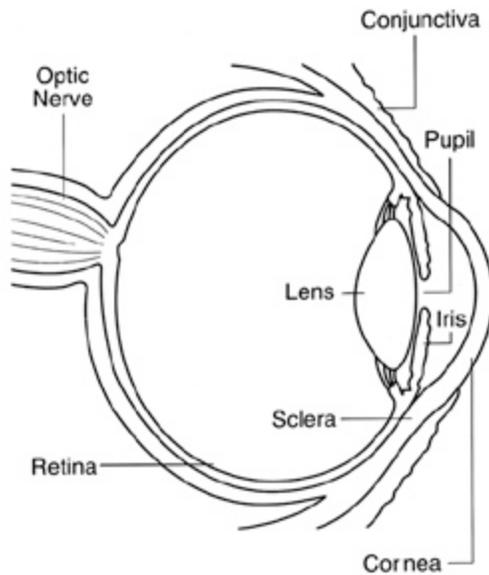


## Overview of the Cornea

### What is the cornea?

The cornea is the eye's outermost layer. It is the clear, dome-shaped tissue that covers the front of your eye.



Unlike most tissues in the body, the cornea has no blood vessels to nourish or protect it against infection. Instead, the cornea receives its nourishment from tears and aqueous humor (fluid) that fills the chamber behind it. The cornea must remain transparent to function properly, and the presence of even the smallest blood vessels or opacity can interfere with this process. To see well, all layers of the cornea must be clear.

The corneal tissue is arranged in five basic layers, each having an important function. These five layers are:

### Epithelium

The epithelium is the cornea's outermost layer, comprising about 10 percent of its thickness. The epithelium: (1) Blocks the passage of foreign material, such as dust, water, and bacteria, into the eye; and (2) Absorbs oxygen and cell nutrients from tears and distributes these nutrients to the rest of the cornea. The epithelium is filled with thousands of tiny nerve endings that make the cornea extremely sensitive to pain when rubbed or scratched. The base of the epithelium is called the basement membrane. This is where the epithelial cells anchor and organize themselves is called the basement membrane.

## **Bowman's Layer**

Lying directly below the epithelium is a transparent tissue known as Bowman's layer. It is composed of strong collagen. If it is injured, Bowman's layer can form a scar as it heals. If these scars are large and centered over the pupil, vision loss can result.

## **Stroma**

Beneath Bowman's layer is the stroma, which accounts for approximately 90 percent of the cornea's thickness. It is made primarily of water and collagen.. Collagen gives the cornea its strength, elasticity, and form. The collagen's unique shape, arrangement, and spacing are essential in producing the cornea's transparency.

## **Descemet's Membrane**

Under the stroma is Descemet's membrane, a thin but strong sheet of tissue that is a protective barrier against infection and injuries. Descemet's membrane is composed of a different type of collagen than the stroma and is made by the endothelial cells that lie below it. Descemet's membrane is able to regenerate after injury.

## **Endothelium**

The endothelium is the very thin, innermost layer of the cornea. Endothelial cells are essential in keeping the cornea transparent. Fluid leaks slowly from inside the eye into the middle corneal layer, or stroma. The endothelium's primary function is to pump this excess fluid out, keeping the cornea clear. Without this pumping action, the cornea would swell with water, become hazy, and ultimately opaque. In a healthy eye, a perfect balance is maintained between the fluid moving into the cornea and fluid being pumped out of the cornea. Once endothelium cells are destroyed by trauma or disease, they are gone forever. If too many endothelial cells are destroyed, corneal edema (swelling) and vision loss ensue. If vision loss is severe, a corneal transplant may be necessary to restore vision.

## **What is the function of the cornea?**

Because the cornea is as smooth and clear but is strong and durable, it helps the eye in two ways:

- It helps to shield the rest of the eye from germs, dust, and other harmful material. The cornea shares this protective task with the eyelids, the eye bones around the eye, tears, and the sclera, or white part of the eye.
- The cornea acts as the eye's outermost lens. It functions like a window that controls and focuses the entry of light into the eye. The cornea accounts for 65-75 percent of the eye's total focusing power.

When light hits the cornea, it bends--or refracts--the incoming light onto the lens. The lens further bends or refracts that light onto the retina, which is a layer of light sensing cells that line the back of the eye. For you to see clearly, light rays must be focused by the cornea and lens precisely on the retina. The retina converts these light rays into electric impulses that are sent to the brain by the optic nerve. The brain then interprets them as images.

The cornea also serves as a filter, screening out some of the most damaging ultraviolet (UV) wavelengths in sunlight. Without this protection, the lens and the retina would be highly susceptible to injury from UV radiation.