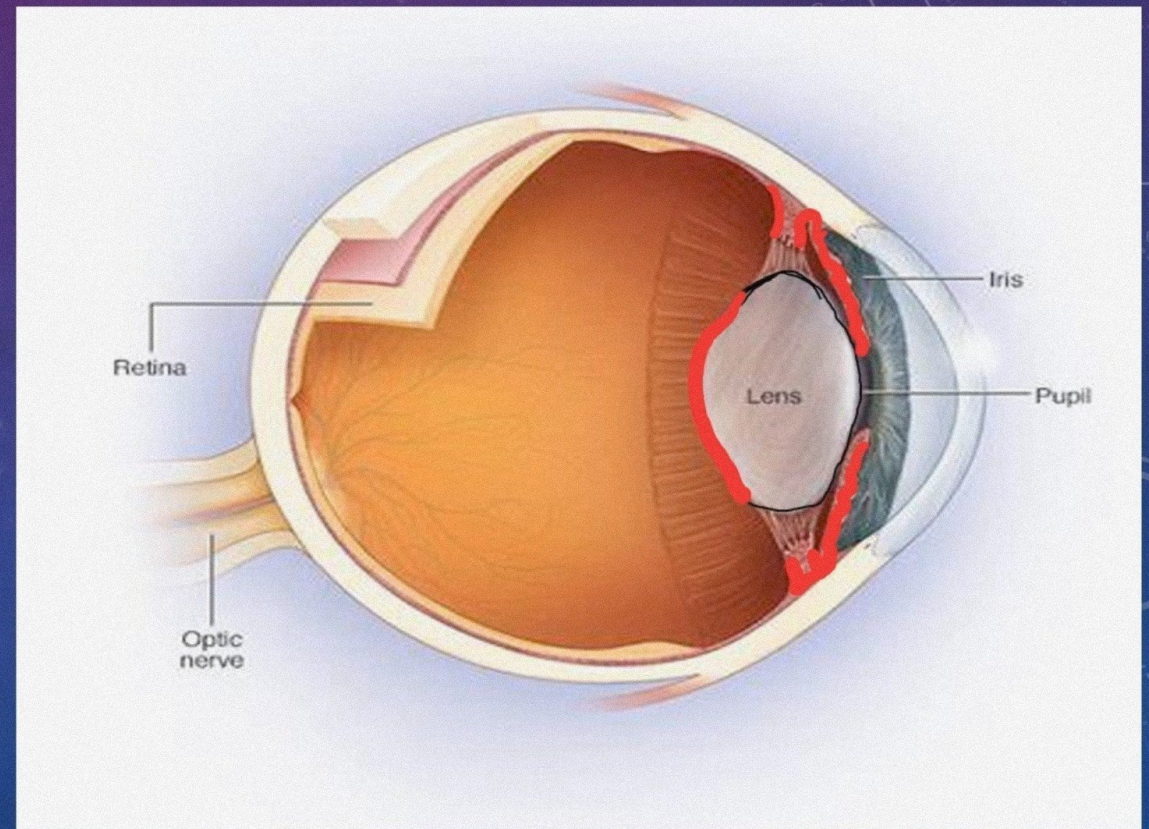
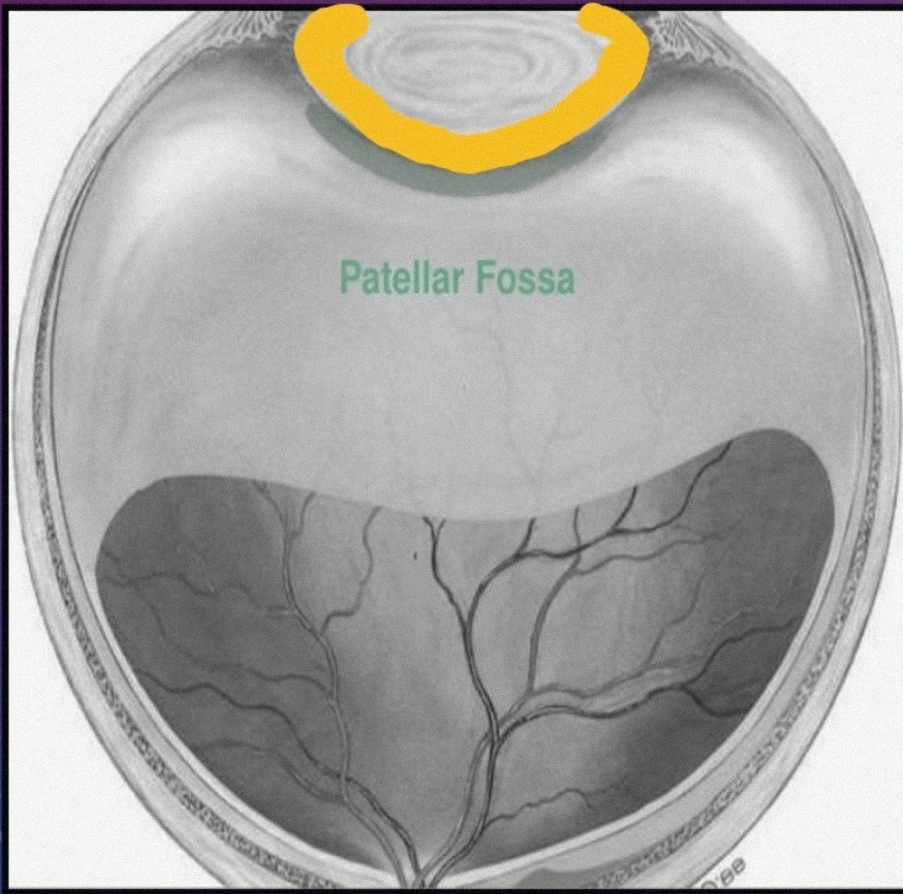


WHAT IS LENS ?

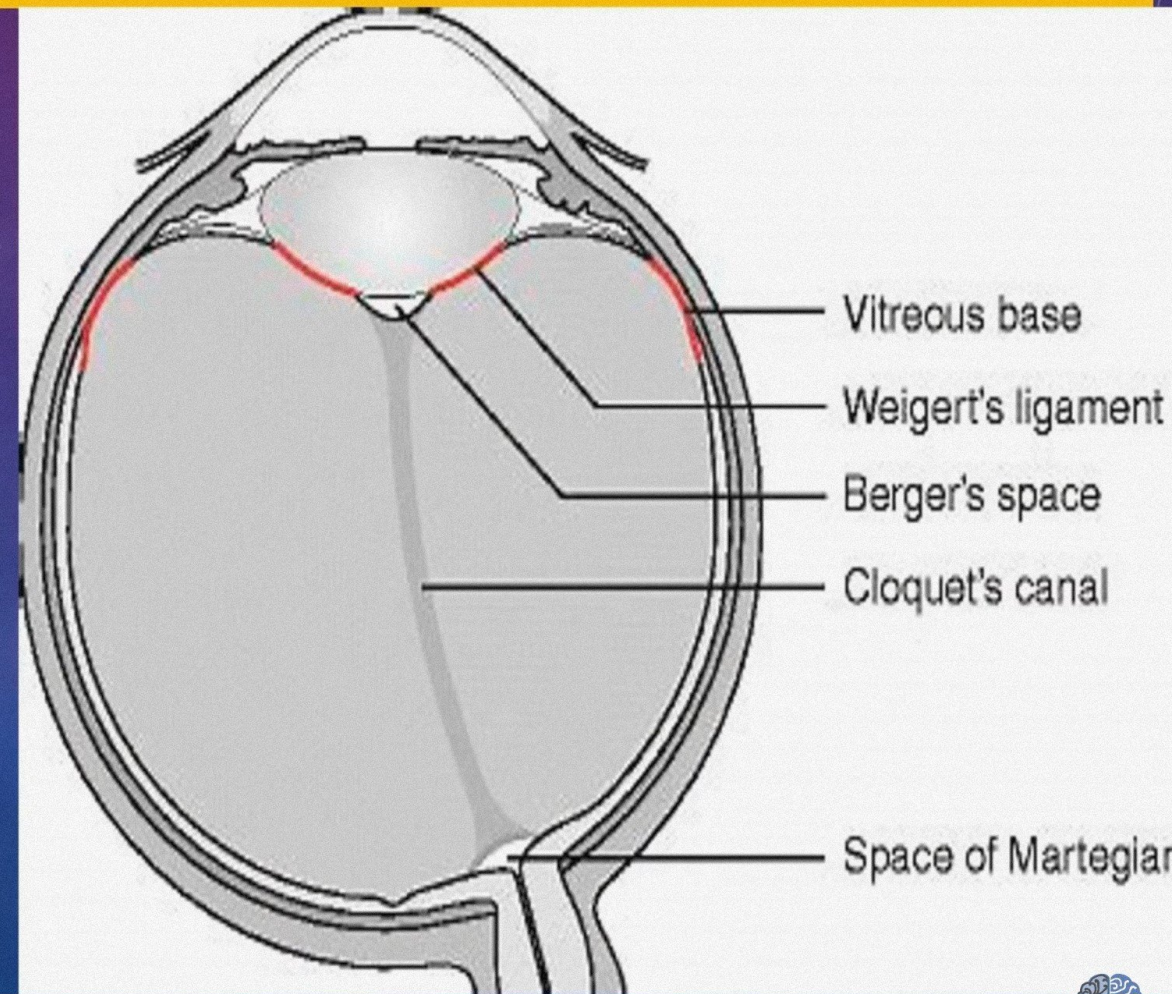
- The lens is a transparent biconvex crystalline mass placed between the iris and the vitreous in a saucer shaped space called the **patellar fossa**.





IMPORTANT LIGAMENTS

- The posterior part of the lens is attached firmly to the patellar fossa with a CIRCULAR LIGAMENT called the **WEIGERT'S LIGAMENT (Hyaloido-capsulare)**
- **RETROLENTAL SPACE (BERGERS SPACE) :**
between the hyaloid face and the lens within the circular ligament



FUNCTIONS OF LENS

- It transmits and refracts the light.
- Lens **absorbs ultraviolet (UV) light** of <350 nm wavelength. Thus, prevents damaging UV radiation from reaching the retina.
- It contributes **35% of refractive power** of the eye.
- It helps in **accommodation**.



IMPORTANT MEASUREMENTS OF LENS



ANTERIOR

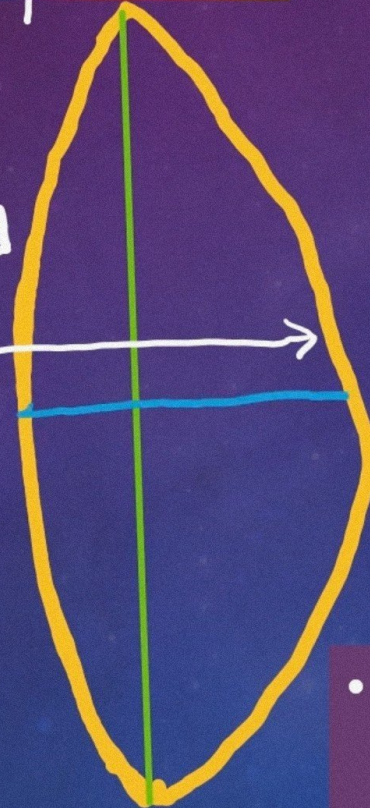
POSTERIOR

Equator

Radius of curvature:

10 mm

6 mm



- The **EQUATORIAL DIAMETER** of lens at birth is 6.5 mm,
- second decade of life becomes 9-10 mm then constant

- **LENS THICKNESS** : 3.5 mm (birth) to 5.5 mm (at extreme of age)

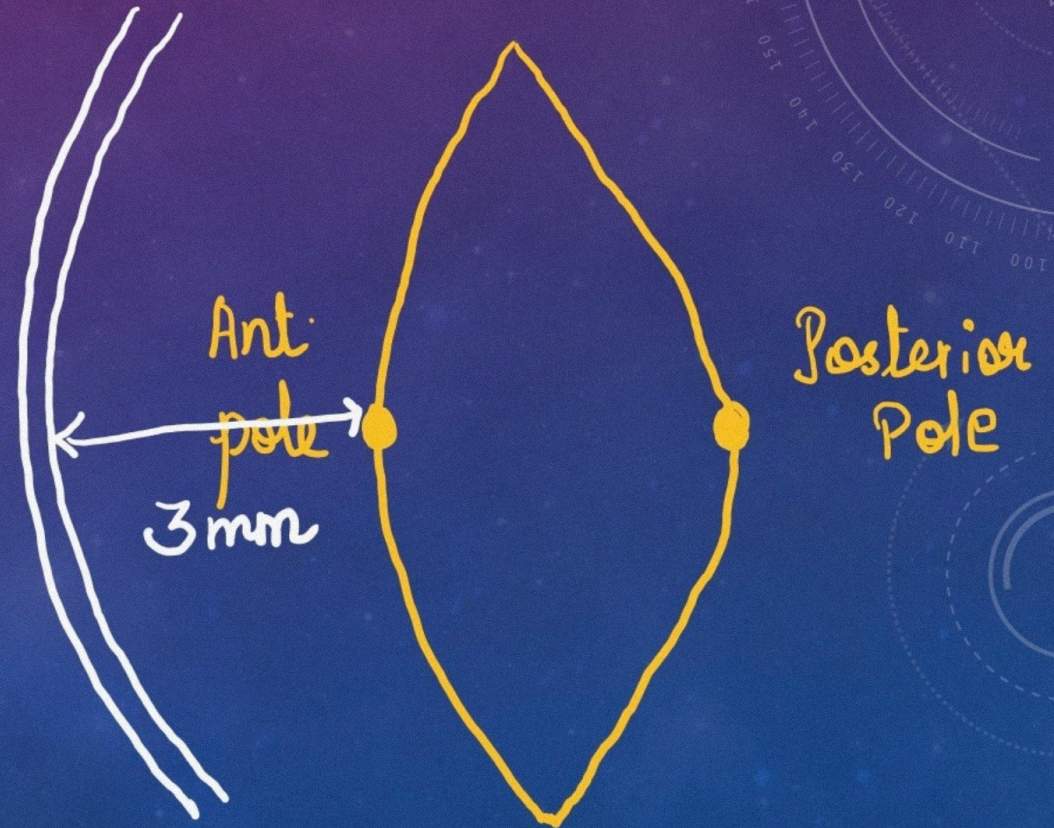
- Increases by 0.2 mm every year

- **POSTERIOR SURFACE** (radius of curvature is 6 mm) IS MORE CURVED THAN the **ANTERIOR** (10 mm)



CORNEA & LENS

- The centre of the anterior surface and the posterior surface is called the **ANTERIOR POLE & POSTERIOR POLE** respectively
- Anterior Pole is **3 mm** from the centre of the cornea .



REFRACTIVE PROPERTIES OF THE LENS

- The refractive index of the lens is **1.39**
- The refractive Power is **16-17D**

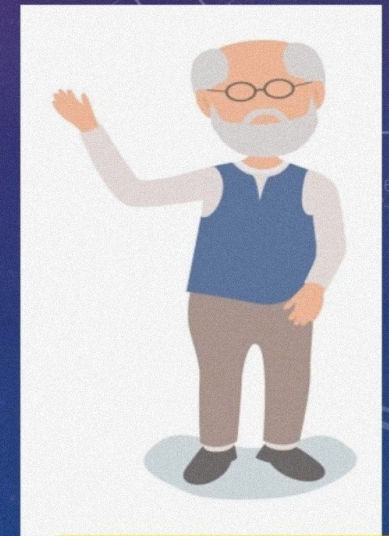
ACCOMMODATIVE
POWER



14-16 D at
birth



7-8 D at 25
years



1-2 D at 50
years of age



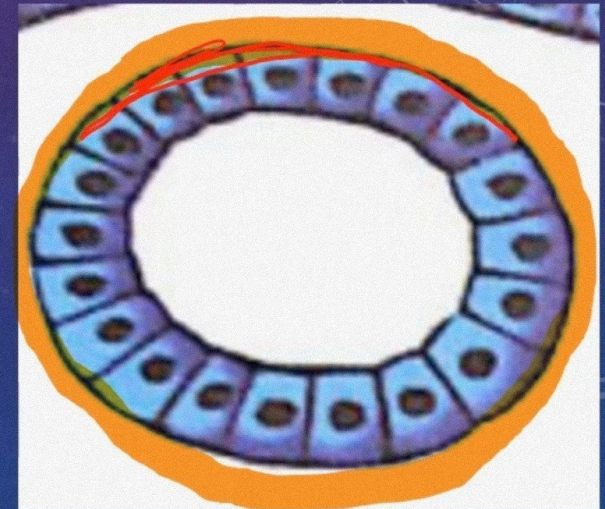
ANATOMY OF LENS

- **LENS CAPSULE**
- **LENS EPITHELIUM**
- **LENS FIBERS**



LENS CAPSULE

- Thin, transparent **HYALINE COLLAGENOUS membrane** surrounds the lens .
- The lens capsule is elastic but **doesn't** have any elastic fibers
- Produced continuously through out life
- Produced by the **basal portion** of the EPITHELIUM Anteriorly and basal portion of the posterior lens fibers posteriorly .



Did You Know?

- THICKEST BASEMENT MEMBRANE IN THE BODY
 - Stains with PAS



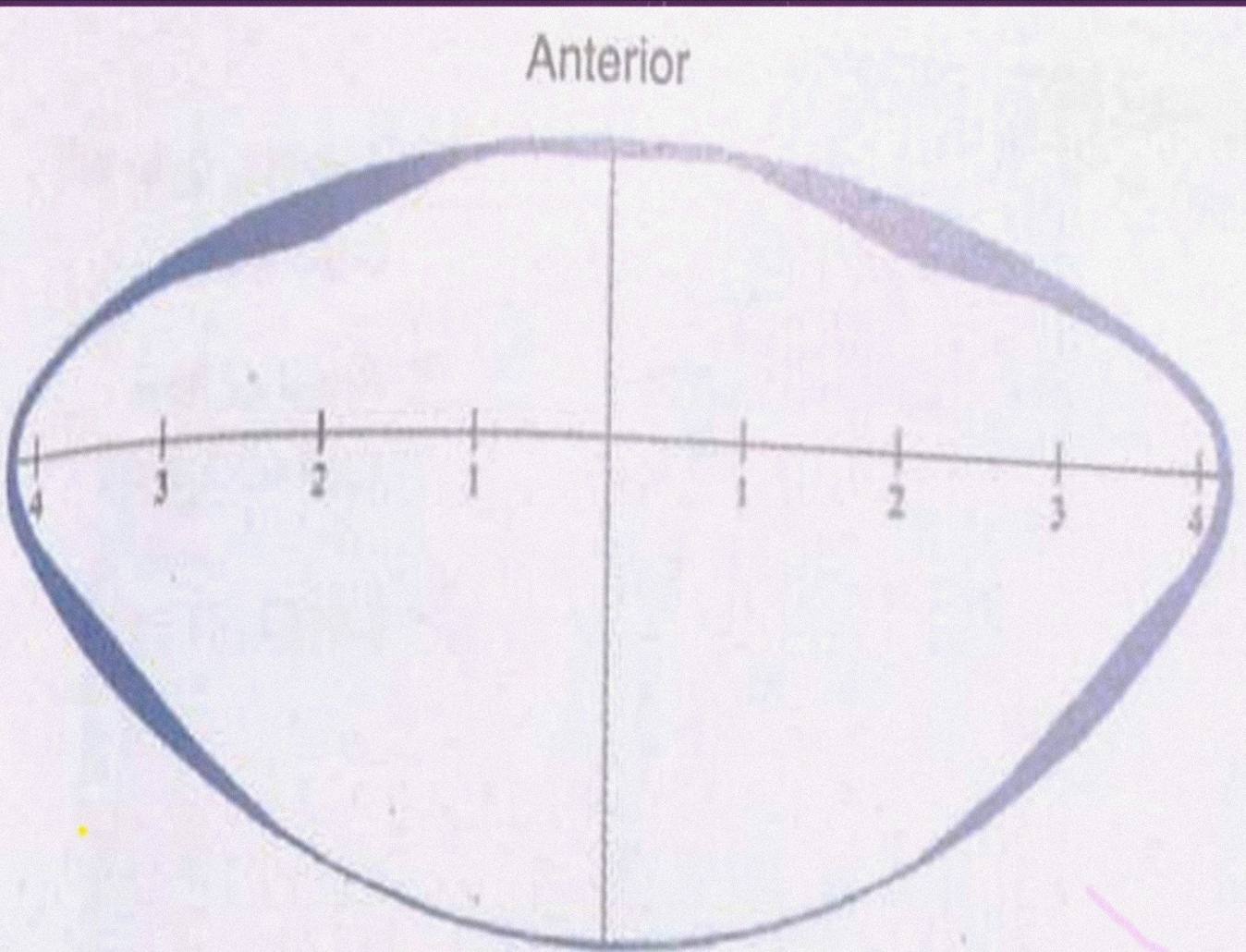
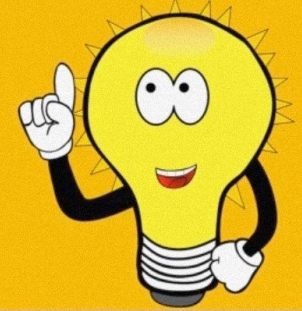


Fig. 4.2. Variable thickness of lens capsule.

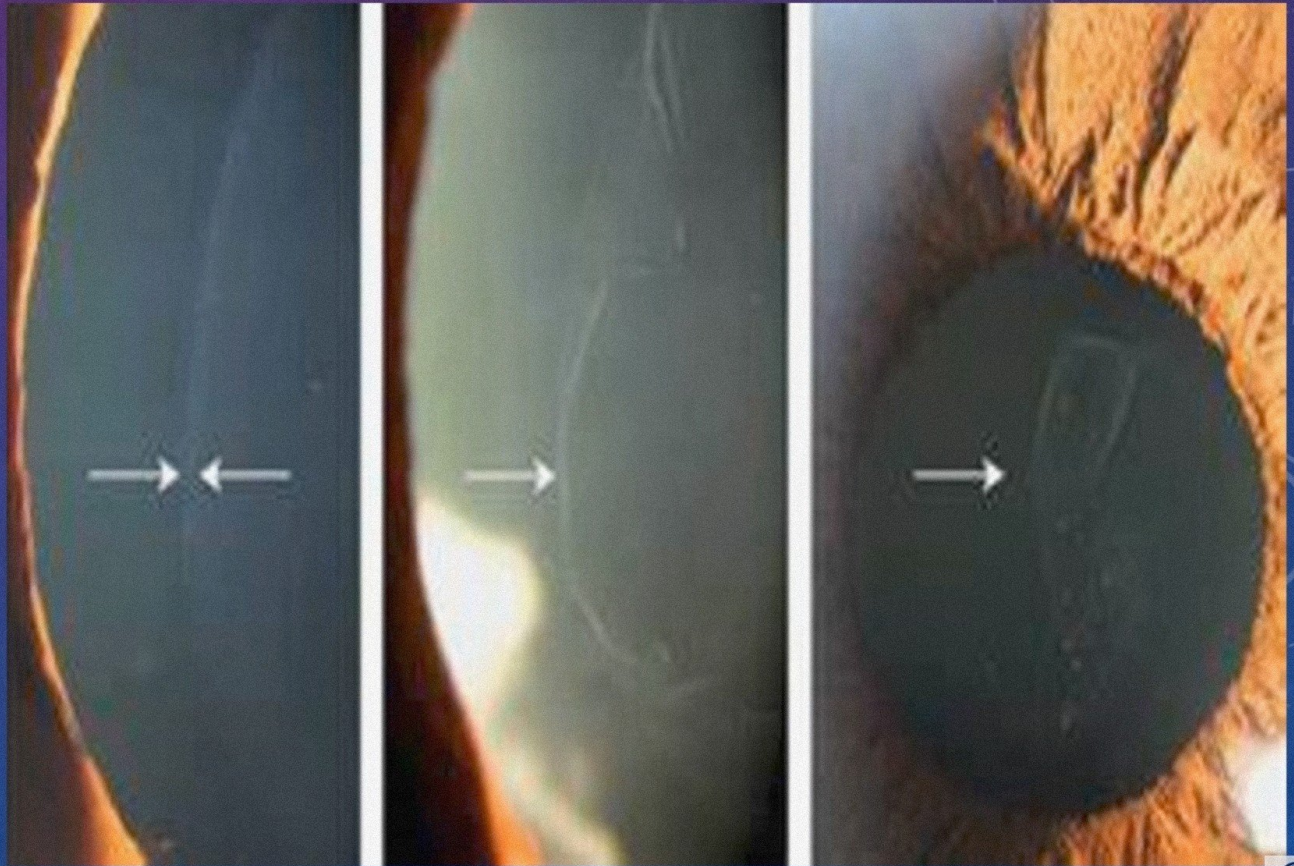
- **THICKER ANTERIORLY** than posteriorly
- Thicker at the **EQUATOR** than at the **POLES**
- **THINNEST** At the **posterior POLE**



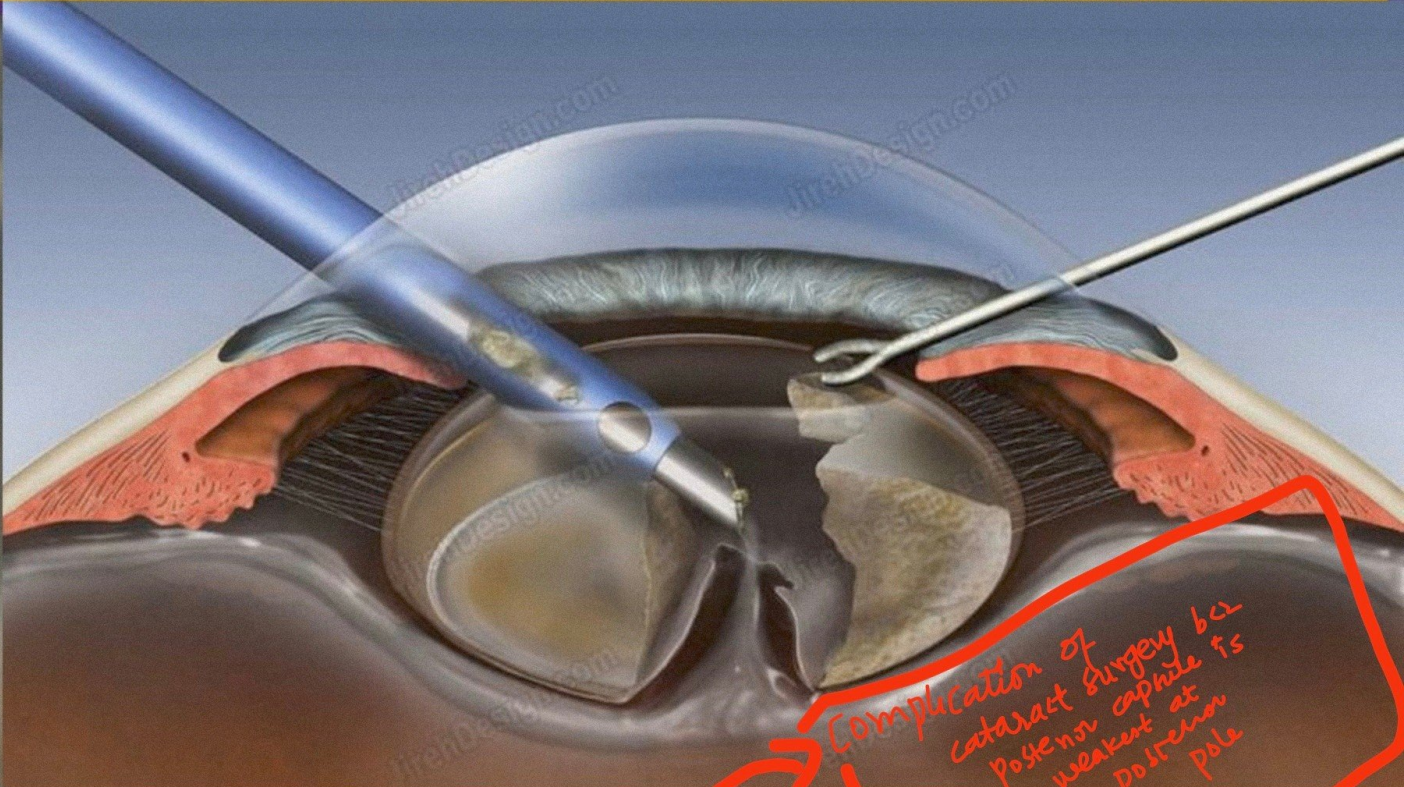
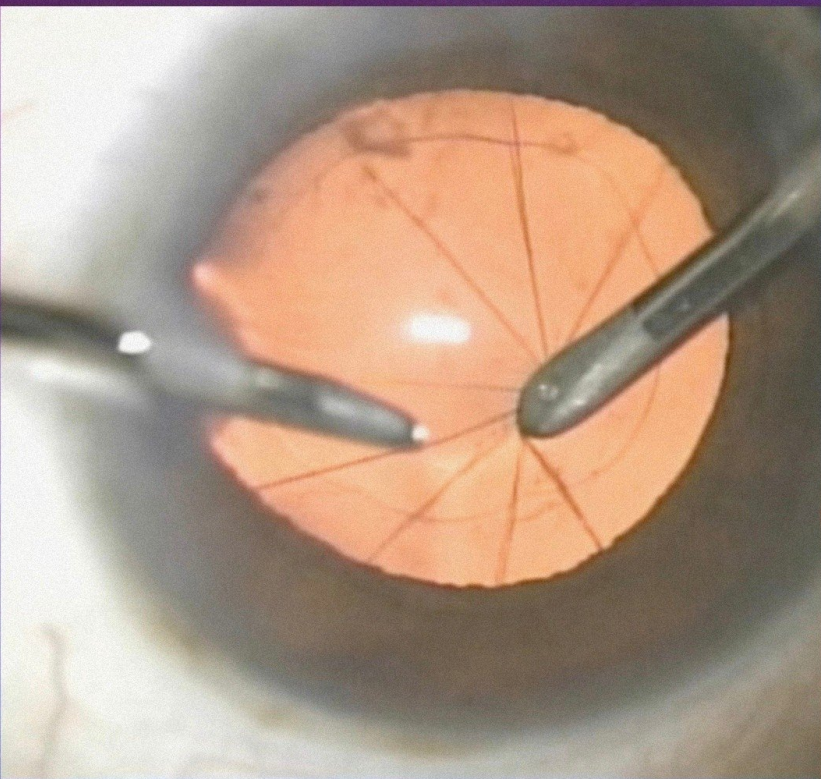
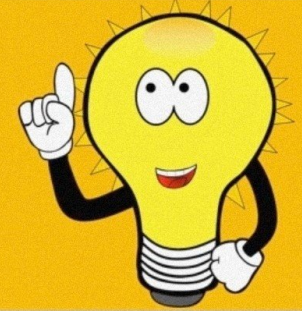
CLINICAL NUGGET



- In **TRUE EXFOLIATION** of the lens :
- The anterior/ superficial lamella of the lens capsule splits off from the deeper lamella



CLINICAL NUGGET

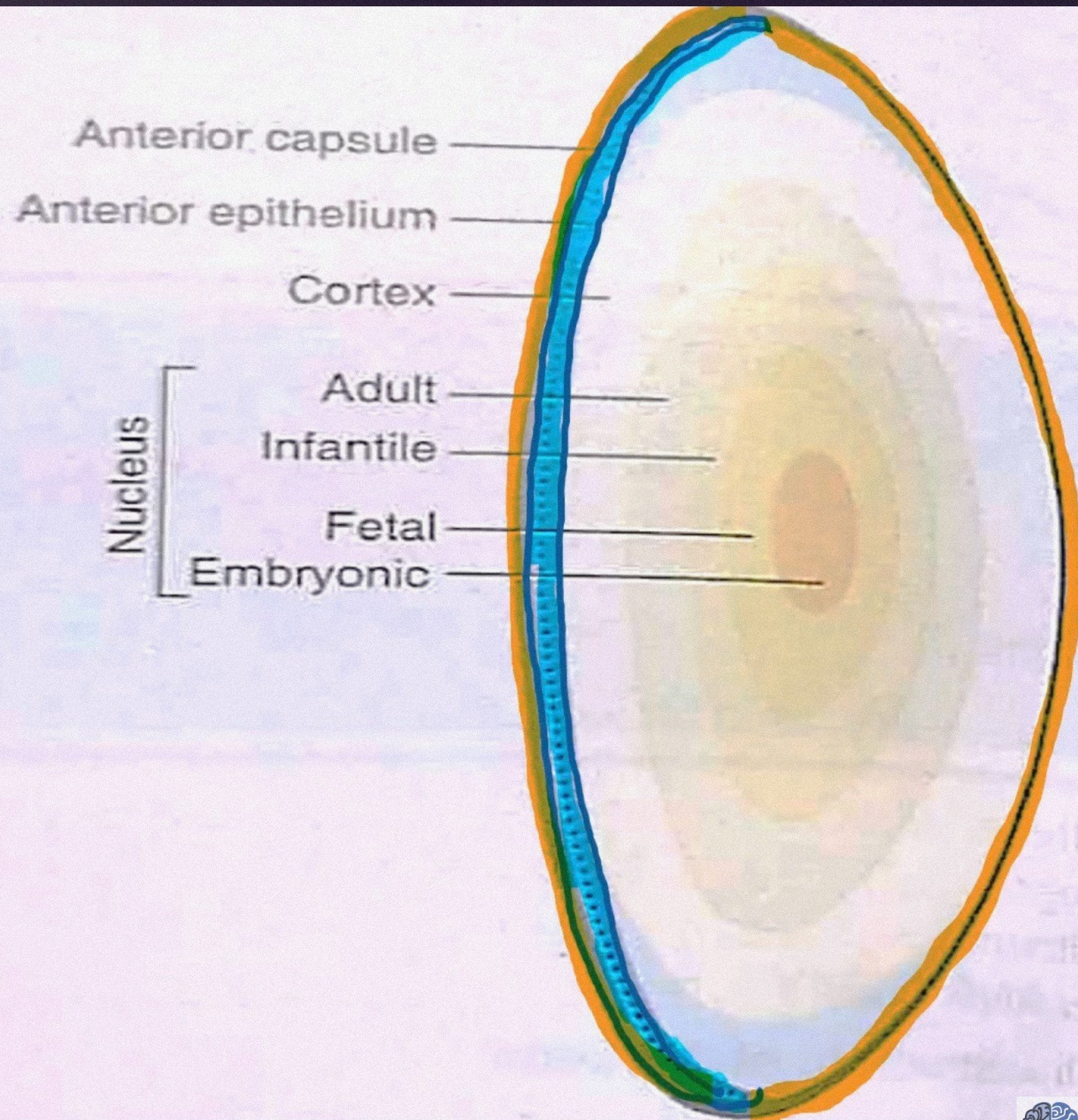


Complication of cataract surgery bc posterior capsule is weakest at posterior pole

POSTERIOR CAPSULAR RUPTURE



LENS EPITHELIUM



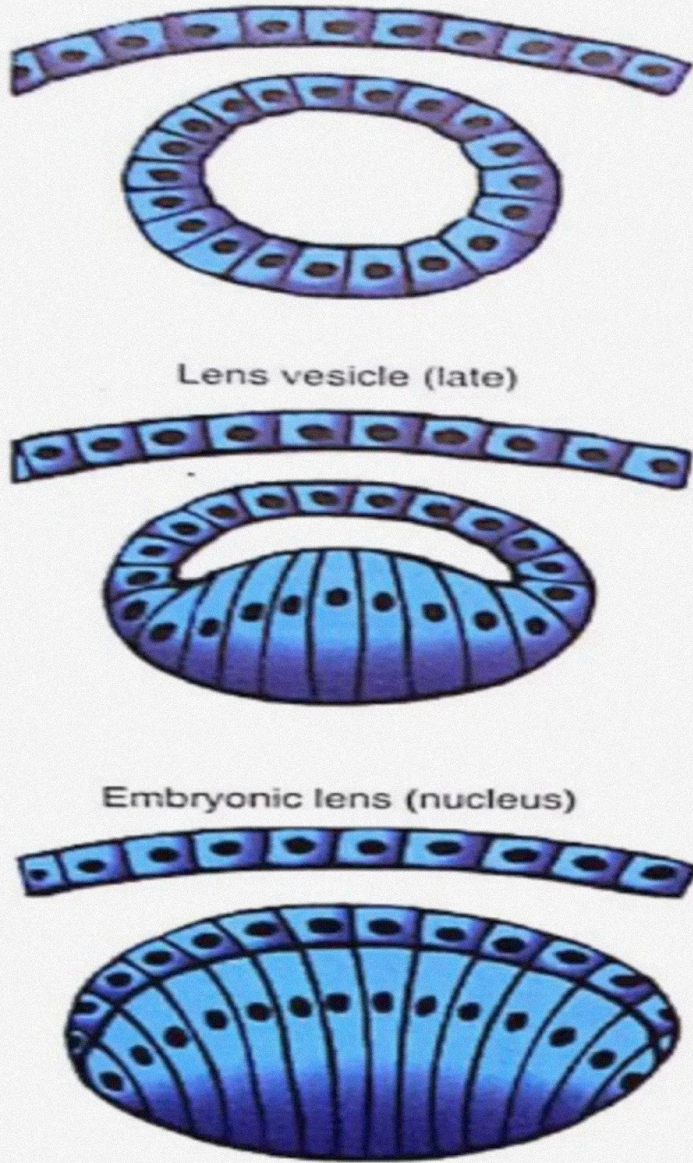


Fig. 1.15. Development of the crystalline lens.

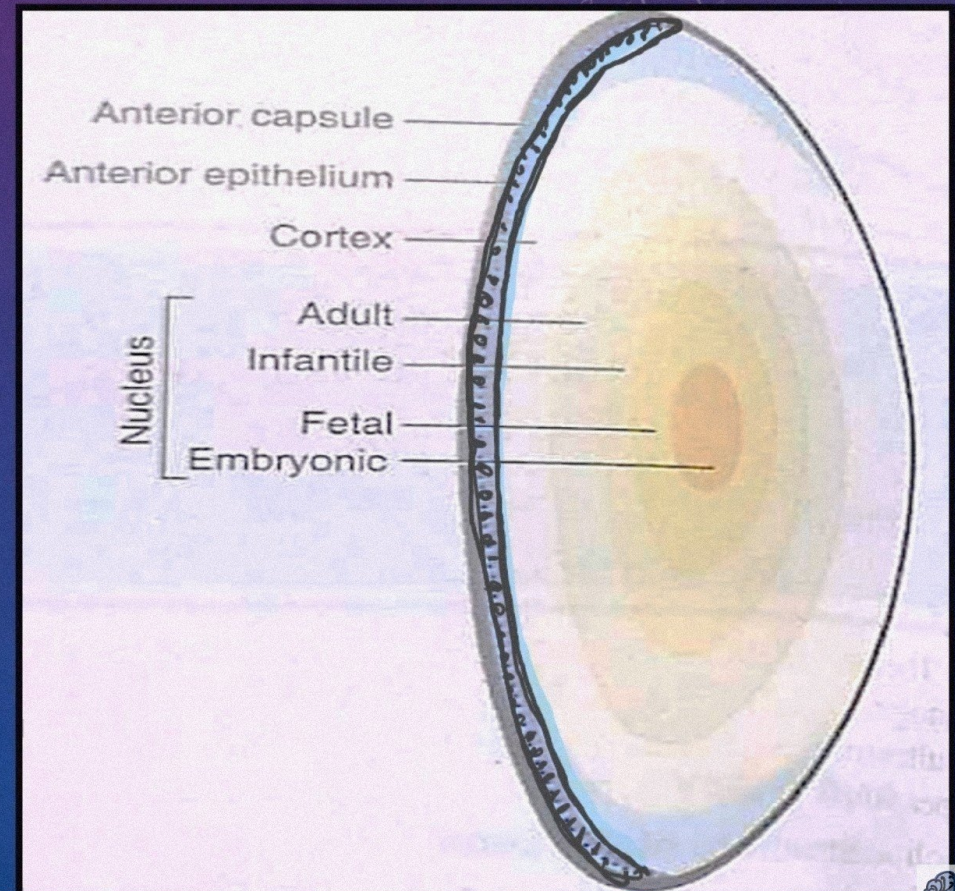
- **POSTERIOR EPITHELIUM** Of the lens vesicle is used up to form the primary lens fibers during embryonic period (0-3 months).

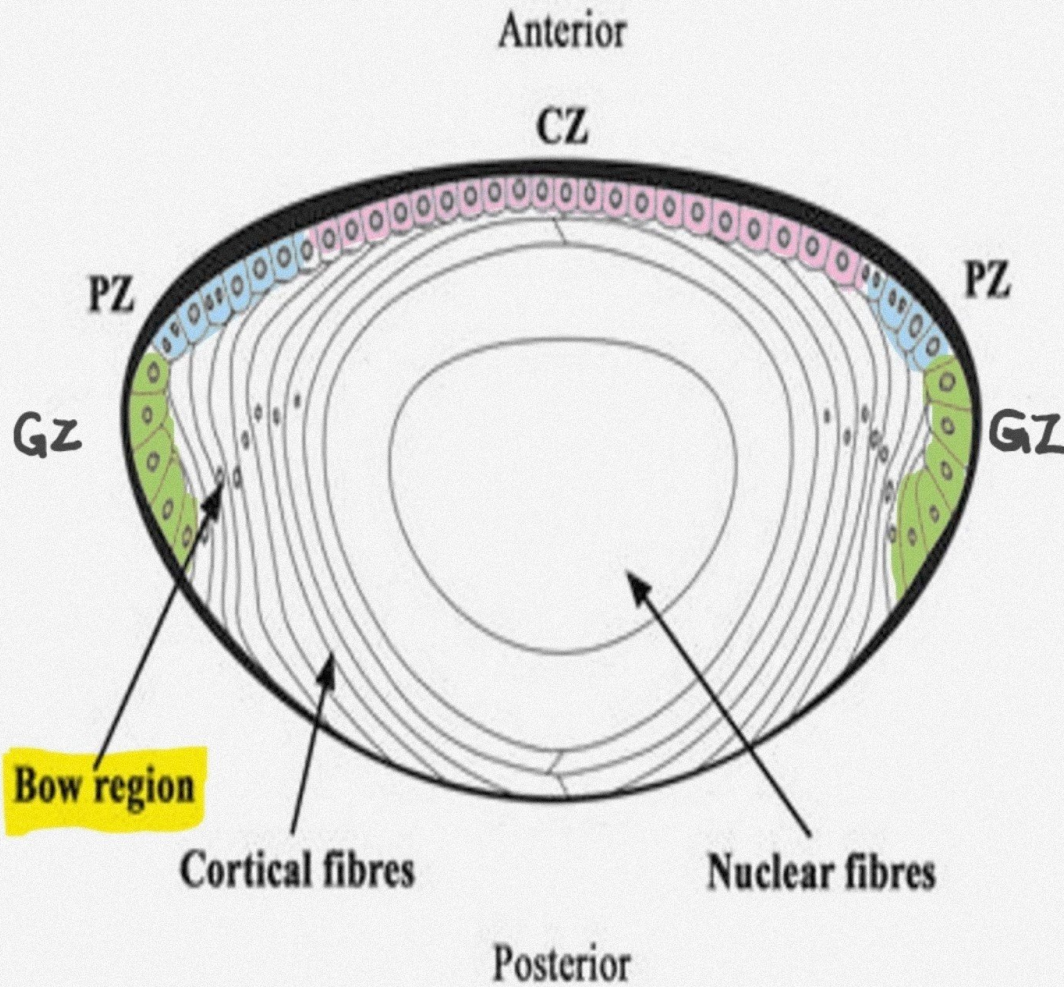
Therefore there is **no** posterior epithelium left after embryonic period



ANTERIOR LENS EPITHELIUM

- **Cuboidal nucleated epithelium** cells below the lens capsule.
- Most **METABOLICALLY ACTIVE** part of the lens (contains all the organelles).
- Epithelium of the **Equatorial region** → **COLUMNAR CELLS** → Actively dividing cells

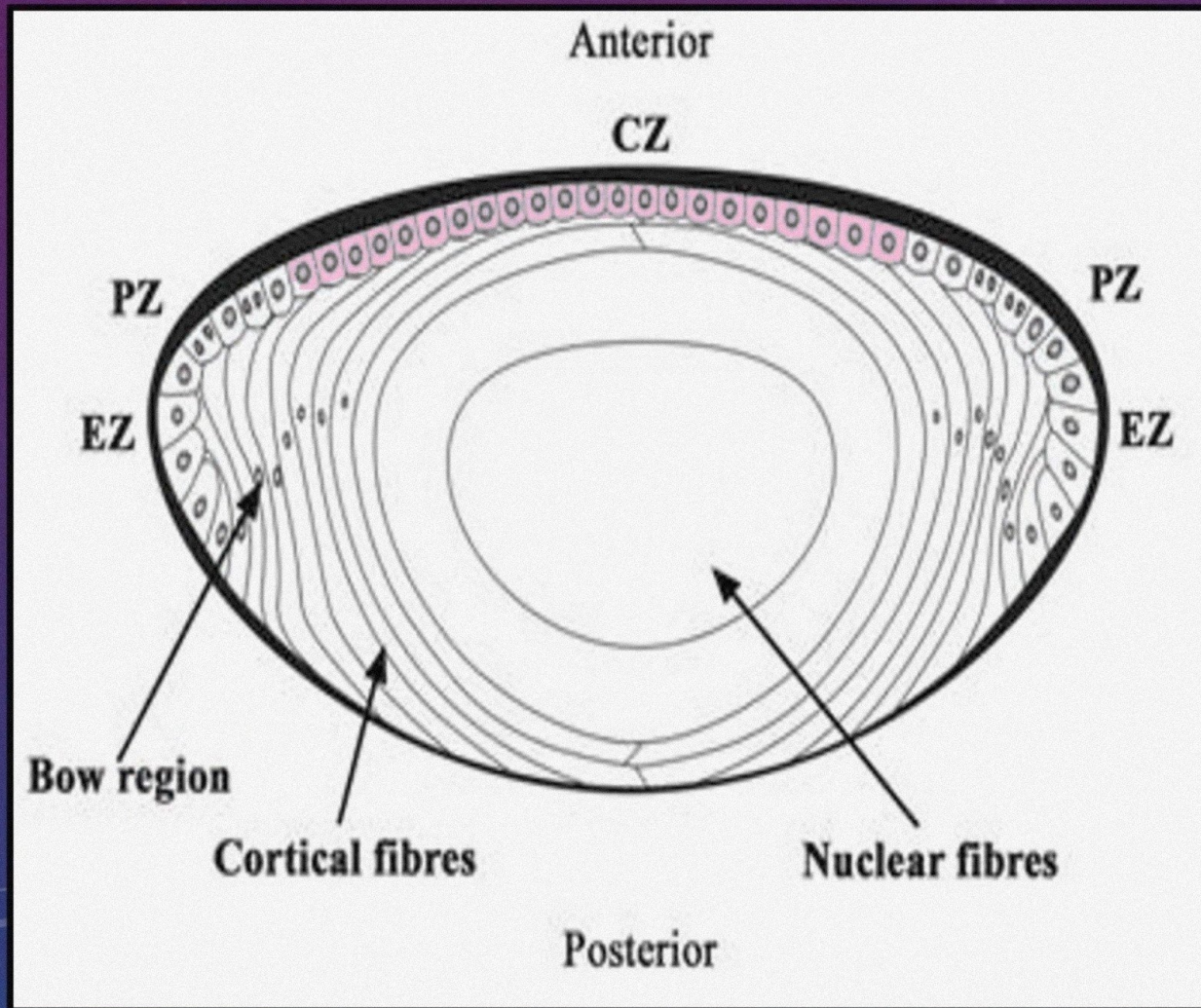




ZONES IN EPITHELIUM

- I. CENTRAL ZONE
- II. PERIPHERAL ZONE
- III. GERMINATIVE ZONE / EQUATORIAL zone

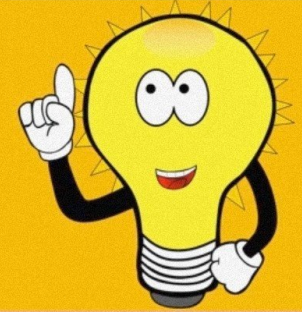




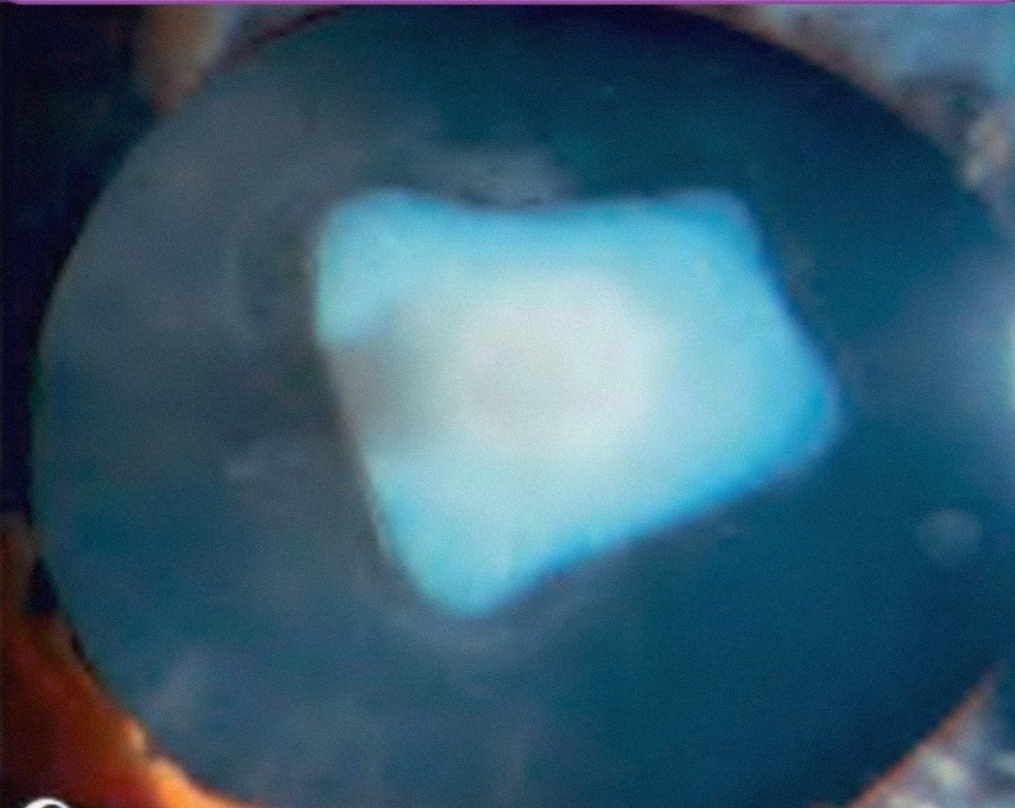
- **CENTRAL CELLS** : cuboidal in shape
- Decreases with age
- Stable , do not mitosis normally
- Can show mitosis in pathological conditions



CLINICAL NUGGET

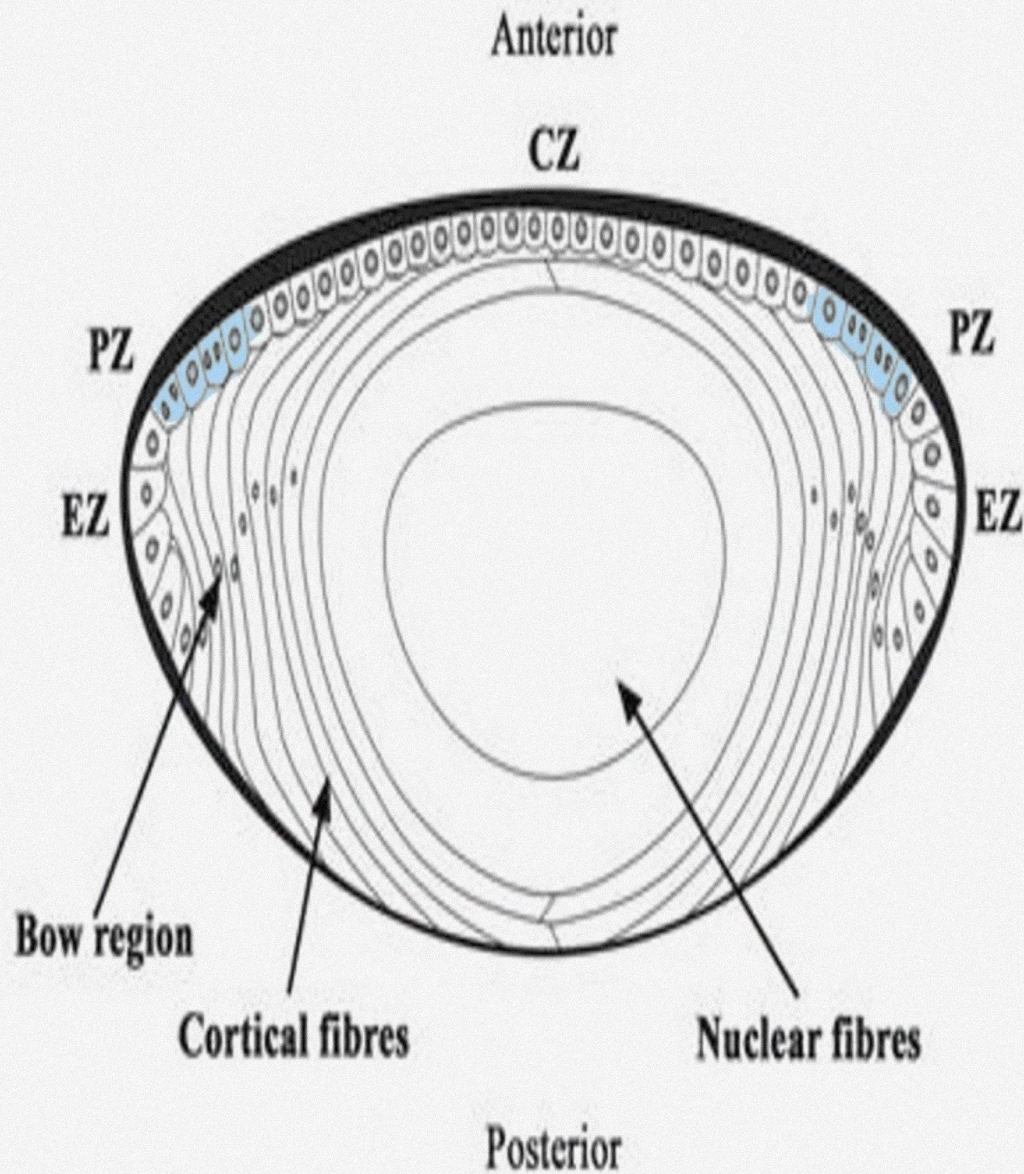


Shield cataract in **ATOPIC DERMATITIS**



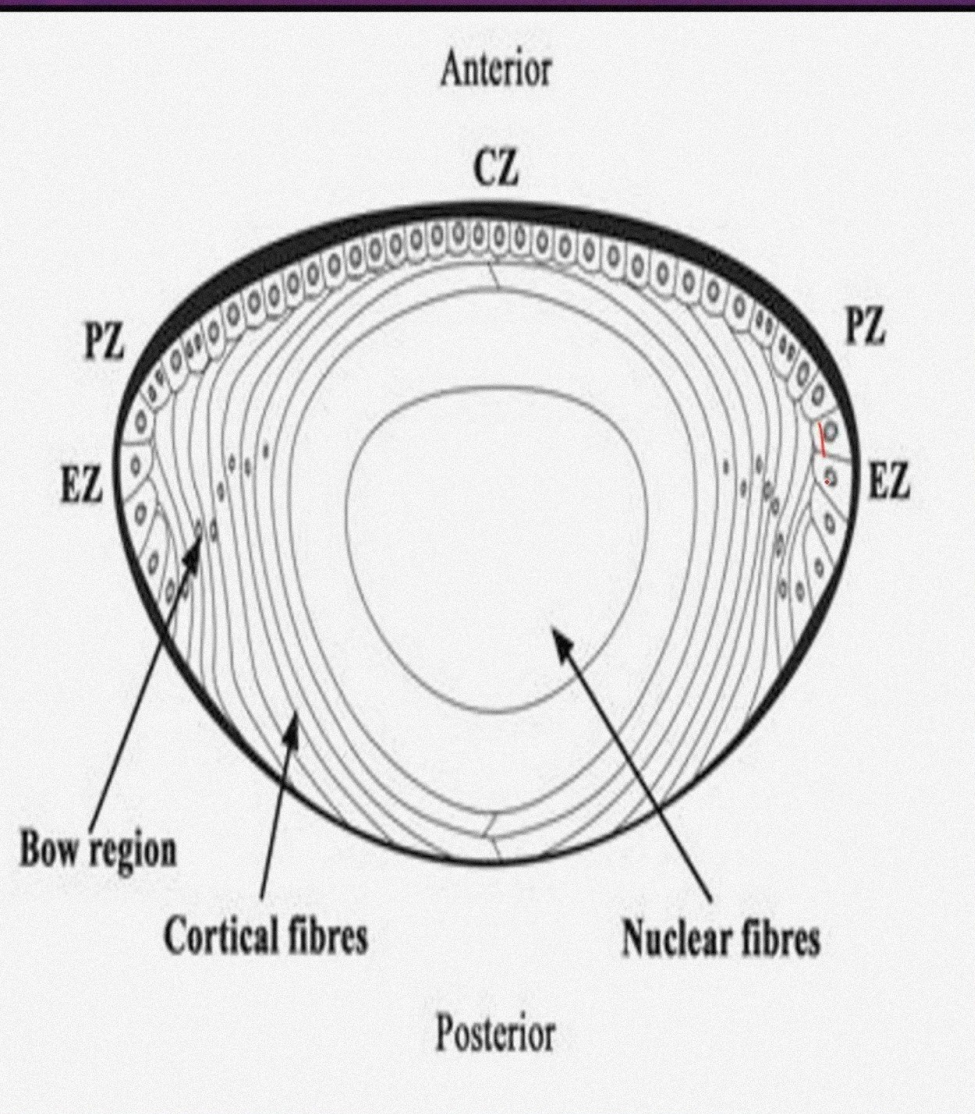
GLAUKOMAFLECKON in Acute angle closure glaucoma →
METAPLASIA of cuboidal cells into myofibroblasts





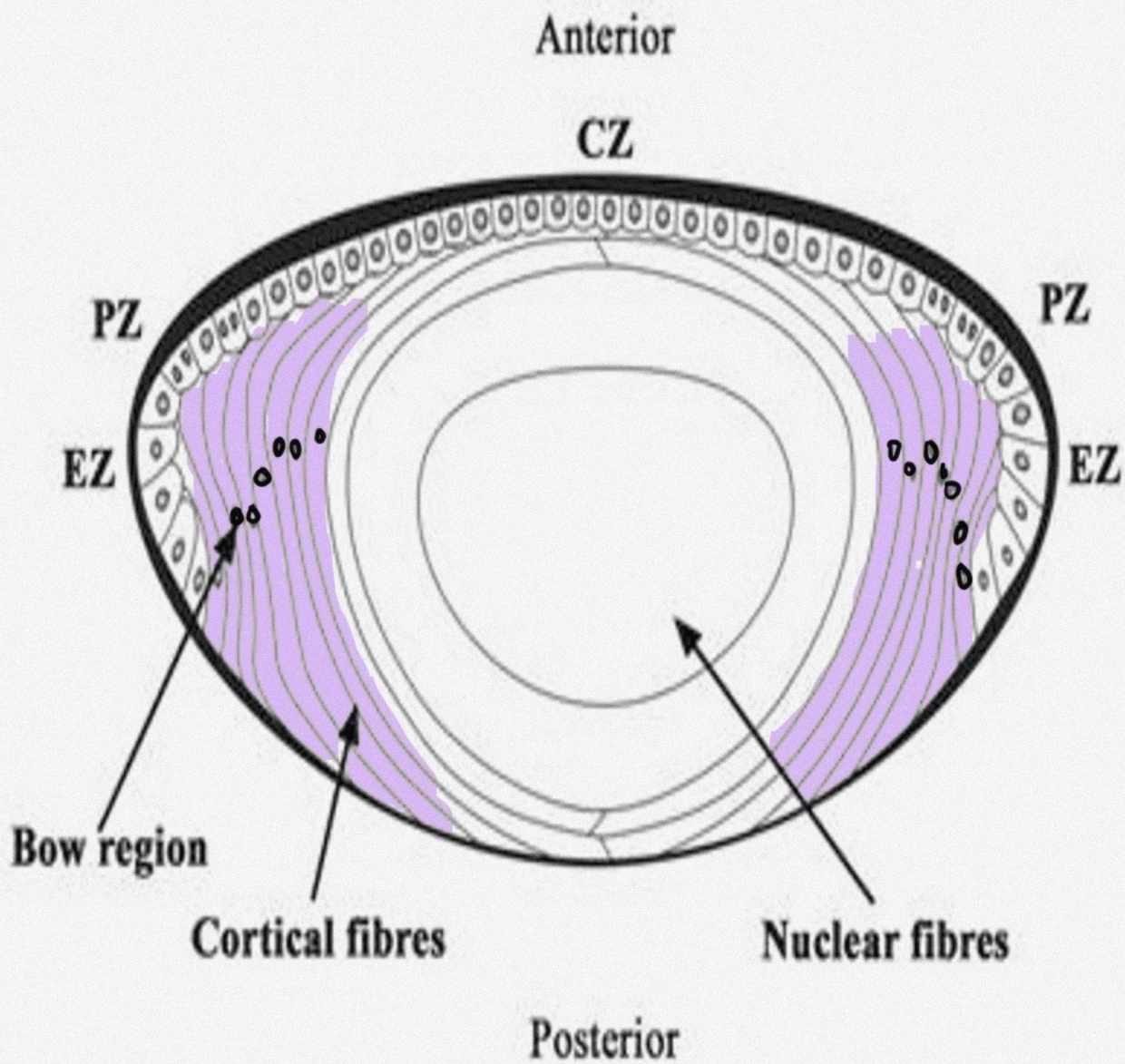
- **INTERMEDIATE ZONES/ PERIPHERAL ZONE** smaller and more cylindrical
- Located peripheral to the central cells
- Rarely undergo **MITOSIS**





- **COLUMNAR CELLS**
located just PREEQATORIAL and most peripheral cells
- **ACTIVELY DIVIDING CELLS**
- New cells migrate posteriorly to form new lens fibers
- Continue to divide through out life

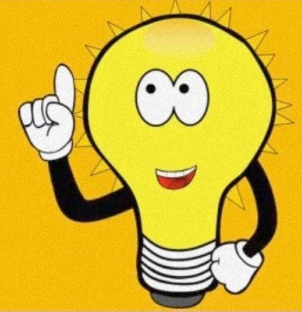




- **BOW REGION**
- The newly laid lens fibers elongate.
- The nuclei are more anterior to the nuclei of the superficial cells

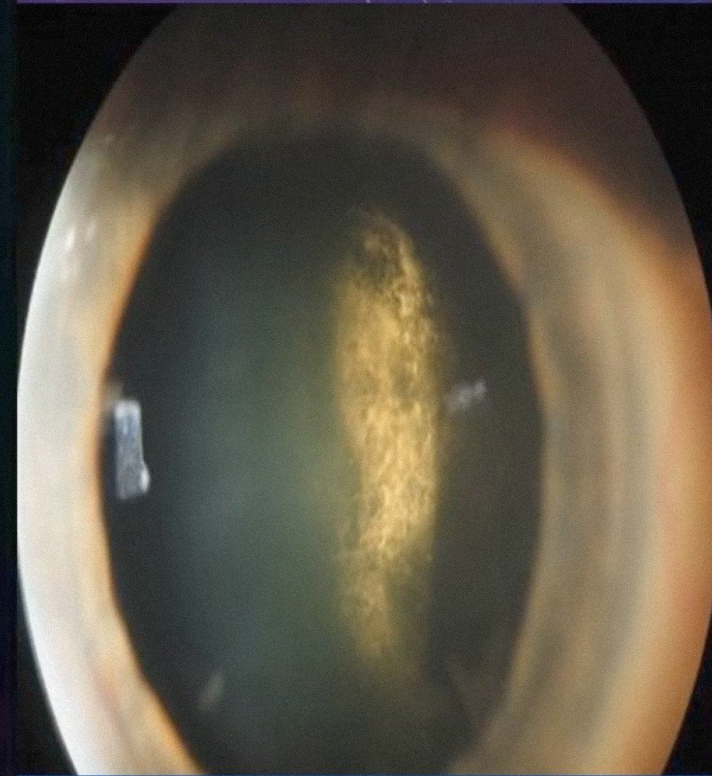


CLINICAL NUGGET

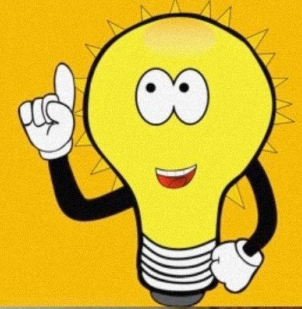


SUSCEPTIBLE To irradiation
Dysplasia of these cells →
formation of **POSTERIOR
SUBCAPSULAR CATARACT**

- Radiation cataract
- Neurofibromatosis 2
- Myotonic dystrophy

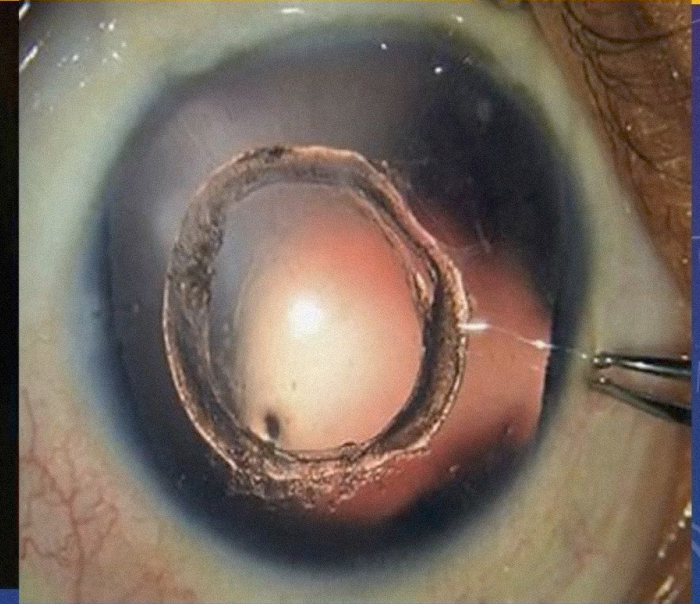
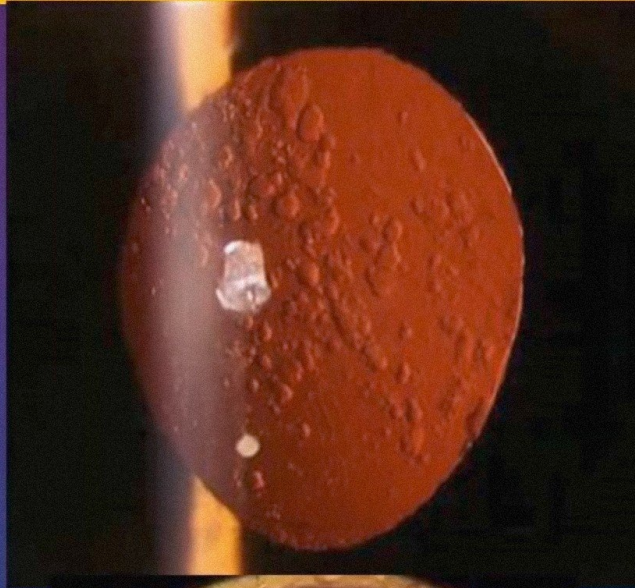


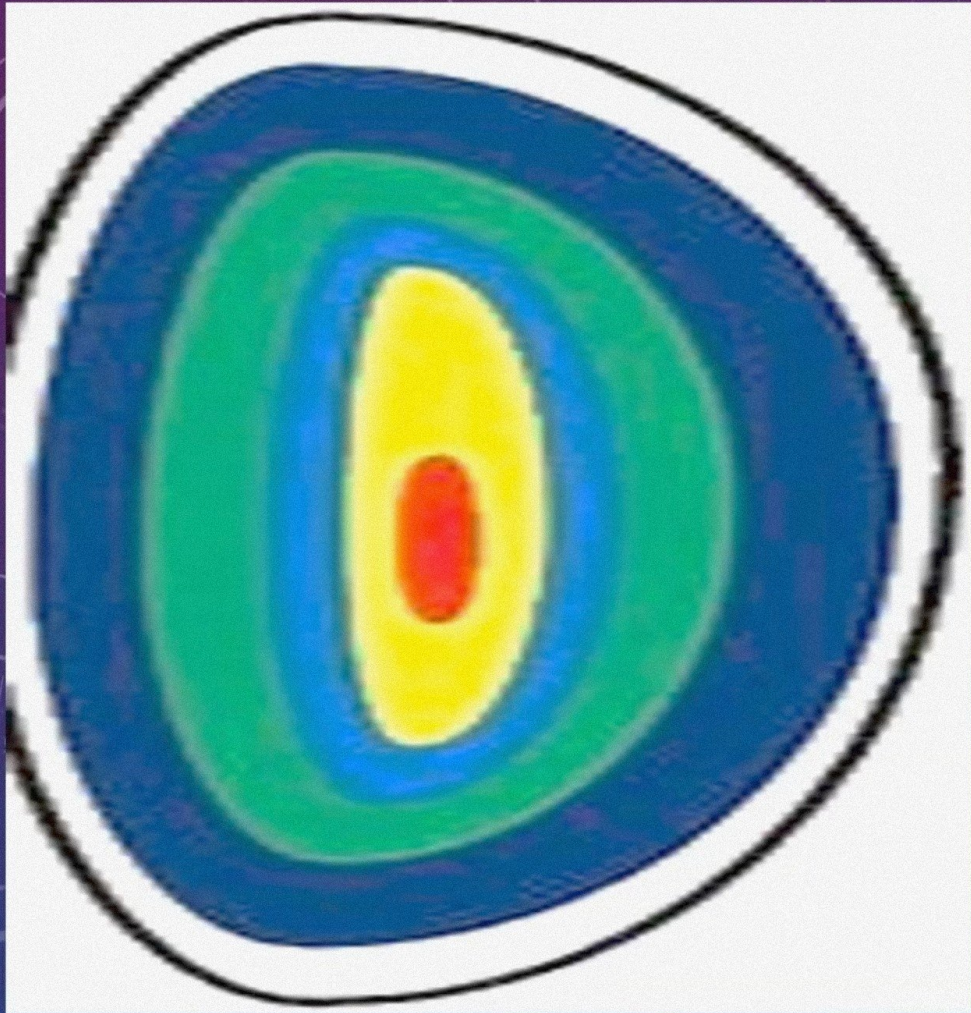
CLINICAL NUGGET



POSTERIOR CAPSULAR OPACIFICATION

- Residual epithelial cells migrate posteriorly → differentiate into a balloon like /wing cell → wedl cell → **ELSCHNIG PEARL**
- Sometimes dough nut shape configuration → **SOEMMERING'S RINGS**

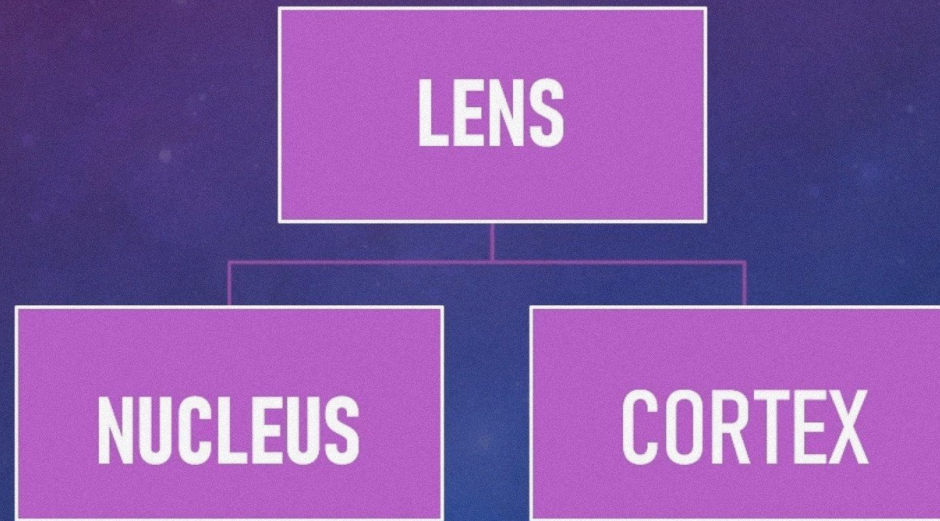




LENS FIBRES



ZONAL ARRANGEMENT OF LENS FIBRES



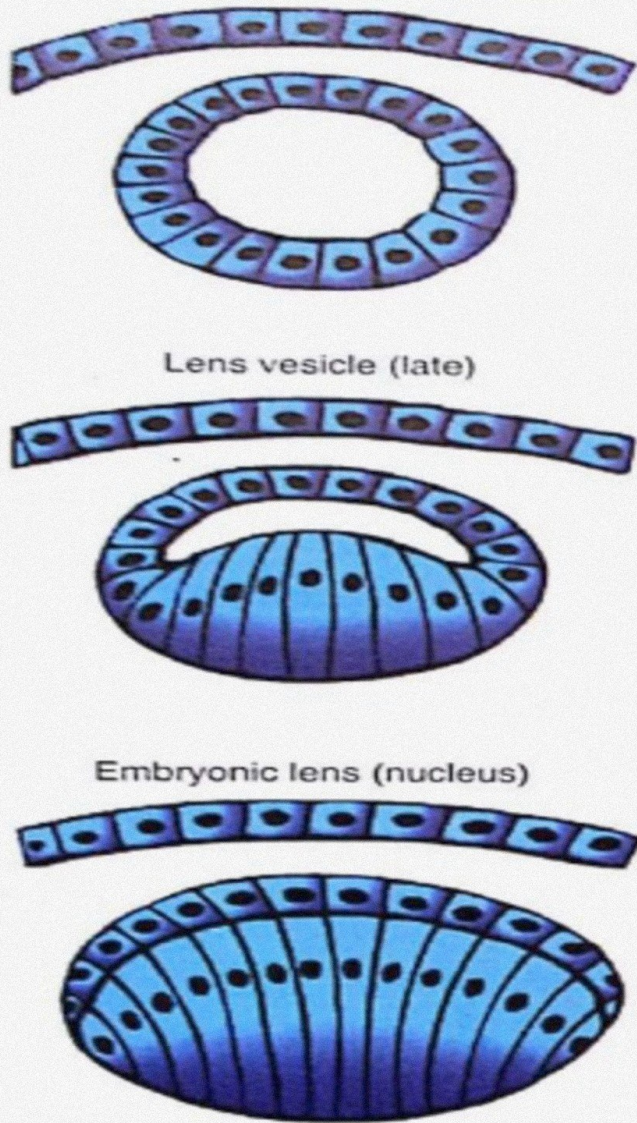
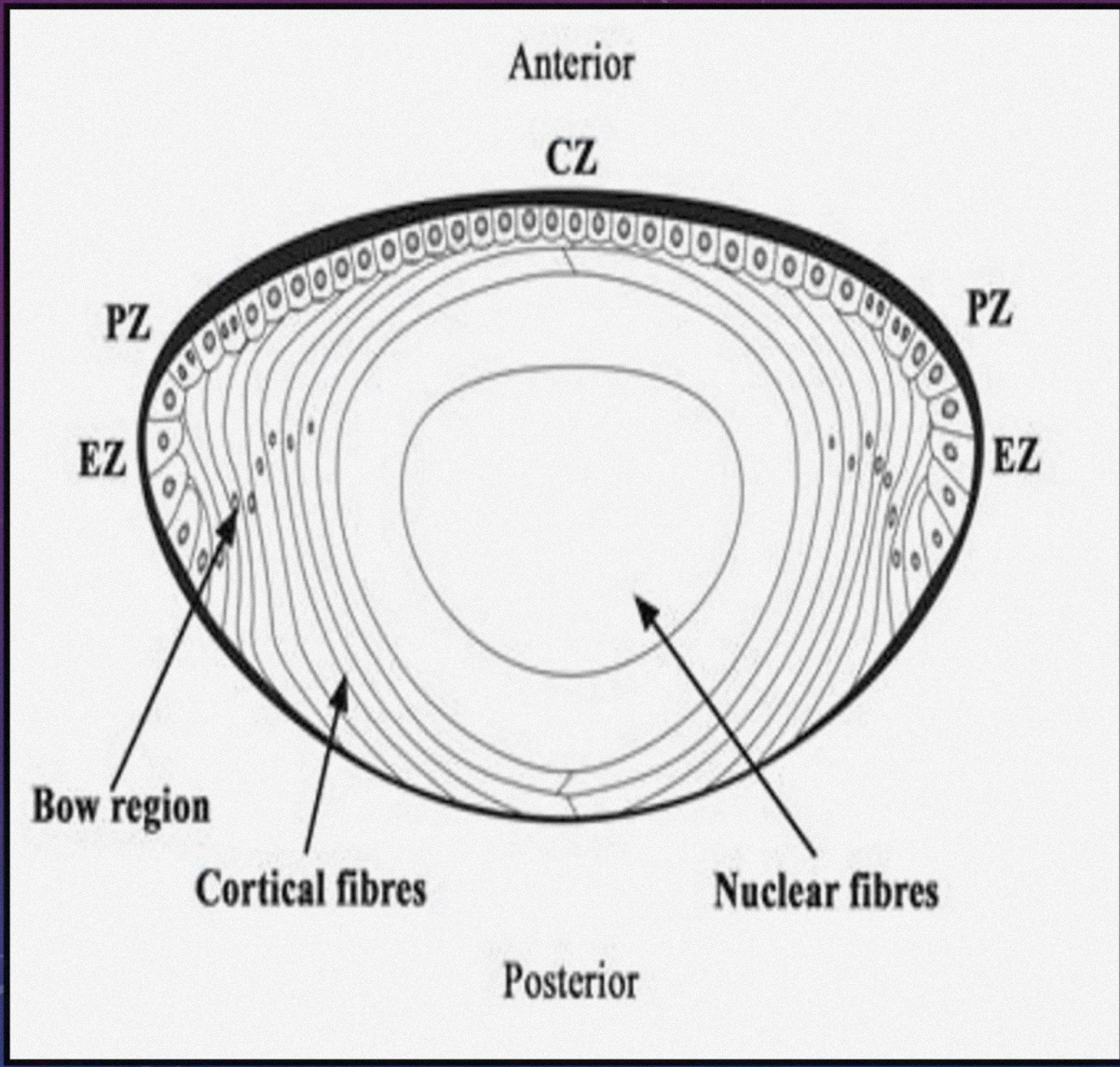


Fig. 1.15. Development of the crystalline lens.

- **PRIMARY LENS FIBERS** : develop before 3 months of age , from the posterior epithelium .
- **SECONDARY LENS FIBERS** : develop from the equatorial zone/ germinative zone





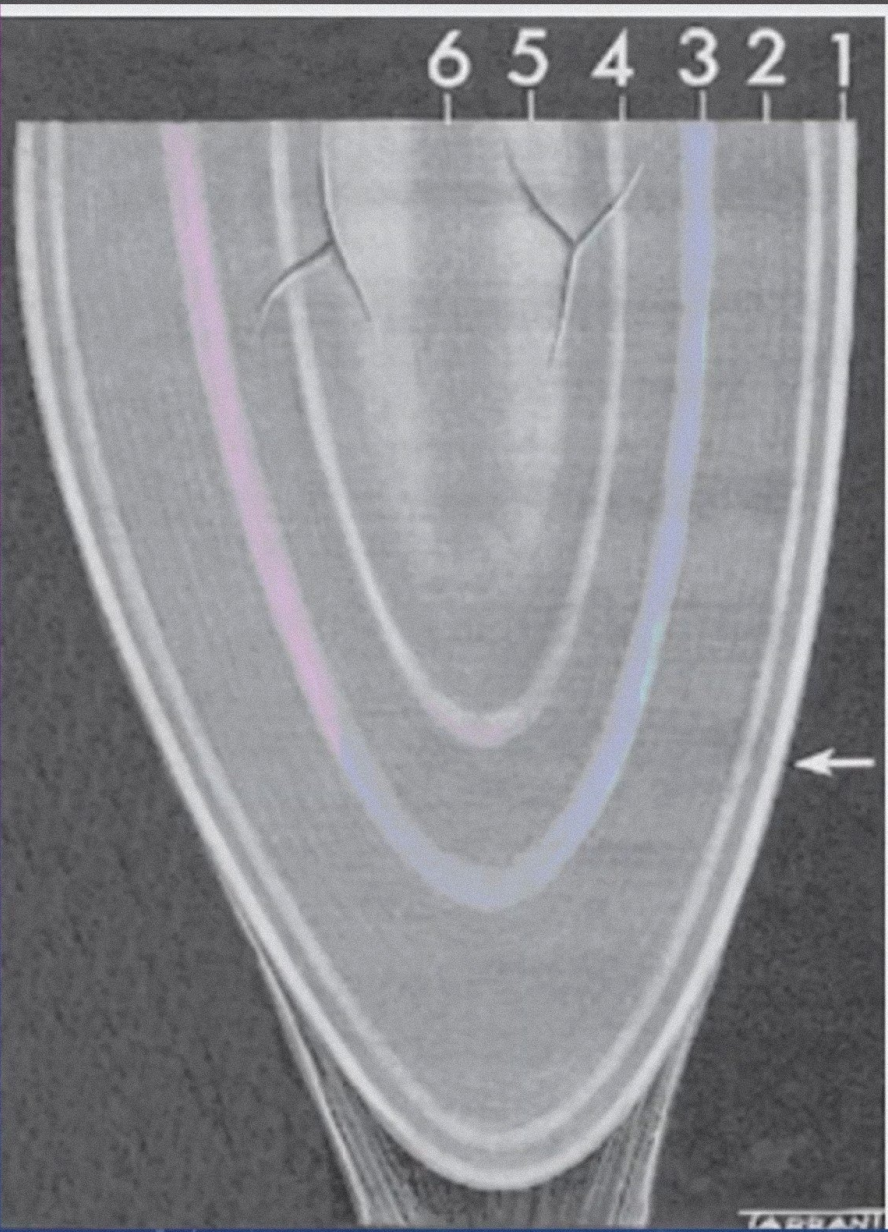
The central nucleus of the lens → oldest cells
The periphery or cortex → youngest cells



The fibres of the lens are split into regions depending on the age of origin.

- **EMBRYONIC NUCLEUS** (3 months of embryonic life)
- **FETAL NUCLEUS** (3–8 months of fetal life)
- **INFANTILE NUCLEUS** (last month of intrauterine life till puberty),
- **ADULT NUCLEUS** (corresponding to the lens in early adult life)
- **CORTEX** consisting of the youngest fibers.





The structure of the lens in an adult 40 years of age, as shown in the optical beam of the slit lamp:

1. anterior capsule
- 2 cortex
- 3 adult nucleus
- 4 infantile nucleus
- 5 fetal nucleus
- 6 embryonic nucleus



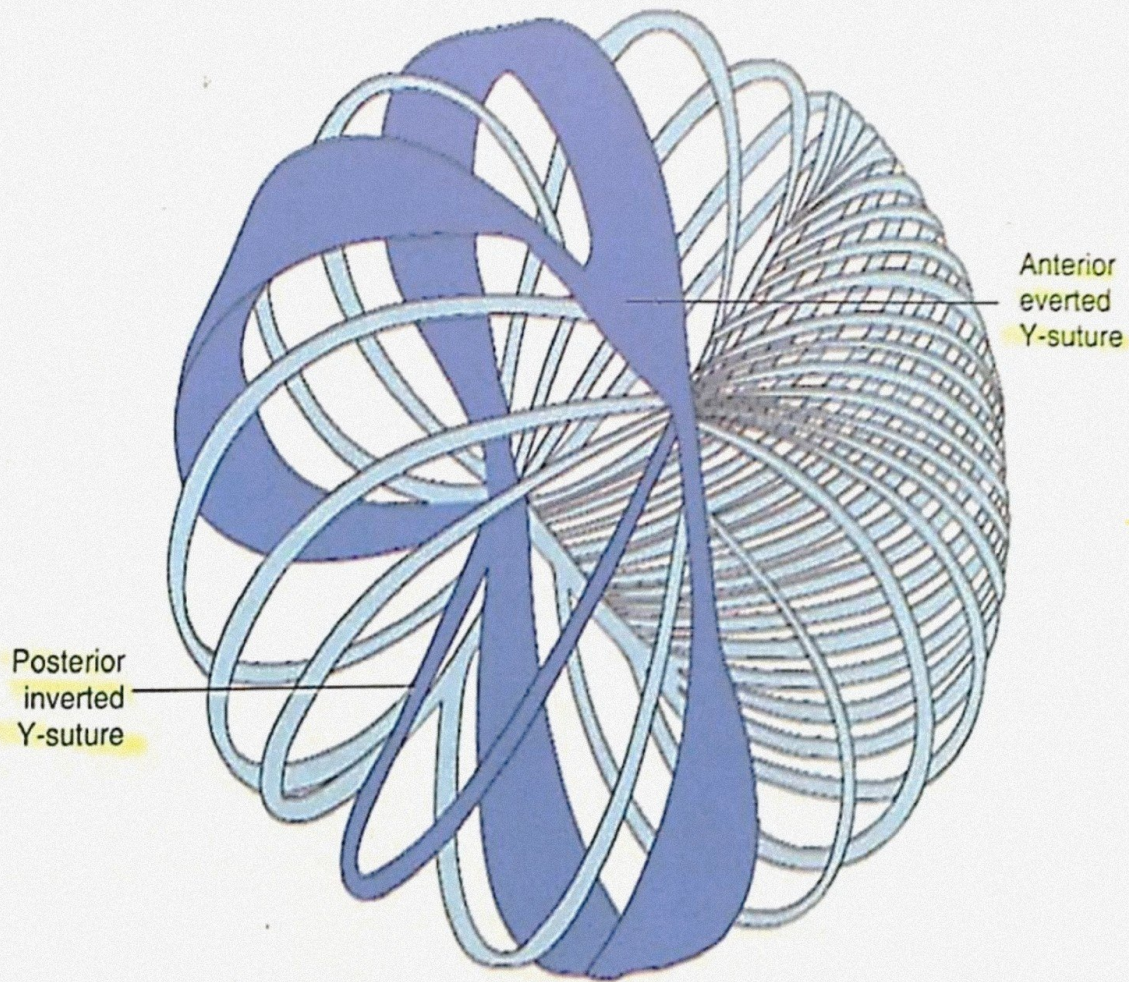
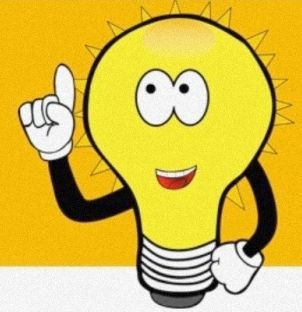


Fig. 4.5. Y-shaped arrangement of lens fibres of embryonic nucleus.

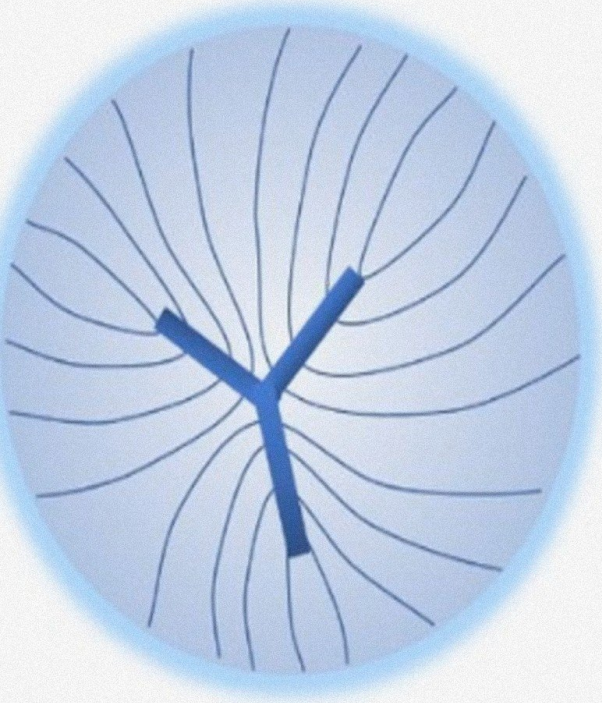
- The initial fibers formed surrounding the embryonic nucleus are arranged in a way that they terminate into two sutures
- Upright (anterior) Y suture
- Inverted (posterior) Y suture



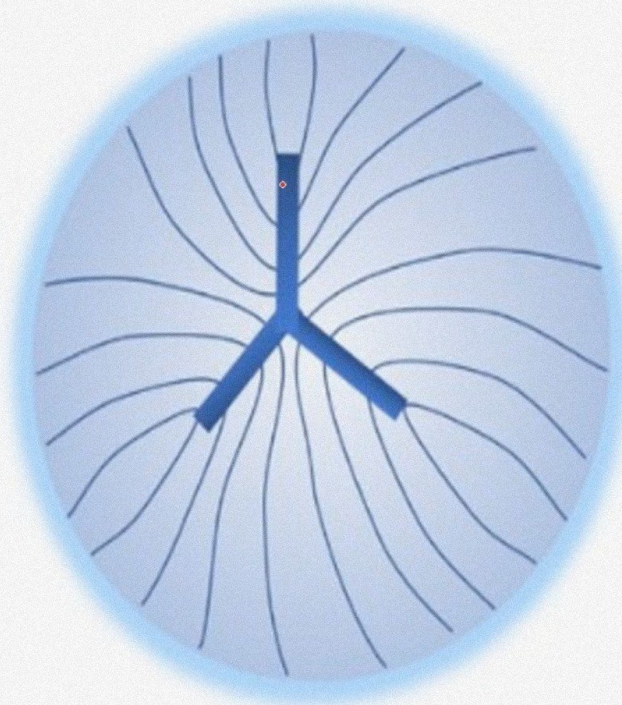
CLINICAL NUGGET



A. Anterior Y-Suture



B. Offset Posterior Y-Suture

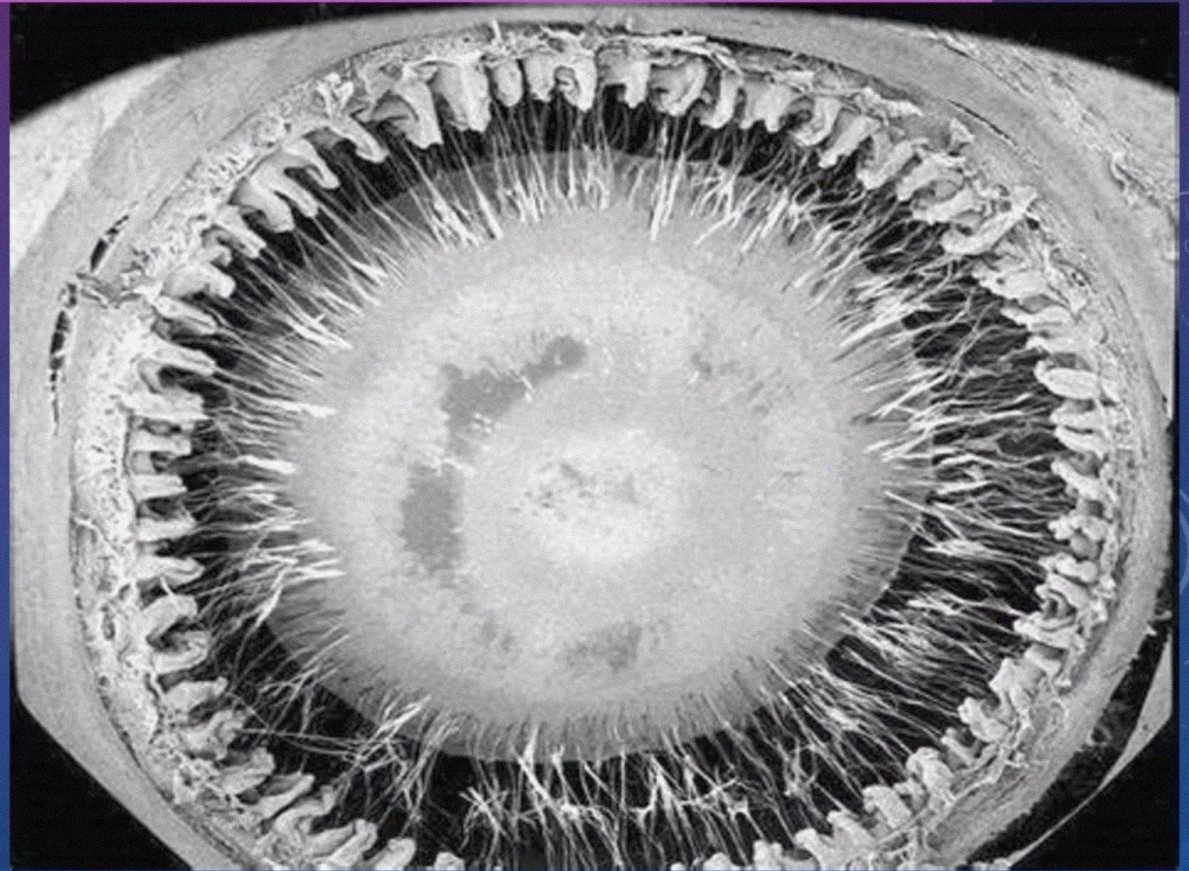


C. Sutural Cataract



SUSPENSORY LIGAMENTS / ZONULES

- Lens is held in place by the **suspensory ligament or zonule of Zinn**.
- Consists of bundles of strands from the surface of the **ciliary body** to **equatorial capsule** where they join with the zonular lamella.



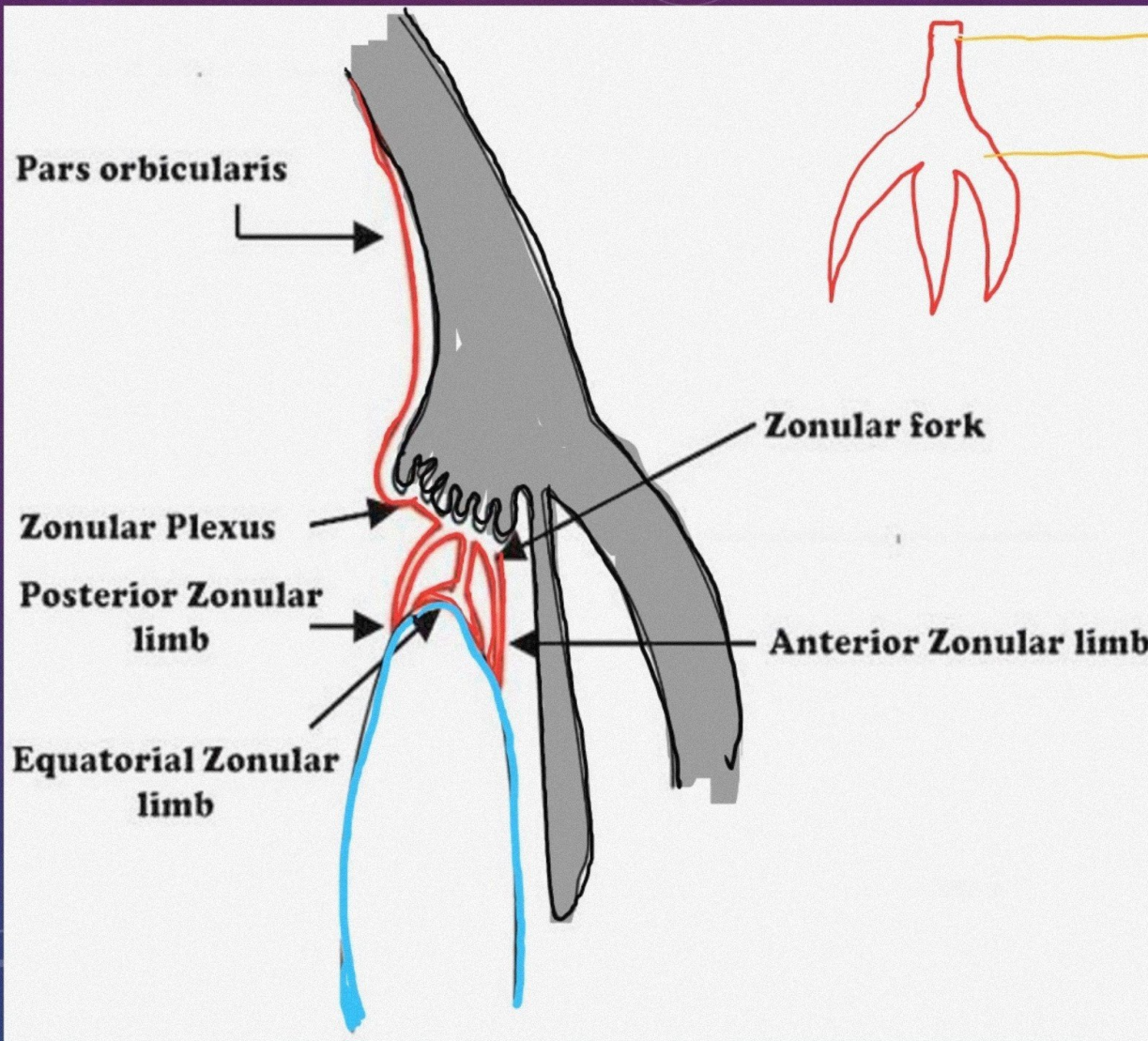
RECENT CONCEPTS ABOUT ZONULAR FIBRES

Recent scanning electron microscopy → Majority of the zonules arise from **the posterior end of the pars plana up to 1.5 mm from ora serrata.**

The suspensory zonular complex is divided into four zones: -

- **PARS ORBICULARIS:** lies on PARS PLANA
- **ZONULAR PLEXUS:** lies between the ciliary process in the region of pars plicata.
- **ZONULAR FORK:** the point of angulation of the zonules at the midzone of the ciliary valleys.
- **ZONULAR LIMBS**

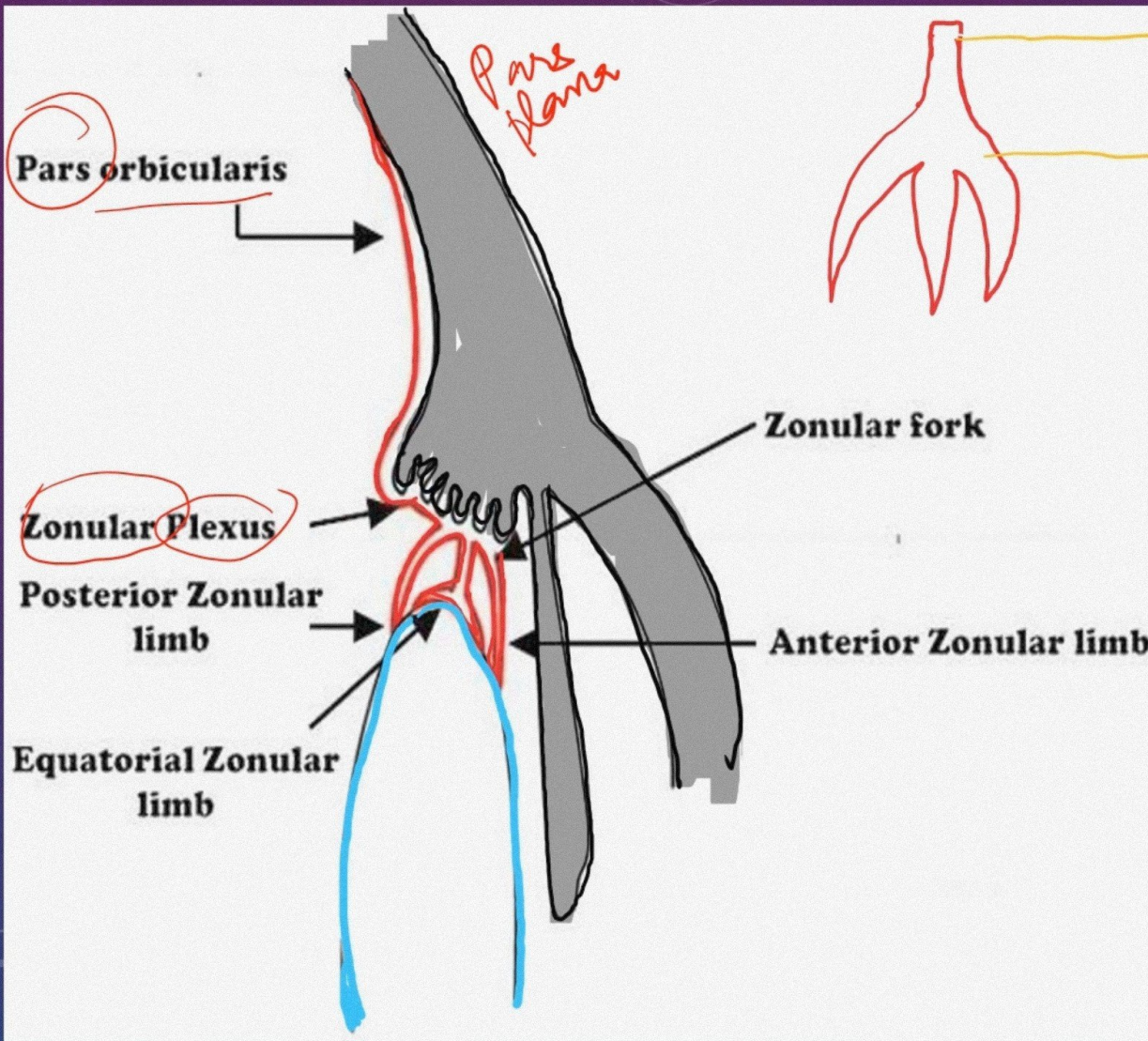




→ Zonular fork
→ Zonular limbs

- **ZONULAR LIMBS:**
- **ANTERIOR ZONULAR LIMB:** passes from pars plana to pre-equatorial part of lens.
- **POSTERIOR ZONULAR LIMB:** passes from pars plicata to post equatorial part of lens.
- **EQUATORIAL ZONULAR LIMB:** passes from pars plicata to lens equator

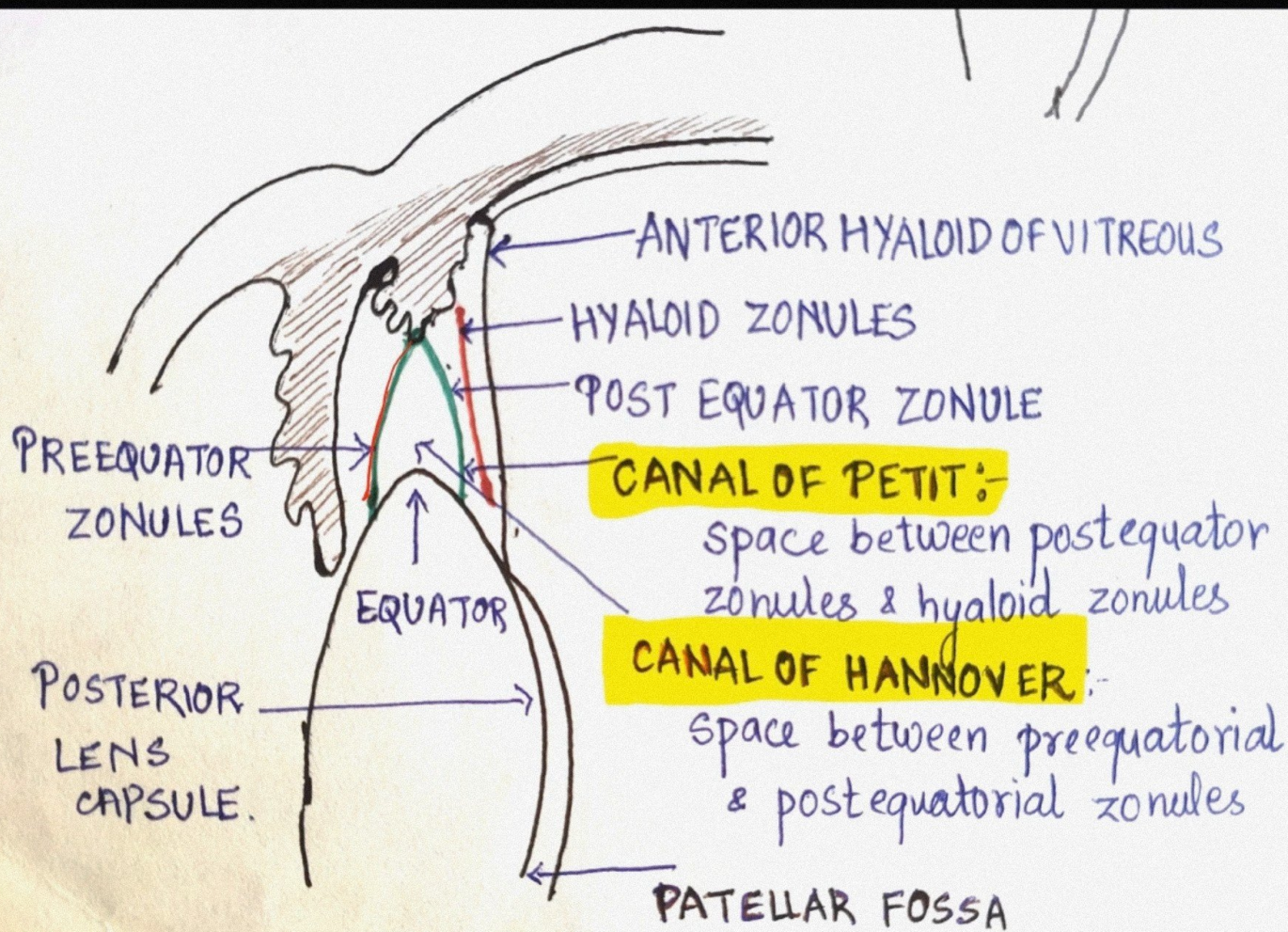




→ Zonular fork
→ Zonular limbs

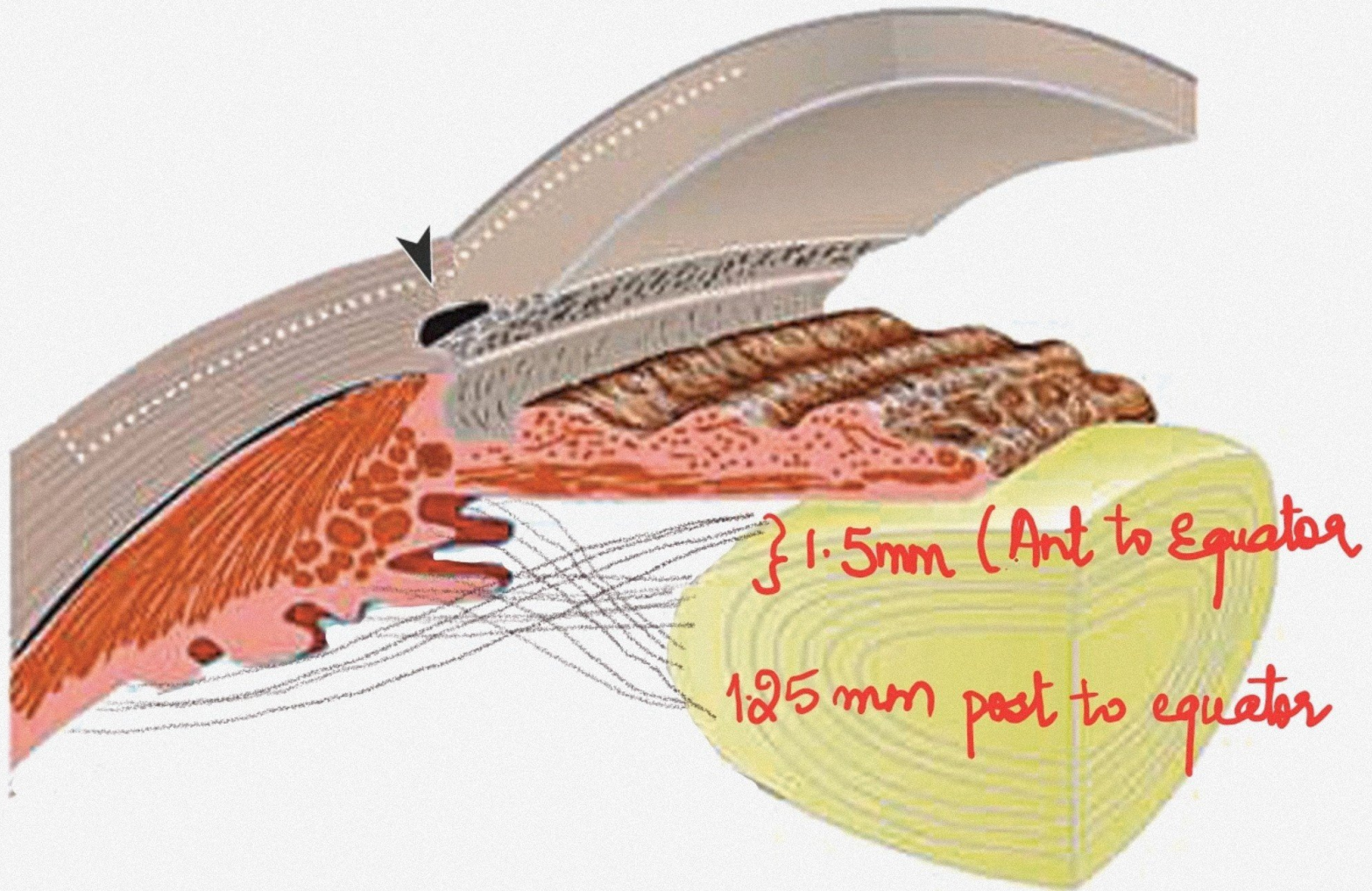
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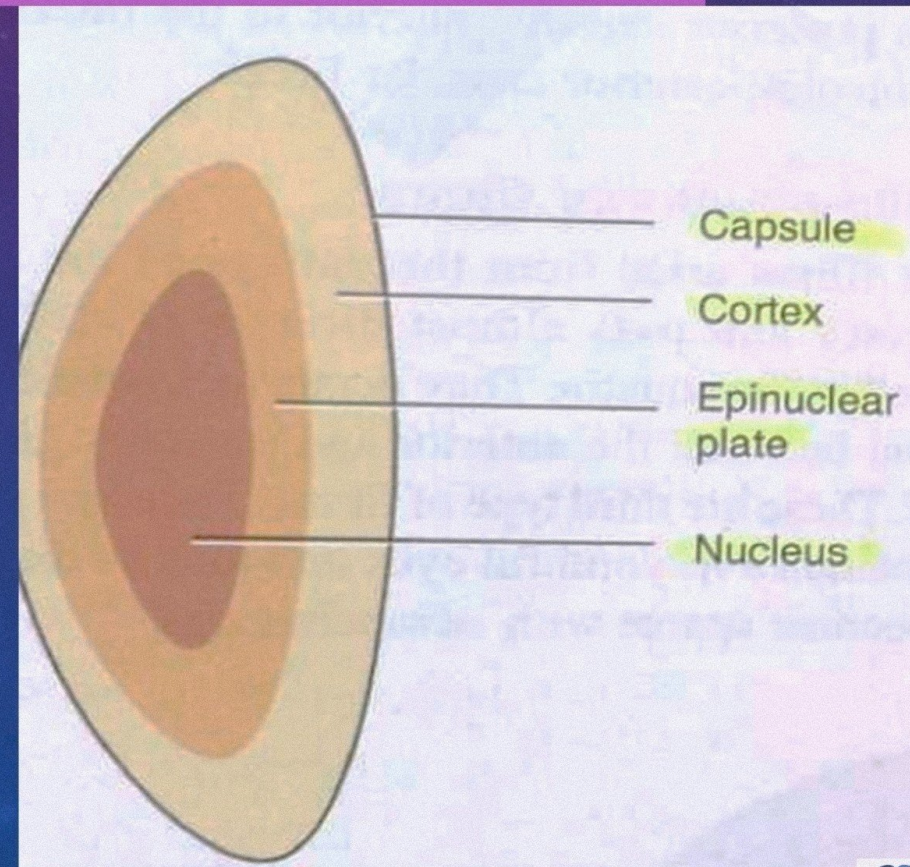
- **CANAL OF HANOVER**
- **CANAL OF PETIT**

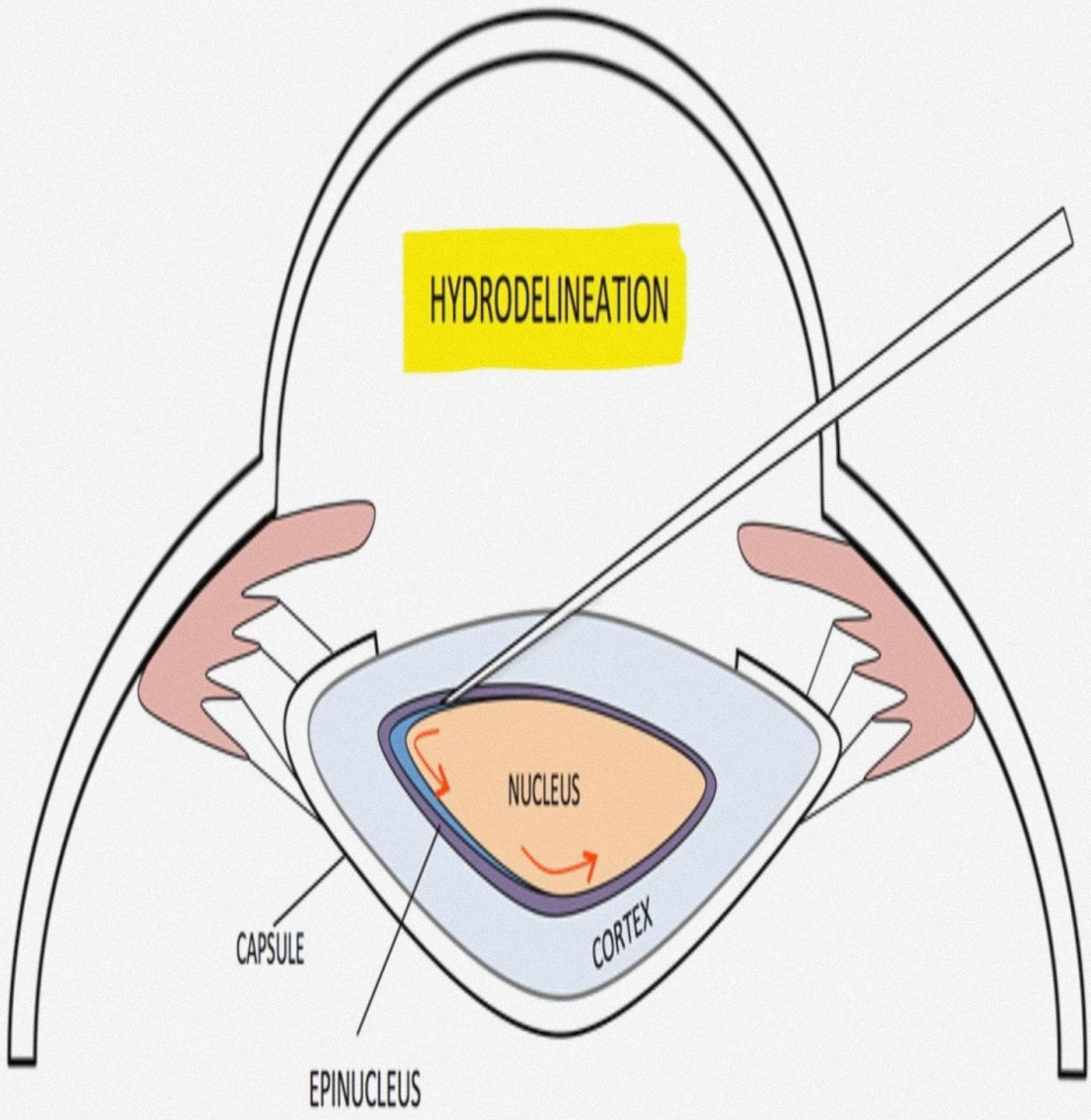
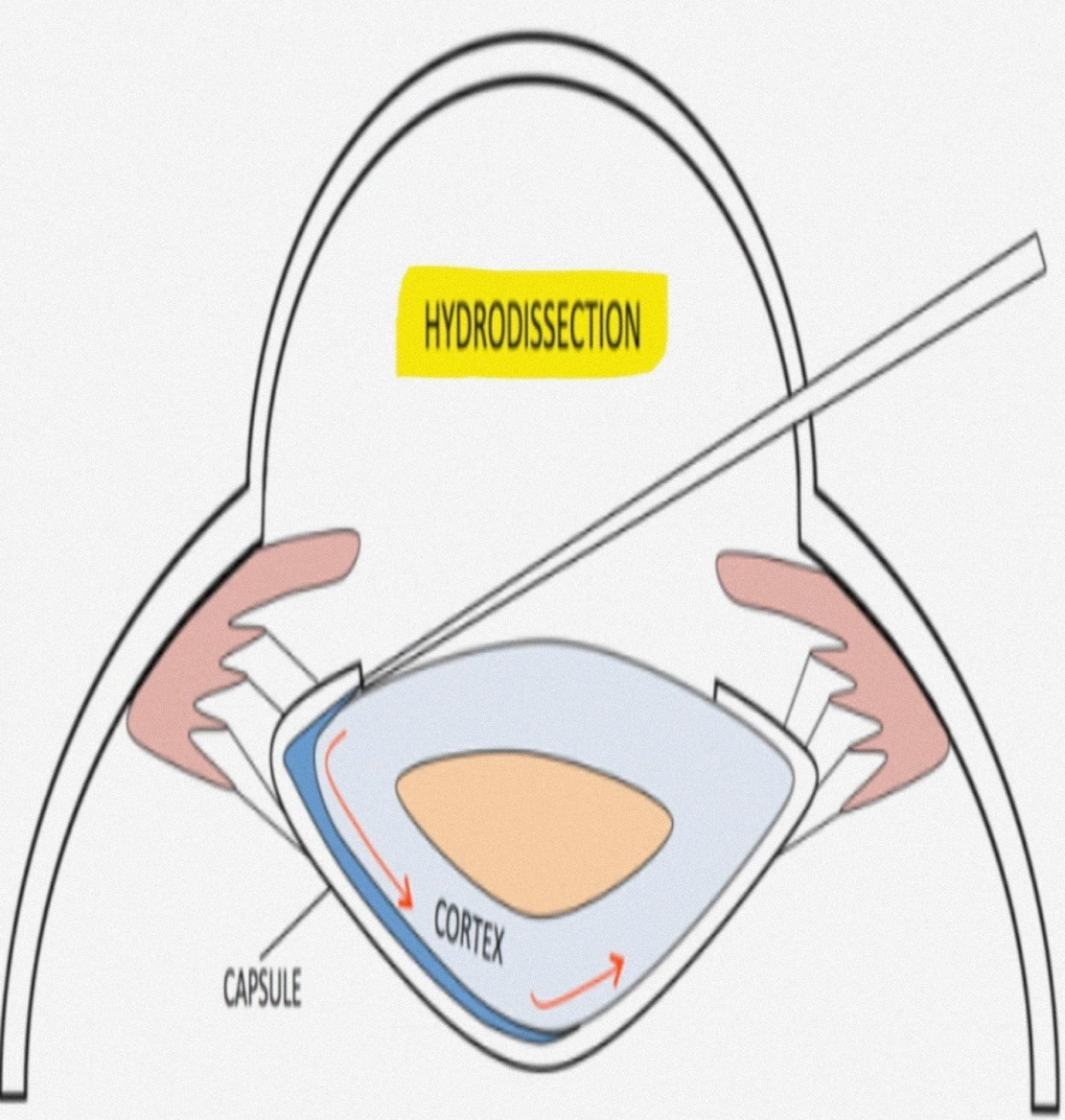




SURGICAL ANATOMY OF THE LENS

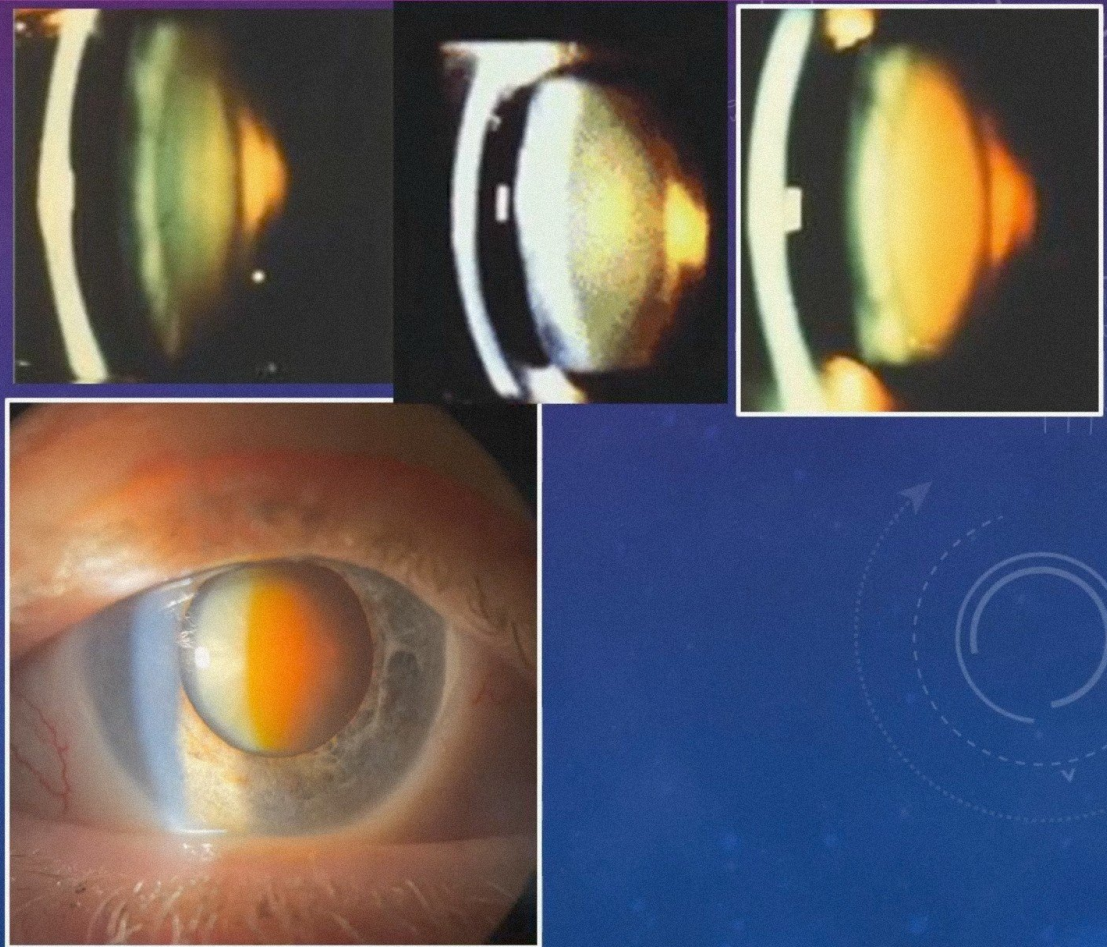
- Central hard nucleus
- Epinuclear plate of variable thickness
- A layer of Cortex
- Capsule





HARDNESS OF LENS BASED ON ITS COLOR

- Grade 1 : grey
- Grade 2 : amber , greenish yellow
- Grade 3 : yellow
- Grade 4 : brown/ brunuscent cataract
- Grade 5 : black

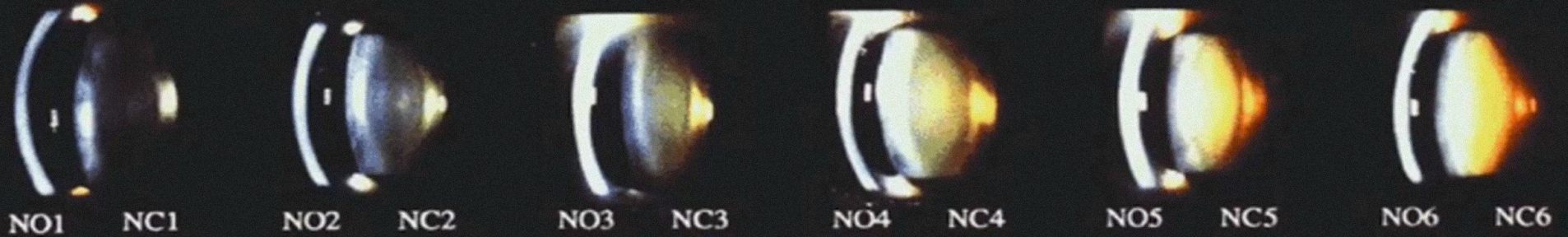


LOC III CLASSIFICATION :



LENS OPACITIES CLASSIFICATION SYSTEM III (LOCS III)

Nuclear
Color/
Opalescence



Cortical



Posterior
Subcapsular

