MANAGEMENT OF ANTERIOR SEGMENT COMPLICATIONS OF POSTERIOR SEGMENT SURGERIES

An Essay

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مناجزة مضاعفات عمليات الجسم الزجاجي والشبكية على الجزء الأمامي للعين

رسالة توطئة للحصول علي درجة الماجستير في طب وجراحة العيون

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Posterior segment of the eye is the posterior two thirds of the eye that include the anterior hyaloids membrane and all of the optical structures behind it.

Posterior segment surgeries are indicated in many cases include: Vitreous floaters, Retinal detachment, Diabetic retinopathy, Macular holes, Macular pucker and Vitreous hemorrhage. (M.Roth 2005)

Posterior segment surgeries include:

1- **Vitrectomy** is surgery to remove some or all of the vitreous humor from the eye.

2- **Pars plana vitrectomy** is a general term for a group of operations accomplished in the deeper part of the eye. (R.MacHemer 1995)

- **<u>Additional surgerical steps include</u>:**

  Epiretinal Membrane Removal

  <u>Fluid/air exchange</u> -injection of air into the eye to remove the intraocular fluid from the posterior segment of the globe while maintaining intraocular pressure to temporarily hold the retina in place or seal off holes in the retina

Air/gas exchange – injection of gas, or more typically mixed gas and air, into the posterior segment of the globe. Typical gases used are perfluoropropane or sulfur hexafluoride.

Silicone oil injection – filling of the eye with liquid silicone to hold the retina in place.

Photocoagulation – laser treatment to seal off holes in the retina or to shrink unhealthy, damaging blood vessels which grow in some diseases such as diabetes.

Scleral buckling – placement of a support positioned like a belt around the walls of the eyeball to maintain the retina in a proper, attached position.

Posterior segment surgeries may result in anterior segment complications include :

Conjunctival damage from using various instruments to stabilize the eye. (Arevalo JF et al., 2008)

Corneal epithelial defects are caused by excessive use of topical anesthetics, excessive exposure to povidone iodine, and inattention to corneal irrigation result in iatrogenic damage to the corneal epithelium.(Rizzo S et al., 2008)

Corneal endothelial failure is caused by poor quality infusion fluid , prolonged operating times with excessive fluid throughout. (Charles S 2007)

Cataract. Development of posterior capsular cataract (Bhatnagar P et al., 2008)

Glaucoma Glaucoma remains the most common and significant anterior-segment complication of posterior vitrectomy

Refractive changes from encircling buckles and silicone oil remain a significant issue in vitreoretinal surgery

Iris damage from iris retractors, sphincterotomies, iris sutures, and phaco probe contact results in cosmetic problems

Improved surgical instruments, equipments and techniques have reduced the prevalence and severity of complications that occur during and after vitreous surgery. However, complications occur despite these improvements, and so, the surgeon must weigh the benefits of Vitrectomy against the possible complications (Charles S et al., 2006)

Aim of the work

This study is designed to spot light on:

- Anterior segment complications of posterior segment surgeries.
- Recent modalities in the management of anterior segment complications of vitreoretinal surgeries.

Posterior segment anatomy

The posterior segment comprises the posterior two third of the eye. That includes the vitreous body, retina, choroid and optic nerve.

Vitreous

The vitreous gel is a transparent matrix that fills the cavity behind the lens of the eye. It occupies an average volume of 4.4 ml in adulthood. It is surrounded by and attached to the retina and lens of the eye. It is a virtually acellular, highly hydrated gel matrix, composed of approximately 99% water. The transparent nature of the vitreous makes it challenging to study its structure and anatomy.(Johnson MW 2010)

The gel structure is maintained by a dilute network of thin, unbranched collagen fibrils that are mixed together in composition, comprising collagen types II, V/XI and IX in a molar ratio of 75:10:15, respectively. Collagen type V/XI forms the core of the fibrils, with type II surrounding the core and type IX on the outside of the fibril. The spaces between these collagen fibrils are mostly filled by glycosaminoglycans (GAGs). (Bishop PN 2000)

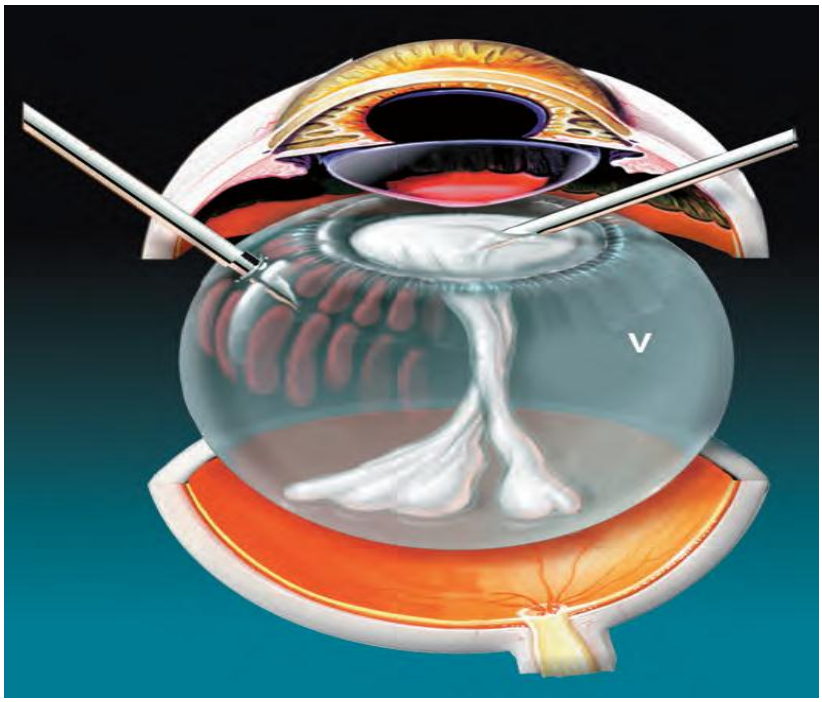

Figure (1): Vitreous (V). The vitreous gel is made up primarily of water (99%) and has only 1% solid, chemical and protein constituents. There are normally no blood vessels within the vitreous gel.(Boyd S et al. 2010)

Retinal pigmented epithelium:

The retinal pigment epithelium (RPE) is a unilayer of polygonal cells that are fairly uniform in size and pigment content, except at the macular area and the vitreous base.(Jones WL 2007)

Some of the main functions of the RPE are the renewal of photoreceptor outer segments , deturgescence of the subretinal space, phagocytosis of the discarded discs of rods and cones. The

inner surface of an RPE cell has tiny extensions, known as microvilli, that are located between the photoreceptors. The space between the microvilli and the photoreceptors is filled with a material that has the staining properties of mucopolysaccharide and is composed of cylinders of material around the microvilli and the outer segments of the photoreceptors. The matrix sheaths serve as a bond between the sensory retina and the RPE and are a bioactive adhesive that becomes inactive 1 minute after death. Fluid that percolates through breaks in the sensory retina may weaken this bond and lead to a retinal detachment.(Jones WL 2007)

Photoreceptors:

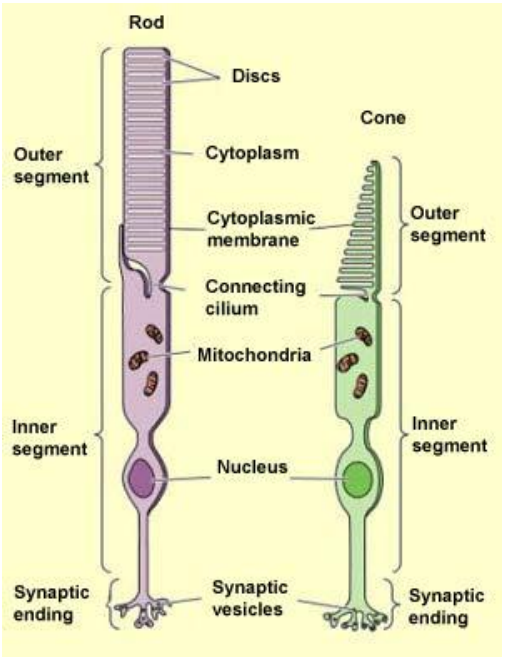

Figure (2): The structure of the photoreceptors: rods (a) and cones (b) (Glenda C& Mercer M 2003)

The photoreceptors are specialized neuroepithelial cell derived from neuroectoderm .the two types of photoreceptors are rods and cones,Each rod or cone cell contains photoreceptor elements and an axon. Cones have a projection called a pedicle at the termination of the axon, which contacts a dendrite. Rods have a similar projection called a spherule. There are three types of cones, varying in specific sensitivity to different wavelengths (colors) of light.(Kolb H et al.,1995)

Each photoreceptor portion of a rod or cone is anatomically divided into an outer segment and an inner segment. In a rod, the outer segment contains the pigment rhodopsin within free floating discs. These discs are stacked within a sleeve, similar to a roll of coins. Iodopsin pigment is contained within cones in folded layers inside a continuous outer membrane. The photoreceptor inner segment contains the cell nucleus and other subcellular structures.

The central retina is cone dominated and the peripheral retina is rod dominated. The highest density of cones is at the center of the fovea. There are no rods in the center of the fovea. At the center of the macula is the fovea, a pit where the cones are smallest and arranged in a mosaic to provide highest and most efficient optical density. (Kolb H et al.,1995)

They are approximately one hundred million rods and five million cones .Rods mediate dim light vision and have great sensitivity.Cones function in bright light and are responsible for colour vision and pattern recognition.((Quillen DA &Blod BA,2002)

Neurosensory retina:

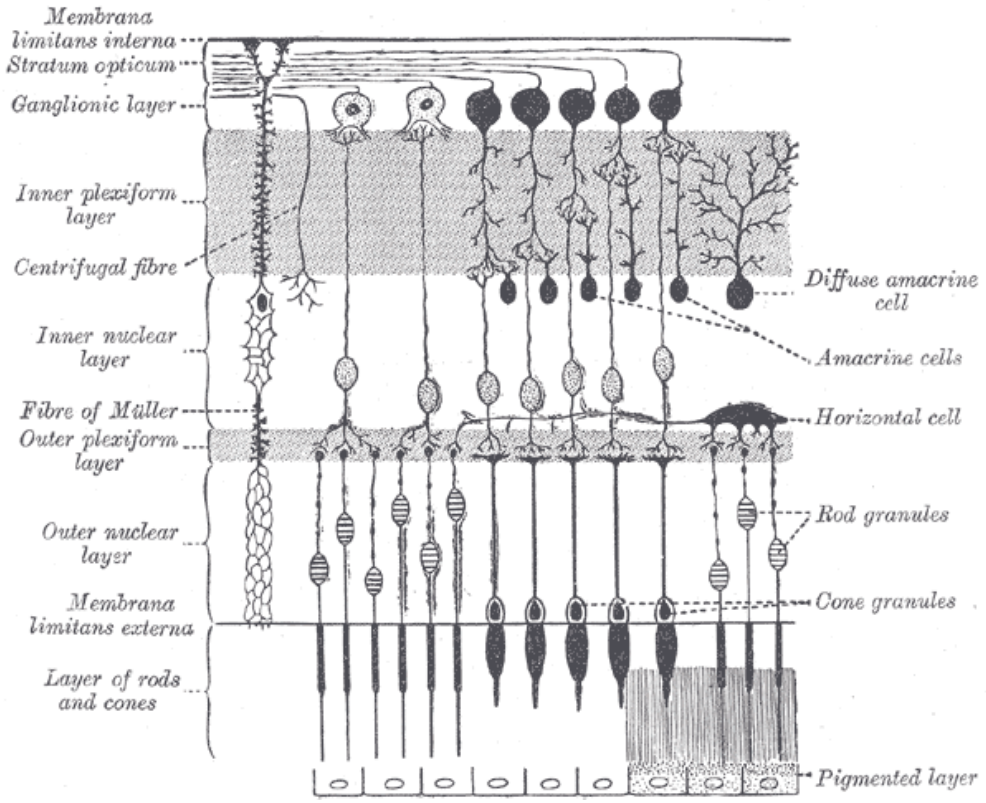

Figure (3): Schematic representation of the cells and layers of the central retinal .(Gray H 2011)