**Anatomy of the eye** 

# **Introduction about Contents of the eye**

lecture

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# The eyes

The eye: is the organ of sight (vision).

- Only a small area of the eyeball can be seen because most of it is surrounded by the bones of the skull that make up the eye socket (orbit).

The eyeball: the main part of the eye.

- Each eye is shaped like a **ball** and its full size

about 2.5 cm (1 inch) in diameter.



# The wall of the eye

-There are three layers of tissue in the walls of the eye:

- The outer fibrous layer: Sclera and Cornea
- The middle vascular layer or uveal tract:

Consisting of the choroid, ciliary body and iris

• The inner nervous tissue layer: the retina.







## **Sclera**

- Is the white of the eye.
- It's made up of **tough connective tissue** and covers most of the eyeball.
- the sclera is the protective covering of the **eyeball**.





## Cornea

- Is the clear, **dome-shaped** covering at the front of the eye.
- -The cornea covers the **pupil** and the **iris**.
- -It doesn't have any blood vessels **So** cells in the cornea get oxygen from **tears.**





## Choroid

-The choroid is a thin layer of tissue that lies between the sclera and retina. It contains many tiny blood vessels that supply oxygen and nutrients to the retina.

-The choroid contains many melanocytes.

- The melanocytes in the choroid <u>absorb light</u> to help lessen light reflection in the eye.





# Ciliary body

-The ciliary body is a muscular ring of tissue at the junction of the iris and the choroid.

- Muscle fibres in the ciliary body help the eye to focus on near or far objects by changing the shape of the lens.





## Iris

- is the thin, muscular coloured part of the eye. It is located between the cornea and the lens.

- The iris has melanocytes, the cells that make a pigment called melanin.

- The amount of melanin in the iris is what gives the eye its colour.





#### Uvea

-The uvea is divided into **3 main parts** - the **iris**, **choroid** and **ciliary body**. -The uvea contains many blood vessels, lymph vessels and the inner muscles of the eye.





## Retina

-The innermost layer of the wall of the eye is made up of the **retina** (also called the **neural** tunic).

- -The retina has a layer of cells that absorb light that make up the **pigmented layer**.
- -The retina also has a layer of nerve cells (neurons) that make up the neural retina.
- The neural retina are specialized cells called photoreceptors.
  There are 2 types of photoreceptors rods and cones.
- Rods and cones are sensitive to light and work together like a **camera** to capture information about what we see.





### Lens

- The lens is a transparent disc-shaped structure in the inner part of the eye. It lies directly behind the cornea and iris.





## **Eyelids**

-The eyelid is a fold of skin that covers and protects the eye. Muscles around the

eye raise and close the eyelid.

# Conjunctiva

-The conjunctiva is a clear mucous membrane that covers



the inner surface of the eyelid and

the outer surface of the eye.





## Lacrimal gland and tears

-The lacrimal gland (also called the **tear gland**) is located at the **upper, outer** 

corner of the eye. - It secretes a watery fluid that makes up tears.



# **Function of the eye**

-The eye and brain work together to allow us to see.

-The main function of the eye is to collect light and information about what we see. This information is sent to the **brain** through the **optic nerve**.

- The brain then turns information into a visual image or picture for us to see.



# Anatomy of the eye

## The Muscles of Eye

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- The extraocular muscles are located within the orbit, but are external to the eyeball itself. They act to control the movements of the eyeball and the superior eyelid.

### There are seven extraocular muscles:

- 1.levator palpebrae superioris,
- 2. superior rectus,
- 3.inferior rectus,
- 4.medial rectus,
- 5.lateral rectus,
- 6.inferior oblique,
- 7. superior oblique.



- Functionally, they can be divided into two groups:
- **1. Responsible for eye movement:**
- Recti muscles (4),
- Oblique muscles (2).
- 2. Responsible for superior eyelid movement:
- Levator palpebrae superioris.



Extraocular Muscles (Left Eve)



## **Muscles of Eye Movement:**

- There are six muscles involved in the control of the eyeball.
- They can be divided into two groups;
- The four recti muscles,
- The two oblique muscles.
- **1. Recti Muscles:** There are four recti muscles;

Superior Oblique Medial Rectus Inferior Oblique Inferior Rectus

Side

Side

Extraocular Muscles

(Left Eve)

superior rectus, inferior rectus, medial rectus and lateral rectus.

- This is a ring of fibrous tissue, which surrounds the optic canal at the back of the orbit.
- These muscles originate from the common tendinous ring.

## **A. Superior Rectus:**

- Originates: from the superior part of the common tendinous ring, and attaches to
- the superior anterior aspect of the sclera.
- Actions: Main movement is elevation of the eyeball.
- Innervation: Oculomotor nerve.



### **B. Inferior Rectus:**

- Originates: from the inferior part of the common tendinous ring, and attaches to the inferior anterior aspect of the sclera.

- Actions: Main movement is depression (downward movement of the eyeball).



## **C. Medial Rectus:**

- Originates: from the medial part of the common tendinous ring, and attaches to the anteromedial aspect of the sclera.

- Actions: inward movement of the eyeball.
- Innervation: Oculomotor nerve.



### **D. Lateral Rectus:**

- Originates: from the lateral part of the common tendinous ring, and attaches to the anterolateral aspect of the sclera.

- Actions: outward movement of the eyeball (looking side).
- Innervation: Abducens nerve.



- 2. Oblique Muscles: There are two oblique muscles:
- The superior oblique muscle.
- The inferior oblique muscle.
- Unlike the recti group of muscles, they do not originate from the common tendinous ring.



## **A. Superior Oblique:**

- Originates: from the body of the sphenoid bone. Its tendon passes through a trochlea and then attaches to the sclera of the eye, posterior to the superior rectus.

- Actions: Medially rotates the eyeball.
- Innervation: Trochlear nerve.



## **B. Inferior Oblique:**

- Originates: from the anterior aspect of the orbital floor. Attaches to the sclera of the eye, posterior to the lateral rectus
- Actions: Laterally rotates the eyeball.
- Innervation: Oculomotor nerve.



# **Muscles of eyelid**

## **Muscles of eyelid Movement:**

## - Levator palpebrae superioris:

**Origin:** from the lesser wing of the sphenoid bone,

Action: Raises upper eyelid (opens eye).

Innervation: CN III (oculomotor nerve).

#### **LEVATOR PALPEBRAE SUPERIORIS**







Cranial nerves





Anatomy of the eye

### **The Lacrimal System and Tears**

lecture 3

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# **The Lacrimal Gland**

#### **The lacrimal glands**

- Are exocrine glands that secrete lacrimal fluid (tears) onto the surfaces of the conjunctiva and cornea of the eye.
- It is located anteriorly in the superolateral aspect of the orbit.
- Lacrimal fluid acts to the clean, nourish and lubricate the eyes. Anatomical Structure:
- The lacrimal gland is approximately 2cm long.
- It can be divided into two main parts:
- **1- Orbital:** larger and sits on the lateral margin of the levator palpabrae superioris muscle.
- **2- Palprebral:** smaller and is located along the inner surface of the eyelid.



Orbital lacrimal gland

upper eyelid

#### Palpebral lacrimal gland

#### Lacrimal canaliculus

# **Lacrimal Gland**

### **Tear Ducts**

- Also known as **lacrimal ducts**, are small channels that drain tears from the eyes into the nasal cavity.
- They play a crucial role in maintaining the proper drainage and regulation of tear fluid

## **Conjunctival Sac**

- is a space between the eyelids and the eyeball.
- It serves as a reservoir for tears and facilitates their distribution over the ocular surface

**Vasculature:** The main arterial supply to the lacrimal gland is from the **lacrimal artery**.



# **Function of the lacrimal gland**

- Secrete lacrimal fluid, which consists of water, electrolytes, and proteins,
- contributing to the necessary lubrication and nourishment of the ocular surface.
- Its continuous secretion and drainage help maintain the health and clarity of the cornea.



## **Steps**

- Involves a coordinated process, starting with the lacrimal gland secreting tears, Followed by
- their distribution across the ocular surface during blinking.

## Function

- Tears are essential for maintaining ocular health by nourishing the cornea.
- Safe the eyes against foreign particles and pathogens.



# **Types of Tears**

## **Basal Tears**

- Are continually released to keep the ocular surface moist and nourished, contributing to the regular lubrication of the eyes,

## **Emotional Tears**

- Are triggered by intense emotions, stress, or pain.
- They contain additional proteins and hormones
- Not found in basal or reflex tears

## **Reflex Tears**

**3 Types of Tears Output Description Descr** 

- Are produced in response to irritants, environmental factors, or emotions, such as **wind**, **smoke**, or **emotional stress**.



Anatomy of the eye

Retina

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# **Retina Definition**

## The retina

- is the sensory membrane that lines the inner surface of the back of the eyeball.

- It's composed of several layers, including one that contains specialized cells called **photoreceptors**.

-There are **two types** of **photoreceptor cells** in the human eye — **rods** and **cones**.

# **Photoreceptors:**

## Rod:

Detect motion, provide black and white vision and function well in low light.( mainly in dim light and provide monochromatic vision).

## **Cones:**

- Are responsible for central vision and color vision and perform best in medium and bright light.

( Cones function in well lit conditions and are responsible for the perception of color)



retinal pigment epithelium (RPE) -



- **Rods** are located throughout the retina;
- **Cones** are concentrated in a small central area of the retina called the **macula**.
- At the center of the macula is a small depression called the **fovea**.
- **The fovea** contains <u>only cone photoreceptors</u> and is the point in the retina responsible <u>for maximum visual acuity</u> and <u>color vision</u>.

# **Retina Function**

- Photoreceptor cells take light focused by the cornea and lens
- Convert it into chemical and nervous signals which are transported to visual centers in the brain by way of the optic nerve. In the visual cortex of the brain, these signals are converted into **images** and **visual perceptions**.

# **Retinal layers**

#### **Retina consists of 10 distinct layers, from outside to inwards of the following layers:**

- 1. Retinal Pigment Epithelium (RPE)
- 2. Layer of Photoreceptors (Rods and Cones)
- 3. External Limiting Membrane (ELM)
- 4. Outer Nuclear Layer (ONL)
- 5. Outer Plexiform Layer (OPL)
- 6. Inner Nuclear Layer (INL)
- 7. Inner Plexiform Layer (IPL)
- 8. Ganglion Cell Layer (GCL)
- 9. Nerve Fiber Layer (NFL)
- 10. Internal Limiting Membrane (ILM)

- Each layer plays a critical role in the process of vision, from light detection to signal transmission to the brain.





# **Blood supply of the retina**

- The retina gets its blood supply from the following source:
- 1. The central retinal vessels (Artery and vein).
- 2. The choroid capillaries.



- The retina is highly metabolically active sheet of the neural tissue with the highest oxygen consumption of any human tissue.
- The retina has a highly selective blood tissue barrier, called **B**lood **R**etinal **B**arrier (**BRB**) **BRB has the following importance:**
- A. **Primarily** it **regulates** the optimal extracellular environment **to** facilitate neural transmission.
- B. It also **control** the passage of pathogens and intravascular leucocytes.
- C. Partly **protect** the neural environment from surveillance by **immune**



# Anatomy of the eye

The lems lecture 5

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# The lens

- is a biconvex, transparent structure located behind the iris.

# It consists of:

- 1.Lens Capsule: Elastic lens capsule.
- 2.Lens Epithelial: Anterior single layer
- of cuboidal epithelial cells.
- 3.Lens Fibres: Elongated lens fiber cells.

# WHAT IS THE STRUCTURE OF THE CRYSTALLINE LENS?



![](_page_51_Figure_0.jpeg)

# **Functions of the lens**

- 1. Maintains its own clarity
- 2. Protects retina from ultraviolet radiation
- 3. Provides ~1/3 of the eye's total refractive power (cornea provides the other ~2/3)
- 4. Flexibility allows for accommodation

# The lens

## **Refractive power**

- It is capable of varying the power of accommodation, allowing the eye to vary its focal point.
- This permits a clear retinal image for objects that are either distant or near.

![](_page_54_Picture_0.jpeg)