

**Histological Study of ciliary body and retina of eye in Iraqi geese (*Anser anser*)**

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Received date:9Dec 2019 Accepted:(460) 22Dec 2019 page (74-81) Pubished:31Dec 2019

DOI: <https://doi.org/10.36326/kjvs/2019/v10i23316>

**Abstract**

The current study includes eye balls of Iraqi geese (*anser anser*). The anatomical characteristics and histological eye structure. The eye ball shape was nearly spherical. The general mean size of the geese's right and left eye was  $2.3 \pm 0.07$  ml.

The ciliary body was the anterior part of the choroid and it joined anteriorly with the iris. The retina was the deepest layer of the eyeball jacket. The retina had two parts, one sensory and the other meaningless.

The sensory part of the retina of the ciliary body began to cover the ciliary body and the iris. The sensory part of the retina consists of ten layers: (1) the pigmented epithelium of the retina (2) of the rods and cones (3) the outer specific membrane (4) the outer nuclear layer (5) the outer layer (6) Internal plexus (8) Layer node cell (9) Fiber optic layer (10) Internal boundary membrane. . The total values of retinal thickness is  $304.68 \pm 0.95$   $\mu$ m.

**دراسة نسيجية للجسم الهدبي و الشبكية لمقلة العين البط العراقي**

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**الخلاصة**

تتضمن الدراسة الحالية الخصائص التشريحية والنسيجية لكرة العين في الوز العراقي و كان شكل العين دائريا تقريبا. فكان معدل حجم العين اليمنى واليسرى في الاوز  $2.3 \pm 0.07$  مل. الجسم الهدبي يكون في بداية المشيمية ويرتبط اماميا بالقزحية . و ان ظهارة الهدبية تتكون من طبقتين. طبقة سطحية مكعبة غير اصطبغية ، وطبقة عميقة ذات صبغة عميقة . الجسم الهدبي يسند بواسطة غضروف إضافة إلى ألياف العضلات الملساء . الشبكية تتألف من عشر طبقات و هي الطبقة العميقة لكرة العين ، القصبان و المخاريط ، الغشاء المحدد الخارجي ، الطبقة النووية الخارجية ، الطبقة الشعيرية الخارجية ، الطبقة النووية الداخلية ، طبقة الخلايا العقدية ، طبقة اليباف العصب البصري ، الغشاء المحدد الداخلي . و معدل سمك الشبكية  $304.68 \pm 0.95$  مايكرون

## Introduction

In bird species, especially in wild birds and raptor species, vision is considered as the most important of the five main senses. The large size of the geese eye in comparison with the body size is a good indicator to understand its importance(1).. The geese classified in animal kingdom belong (1).

Kingdom: Animalia

Phylum: Chordata

Subphylum :Vertebrata

Class: Aves

Order: Anseriformes

Family: Anatidae

Genus: Anser

Species: *Anser anser*

The sclera is the biggest component of the eye's fibrous tunic. It is strong and elastic because its primary purpose for safe guarding intraocular contents. The limbus is the region of transition between cornea and sclera. where, the opaque and fibrous transform the homogeneous and transparent corneal collagen fibers. The cornea is the fibrous tunic's clear inner layer and the eye's finest powerful refractory layer. To light concentrating on the Retina, transparency and periodic curvature are essential and because it is avascular, it obtains nutrients from the front chamber through the limbus vessels and the fluid. (2 ,3).

The retina contains of many cell types arranged in two membranes and eight layers (4). Visual belief is a sensory mechanism initiated at the retina, and completed inside the cerebral cortex. Two most important functions are executed via the retina: 1) The preliminary conversion of light strength into electric <sup>اع</sup>signals, phototransduction, that's accomplished with the aid of photoreceptors 2) A sequence of physiological methods completed by using retinal interneurons (bipolar, horizontal and amacrine cells), in order to encode the

different attributes of the visual stimuli (shape, movement and color) in electrical signals (5). Any structural changes may also result in temporary or permanent blindness.

## Material and method

### Histological preparation:-

Ten eye from five birds were used to study the histology of the eye according to (6).

The sample was put in labeled container containing 10 % buffered formalin solution for 48 hours and ensuring that the fluid reached all sample surface. After fixing with 10 % buffered formalin solution, the fixative was washed with running water to avoid interference with subsequent procedures. In order to perform histological slides, the specimens underwent routine histological techniques which were transferred to the following steps (7).

### Stains :-

**Harris Haematoxylin and Eosin Stain:** (8)

**Masson Trichrome Stain:** (9)

### The micrometry

The micrometrical measurements were recorded by using 10X graduated eye piece for the component of different tunics of the eye ball as follows:

- 1.thickness and width of ciliary body
2. Total thickness of the retina at. Equator.
3. Thickness of the different layers of the retina at equator.

### Statistical Analysis:

The data were statistically analyzed using SPSS (version 16.0 2007). All numerical results have expressed as the mean values  $\pm$  standard error (SE).

## Result

### Ciliary body

The ciliary body was the anterior maintenance of the choroid and it joined anteriorly with the iris (figure 1). It was attached to the internal surface of the sclera".

It interconnects from the other side with the iris, and from the other side was

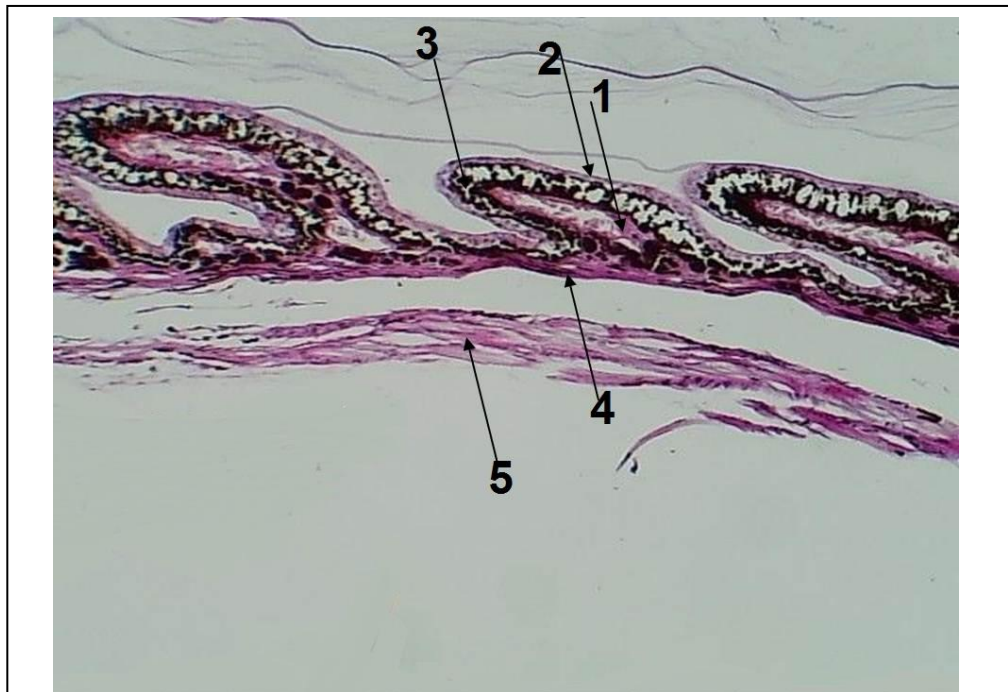
connected the choroid. It was composed of a continuous, fissured ring situated at the inner surface of the anterior portion of the sclera. It has a wide area and contains multiple thick folds (figure2) . The ciliary body involved the smooth muscles, stroma and epithelium (figure3). There were two cell layers in the ciliary epithelium. The innermost part of epithelium was nonpigmented and is adjacent to the aqueous humor of the posterior chamber The exterior ciliary epithelium was pigmented and joined with the retinal pigmented epithelium. It is constant as the lens ' posterior pigmented epithelial layer. Each ciliary process included the blood vessels and the main stroma nucleus surrounded by the epithelium bilayer .The ciliary body stroma was made up of blood vessels, melanocytes, and fibroblast and was most prevalent in the plicata pars. The ciliary body's smooth muscles were mostly focused along the southern axis and linked with melanocytes as well .

### **Retina**

The retina was the innermost layer of the tunic of the eye ball. Retina had two portion, one was sensory and another one was nonsensory. Non sensory part of the retina was started from the ciliary body and covers the ciliary body and iris . The sensory part of the retina was composed of ten layer: (1) the retinal pigmented epithelium (2) layer of rods and cones (3) external limiting membrane (4) outer nuclear layer (5) outer plexiform layer (6) inner nuclear layer (7) inner plexiform layer (8) ganglion cell layer

(9) nerve fibers layer (10) internal limiting membrane and the mean value of all layer of retina were (1)  $21.80 \pm 0.78 \mu\text{m}$  , (2)  $30.41 \pm 0.92 \mu\text{m}$  (3)  $14.81 \pm 0.45 \mu\text{m}$  , (4)  $37.68 \pm 0.39 \mu\text{m}$  , (5)  $19.33 \pm 0.53 \mu\text{m}$  ,(6) $59.09 \pm 0.43 \mu\text{m}$  (7)  $76.43 \pm 0.55 \mu\text{m}$ , (8) $7.31 \pm 0.73 \mu\text{m}$ , (9)  $31.71 \pm 0.49 \mu\text{m}$  , (10)  $6.11 \pm 0.15 \mu\text{m}$  (figure 4).

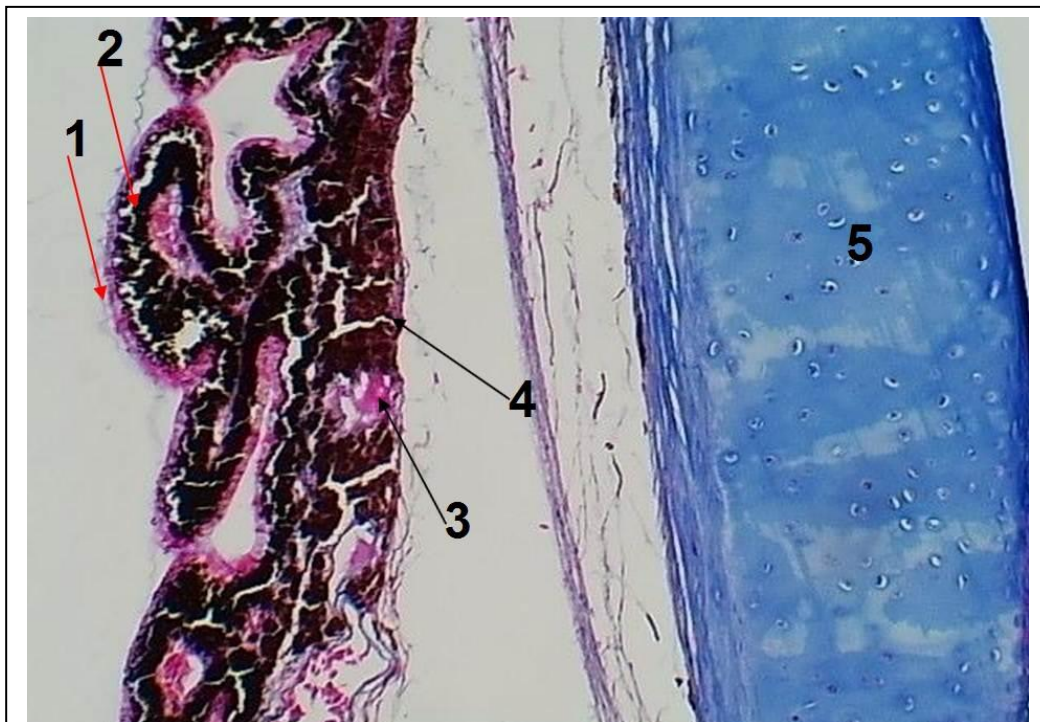
The retinal pigmented epithelium was the outermost single layer of flat cells of the retina. The cells of the retinal pigmented epithelium were pigmented except the area where the tapetum fibrosum was present. The next layer was layer of rods and cone cells which comprised of only outer part of the rods and cones i.e. outer and inner segment. Outer limiting membrane separated the layer of rods and cones from the outer nuclear layer. The outer nuclear layer was composed mainly of nuclei of rods and cones. The outer plexiform layer was a thin layer that separated the outer nuclear layer from the inner nuclear layer. The inner nuclear layer was comprised of the nuclei of the horizontal cells, bipolar cells, amacrine cells and Muller's cells. The inner plexiform layer was comprised of the bipolar and amacrine cell axon and dendrites of the ganglion cells. The ganglion cell layer was the innermost cell layer of the retina. The nerve fiber layer formed by the axon of ganglion cell. The internal limiting membrane was the innermost layer of the retina (figure 5 ,6). The mean values of the total retinal thickness were  $304.68 \pm 0.95 \mu\text{m}$  .



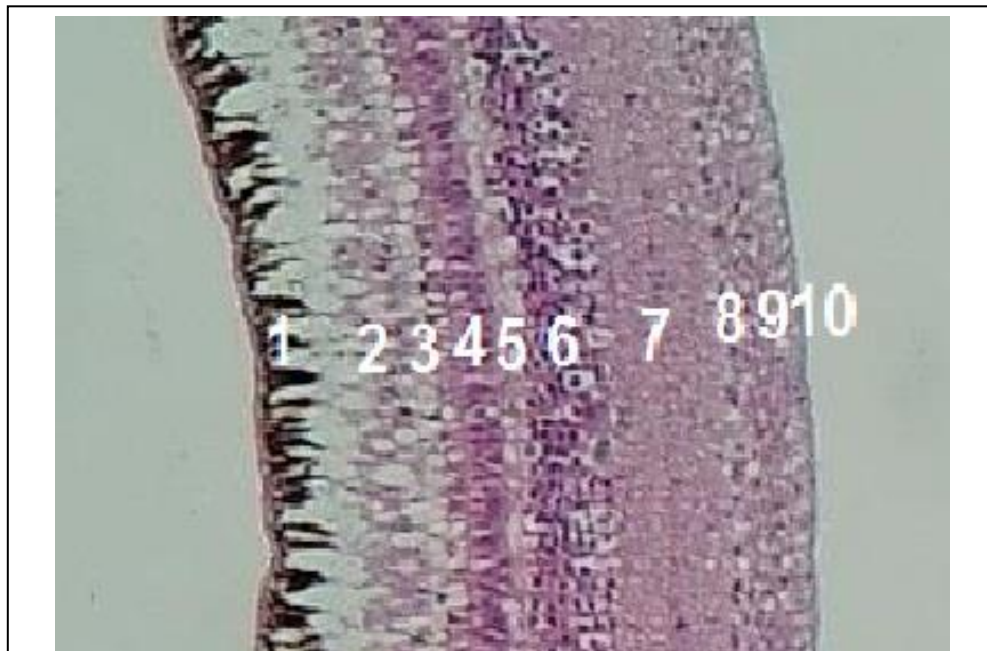
**Figure 1.** Histological section of eye Anser Anser geese shows layers of ciliary body : 1- Stroma , 2- Non pigmented ciliary epithelium , 3- pigmented ciliary epithelium , 4- Supraciliary lamina 5- masson Trichrome stain 10 X



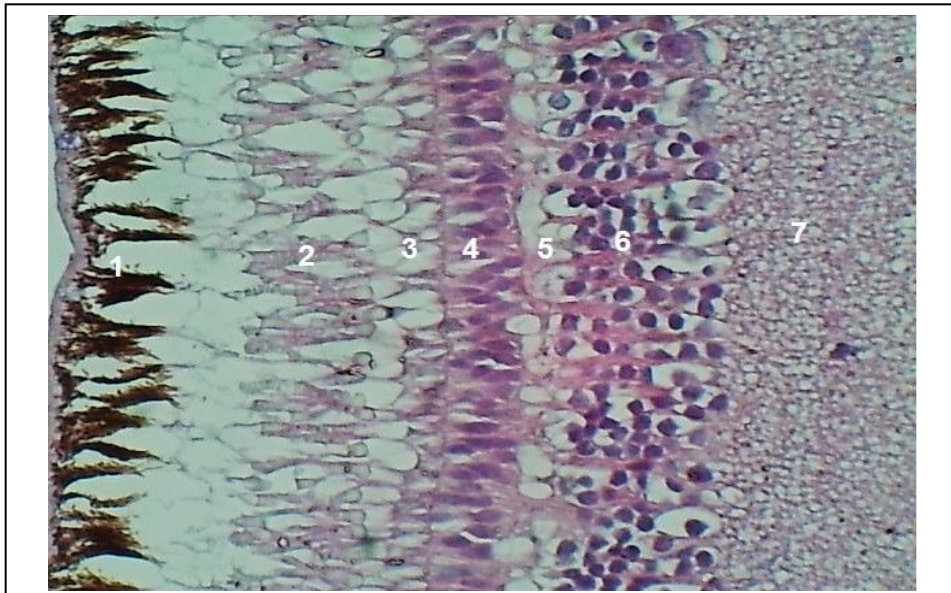
**Figure 2.** Histological section of eye Anser Anser geese shows layers of ciliary body : 1- Stroma , 2- Non pigmented ciliary epithelium , 3- pigmented ciliary epithelium , 4- Supraciliary masson Trichrome stain 40 X



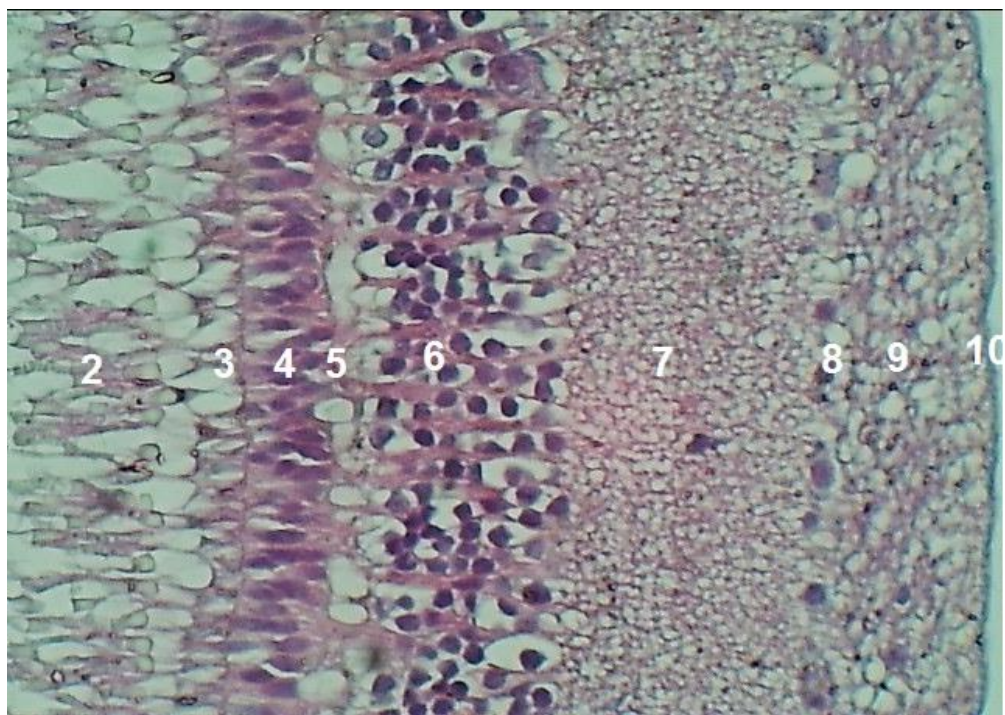
**Figure 3. Histological section of eye Anser Anser geese shows layers of ciliary body and scleral cartilage . 1- Non pigmented ciliary epithelium , 2- pigmented ciliary epithelium , 3- Stroma ,4- Supraciliary lamina , 5- Scleral cartilage masson Trichrome stain 10X**



**Figure 4. Histological section of eye Anser Anser geese shows layers of retina 1. Pigmented epithelium layer ,2. Rods and cons layer 3. External limiting membrane ,4. External nuclear layer 5. External plexiform layer 6. Internal nuclear layer 7. Internal plexiform layer 8. Ganglionic cell layer 9. Neurofibrous layer 10. Internal limiting membrane H &E stain 10 x**



**Figure 5. Histological section of eye Anser Anser geese shows layers of layers of retina 1. Pigmented epithelium layer ,2. Rods and cons layer 3. External limiting membrane ,4. External nuclear layer 5. External plexiform layer 6. Internal nuclear layer 7. Internal plexiform layer H &E stain 10 x**



**Figure 6. Histological section of eye Anser Anser geese shows layers of.2. Rods and cons layer 3. External limiting membrane ,4. External nuclear layer 5. External plexiform layer 6. Internal nuclear layer 7. Internal plexiform layer 8. Ganglionic cell layer 9. Neurofibrous layer 10. Internal limiting membrane H &E stain 10 x**

## Discussion

### Ciliary body

The ciliary body involved the smooth muscles, stroma and epithelium. The ciliary body have the smooth muscle fiber good performance ,in chicken the muscle were divided in two group :the first frontal muscular fiber (Crampton's muscle ) and the second posterior muscular fiber (Brucker's muscle).(10).

The ciliary body consist from following histological layer :

- 1-Supraciliary lamina
- 2-Stroma
- 3-Pigment ciliary epithelium
- 4-Non-pigment ciliary epithelium

The same finding stated by (11).

The frontal muscular fiber were larger in Owls and Hawks and it's smaller in water birds ,but the posterior muscular fiber were larger in bird Cormorant (*Phalacrocorax* species ) and bird Morus (Gannet) (12). The frontal muscular fibers is responsible for adaption of the cornea but the posterior muscular fibers responsible for adaptation the lens, these finding parallel with result of (13).

### Retina

In eye of Iraqi geese histological retina structures have the same layers presented by other vertebrates. the retina is not vascularized. since the diurnal birds analyzed (*Caracara plancus*, *Falco sparverius* and *Rupornis magnirostris*) presented a more heavily pigmented retinal epithelium when compared with the diurnal species studied.

The pigment melanin present in pigment epithelium of retina offers direct protection against ultraviolet radiation damage and is produced by melanocytes these result agree with (14). Melanocyte counts vary in esponse to environmental factors such as sunlight exposure (15). Diurnal birds are highly exposed to direct sunlight and therefore have higher melanin levels in the

retinal pigment epithelium (16), this result agree with (17 and 18) by the other hand, result showed that the second layer in retina consisting of photoreceptors cells in two shapes ( rods and cones cells )geese retina this study agreed with(17 ,18 ,19) this study showed the rod cell with elongated cells up to layer pigmented epithelium layer retina and the cones are small in dimensions

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