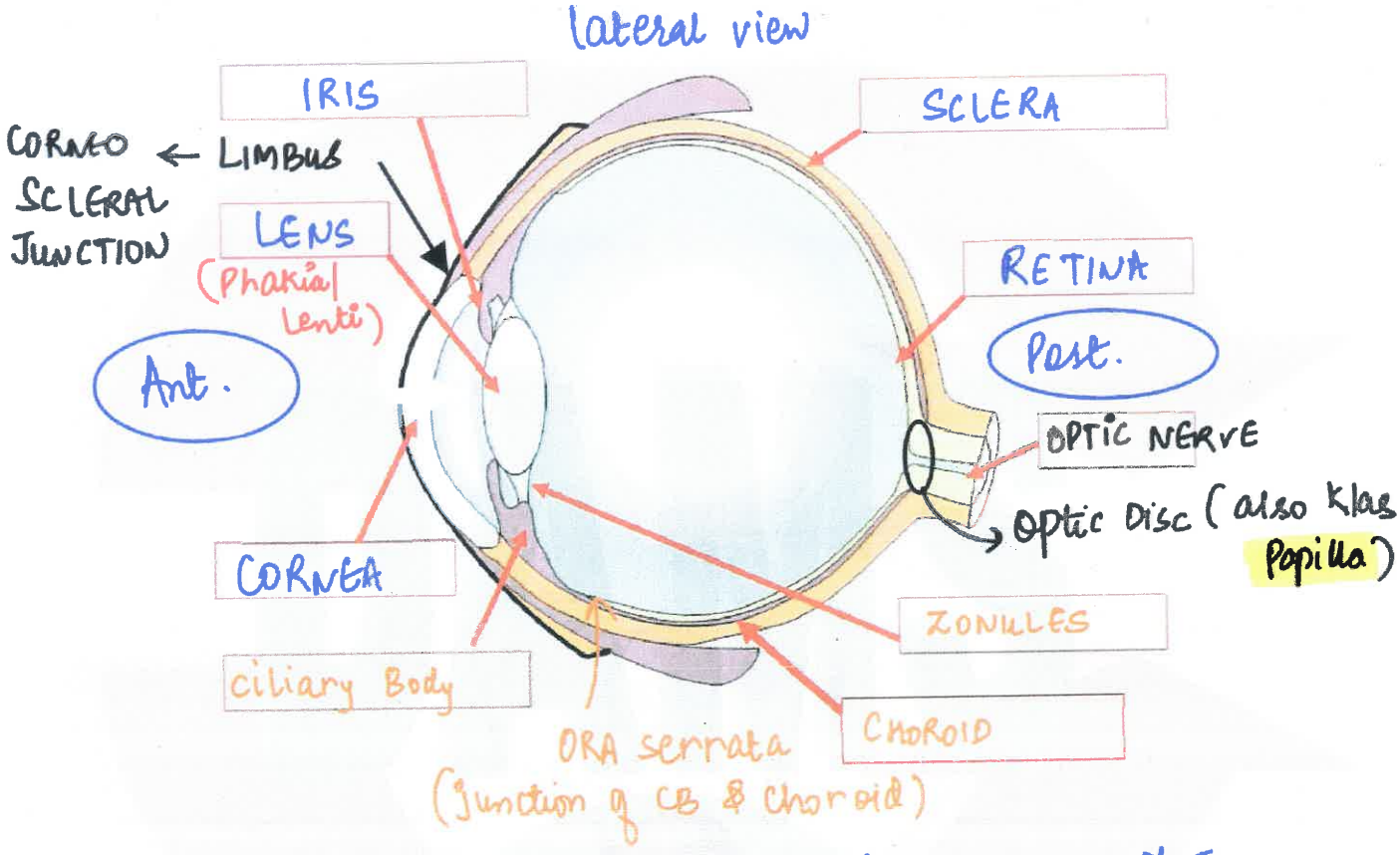
INDEX

OPHTHALMOLOGY

Embryology and Anatomy

Anatomy and Nomenclature of eyeball

Klas Tunica ← **Layers or Coats of eyeball** (also Klas BULBAR)



➤ Eyeball shape is Spheroidal, Volume: 6.5ml, Weight : 7gm, Circumference : 7.5cm

Outer fibrous → FOR PROTECTION

KERA : NOMENCLATURE of CORNEA

Cornea ➤ Anterior 1/6th

Corneo-scleral junction is LIMBUS

Sclera ➤ Posterior 5/6th

Middle vascular = UVEA = FOR: NUTRITION

Iris

➤ Central aperture of iris is Pupil

Cyclo

Ciiary body ➤ Anterior is pars plicata, Posterior is pars plana → Relatively avascular

Choroid ➤ Ciliary body- choroid junction is Ora serrata (360°)

Inner neural : FOR VISION

(FUNDUS)

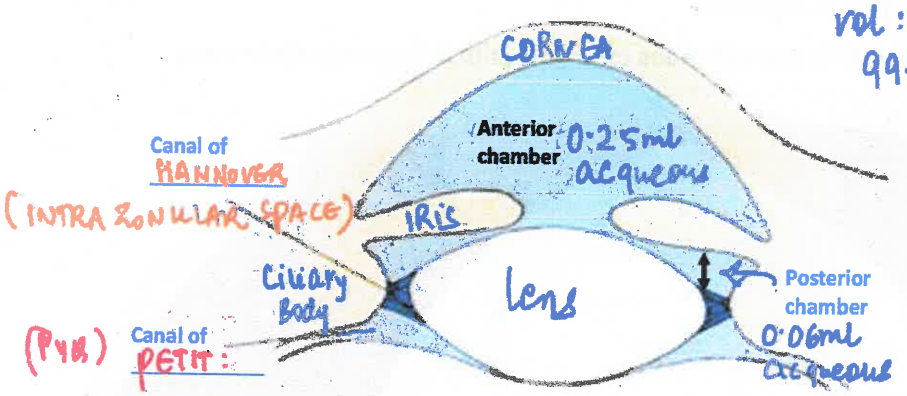
Retina ➤ From ora serrata to optic disc margins

Anisocoria: Difference in size of pupil

Polycoria: Multiple pupil

Anatomical spaces

Aqueous:
vol: 0.31 ml
99.9% water



Anterior segment

- Contains AQUEOUS humour
- Has high concentration of
  - Lactate
  - Chlorine
  - vit C (ascorbate)

- POSTERIOR part of lens is demarcation between 2 segments

Posterior Segment

Behind the lens

Contains VITREOUS humour (c/a HYALOID)

vol: 4ml
99.9% water
2° vitreous

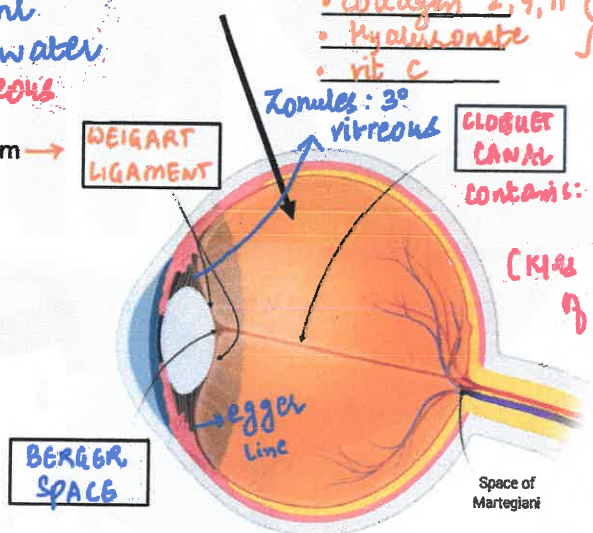
- Has high concentration of
  - collagen 2, 9, 11 } gel
  - hyaluronate
  - vit C

Collagen 2: (MC) in vitreous

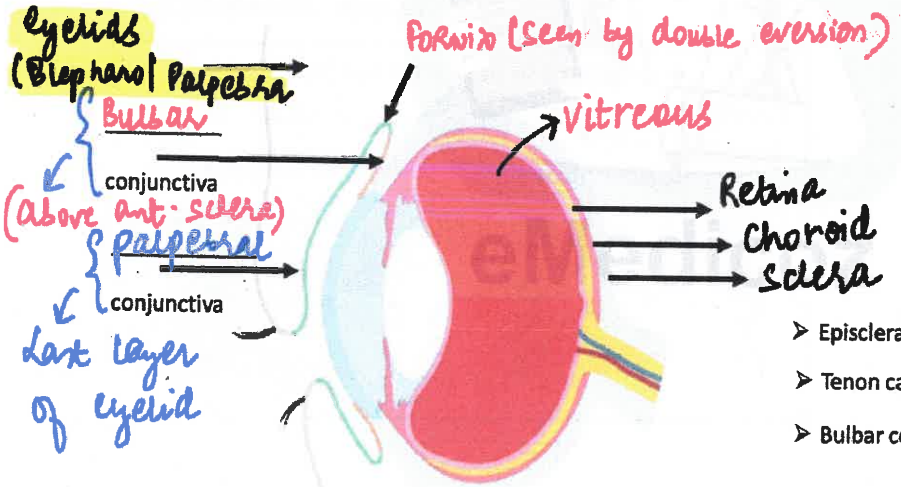
- Anterior vitreous (Egger line) condenses to form → WEIGART LIGAMENT
- creating a BERGER space forming patellar fossa

Zonules: 3° vitreous

CLOQUET CANAL
contains: Hyaloid vessels (Runs 1° vitreous of eye)



✓ Hyaloid vessels:
Regresses by 8th month of embryonic life.

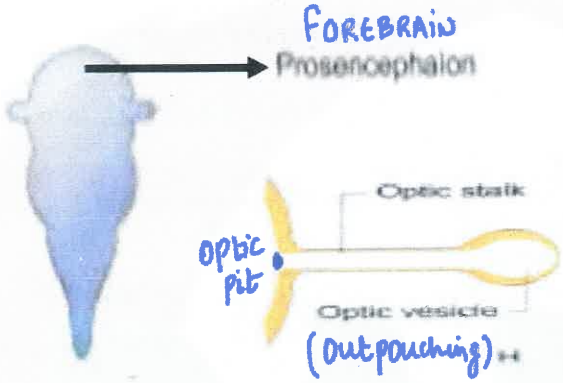


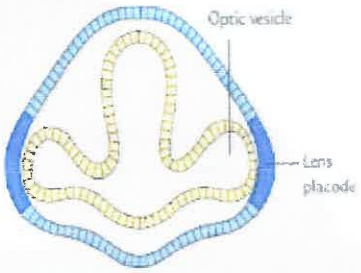
- Episclera covers entire sclera (From Limbus to optic disc)
- Tenon capsule (Bulbar fascia) covers entire sclera
- Bulbar conjunctiva covers anterior sclera

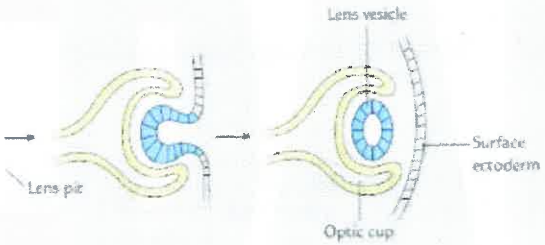
Embylology of eyeball

Eyeball development starts at 22nd **day of intrauterine life**

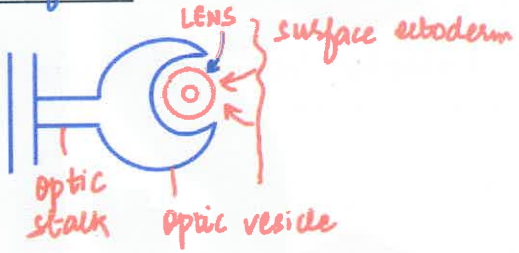
GENE for eye development is PAX-6**, mutation of which leads to** an **-ophthamia/ micro-ophthalmia**



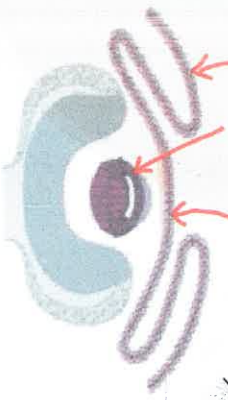




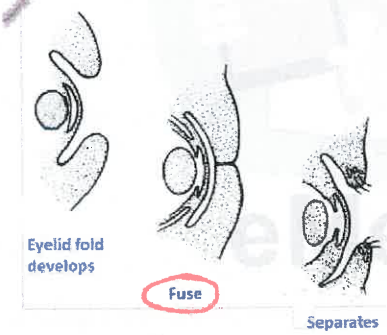
➢ Surface ectoderm covers entire embryo



Surface ectoderm derivatives



- S- Skin of eyelids glands /appendages
- L- Lens
- L- Lacrimal gland
- E- Epithelium of cornea/conjunctiva



Clinical aspect

Failure of : Surface ectoderm

Failure to eyelid development

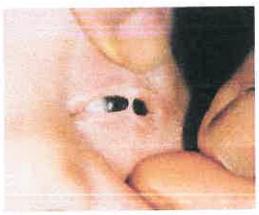
eyelid coloboma

➢ MCCx: ♀ EXPOSURE KERATOPATHY

Failure to separate eyelids

Complete Failure: Cryptophthalmos

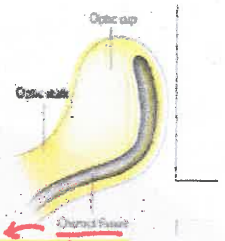
Partial Failure: ♀ Ankylo-Blepharon



Neuro ectoderm/ Optic cup

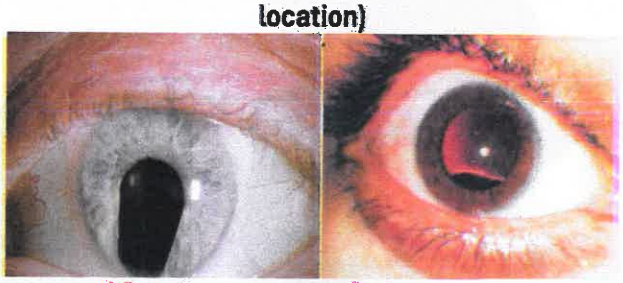
- R- Retina
- O- Optic stalk / optic nerve
- M- Muscles of iris (sphincter and dilator pupillae)
- E- Epithelium of iris/ciliary body
- Secondary/tertiary vitreous → zonules
  ↓
  Definitive vitreous

Clinical aspect



Also K/as Embryonic fissure

Failure of closure of optic cup/embryonic fissure at 36 days leads to eyeball coloboma (INFERIOR location)



IRIS COLOBOMA

LENS COLOBOMA : micromes

lens shape altered like a notch bcoz of loss of zonules inferiorly.

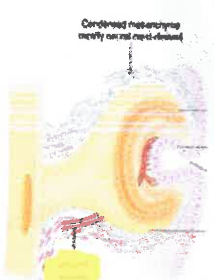
Mesoderm

M - Muscles EXTRAOCULAR)

E - Endothelium of Blood vessels

S - Sclera (temporal)

O - Ocular Primary vitreous = Hyaloid vessel



Starts by 1 month

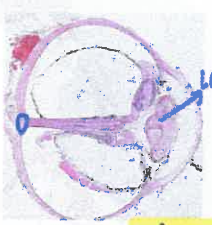
degenerates by 8th month of IUL

Clinical aspect

Remnants of hyaloid vessel

DD

1. Persistent Hyperplastic PRIMARY vitreous : usually U/L.



Associated with:

- Cataract
- RD
- Vitreous hemorrage
- Micro-ophthalmous

} very poor eye Prognosis

ASYMPTOMATIC CONDITIONS :

ANT. PART PERSISTS

POSTERIOR PART PERSISTS

→ Posterior Part (touching optic disc) persists

4. Persistent pupillary membrane (Remnant of tunica vasculosa lentis)

5. Muscae volitantes (degenerated vessel in vitreous)

Symptom in later life : FLOATERS

DAMS α

✓ Temporal part of sclera formed by : mesoderm

Neural crest

Mesenchymal
- Cornea except: epithelium : surface ectoderm
- Sclera except: Temporal part
- Orbital bones
- Trabecular meshwork
- Schlemm's canal
- Ciliary body muscles
- Tarsus
- Uveal stroma

Neural
- Optic nerve coverings
- Myelin sheath : Oligodendrocytes
- Ciliary ganglion
- Melanocytes Producing/containing melanin

→ melanin +nt in :
- uvea
- Limbus
- Retinal pigment epi (RPE)

Solve some questions

15. This is due to which of the following?
a. Failure of eyelid development
b. Failure of eyelid fusion
✓ c. Incomplete failure of eyelid separation
d. Complete failure of eyelid separation

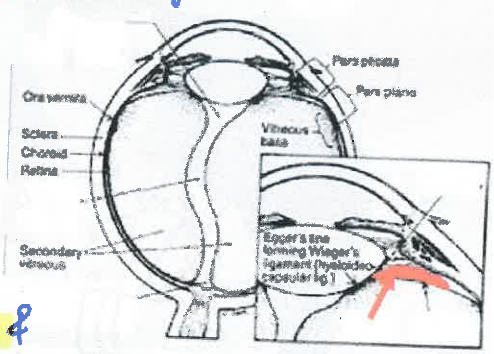
Ankyloblepharon
adhesion between upper & lower eyelid

11. Which of the following is the correct order of development?
✓ a. Optic pit→optic vesicle→optic cup
b. Optic vesicle→optic pit→optic cup
c. Optic pit→optic cup→optic vesicle
d. Optic cup→optic pit→optic vesicle

INI May 2023 Q
What structure is marked here?

✓ a. Canal of Petit
b. Canal of Hanover
c. Lens capsule
d. Egger line

• Space behind : zonules & vitreous



Tunica vasculosa includes all except:
✓ a. Retina : Tunica nervosa
b. Ciliary body
c. Iris
d. Choroid

} uvea (b, c, d)

Adhesion between bulbar and palpebral conjunctiva is called:
a. Ankyloblepharon : Incomplete failure of separation of eyelids
✓ b. Symblepharon
c. Cryptothalmous Complete failure of separation of eyelids
d. Coloboma ↓
d/t failure of embryonic fissure

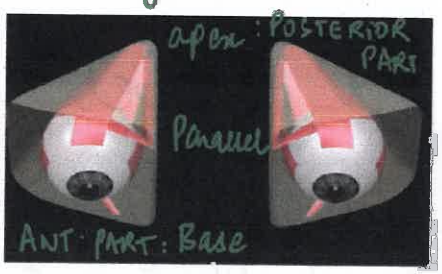
Anatomy of orbit

➤ Orbit shape is Pyramidal Volume: 30 ml

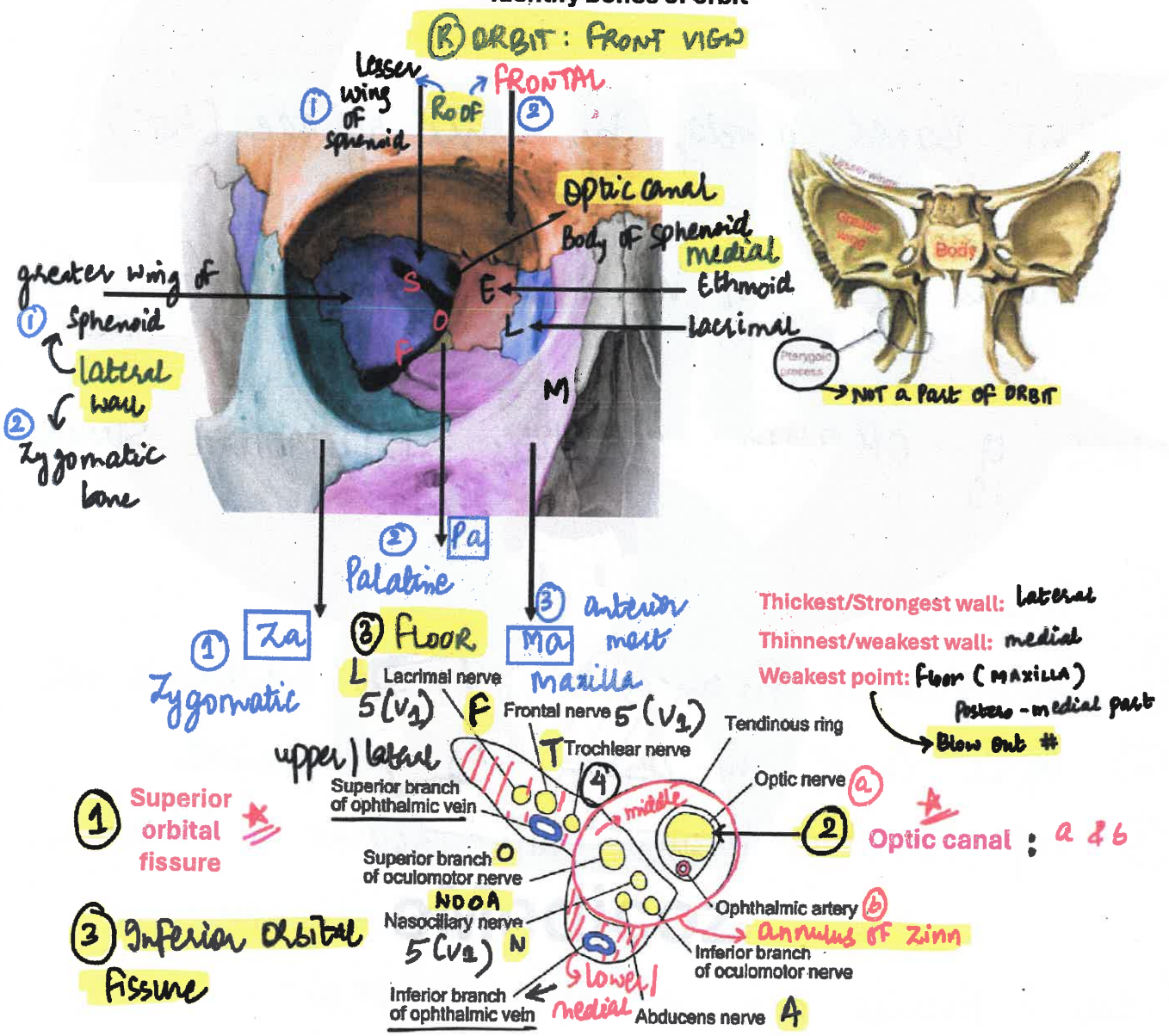
➤ Angle b/w lateral and medial wall is 45° in adults

➤ Its 50° in newborn

➤ Newborn orbit is DIVERGENT



Identify bones of orbit



➤ Fibrous tissue surrounding the SOF and optic canal is tendinous ring of Zinn.

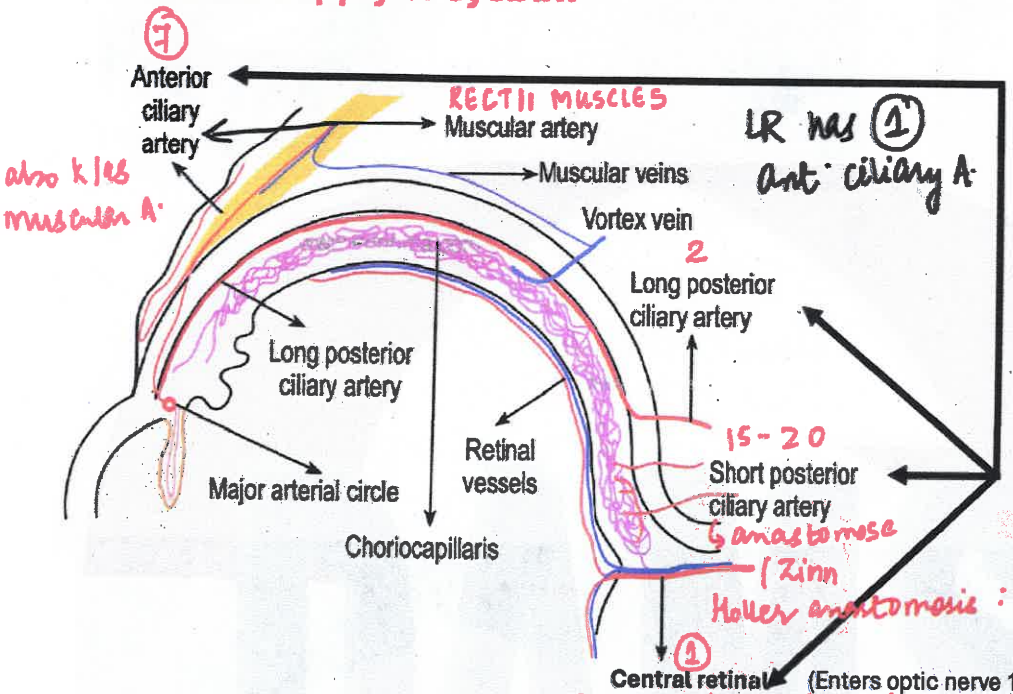
➤ It is the origin of the four recti mucles

- Eyeball is towards the Base of Orbit
- ORBIT BONES are developed by NEURAL CREST
- Total Bones in 1 orbit = 7
- ORBIT BONES develop by 4 yrs of age (45°)
- annulus of Zinn has: 2nd, 3rd, 6th N. (x 4th N. Outside)
- MCC of ORBITAL cellulitis: ETHMOIDAL SINUSITIS

(3) fissures:
(1) Sup. orbital fissure: L, F, T, Sup. ophthalmic vein
(2) Optic Canal: in lesser wing of Sphenoid
(3) Inf. orbital fissure: infra orbital N. & vessels, Zygomatic N.

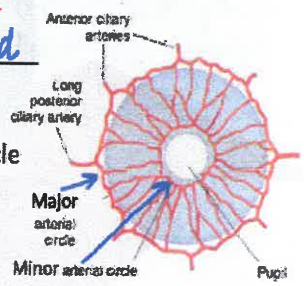
✓ all 3 fissures are in APEX of ORBIT.

Arterial supply of eyeball



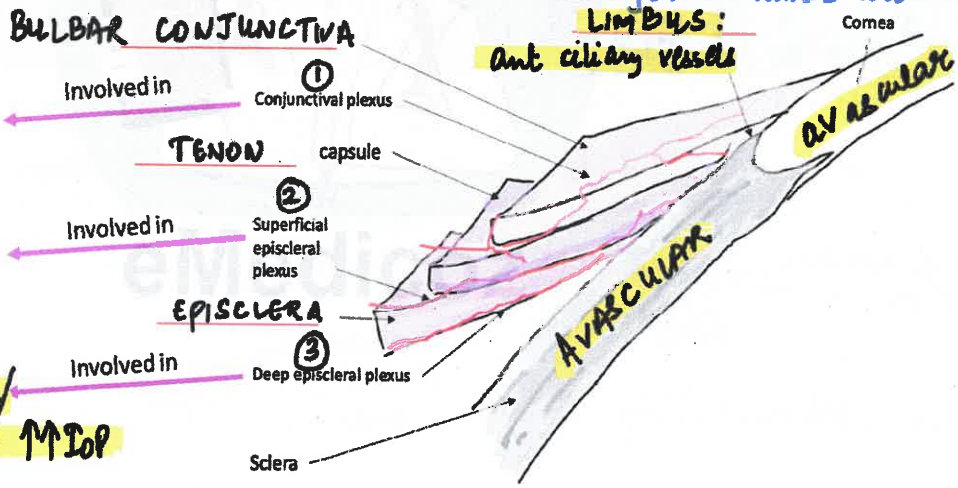
- Posterior ciliary vessels and neves are present in suprachoroidal space (b/w Choroid and Sclera)
- Long posterior ciliary and anterior ciliary form anastomoses known as arterial circle

Major (around root of iris and ciliary body) Minor (around pupil)



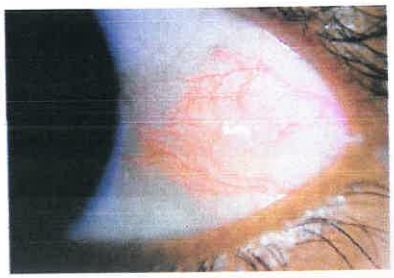
Clinical aspect

- Blood in Ant chamber: Hyphema
  - major >> minor arterial circle



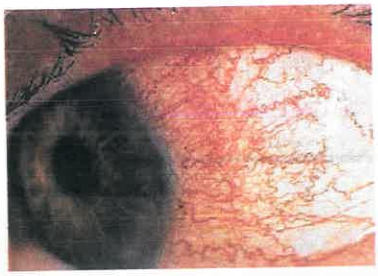
Clinical aspect

- Topical phenylephrine drug can blanch conjunctival and superficial episcleral vessels → Redness goes away



Superficial congestion

Bright red (branching)



Deep congestion

Violet/dusky red (radial) CIRCUMCORNEAL

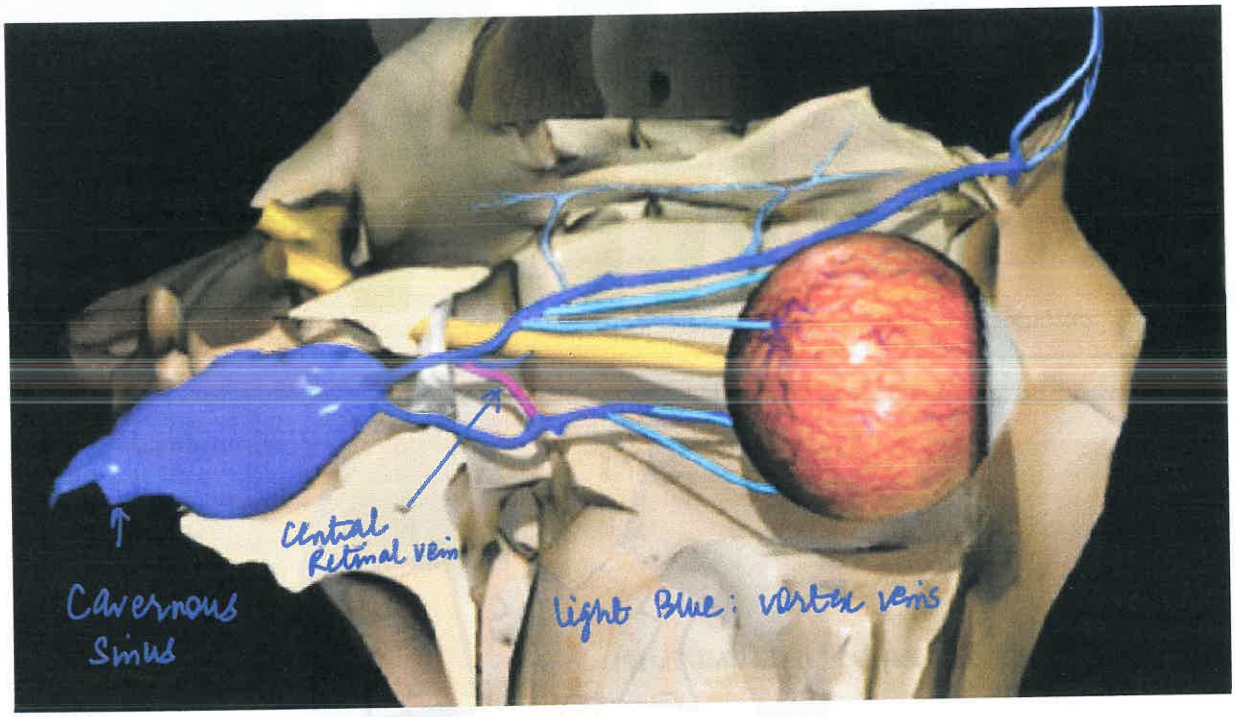
↓

around limbus

Sub-conjunctival hemorrage

Bright red (Diffuse)

Venous drainage of eyeball



Anterior + posterior ciliary veins → Vortex (4) veins

EXIT SCLERA

→ 2 superior + central Retinal vein → Sup. Ophthalmic vein

→ 2 inferior vortex veins → Inf. Ophthalmic vein

→ Cavernous Sinus (Behind apex of orbit)

(*) No vortex artery.

- Superficial congestion: seen in conjunctivitis / episcleritis
  - Topical phenylephrine can Blanch

- Deep congestion: seen in Scleritis, Keratitis, anterior uveitis, acute angle closure

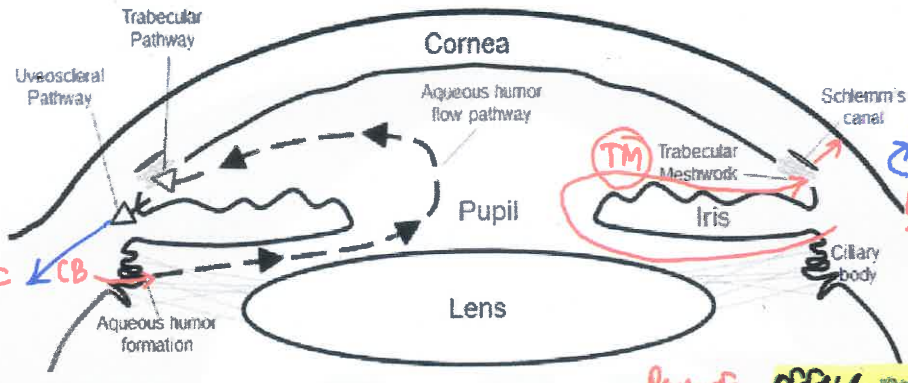
- Sub conjunctival hemorrhage: seen in Blunt TRauma
  RF: old age, HTN, Bleeding DIO
  Mx: wait & watch

Q. which A enters ORBIT: Ophthalmic A.

Q. which vein Exits orbit: Sup. & inf opth. vein via SOF

Q. which A enters optic N: central Retinal A.
& vein Exit optic N: Central Retinal vein

Aqueous humour dynamics



aqueous: filtrate of plasma

CB

Q offers: max. Resistance
1. Juxta canalicular TM
2. uveal meshwork
3. cerneoscleral meshwork

formed: From ciliary Body (pars plicata) into posterior chamber via Pupil anterior chamber → TM (part of sclera) → Schlemms canal → episcleral veins

offers max. Resistance to flow of aqueous

(Trabecular outflow) 90%

At 2.0–2.5 µL/min

By Secretion: Max (active process): ATP

Diffusion } Passive process x ATP

Ultrafiltration }

Supra choroidal space 10%

(Uveoscleral outflow)

vortex veins minimal %

(Uveovortex outflow)

- Maximum resistance to aqueous is at Juxta Canalicular TM
- Normal Intraocular pressure (IOP) is 10–21 mm Hg
- IOP increases with ↑ formation of aqueous, ↓ drainage of aqueous, ↑ episcleral venous pressure

IOP Varies with

Age: TM size ↓ : Drainage ↓ : ↑ IOP

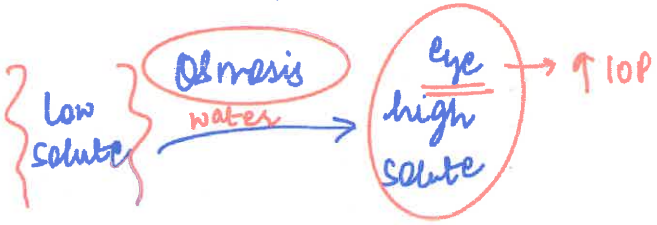
Diurnal variations: max: early morning

Body position: sitting < supine < prone

Exercise → head down : ↑ IOP
→ aerobic : ↓ IOP

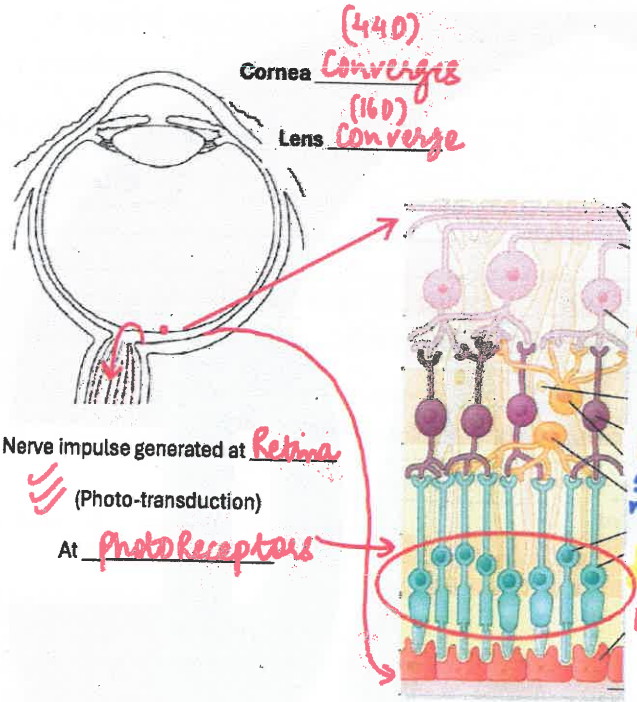
Forceful Blinking/Valsalva → ↑ IOP

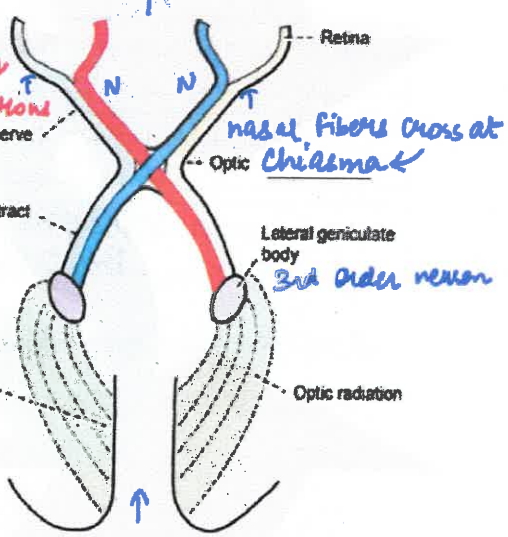
Drinking large volumes of fluid: ↑ IOP



Visual pathway

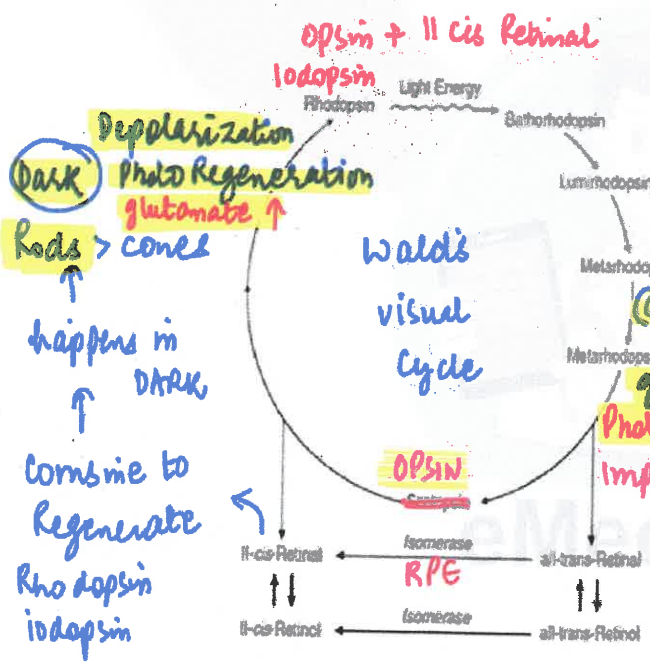
Light reflected from object





Nerve impulse reaches occipital lobe in 124 ms
(Photo-Transmission)

Visual cortex Fuses and Reinverts retinal images to give perception of single image in stereopsis (depth perception) 3D vision



The time taken to adjust in dark is photoRegeneration time

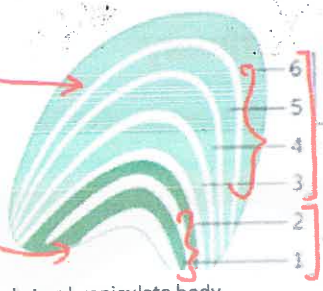
Rods are specialized for low-light vision

Vitamin A is important for rod function

• Optic N. is formed by NFL

P Ganglion ells project to

M Ganglion ells project



6 layers

PARVOCELLULAR LAYERS → Colour, Contrast, Form (Red / green) } Sense

MAGNOCELLULAR LAYERS → Motion Sense

B Konio cells are present in the intralaminar area → Colour sense (Blue)

Ability of an eye to steadily look at object is FIXATION (starts at 6 weeks, completed by 3-6 m)
Uniocular Phenomena

To see Binocular single vision, both eyes undergo Fusion (starts at 6 weeks, completed by 3-6 m)
Binocular Phenomena 2D

Depth perception (Stereopsis) (starts at 6 months, completed by 6 yrs)
Binocular Phenomenon

Sensitive period of eye development is 8 yrs