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COURSE> NEUROHISTOLOGY/ ANA 305

Assignment

1. Write an essay on the histological importance of eye in relation to their cellular functions
2. Corona virus can penetrate the body through eye and implicate the immune system, briefly discuss the layer of retina for information penetration

Answer 1

Histological understanding of the layers and cells of the eye is essential for appreciating disease pathophysiology and also understanding certain therapeutic approaches. The eye has the outermost layer, middle layer and innermost layer.

OUTERMOST LAYER OR FIBROUS LAYER OF THE EYE> it is composed of the sclera and cornea

Sclera> dense connective tissue made up of type 1 collagen fibers, lack of parallel orientation of collagen fibers gives the sclera its white appearance, it has four layers> episclera, stroma, lamina fusca, and endothelium, it functions to provide protection and form to the eye.

Cornea> consist of type 1 collagen fibers oriented in a uniform parallel direction to maintain transparency, it consists of five layers> non-keratinized stratified squamous epithelium, bowman layer also called substantia propria, descemet's membrane and corneal epithelium. It functions to refract the light that enters the eye.

MIDDLE LAYER OR VASCULAR LAYER OF THE EYE> it is also called th UVEA, consist of the iris, ciliary body and choroid

Iris > consists of stromal layer with pigmented tissue and pigmented epithelial cells beneath the stroma. The pigmented layer of cells blocks rays of light and ensures that light must move through the pupil to reach the retina. The angle formed by the iris and cornea contains connective tissue with endothelial channels called the trabecular meshwork, which drains aqueous humour in the anterior chamber into the venous canal of schlemm and from here drains into the episcleral veins. It functions to control light constantly, adapts to lighting changes and is responsible for near point reading.

Ciliary body> the tissue that divides the posterior chamber and vitreous body, consists of ciliary muscle which via the lens zonules controls the structures of the lens, which is vital for accommodation. Zonules are connective tissue fibers that connect the ciliary muscle and lens. The ciliary epithelium, produces aqueous humour which fills the anterior compartment of the eye.

Choroid > consists of dense network of blood vessels supplying nourishment to structures of the eye, housed in loose connective tissue. The choriocapillary layer is located in the innermost part of the choroid and supplies the retina. The bruch membrane is an extracellular matrix layer situated between the retina and choroid and has significance ion age-related macular degeneration, where an accumulation of lipid deposits prevent diffusion of nutrients to the retina.

INNERMOST LAYER OF THE EYE> consist of lens, vitreous and retina

Lens > separates the aqueous and vitreous chambers. Consist of an outer capsule, a middle layer called cortex and an inner layer called the nucleus. The capsule is the basement membrane of the lens epithelium which lies below. New lens cells differentiate from lens epithelium and are incorporated peripherally, pushing older lens cells towards the middle. It functions with the help of the cornea to refract light focused on the retina, therefore creating images on it.

Vitreous > a jelly-like space made of type IV collagen separating the retina and the lens, it plays an important role in maintaining the shape of the eye and also causes refraction of light before it reaches the retina.

Retina > nervous tissue of the eye where photons of light convert to neurochemical energy via action potentials. It functions by converting the light rays into impulses and sending the signals to the brain through the optic nerve. The retina consist of two major layers among its many layers; the inner one, the neural retina, contains the neurons and photoreceptors, the outer pigmented layer is an epithelium resting on bruch's membrane just inside the choroid. The diverse functions of the cells in the retinal pigmented epithelium include the following;

1. Serve as an important part of the blood-retina barrier
2. Absorb light passing through the retina to prevent its reflection
3. Phagocytose shed components from the adjacent rods and cones
4. Remove free radicals
5. Isomerize and regenerate the retinoids used as chromophores by the rods and cones

Answer 2

The retina is the thick layer of the eye inside the choroid, between the vitreous body and the choroid the retina can usually be seen to have ten distinct layers, following the path of the light;

1. Retinal pigment epithelium; known as the pigmented layer, made of cuboidal cells containing melanin which absorbs light. These cells also establish a blood-retina barrier through tight junctions.
2. Rod and cone cell layer; the layer of cells with photoreceptors and glial cells. Rods are located peripherally and are more sensitive to light and motion than cones. Cones have higher visual acuity and specificity for colour vision.
3. Outer limiting layer; a layer of muller cells and rod/cone junctions which serves to separate the photosensitive regions of retina from the areas that transmit the electrical signals.
4. Outer nuclear layer; this layer consists of nuclei of rod and cone cells
5. Outer plexiform layer; this layer contains synaptic processes of rod and cone cells
6. Inner nuclear layer; this layer contains the cell body of glial, amacrine, bipolar and horizontal cells
7. Inner plexiform cells; relays information from cells of inner nuclear layer. Thus , this layer has axons of amacrine, bipolar and glial cells and dendrites of retinal ganglion cells
8. Ganglion cell layer; contains nuclei of retinal ganglion cells
9. Nerve fiber layer; contains axons of retinal ganglion cells and the astroglia which support them collectively, these axons constitute the optic nerve
10. Internal limiting layer; a thin layer of muller glial cells and basement membrane which demarcates the vitreous anteriorly from the retina posteriorly.

