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17/MHS01/137

300 level

ANA305(Neurohistology)assignment

Special senses

Questions

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

Answers

1. The human eye is a sense organ capable of receiving visual images, which are then carried to the brain. It is a highly specialized organ of photoreception that is the conversion of light energy to nerve action potential. The photoreceptors are modified dendrites of two nerve cells, rod cells and cone cells.

The eye is made up of 3 layers, outer corneoscleral layer, intermediate uveal layer and inner retinal layer.

* Corneoscleral layer: forms a tough fibroelastic capsule which supports the eye the posterior five-sixths, the sclera is opaque and insertion of extraocular muscles. Anterior one-sixth is the cornea is transparent. The cornea is the principal refracting medium of the eye and roughly focuses images on the retina. Surface of the eye is covered by the conjunctiva.
* Uveal layer: highly vascularized, made up of choroid, ciliary body and iris. The iris consists of stromal layer with pigmented fibrovascular tissue and pigmented epithelial cells beneath stroma. Pigmented layers of cells block rays of light and ensure light moves through pupils to reach the retina. Iris drives aqueous chamber to posterior and anterior.

The choroid consists of dense network of blood vessels supplying nourishment to structures of the eye housed in loose connective tissues.

Ciliary body consists of ciliary muscles and ciliary epithelium. The ciliary muscles control accommodation. The ciliary epithelium produces aqueous humor which fills the anteriorcompartment of the eye

Lens separated the virtreous and aqueous layer. It has outer capsule, middle cortex and nine nucleus.

* Retinal layer. Nervous tissues where photons of light converts neurochemical energy via action potential. It contains pigment cells, photoreceptor cells and nerve fibers. It consists of 10 layers.
* **Clinical Significance**
* Detached retina: A condition when the retina comes loose. It requires urgent treatment.
* Diplopia or double vision: This can be caused by several conditions that are often serious and should be checked by a doctor, as soon as possible.
* Floaters: These are specks that drift across a person’s visual field. They are normal but can also be the sign of something more serious, such as retinal detachment.
* Glaucoma: Pressure builds up inside the eye and can eventually damage the optic nerve. It can eventually lead to loss of sight.
* Myopia: This is otherwise known as nearsightedness. With myopia, it is difficult to see things that are far away.
* Optic neuritis: The optic nerve becomes inflamed, often due to an overactive immune system

1. The retina is the innermost layer of the wall of the eye. It is responsible for the visual processing that turns light energy from photons into three dimensional images. It is in immediate contact with the vitreal cavity on one side and with the choroid (of the uveal layer) on the other side. The retina itself consists of six different cell lines divided into ten different layers, each playing a specific role in creating and transmitting vision. The different cell types perform a particular role and form functional circuits that specialize in detecting specific variations and movements of light. The cellular layer of the retina as follows:

* The pigmented epithelium, which forms a single layer resting on Bruch’s membrane which separates them from the choroid. It absorbs light to reduce the back reflection of light onto the retina.
* External limiting membrane: layer of the rods and cones, which converts light by photoreceptor cells into electric impulses. The ELM forms a barrier between the subretinal space, into which the inner and outer segments of rods and cones project to be in close association with the pigment epithelial layer behind the retina, and the neural retina proper.
* Outer nuclear layer: This layer contains the rod and cone granules that sense photon, extensions from the rod, and cone cell bodies.
* Outer plexiform layer: contains synaptic connections between the short axons of the photoreceptor cells and integrating neurons. Capillaries are also found to be primarily running through the outer plexiform layer.
* Inner nuclear layer: This layer of the retina contains the cell bodies of bipolar cells, horizontal cells, and amacrine cells.
* Inner plexiform layer: the cells lie here. The integrating neurons make synaptic connections with dendrites of neurons whose axons form the optic tract.
* Ganglionic layer: the cell bodies of the optic tract neurons (retinal ganglion cells) comprise of this layer. As a rule of thumb, smaller RGCs dendrites arborize in the inner plexiform layer while larger RGCs dendrites arborize in other layers.
* Optic nerve fiber layer: the afferent fibers pass towards the optic disc to form the optic nerve.
* Inner limiting membrane: this demarcates the innermost layer of the retina from the vitreous body and thereby forming a diffusion barrier between the neural retina and vitreous humor. The ILM contains laterally contacting Muller cell synaptic boutons and other basement membrane parts.

**Clinical Significance**

In a retinal detachment, layers of rods and cones become detached from the Retinal pigment epithelium. The separation of the neurosensory layer of the retina from the outermost pigmented epithelium leads to the degeneration of photoreceptors and subsequent vision loss. Symptoms of early retinal detachment include flashes and floaters in the affected eye or a veil/curtain type of vision loss that is constant (vs. transient loss due to amaurosis fugax). Treatment includes lasering around the detached area to re-adhere the retina to the underlying retinal pigment epithelium or doing a vitrectomy and filling the eye with oil to press the retina back onto the RPE. Common causes of retinal detachment include trauma, hypertension, and diabetic retinopathy.