

the Eye, Lect 1

1. Overview of the Eye

Overview of the Eye

| Description | Feature |
|---|---------------------|
| Eye (organ of vision) | Organ |
| Photosensitive: converts light → electrochemical signals → cerebrum | Function |
| Within bony cavities called orbits | Location |
| 3 Tunics: External (Fibrous), Middle (Vascular), Inner (Nervous) | Histological Layers |

2..Layers of the Eye

Layers of the Eye

| Components | Type | Layer |
|--|-------------------------------|----------|
| Cornea, Sclera | Fibrous | External |
| Iris, Ciliary Body, Choroid | Vascular, Muscular, Pigmented | Middle |
| Retina (Neural layer + Pigmented Epithelium) | Nervous | Inner |

3. The Cornea

| Details | Feature |
|--|-------------|
| Dome-shaped | Shape |
| Transparent (colorless) | Color |
| Avascular | Vascularity |
| Refracts light to focus on the retina | Function |
| Rich in sensory nerve endings | Innervation |
| Maintained by tarsal & lacrimal gland secretions | Wetting |

4. Histological Layers of the Cornea

| Description | Layer |
|--|------------------------|
| Non-keratinized stratified squamous (5–6 layers); basal cells are mitotic; has microvilli | 1. Anterior Epithelium |
| Thick, non-cellular collagen layer (types I & V); supports and protects subepithelial nerves | 2. Bowman's Membrane |
| 90% of thickness; parallel collagen fibers (type I) in lattice pattern; contains keratocytes | 3. Stroma |
| Non-cellular membrane (types IV & VIII collagen); made by endothelium | 4. Descemet's Membrane |
| Simple squamous cells; active in pumping water; maintains corneal transparency | 5. Endothelium |

5..Functions of Microvilli on Corneal Surface Cells

| Role | Function |
|--|------------------------|
| Enhance adherence of tear film | Increase surface area |
| Retain hydration & nutrient transport | Tear film stability |
| Absorb water, electrolytes & nutrients | Transport & absorption |

6..Tear Film Layers

| Function | Secreted By | Layer |
|---|---------------------------|------------|
| Convert surface from hydrophobic → hydrophilic; lubrication | Conjunctival goblet cells | 1. Mucus |
| Supply oxygen, maintain electrolyte composition | Lacrimal glands | 2. Aqueous |
| Prevent evaporation, reduce blinking friction, protect from dryness | Tarsal glands (eyelids) | 3. Lipid |

? Why is the Cornea Transparent?

Reason

Avascular (no blood or lymphatic vessels)

Smooth, non-keratinized surface epithelium

Regular collagen fiber arrangement in stroma

Similar refractive index of cells, fibers, and matrix

Controlled hydration via endothelial active transport



LASIK Surgery

Description

Aspect

Correct vision issues (myopia, hyperopia, astigmatism)

Purpose

Epithelium displaced → stroma reshaped with laser → epithelium repositioned

Technique

Rapid regeneration restores normal corneal physiology

Healing

Sclera

| Description | Feature |
|--|--------------------|
| Thick, white, opaque | Appearance |
| Irregular type I collagen fibers, fibroblasts, elastic fibers | Composition |
| Insertion of extraocular muscles, structural support, protection | Functions |
| Episclera, Scleral stroma, Lamina fusca | Layers |
| Conjunctiva (vascular) | Covering |
| Tenon's capsule: attachment for ocular muscles | Surrounding fascia |

Conjunctiva & Related Conditions

| Description | Condition/Note |
|--|---------------------------|
| Inflammation (pink eye); conjunctiva is vascular | Conjunctivitis |
| Sclera absorbs bilirubin due to collagen fibers | Jaundice effect on sclera |

Corneo-Scleral Junction (Limbus)

| Description | Feature |
|--|---------------------|
| Between cornea and sclera | Location |
| Limbal stem cells, Canal of Schlemm, Trabecular meshwork (Spaces of Fontana) | Structures |
| Site for cataract/glaucoma surgery | Clinical importance |
| Corneal epithelium → bulbar conjunctiva; Bowman's ends; stroma connects | Continuities |

Aqueous Humor Drainage

| Function | Structure |
|--|----------------------------|
| Drains aqueous humor into venous system | Canal of Schlemm |
| Uveoscleral, Corneoscleral, Juxtacanalicular tissue (JCT) | Trabecular Meshwork Layers |
| Passageways at irido-corneal angle aiding aqueous humor flow | Spaces of Fontana |

Limbal Stem Cells

| Description | Feature |
|---|-------------------|
| Renewal of corneal epithelial cells (lifespan = 7–10 days) | Role |
| Chemical/thermal burns, surgery, inflammation, contact lenses | Deficiency causes |

Middle (Vascular) Layer: Uvea

| Description | Component |
|--|--------------|
| Colored disc, controls pupil size & light entry | Iris |
| Produces aqueous humor, accommodation, supports lens | Ciliary Body |
| Not detailed in this part (likely in Part II) | Choroid |

Iris Structure

| Description | Part |
|--|-------------------|
| Lined with fibroblasts & melanocytes → eye color | Anterior Surface |
| Loose vascular CT, fibroblasts, melanocytes; contains iris muscles | Stroma |
| Pigmented cuboidal epithelium (prevents light scattering) | Posterior Surface |

Ciliary Body

| Description | Feature |
|---|------------|
| Ciliary muscles + Ciliary processes | Components |
| 1. Accommodation, 2. Produce aqueous humor, 3. Support lens zonules | Functions |
| Behind iris, surrounds lens | Location |



Histology of Ciliary Body

| Description | Component |
|---|-----------------------|
| Two cuboidal layers: outer non-pigmented & inner pigmented (secretes aqueous humor) | 1. Ciliary Epithelium |
| Loose CT with blood vessels, elastic fibers, melanocytes | 2. Stroma |
| Smooth muscle controlling accommodation (changes lens shape) | 3. Ciliary Muscle |



Accommodation

Accommodation

| Vision Focus | Lens Shape | Ligament Tension | Muscle Action | Condition |
|--------------|------------|------------------|--------------------------|----------------|
| Near objects | Rounded | Decreased | Ciliary muscle contracts | Near Object |
| Far objects | Flattened | Increased | Ciliary muscle relaxes | Distant Object |



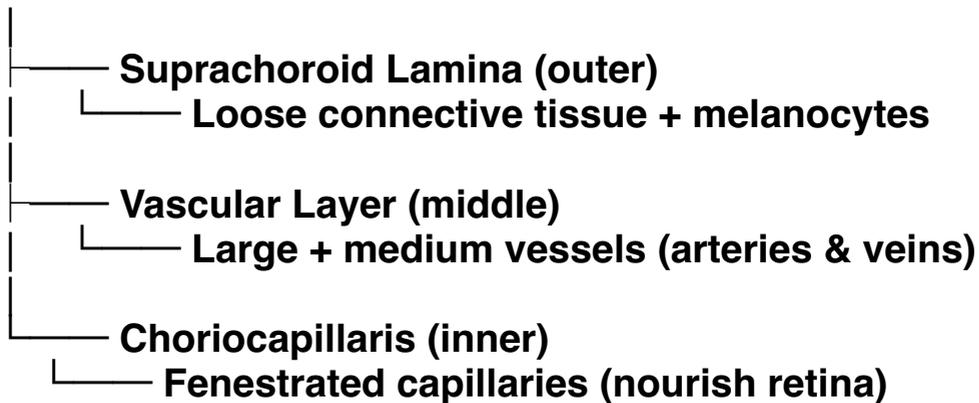
Ora Serrata

| Description | Feature |
|--|----------|
| Junction between retina & ciliary body | Location |
| Boundary between neural retina & non-visual retina | Function |

the Eye, Lect 2

Choroid & Bruch's Membrane

Choroid



Bruch's Membrane

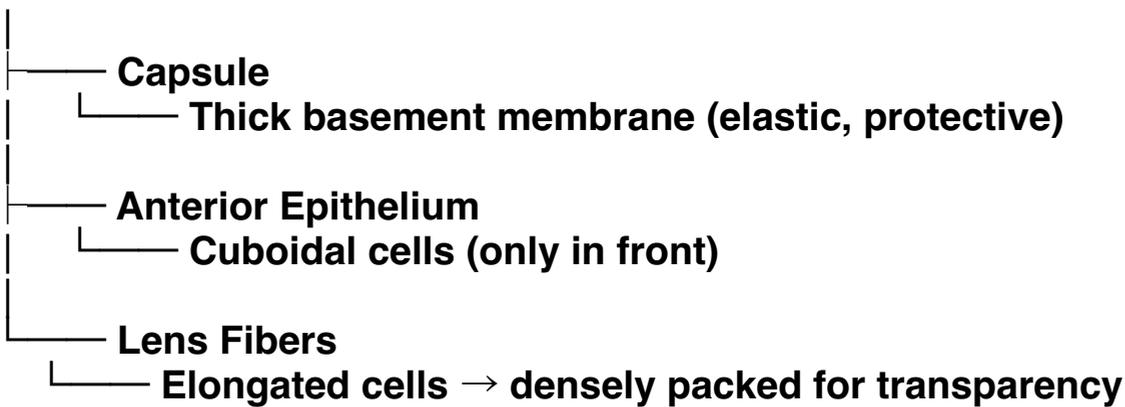
| Composition & Function | Layer Name | Layer No. |
|--|----------------------------------|-----------|
| Support for retinal pigment epithelium | Basement membrane of RPE | 1 |
| Strength & elasticity | Inner collagenous layer | 2 |
| Flexibility & diffusion | Elastic fiber layer | 3 |
| Structural support | Outer collagenous layer | 4 |
| Connects to choriocapillaris | Basement membrane of capillaries | 5 |

Chambers of the Eye

| Role | Content | Location | Chamber |
|--|---------------|-----------------------|-----------|
| Nourishes lens & cornea ⚠️ | Aqueous humor | Between cornea & iris | Anterior |
| Transports aqueous humor | Aqueous humor | Between iris & lens | Posterior |
| Maintains eye shape ⚠️ + retinal support | Vitreous body | Behind lens to retina | Vitreous |

Lens Structure

Lens



Lens Layers by

Embryonic Nucleus → **Fetal Nucleus** → **Infantile Nucleus** → **Adult Nucleus** →
 (central) (formed later) (develops postnatally) (outer)



Retina Layers (10)

Retina (from outer to inner)

1. Retinal Pigment Epithelium (RPE) ⚠
2. Photoreceptor Layer
 - Rods & Cones
3. External Limiting Membrane
4. Outer Nuclear Layer
 - Nuclei of rods & cones
5. Outer Plexiform Layer
 - Synapse: photoreceptors ↔ bipolar cells
6. Inner Nuclear Layer
 - Nuclei of bipolar, amacrine, horizontal cells
7. Inner Plexiform Layer
 - Synapse: bipolar ↔ ganglion cells
8. Ganglion Cell Layer
9. Nerve Fiber Layer
 - Axons of ganglion cells → optic nerve ⚠
10. Internal Limiting Membrane

Rods vs Cones

| Cones | Rods | Feature |
|---|---|-------------------|
| ~6 million | ~120 million  | Quantity |
| Low (needs bright light ) | High (night vision ) | Light Sensitivity |
| Yes (color vision ) | No (black & white only) | Color |
| High (sharp vision ) | Low (poor detail) | Resolution |
| Mostly central (esp. fovea)  | Mostly peripheral retina | Location |

Accessory Structures –

A. Conjunctiva

| Function | Epithelium Type | Part |
|-----------------------------|---------------------------|-----------|
| Lines inside eyelids | Stratified columnar | Palpebral |
| Covers sclera | Stratified columnar | Bulbar |
| Transition zone (eye ↔ lid) | Loose connective junction | Fornix |

Eyelids

| Function | Component | Structure |
|---|--|------------------|
| Protection | Thin & elastic | Skin |
| Movement ⚠️ | Orbicularis oculi (close), Levator (open) | Muscles |
| Shape + supports Meibomian glands | Dense connective tissue | Tarsal Plate |
| Secrete lipid → prevent evaporation ⚠️ | Sebaceous glands | Meibomian Glands |

Lacrimal Apparatus

Tissue Type / Epithelium



Component

Serous **tubuloalveolar**
gland

Lacrimal Gland

Stratified cuboidal
epithelium

Lacrimal Ducts

Lined by **stratified**
squamous epithelium

Lacrimal Puncta

Lined by **stratified**
squamous non-
keratinized epithelium

Canaliculi

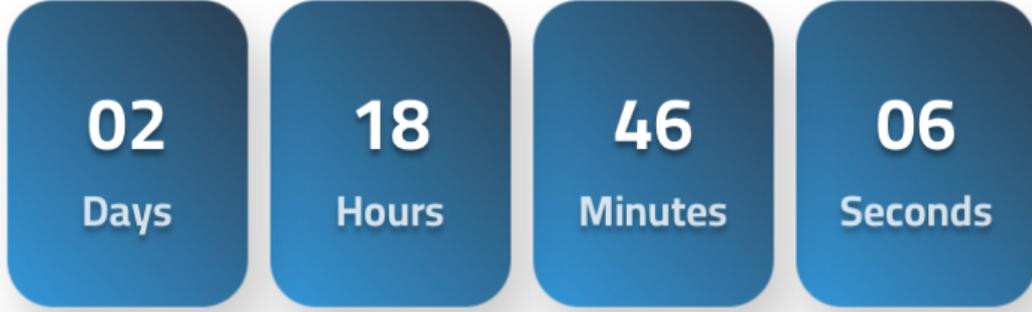
Pseudostratified
columnar epithelium with
goblet cells ⚠️

Lacrimal Sac

Pseudostratified
columnar epithelium with
goblet cells ⚠️

Nasolacrimal Duct

بَاقِي مَنَ الزَّمَنَ لِنَهَايَةِ آخِرِ اخْتِبَارِ بِيَسْكَ:



أَبَارِكْ فِي النَّاسِ أَهْلَ الطَّمُوحِ
وَمَنْ يَسْتَلِذُّ رُكُوبَ الْخَطَرِ

وَأَعْلَنَ فِي الْكُونِ أَنَّ الطَّمُوحِ
لَهَيْبِ الْحَيَاةِ وَرُوحِ الظَّفْرِ.

Done by :- Rama Al bustanji💙💙

