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DEPARTMENT: MEDICINE AND SURGERY

1) Write an essay on the histological importance of the eyes in relation to their cellular functions

ANSWER

The eye is a photosensitive organ responsible for vision. It receives light through the cornea. The light is focused by the lens onto the retina which contains specialized cells that can code various patterns of the image for transmission to the brain via optic nerve. The eye is composed of three layers:

1) Tunica fibrosa(Outer layer)

2) Tunica Vasculosa(Middle layer)

3) Retina(Inner Sensory Layer)

The eye is covered by upper and lower eye lids, which protects the anterior surface

TUNICA FIBROSA

a) Sclera: Is the fibrous, external layer of the eyeball that protects the more delicate internal structures and provides sites for muscle insertion. The Sclera is the opaque white posterior 5/6 of the external layer. It is relatively vascular and consists of tough, dense connective tissue containing flat type 1 collagen bundles which intersects in various directions with a moderate amount of scattered fibrolasts.

b) Cornea: It is the anterior 1/6 of the eye. It is colourless, transparent and completely avascular. It is highly innervated and forms the sclera in a region called the Limbus. The cornea is composed of five layers:

\*Corneal epithelium: It is a stratified squamous non-keratinized epithelium. It lines the anterior aspect of the cornea. It possess microvilli in its superficial layer; the microvilli trap moisture, protecting the cornea from dehydration.

\*Bowman membrane: It is a homologous non-cellular layer that functions to provide form stability and strength to the cornea

\*Corneal stroma: This is the thickest corneal layer. It has channels located in the region of the limbus, that are lined by epithelium, forming the canal of schlemn. This canal drains fluid from the anterior chamber of the eye into the venous system

\*Dexement membrane: Is a thick basal lamina separating the stroma from the endothelium lining the cornea

\*Corneal endothelium: Lines the posterior aspect of the cornea. It is a simple squamous epithelium with cells that exhibit numerous pinocytic vessicles. It reasorbs fluid from the stroma, thus contributing to the transparency of the cornea. It also contributes to light refraction.

TUNICA VASCULOSA

It is the middle layer of the eye. It consists of three parts, from Sposterior to anterior:

\*Choroid: Is a highly vascular tunic in the posterior 2/3 of the eye, with loose, well vascularized connective tissue rich in collagen and elastic fibres, fibroblasts, melanocytes, macrophages, lymphocytes, mast cells and plasma cells. The abundant melanocyte give the layer its characteristic black color and block light from entering the eye except through the pupil.

\*Ciliary body: An anterior expansion of the choroid at the level of the lens, is a thickened ring of tissue lying just inside the anterior portion of the sclera. It completely circles the lens and separates the serrata from the iris. It is lined on its inner surface by two layers of cells, an outer pigmented columnar epithelium rich in melanin and an inner non-pigmented simple columnar epithelium

\*Iris: The iris is the most anterior extension of the Tunica Vasculosa that partially covers the lens, leaving a round opening in the center called the pupil. It consists of an irregular, discontinous layer of fibroblasts and melanocytes densely packed. The heavy pigmented epithelium of the iris prevents light from entering the eye except through the pupil. Melanocytes of the iris stroma also provides the colour of the eyes. The dilator pupillae muscle which is a smooth muscle with fibers that radiate from the periphery of the iris towards the pupil dilates the pupil by contracting upon stimulation by sympathetic nerve fibres

Sphincter pupillae muscle is also a smooth muscle from the iris arranged in concentric rings around the pupillary orifice. It constricts the pupil of contradicting upon stimulation by parasympathetic nerve fibres

REFRACTILE MEDIA OF THE EYE

1) Aqeuous Humor: It is a plasma-like fluid located in the anterior compartment of the eye, that is formed by the epithelial cells lining the ciliary process. It is secreted into the posterior chamber of the eye and their flows to the anterior chamber, from there, it enters the various system via the canal of the Schlemn

2) The lens: The lens is a transparent bi-convex structure immediately behind the iris . It focuses light on the retina. The lens has 3 principle components:

a) Lens capsule: Covererd by a thick capsule rich in proteolycans and type IV collagen. The lens capsule protects the underlying cells and provides the place of attachments for zonular fibres.

b) Lens epithelium: Consists of a single layer of cuboidal epithelial cells and is present on the anterior surface of the lens. At the posterior edge of this epithelium, near the equator of the lens, the cells divide to provide new cells that differenciates as lens fibres. This process allows for the growth of the lens

c) Lens fibres: They appear as thin, flattened structures. The fibres are densely packed together, forming a perfectly transparent tissue highly specialized for light refraction

3) Vitreous Body: Occupies the vitreous chamber behind the lens. It is composed of a transparent connective tissue containing mostly 99% water( vitreous humour). The only cells in the vitreous body are a few macrophages and a small population of cells near the membrane called hyalocytes which synthesize hyaluronate and collagen

4) Retina: The retina is the innermost of the three tunics of the eye and is responsible for photoreception. It has a shallow depression in its posterior wall that contains only cones; this avascular region called the forea centralis, exhibits the greatest visual acuity. The photoreception is achieved by the photoreceptor layers which are the rods and cone cells. The rods are more sensitive to light even of low intensity, which is why we can see even at night or when the light is dim

ASSESORY STRUCTURES OF THE EYE

1) Conjuctiva: It lines the eyelids and is reflected onto the anterior portion up to the cornea, where it becomes continous with the corneal epithelium.

2) Eyelids: The eyelids are lined internally by conjuctiva and externally by skin that is elastic and covers a supportive framework of tarsal plates. They contain highly modified sebaceous glands(meibonian glands) and sweat glands (glands of moli)

3) Lacrimal apparatus

a) Lacrimal gland

\* Is a compound tubuloalveolar gland with secretory units that are surrounded by an uncomplete layer of myoepithelial cells

\*It secrets tears. Tears drain via 6-12 ducts into the conjuctival fornix, from which the tears flow over the cornea and conjuctiva keeping them moist.

Tears( which contain Lysozymes, an antibacterial enzyme) then enters the lacrimal canaliculi