

Chapter Opener

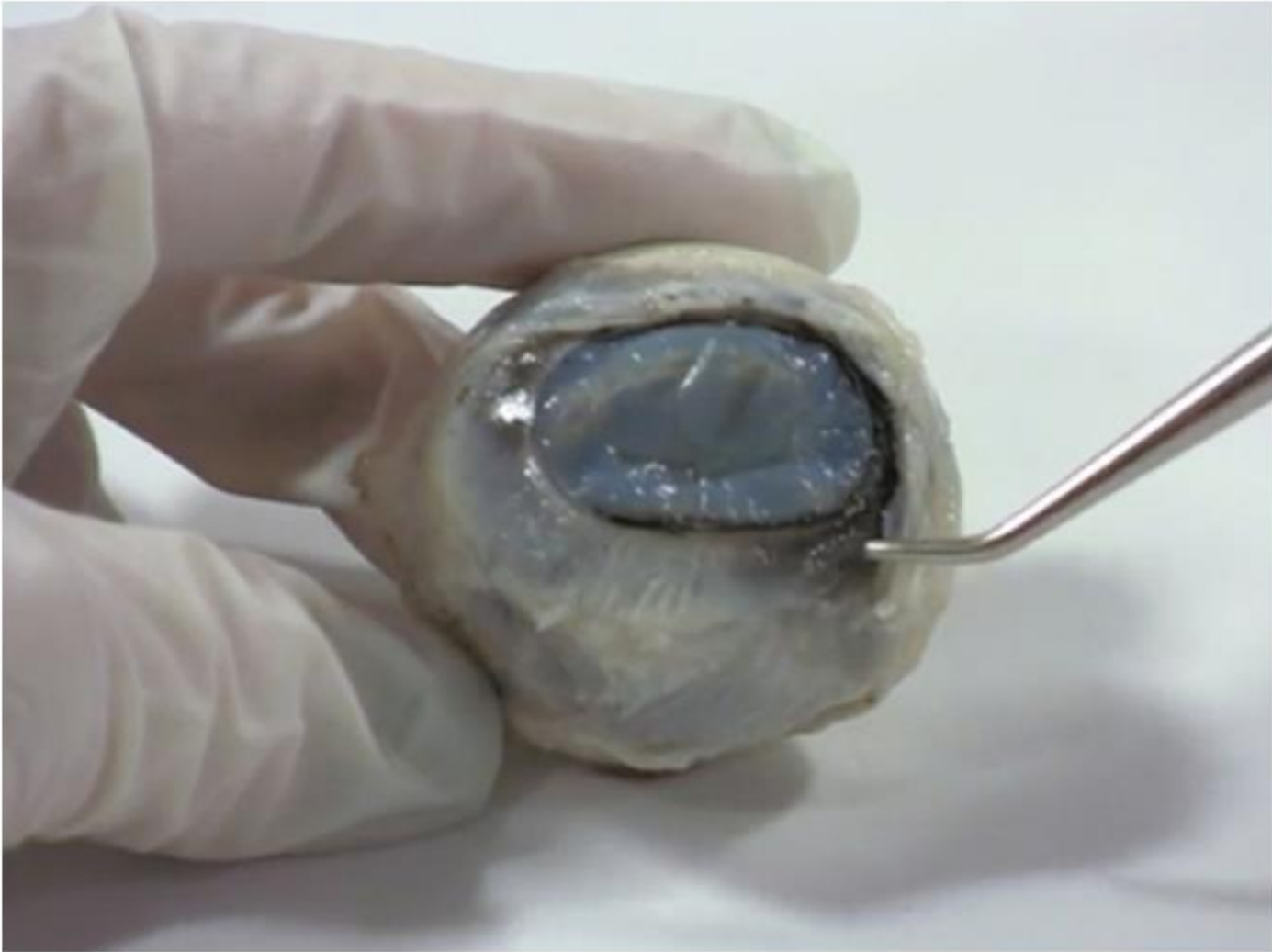
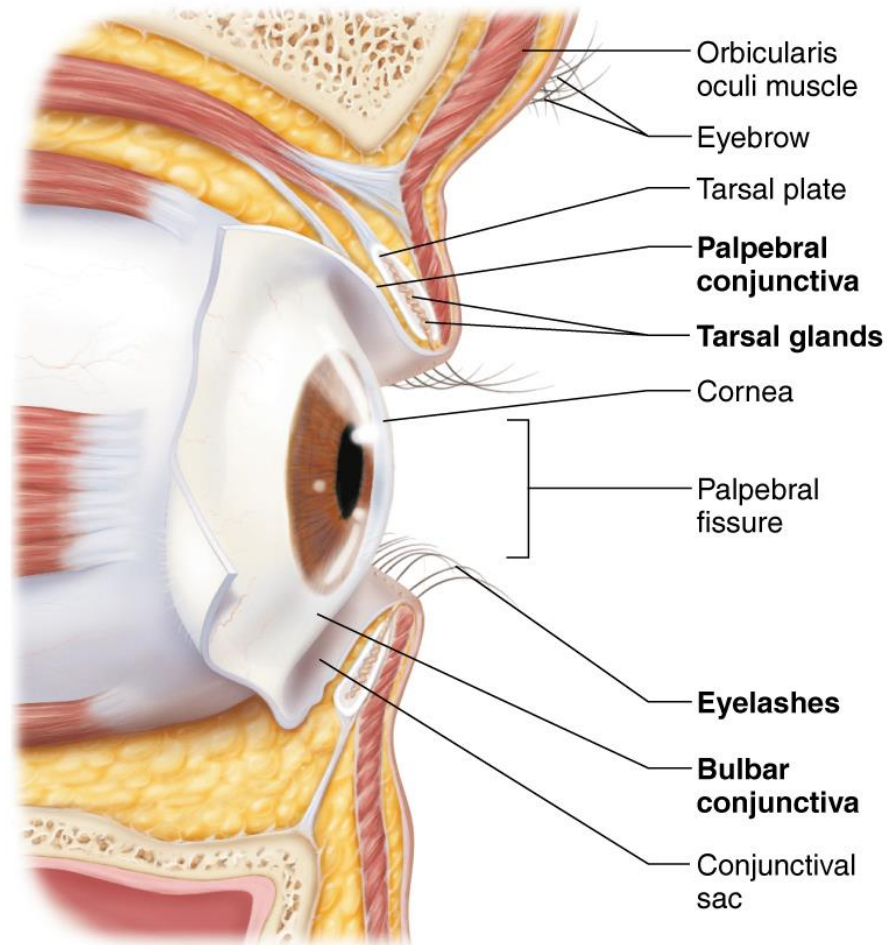
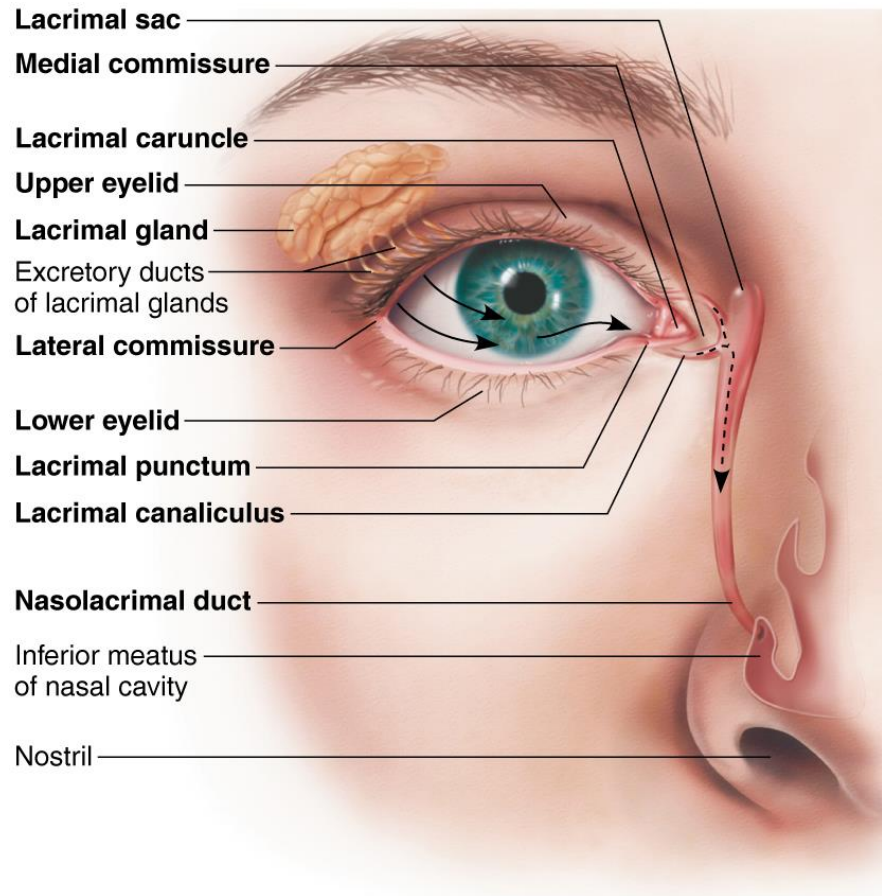


Figure 23.1a The Eye and Accessory Structures



(a)

Figure 23.1b The Eye and Accessory Structures

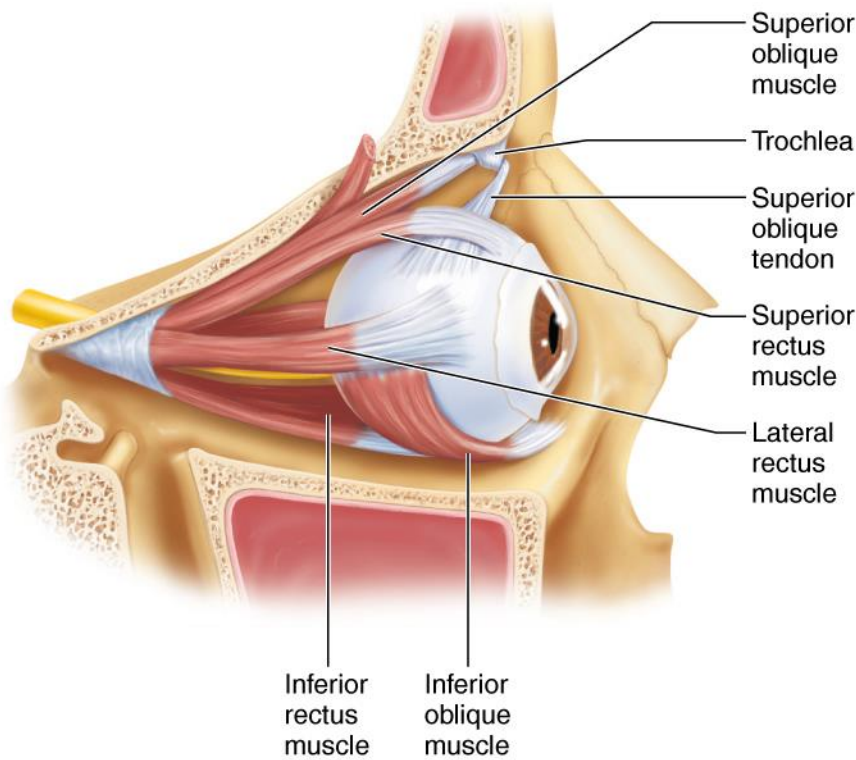


(b)

Table 23.1 Accessory Structures of The Eye (Figures 23.1 and 23.2)

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Structure	Description	Function
Eyebrows	Short hairs located on the supraorbital margins	Shade and prevent sweat from entering the eyes.
Eyelids (palpebrae)	Skin-covered upper and lower lids, with eyelashes projecting from their free margin	Protect the eyes and spread lacrimal fluid (tears) with blinking.
Tarsal glands	Modified sebaceous glands embedded in the tarsal plate of the eyelid	Secrete an oily secretion that lubricates the surface of the eye.
Ciliary glands	Typical sebaceous and modified sweat glands that lie between the eyelash follicles	Secrete an oily secretion that lubricates the surface of the eye and the eyelashes. An infection of a ciliary gland is called a sty .
Conjunctivae	A clear mucous membrane that lines the eyelids (palpebral conjunctivae) and lines the anterior white of the eye (bulbar conjunctiva)	Secrete mucus to lubricate the eye. Inflammation of the conjunctiva results in conjunctivitis, (commonly called "pinkeye").
Medial and lateral commissures	Junctions where the eyelids meet medially and laterally	Form the corners of the eyes. The medial commissure contains the lacrimal caruncle.
Lacrimal caruncle	Fleshy reddish elevation that contains sebaceous and sweat glands	Secretes a whitish oily secretion for lubrication of the eye (can dry and form "eye sand").
Lacrimal apparatus	Includes the lacrimal gland and a series of ducts that drain the lacrimal fluid into the nasal cavity	Protects the eye by keeping it moist. Blinking spreads the lacrimal fluid.
Lacrimal gland	Located in the superior and lateral aspect of the orbit of the eye	Secretes lacrimal fluid, which contains mucus, antibodies, and lysozyme.
Lacrimal puncta	Two tiny openings on the medial margin of each eyelid	Allow lacrimal fluid to drain into the superior and inferiorly located lacrimal canaliculi.
Lacrimal canaliculi	Two tiny canals that are located in the eyelids	Allow lacrimal fluid to drain into the lacrimal sac.
Lacrimal sac	A single pouch located in the medial orbital wall	Allows lacrimal fluid to drain into the nasolacrimal duct.
Nasolacrimal duct	A single tube that empties into the nasal cavity	Allows lacrimal fluid to flow into the nasal cavity.
Extrinsic eye muscles	Six muscles for each eye; four recti and two oblique muscles (see Figure 23.2)	Control the movement of each eyeball and hold the eyes in the orbits.

Figure 23.2 Extrinsic Muscles of The Eye



Muscle	Action
Lateral rectus	Moves eye laterally
Medial rectus	Moves eye medially
Superior rectus	Elevates eye and turns it medially
Inferior rectus	Depresses eye and turns it medially
Inferior oblique	Elevates eye and turns it laterally
Superior oblique	Depresses eye and turns it laterally

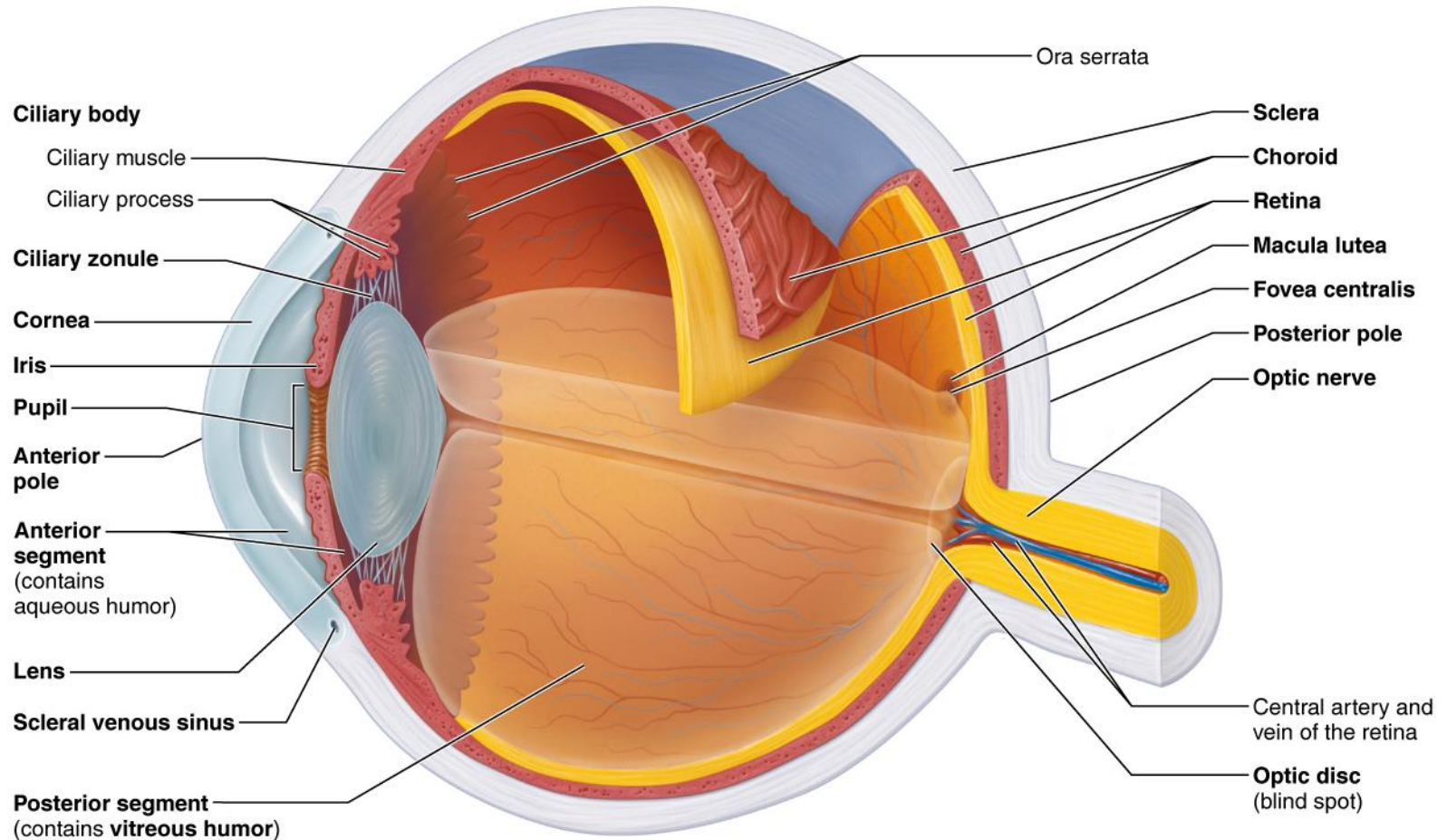
(b)

(a)

Table 23.2 Layers of The Eye (Figure 23.3)

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Structure	Description	Function
Fibrous Layer (External Layer)		
Sclera	Opaque white connective tissue that forms the “white of the eye.”	Helps to maintain the shape of the eyeball and provides an attachment point for the extrinsic eye muscles.
Cornea	Structurally continuous with the sclera; modified to form a transparent layer that bulges anteriorly; contains no blood vessels.	Forms a clear window that is the major light bending (refracting) medium of the eye.
Vascular Layer (Middle Layer)		
Choroid	A blood vessel–rich, dark membrane.	The blood vessels nourish the other layers of the eye, and the melanin helps to absorb excess light.
Ciliary body	Modification of the choroid that encircles the lens.	Contains the ciliary muscle and the ciliary process.
Ciliary muscle	Smooth muscle found within the ciliary body.	Alters the shape of the lens with contraction and relaxation.
Ciliary process	Radiating folds of the ciliary muscle.	Capillaries of the ciliary process form the aqueous humor by filtering plasma.
Ciliary zonule (Suspensory ligament)	A halo of fine fibers that extends from the ciliary process around the lens.	Attaches the lens to the ciliary process.
Iris	The anterior portion of the vascular layer that is pigmented. It contains two layers of smooth muscle (sphincter pupillae and dilator pupillae).	Controls the amount of light entering the eye by changing the size of the pupil diameter. The sphincter pupillae contract to constrict the pupil. The dilator pupillae contract to dilate the pupil.
Pupil	The round central opening of the iris.	Allows light to enter the eye.
Inner Layer (Retina)		
Pigmented layer of the retina	The outer layer that is composed of only a single layer of pigment cells (melanocytes).	Absorbs light and prevents it from scattering in the eye. Pigment cells act as phagocytes for cleaning up cell debris and also store vitamin A needed for photoreceptor renewal.
Neural layer of the retina	The thicker inner layer composed of three main types of neurons: photoreceptors (rods and cones), bipolar cells, and ganglion cells.	Photoreceptors respond to light and convert the light energy into action potentials that travel to the primary visual cortex of the brain.

Figure 23.3a Internal Anatomy of The Eye



(a) Diagram of sagittal section of the eye. The vitreous humor is illustrated only in the bottom half of the eyeball.

Review Figure 23.01

