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COURSE TITLE : NEUROHISTOLOGY

1. Histological importance of the eye in relation to their cellular functions

The eye is a photosensitive organ that permits an accurate analysis of form, light intensity and color reflected from objects. Explained below are certain parts which helps in the functioning of the eye ;

• External features of the eye

⁃ Tear film : composed of deep aqueous mucin phase that supports a thin superficial lipid phase, the fluid produced helps in lubrication and protection

⁃ Accessary glands : apocrine glands of moll, meibomain glands, lacrimal glands all help produce secretions which lubricates the eye

⁃ Muscles : smooth muscles located around the eye help in movement and protection of the eye

• Internal structures of the eye

• Outermost layer

⁃ Conjuctiva : consists of unkeratinized both stratified squamous & stratified columnar epithelium with goblet cells and accessory lacrimal glands which help with lubrication and also contribute to immune surveillance

⁃ Sclera : this Is a dense connective tissue made up of type 1 collagen fibers oriented in different directions giving it a white appearance this histological feature aids in protective function and also helps give it form

⁃ Cornea : It has 5 layers namely epithelium (non-keratinized stratified squamous epithelium), Bowman layer, stroma, Descemet’s membrane, corneal endothelium. It’s stroma consists of type 1 collagen fibers oriented in uniform parallel directions giving it a transparent look this contributes to about 70% of the refractive power of eye .

⁃ Limbus : forms border between transparent cornea & opaque sclera , contains pathway for aqueous humor outflow which helps to nourish the lens and maintain pressure in the eye

• Middle layer (uvea)

⁃ Iris : consists of stromal layer with pigmented, fibro vascular tissue & pigmented epithelial cells beneath the stroma. The anterior surface of the iris is an incomplete layer of fibroblasts while deeper part contains blood vessels and nerves, sphincter & dilator pupillae muscles which is connected to the pigmented layer and ensures rays of light moves through the pupil to the retina. On posterior side is a double layer of pigmented epithelial cells reflected at pupillary margin, the basal lamina of inner layer faces the lens.

⁃ Ciliary body : extends from limbus to anterior limit of retina and choroid, it is covered by an outer pigmented ciliary epithelium (which produces the aqueous humor) & inner non-pigmented ciliary epithelium. The presence of muscles in the ciliary body help to control the tension on the lens capsule which helps in changing the shape of the lens to accommodate light rays

⁃ Choroid : consists of dense network of blood vessels which supply the outer retina and pigmented connective tissue on the epithelium which helps in light absorption.

• Inner layer

⁃ Retina : consists of a pigmented epithelium adjacent to the choroid which helps absorb light and reduce back reflection of light onto the retina, the photoreceptor contains segments of rods and cones which respond to dark and bright light respectively. Presence of bipolar cells which convert photon of light to neurochemical energy via action potentials

⁃ Lens : consists of outer capsule, middle layers called cortex & inner layer called nucleus. The second refracting unit of the eye focuses light rays on retina , it is adjusted by the action of zonular fibers and ciliary muscles.

2. Briefly discuss the layers of retina

This is the innermost layer of the wall of the eye consisting of 8 layers, namely from outer to inner

⁃ Pigmented epithelium: cuboidal cells that absorb light not captured by photoreceptors, also contributes to maintenance of rods and cone outer segments. It establishes a blood-retina barrier through tight junctions

⁃ Receptor layer: layer is cells with photoreceptors cells. Rods are more peripheral and more sensitive to light & motion while cones have higher visual acuity and specificity for color vision

Outer limiting membrane : layer of muller cells & rod/cone junctions which serve to separate the photosensitive region of retina from areas that transmit the electrical signals

⁃ outer nuclear layer : layer of nuclei of rods and cone cells

⁃ Plexiform layer : contains dendrites of bipolar cells synapsing with axons of photoreceptor cells

⁃ Inner nuclear layer: contains cell bodies of glial, amacrine & bipolar cells

⁃ Inner plexiform layer : contains axons of amacrine, bipolar & glial cells of inner nuclear layer

⁃ Ganglion cell layer : contains cell bodies of ganglion cells, whose axons projects to the brain

⁃ Nerve fiber layer: contains axons from ganglion cells which travel across to retina to the optic nerve to pass the optic chiasm and optic tract to the thalamus

Inner limiting membrane : A thin layer of muller glial cells & basement membrane which demarcates the virteous anterior you from retina posteriorly