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THE CILIARY BODY OF EYEBALL IN GRAY SQUIRREL *(SCIURUS CAROLINENSIS)*

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ABSTRACT

This Research aimed investigates the histomorphological structure of ciliary body of left and right eye ball in squirrel, the ciliary body was the anterior continuation of the choroid and it joined anteriorly with the iris. Both portion of the ciliary body consisted of the epithelium, stroma and smooth muscles. Iris was extended from the ciliary body to form a diaphragm between anterior and posterior chamber of the eye and posses central opening called pupil connect between these chambers located anterior surface of the lens, this Iris was mainly consisted of the stroma and the posterior epithelial lining. The stroma of iris was comprised of the loose connective tissue with smooth muscles, blood vessels, melanocytes and fibroblasts. In cross-section the ciliary body appeared as triangular shape, it's apex is continuous with choroid and base close to the iris, the internal surface of the ciliary body contact with vitrous surface and continuous with the retina.

Keywords: Ciliary body, eyeball, Gray Squirrel, *Sciurus carolinensis*

Introduction

Ciliary body is important vital structure for eye the source of aqueous humor production that keep the regular pressure of eye and is involved directly in aqueous dynamics of humor. The ciliary body is the uveal tract's anterior portion, which is between the iris and the choroid (Kassab *et al.,* 2010). The ciliary body has a right triangle shape, the apex is adjoined to the choroid and the base near the iris. It attaches to the scleral creating potential space between it and the sclera, the supraciliar space (Bayon *et al.,* 2006). The ciliary body portion of squirrel was composed of the epithelium, stroma, and smooth muscles. Iris had been extended from the ciliary body and covered the lens' anterior surface, except for the central opening pupil. It consisted predominantly of stroma and posterior epithelial lining. (McMaughlin *et al.,* 2001). The stroma consisted of loose connective tissue with smooth muscles, vessels of the blood, melanocytes and fibroblast. (Kiama *et al.,* 2006). Ciliary body smooth muscle, zonulal attachment (lens suspensive ligament) which play a big role in Accommodation of lens. The smooth muscle fibers, arranged with few circular fibers, were parallel to sclera. The basal plate had large blood vessels presenting the core of connective tissues (Rao *et al.*, 2014). Ciliary processes were projected through the ciliary body into the posterior chamber. The processes greatly increased the surface area for aqueous humor production and also served as the origin for zonular fibers which were attached to the lens. (Pantcheva *et al.,* 2007; Franz-Odendaal *et al.*, 2005). The ciliary muscle is made up of three distinct muscle fibers: longitudinal, circular, and oblique. The longitudinal (meridional) fibers, which are the most external, anteriorly attach the ciliary body to the scleral spur and trabecular meshwork at the limbus, and subsequently to the supracoroidal lamina (fibers connecting choroid and sclera) as far back as the eye equator. (Sliverman *et al.*, 2010). Longitudinal muscle contraction, opens the trabecular meshwork and the canal of Sachlemm (Aint *et al.,* 2010). The circular fibers make up the older and inner portion, running parallel to the limbus. That insertion is in the rear iris (Ross *et al.,* 2016) When these fibers contract, axial diameter of the lens and its convexity increase. The oblique fibers bind the longitudinal and circular fibers together. These fibers may contract to widen the uveal trabecular spaces (Tserevlakis *et al.*, 2016). Schlemm's canal is an endothelial channel that runs around the globe in circumference. In general, it has a single lumen, but occasionally it's like a plexus with multiple branches (Johnson *et al.,* 2011). The outer wall of Schlemm's canal is a single layer of endothelium, without pores but with numerous large outlet channels and a series of giant vacuoles that form projections into the canal. Serving as a pathway for fluid movement. (Hann *et al*, 2014).

Materials and Methods

The study included 20 eye specimens (10 right and 10 left) of (10) healthy adult male gray squirrels were brought from market of animals in Erbile city used for Anatomical and histological study. Aged between 6-9 months, All the eyes were collected from the animals immediately after euthanized by injection by ketamine (1.5 B.W) and (1.5 B.W) xylazine. The dissection of the eye balls was carried out by removing the extra ocular muscles, the fat and the peri-orbital tissue as much as possible in order to facilitate the correct measurement of the eye balls. After scarified and fixed in 10% neural buffered formalin for 48 hours.

The anatomical study included: Anatomical description. Which includes anatomical description, topographical location of ciliary body of eye ball squirrel. Anatomical parameters of the ciliary body of eye ball squirrel.

A histological parameters: Ten eye (5 right and 5 left) from five squirrels were used to study the histology of the ciliary body of eye. The sample was put in labeled container containing 10% neural buffered formalin solution for 48 hours and ensuring that the fluid reached all sample surface. Then , washing of sample by tap water, the surplus fixative was washed with running water to avoid interference with subsequent procedures for 6 hours, the specimens underwent routine histological techniques steps (Vacca, 1985).

Results

The ciliary body was the choroid's anterior preservation and was anteriorly joined to the iris, (Table-1) showing the histological measurements of ciliary process of the ciliary body are two types major ciliary process the mean numbers (33 ± 3.63) and minor ciliary process the mean (18 ± 4.92) of right eye and the number of ciliary process the mean number of minor ciliary process (31± 4.10) and the minor ciliary process (12 ± 3.41). these ciliary process responsible for aqueous humor production. It was predispose the attachment of iris (iris origin) (Figure 1). and the choroid has been attached at the other side, it's Smooth muscles, stroma, epithelium involved, Anterior endothelium: The anterior area is coated by a single layer of endothelium except for occasional areas where endothelium may be absent. When those gaps occur, the anterior surface of the iris stroma is exposed. The anterior endothelium of the iris pillars and the corneal endothelium is continuous (figure 1).

Stroma: The iris stroma comes from the eye's uveal coat and is tinuous with the ciliary body's stroma (Figure -1) (Figure -2). but denser than the latter. It is full of vessels and pigmented cells. chromatophores cells were branching and scattered all over the stroma Completely continuous layer. The vessels are numerous and run radially for the most part.

There are large, thin-walled veins in the vicinity of the iris root, surrounded by perivascular lymph spaces, Fully continuous stratum. The vessels are numerous, and mostly run radially.

Posterior Epithelium: Dense layers of pigmented epithelium cover the posterior surface of the iris. The intrinsic smooth muscle fibers which consists from internal circular (constructed) muscle fibers act as (sphincter of pupil) and out longitudinal muscles fibers act as dilator of pupil. The ciliary body possess ciliary process projects in the posterior chamber (Figure-1) (Figure-3).

Discussion

The structure of ciliary processes play an important role in the production of intraocular fluids. Its consist of four layers supraciliary lamina, stroma, pigment ciliary epithelium, non- pigment ciliary epithelium. (Sivak *et al.,* 2004).

Agree with results of rabbit ciliary processes which plays an important role in the production of intraocular fluids, Its consist of four layers supraciliary lamina, stroma, pigment ciliary epithelium, non- pigment ciliary epithelium (Duke *et al*., 2013).

The ciliary region of squirrel eye is asymmetric through the horizontal plane, with distance from limbus to the equator of the eye. This results agree with this asymmetry is reflected in the relative development of the ciliary musculature and the ciliary muscle also may serve in the regulation of aqueous dynamics within the eye in chicken. (Johnson *et al.,* 2011).

The ciliary body in the ostrich, which is the continuation of the choroid layer, is observed to be completely round and radially arranged folds inside the eye ball. some parts of the ciliary body are covered by retina. In other animals, the frontal limit of the retina is the starting point of the ciliary body, The number of ciliary processes in the ostrich is almost 120. In other animals, the number of such processes depends on the species and includes 70 to 100 ciliary processes. For example, 75 to 76 ciliary processes have been reported in the dog.16, 17. (Weir *et al*, 2013).

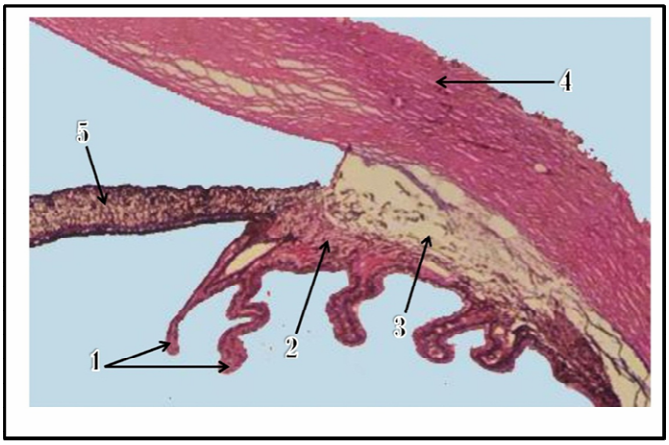

Fig. 1: Histological section of eye squirrel shows layers of ciliary Body :
1-Ciliary Processes 2-ciliary body 3- ciliary smooth muscles 4-sclera 5- iris Hematoxylin and Eosin stain 40 x

Table 1 : Showing the histological measurements of ciliary body (µ)

Left eye			Right eye	
No.	Number of ciliary process		Number of ciliary body	
1.	Major ciliary Process Mean ± SE 33 ± 3.63	Minor ciliary process intermediate)(Mean ± SE 18 ± 4.92	Major ciliary process Mean ± SE 31 ± 4.10	Minor ciliary process (intermediate) Mean ± SE 12 ± 3.41
2.	Length of major ciliary body (µ) Mean ± SE 851 ± 3.63	Length of minor ciliary body (µ) Mean ± SE 2.66 ± 4.81	Length of major ciliary process (µ) Mean ± SE 881 ± 2.63	Length of minor ciliary process (intermediate) (µ) Mean ± SE 221 ± 1.99
3.	Width of major ciliary process Mean ± SE 131 ± 2.69	Width of minor ciliary body Mean ± SE 97 ± 3.78	Width of major ciliary process Mean ± SE 130 ± 3.92	Width of minor ciliary process (intermediate) (µ) Mean ± SE 89 ± 4.34

Fig. 2 : Histology section of eye Squirrel shows layers of ciliary processes 1- stroma 2- non pigmented ciliary epithelium 3- pigmented ciliary epithelium Masson's Trichrome stain 10 x

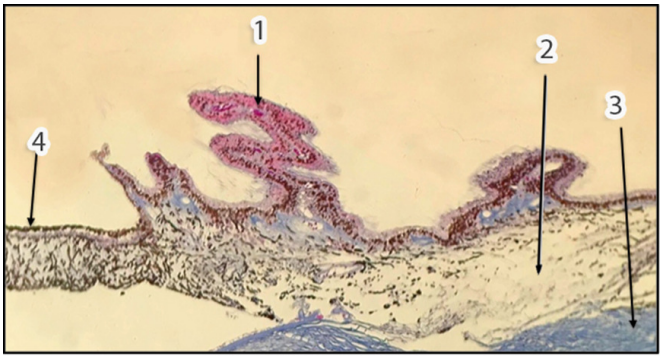

Fig. 3 : Histological section of ciliary body of the eye of Squirrel shows: 1-Ciliary process 2- Ciliary body 3-Sclera 4- Iris Masson's Trichrome stain 40 x

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