



جامعة المستقبل
كلية التقنيات الصحية والطبية
قسم تقنيات البصريات



First Stage 2023-2024

ANATOMY

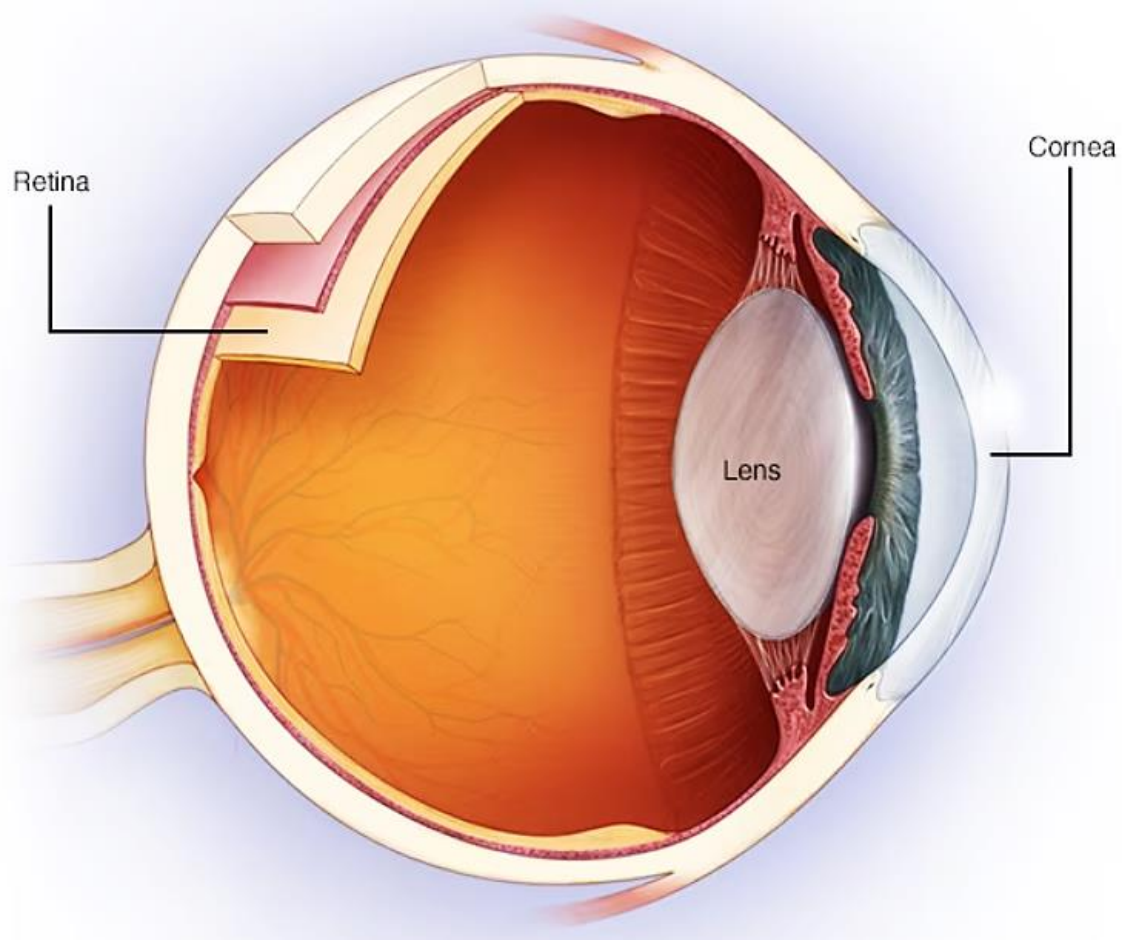
Practical Lecture Title
Cornea

Lecture Number: 2 / course 2

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CORNEA قرنية العين

The cornea is the transparent, curved front part of the eye that covers the iris, pupil, and anterior chamber. It plays a crucial role in focusing light onto the retina and accounts for a significant portion of the eye's refractive power. The cornea consists of five main layers:



- The word cornea has come from “kerato”. The term in Greek means horn or shield like.



Layers of Cornea

1. Epithelium:

- The outermost layer, comprising 5-6 layers of cells.
- Provides a smooth surface and protection against infections and injuries.
- Renews itself continuously through cell division.
- Its thickness ranges from about 50 to 60 micrometers (μm) on average.

2. Bowman's Layer:

- A thin, acellular layer composed of collagen fibrils.
- Provides structural strength and protects the stroma.
- It has an average thickness of approximately 8 to 12 μm .

3. Stroma:

- The thickest layer, comprising about 90% of the corneal thickness.
- Consists of regularly arranged collagen fibrils and keratocytes (corneal cells).
- The precise arrangement of collagen fibrils is crucial for transparency.
- On average, the stroma has a thickness of around 450 to 500 μm .

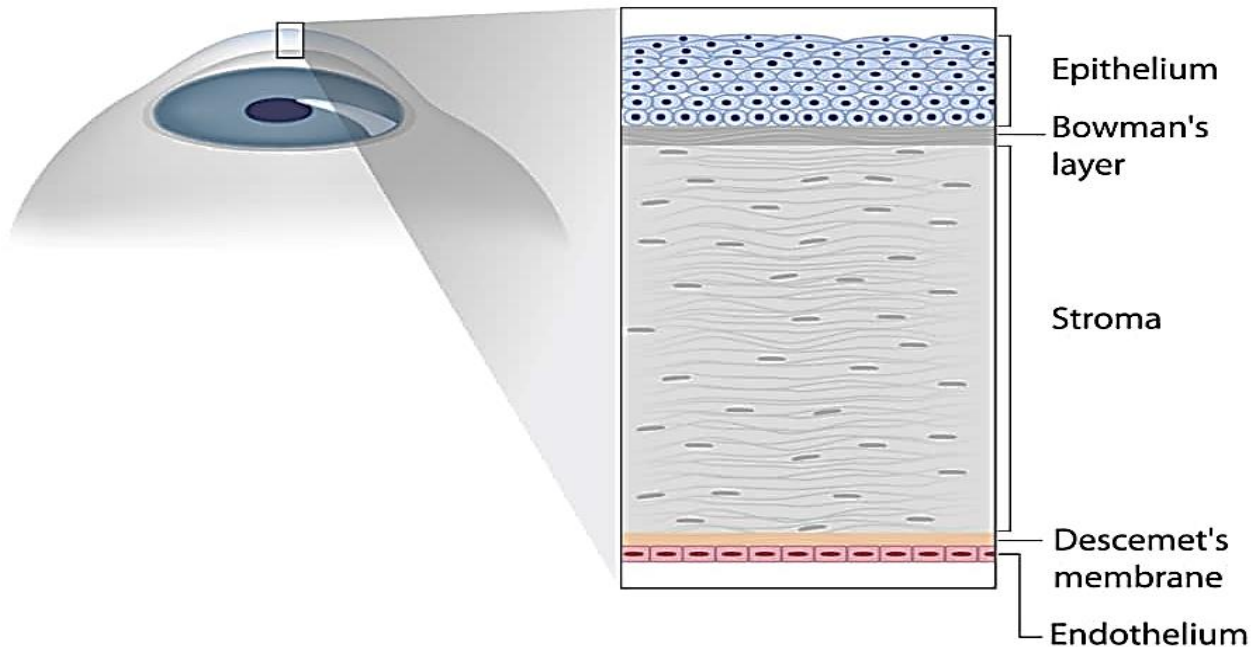
4. Descemet's Membrane:

- A thin, elastic layer that separates the stroma from the endothelium.
- Secreted by the endothelial cells during development.
- Its thickness ranges from about 8 to 12 μm .

5. Endothelium:

- A single layer of cells lining the inner surface of the cornea.

- Regulates the hydration level of the stroma by pumping out excess fluid.
- Maintains the cornea's transparency and dehydration.
- Its thickness is typically around 5 to 10 μm .



Measurements of Cornea

The curvature of the cornea is typically measured using two primary parameters:

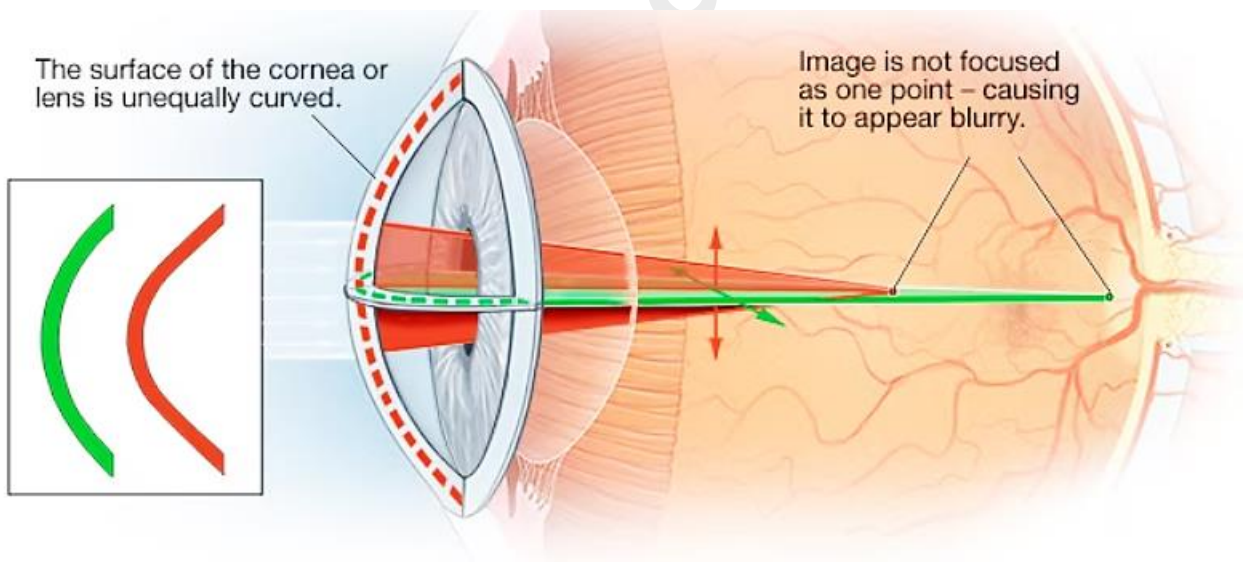
1. Corneal Power:

- Corneal power represents the refractive power of the cornea, which is the ability of the cornea to bend light rays. It is measured in diopters (D) and is derived from the radius of curvature.
- The average corneal power typically ranges from about 40 D to 45 D.
- It has a refractive index of 1.376

2. Corneal Curvature:

- The radius of curvature refers to the distance from the center of the cornea to its surface. It is measured in millimeters (mm) and represents the curvature of the cornea.
- The cornea is not perfectly spherical, so it has different radii of curvature in different meridians. Typically, two radii of curvature are measured:
 - ✓ one in the steepest meridian (usually the vertical meridian). Radius of curvature is approximately 7.7 mm
 - ✓ one in the flattest meridian (usually the horizontal meridian). Radius of curvature is approximately 7.8 mm

This curvature results from differences in the radius of curvature between the vertical and horizontal meridians, leading to astigmatism



3. Corneal Topography:

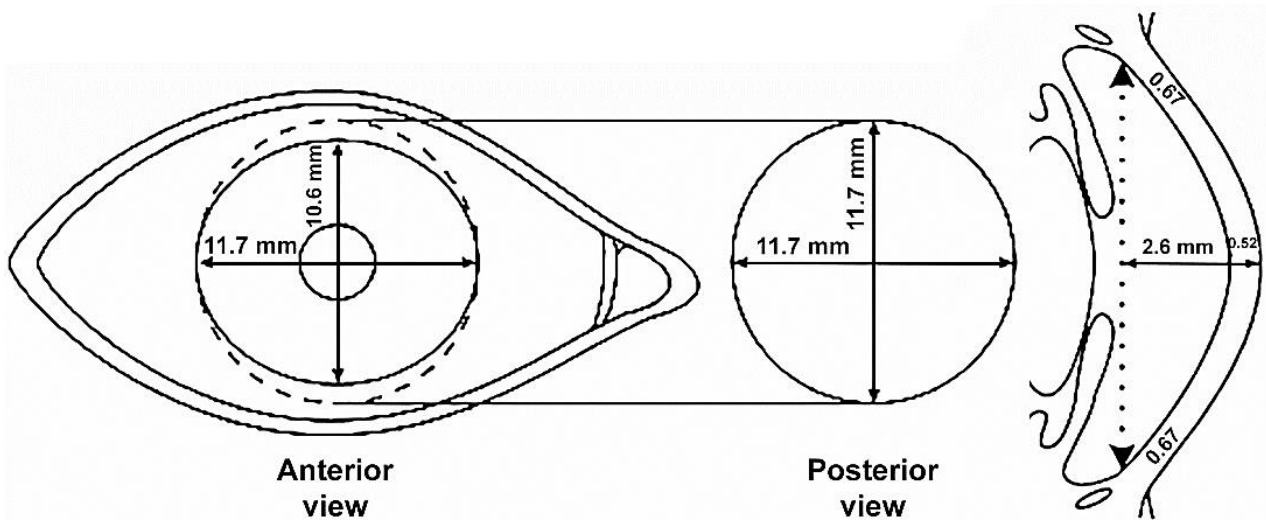
Anterior Surface:

- ✓ The anterior surface of the cornea is elliptical in shape.
- ✓ The horizontal diameter is approximately 11.7 mm.
- ✓ The vertical diameter is approximately 10.6 mm.

- ✓ The average radius of curvature for the anterior surface of the cornea is approximately 7.8 millimeters (mm).

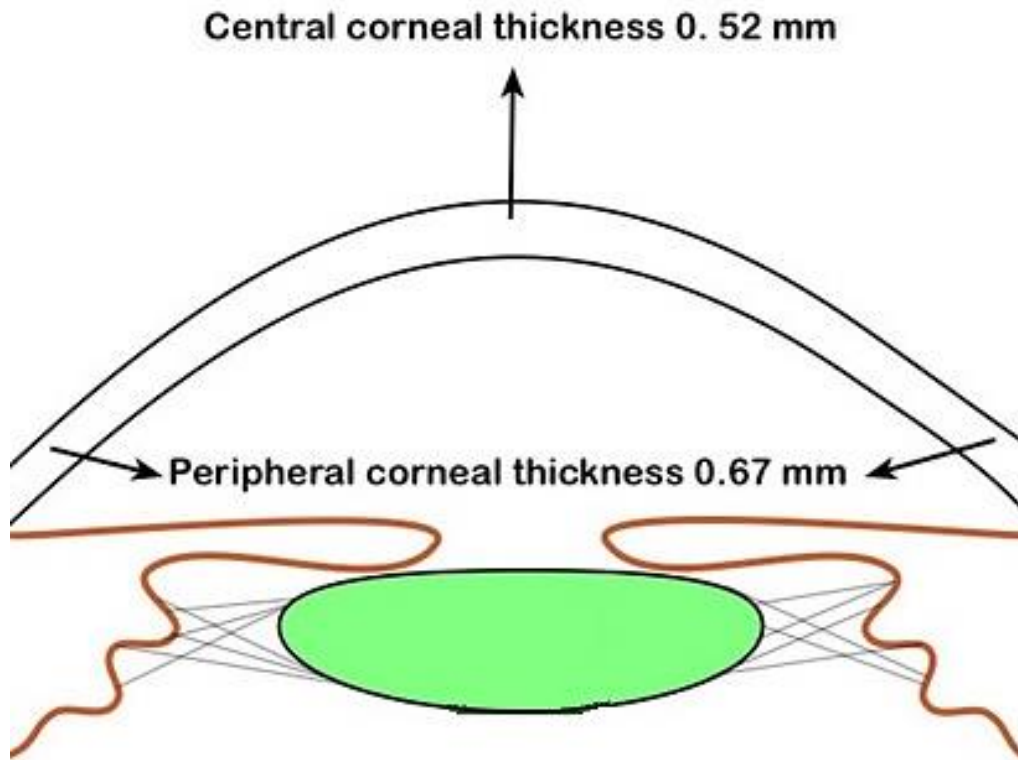
Posterior Surface:

- ✓ The posterior surface of the cornea is spherical.
- ✓ Its average diameter is 11.7 mm.
- ✓ The average radius of curvature for the posterior surface of the cornea is approximately 6.8 millimeters (mm).



4. Central Corneal Thickness (CCT):

CCT refers to the thickness of the central portion of the cornea. It is an essential measurement in assessing corneal health and is typically measured using pachymetry. The average CCT in healthy individuals ranges from around 500 to 600 micrometers (μm), but it can vary depending on factors such as age, refractive error, and corneal conditions.



Functions of the Cornea

The cornea plays several crucial functions for vision and eye health:

1. Refraction:

- The cornea is the primary refractive surface of the eye, control and focus the entry of light into the eye. The cornea contributes between 65-75 percent of the eye's total focusing power.

2. Protection:

- The cornea acts as a protective barrier for the eye, shielding the inner structures from dust, germs, and other harmful agents.

3. Filtration:

- The cornea filters out a significant portion of ultraviolet (UV) radiation from the sun, protecting the inner eye structures from damage.

4. Transparency:

- The precise arrangement of collagen fibrils and the lack of blood vessels (avascularity) in the cornea allow for maximum transparency, ensuring clear vision.

5. Sensation:

- The cornea is highly innervated, making it one of the most sensitive tissues in the body.

6. Tear film maintenance:

- The corneal nerve endings play a role in regulating tear production and maintaining a healthy tear film, which is essential for corneal clarity and comfort.

7. Wound healing:

- The corneal nerves are involved in the wound healing process, releasing neurotransmitters and other substances that aid in epithelial regeneration after injury or surgery.

8. Metabolic needs:

- The lack of blood vessels means the cornea relies on the tear film, aqueous humor, and atmospheric oxygen to meet its metabolic demands.

How does the cornea get oxygen?

The cornea gets its oxygen supply in a unique way compared to other tissues in the body. Here's how the cornea receives oxygen:

1. From the air

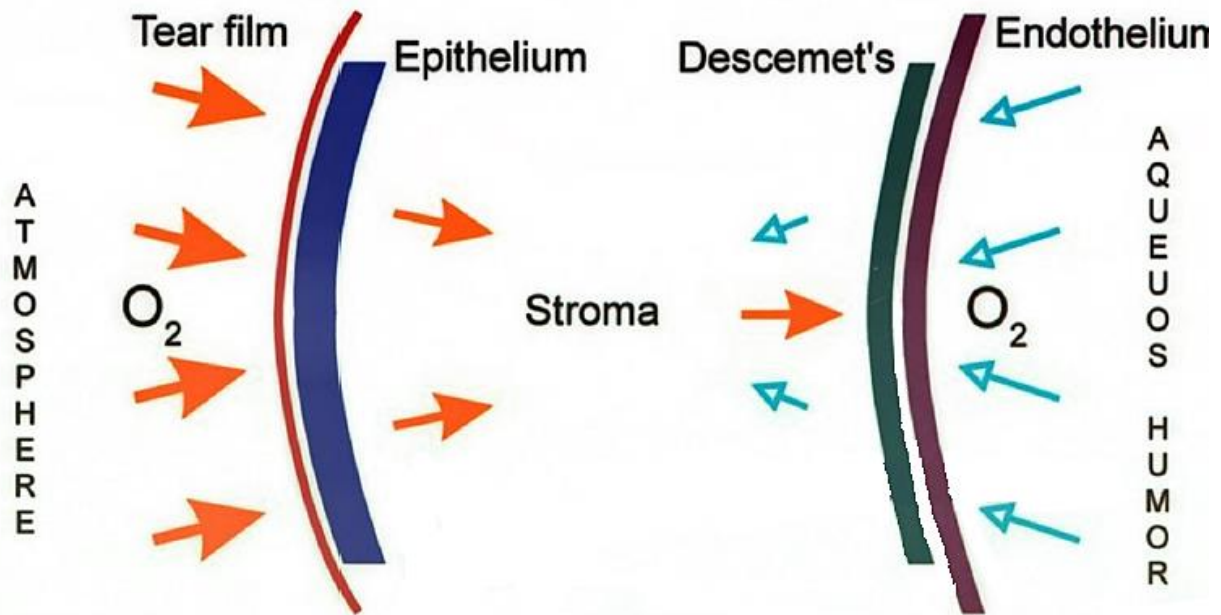
Since the cornea is exposed to the atmosphere, it gets about 90% of its oxygen directly from the air. The outermost epithelial cells of the cornea absorb oxygen from the tear film on the eye's surface.

2. From the tear film

The precorneal tear film, which is the thin liquid layer covering the cornea, contains dissolved oxygen. The tears receive their oxygen supply from the atmosphere and from blood vessels around the cornea.

3. From the aqueous humor

The remaining 10% of the cornea's oxygen comes from the aqueous humor, which is the fluid inside the anterior chamber of the eye behind the cornea. The aqueous gets its oxygen from the ciliary body's blood vessels.



Innervation of Cornea

The cornea is one of the most highly innervated tissues in the human body. The innervation of the cornea is provided by the ophthalmic division of the trigeminal nerve (the 5th cranial nerve).

