

The tear film

The ocular surface is bathed constantly by the tears, secreted mainly by the lacrimal gland but supplemented by conjunctival secretions. They drain away via the nasolacrimal system.

The ocular surface cells express a mucin *glycocalyx* which renders the surface wettable. When the eyes are open, the exposed ocular surface (the cornea and nasal and temporal wedges of conjunctiva) are covered by a thin tear film, 3 μ m thick, which comprises three layers:

1 a thin *mucin layer* in contact with the ocular surface and produced mainly by the conjunctival goblet cells;

2 an *aqueous layer* produced by the lacrimal gland;

3 a surface *oil layer* produced by the tarsal meibomian glands and delivered to the lid margins.

Functions of the tear film

• It provides a smooth air/tear interface for distortion-free refraction of light at the cornea.

• It provides oxygen anteriorly to the avascular cornea.

• forms microvilli which project between and embrace the outer segment discs of the rods and cones:

• phagocytoses the redundant external segments of the rods and cones;

• facilitates the passage of nutrients and metabolites between the retina and choroid:

• takes part in the regeneration of rhodopsin and cone opsin, the photoreceptor visual pigments and in recycling vitamin A;

• contains melanin granules which absorb light scattered by the sclera thereby enhancing image formation on the retina.

The photoreceptor layer

tesale The photoreceptor layer is responsible for converting light inte The initial integration of these signals is also performed by t

• Cones (Fig. 1.8) are responsible for daylight a ol u vision and have ively high threshold to light. Different suit of cones a medium and long wavelen e, green, red). They ntimed at the fovea, which ole for detailed vicio. is D II ST ID S T ¹⁹Ig fine print. • Rods ar nespensible for night vision. The naw also light threshold and do not signal wavelength information (colour). They form the large majority of photoreceptors in the remaining retina.

The vitreous

- The vitreous is a clear gel occupying two-thirds of the globe.
- It is 98% water. The remainder is gel-forming hyaluronic acid traversed by a fine collagen network. There are few cells.
- It is firmly attached anteriorly to the peripheral retina, pars plana and around the optic disc, and less firmly to the macula and retinal vessels.

• It has a nutritive and supportive role.

Collapse of the vitreous gel (vitreous detachment), which is common in later life, puts traction on points of attachment and may occasionally lead to a peripheral retinal break or hole, where the vitreous pulls off a flap of the underlying retina.

The ciliary body

The ciliary body (Fig. 1.9) is subdivided into three parts:

- 1 the *ciliary muscle*;
- 2 the ciliary processes (*pars plicata*);
- 3 the pars plana.

Multiple choice questions

1 The cornea

- a Has an endothelial layer that regenerates readily.
- b Comprises three layers.
- c The endothelium actively pumps water from the stroma.
- d Is an important refractive component of the eye.
- e Has a stroma composed of randomly arranged collagen fibrils.

2 The retina

- a Is ten layers thick.
- b Has ganglion cells whose axons form the optic ner
- c Has three types of rods responsible for colour
- optic nerver Notesale volvin etinal pigment exitled un. production d The neuroretina is firmly attached to the
- e The RPE delivers vitar li odopsin prod

3. The lens

- a Grows throughout life.
- b Is surrounded by a collagenous capsule.
- c Cortical and nuclear fibres are nucleated.
- d Has a high refractive index owing to its protein content.
- e Changes in shape with accommodation.

4. The suspensory ligament of the lens (the zonule)

- a Attaches the lens to the ciliary body.
- b Is part of the iridocorneal angle.
- c Is composed of smooth muscle.
- d Transmits changes in tension to the lens capsule.

5. The posterior chamber

- a Is another name for the vitreous body.
- b Lies between the iris, lens and ciliary body.
- c Contains aqueous humour, secreted by the ciliary processes.
- d Is in communication with the anterior chamber.