Histological Study to compare between Lens of the Zajel pigeons and Taphozous kachhensis eyes by using light microscope

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ABSTRACT

The lens of the Zajel pigeons eye and Taphozous kachhensis were studied histologically with the use of light microscope. The results show that the lens of Zajel pigeons has high transparency and elasticity with nearly circular shape. The front surface was more flatten than the hind surface. The lens was surrounded by homogenous capsule with two zones the peripheral zone which called Annular pad but another zone it’s called lens body. The Lens also contain transparent fibers, thin and tall, expanding aray at spot of annular pad, but in spot of Lens body, it’s expanding equal to optical axis for eye. The Lens stabled in its spot by zonular fibers expanded from ciliary body in front of annular pad spot. As the study showed, that Lens of Taphozous kachhensis eye occupies nearly, half of measure for Length axis to eye-ball and distinguishes with increasing its convexity and it’s appeared hanging in its place by group of fibers formed zonula which its fibers stabled as a circular on the ciliary body and it is spherical shape. The Lens it be transparent and convex of two faces, and increase its convexity in back part which opposite to vitrous body, the Lens surround with(Homogenous capsule) rubber, it’s thick different according to location, and increase at front pole and edges. Stick with capsule zonular fibers, pass to ciliary body as a hanging tie, this system consider important in an operation which called(Adaptation) which allow to concentration on far and nearby things by change to bend of Lens.
INTRODUCTION

Lens of birds eye is around transparent construction in equal sections, and double convexity at the pole sections, without face, less convexity from in face, and separate (Anterior and posterior chamber), vitreous body[1], change shape of Lens during operation of (adaptation), where the back roof become more convexity[2].

Researcher also appointed [3] that the Lens of Hoopoe eyes and (psittaci- forms), its being flat at front surface and keen convexity at back surface. The Lens convexity it is keen at back surface more than front as in Oscine passennes. For this base, eye Lens of day varieties to birds with front roof more flat as comparisons with night and day varieties, [4,5]. The Lens surrounds by glass homogenous capsule and it be thin at spot of lens axis, then it’s become thick at spot of tie with ciliary body [1]. In adult bird of golden eagle (Aquila chrysaetos ) Golden eagle, the thick of capsule at front pole it be (8Mm) but it’s thick at back pole it be (4Mm), [6], except the capsule, the Lens divide to two spots, first spot it’s spot of (Annular pad) which is make out link, surrounded with equator of Lens, and second, it’s spot of (Lens body), [7]. The annular area it makes (1/7) from all size to Lens, and expand as a circular and compose from fibers, arrange as a ray from, with single spherical nuclei, arrange in front of circle of annular pad, but spot of Lens body it occupies Lens center, and compose of collagenous fibers transparent and thin, expanding as length, parallel to optical axis for eye, and it be with narrow ends [1, 7].

The fibers of lens body it is losing to nuclei, but it existing chiefly nearby with annular pad [8]. The annular pad to Lens of birds eye day, good forming, while it be short hand at the night birds, and the birds who can’t fly, annular pad may disappear at the (Australian goose)-(cebropsis), as researcher had appoint it [3].The lens it is fixed in its place by vitrous body and Zonular fibers which tie with annular pad at the equator line of Lens [9].

MATERIALS AND METHODS

The purpose of histological study is to identify the composition of eye Lens of the Zajel pigeons and Taphozous kachhensis, five healthy and adult birds from Zajel pigeons and five of Taphozous kachhensis (two males and three females for each were used). The animals anesthetized at laboratory by using Ether, then killed by head cutting. Anatomically (10) eyes from Zajel pigeons, and (10) eyes form Taphozous kachhensis, were removed with their derivatives (the bone tissues, muscles and fat) by using Anatomical microscope, which surrounded with eye-ball by using anatomy dish and sharp scalpel to removed every eye from its (orbit) to get the wanted spot (Lens), and then put it directly in solution(formalin saline solution 10%) with two change, so that to fix
samples and then pass the samples after washing with tap water to series of upstairs concentrations to Ethyl alcohol 60%, 70%, 80%, 90%, 95%, 100%, for two hours to every concentration. In order to pull water from inside of sample (dehydration), and to clear the sample and make it translucent and easy exudation with paraffin wax, it had put in Xyline for half hour, and then transport the sample to paraffin wax and put it at oven (furnace) at degree (58°C) to dehydration (Exudation) of sample with wax, after that the sample it had buried (Embedding) in pure wax to be ready for cutting, then the samples had cut by using (Rotary microtome) to (4-6) micron thick at shape of lace from serial parts. The parts moved to water bath at degree (42 - 52°C) to be as tissue mattress, and then carried on glass’s slides. The parts it had dried at oven at degree (40°C) for (24) hours, the tissue parts had stained by using (Harris Haematoxlin-Eosin) stain it’s a routine stain in all histological work to investigate the general features of the tissue, and then covered with a cover slips [10].

RESULTS AND DISCUSSION

The recent study by light microscopy showed that Lens of Zajel pigeons is soft transparent composition with high flexibility with nearly spherical shape, where the front surface it be flat as comparison with back surface that seem more convexity.

The lens was surrounded with homogenous capsule which composedes from coils of collagenous fibers, thin and transparent, the next layer appear as short cube cells, with a pure spherical nuclei, arrange as surrounding, and to the inside of thick zone with collagenous fibers, it represents lens body and changing (Annular pad) at zone of lens equator which contain pure nuclei which distinguish with existence crypts, and this zone called annular pad (filled-fluid) figure {4, 5, 6, 7, 8}.

The fibers of annular zone it arrange with array-shape, but the fibers of lens body zone, expanding as length parallel to optics axis of eye. The lens was stabled at its place by zonular fibers which expanded from cicatrixes of ciliary body in front of lens, this fibers tie with lens at zone of annular pad.

The cup of eye separate the lens in to two zones, the front is zone of front room and back (Anterior and posterior), but back zone called vitrous body and lie behind the lens, figure {1, 2, 3}. while eye lens of Taphozous kachhensis it distinguished at big size and it's spherical shape, nearly which occupy about radius of measurement the length axis for eye-ball, the lens distinguished with its transparent and it be convexity of in both faces, and increase its convexity at rear part which opposite to vitrous body.
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The lens surrounding with homogenous capsule rubber, its thick, differ according to site, where increasing at front pole and edges. It sticks with capsule, zonular fibers passes to the ciliary body as a shape of suspensory ligaments, this system is consider important at a process that called (Adaptation) which allow the concentration over things, focus sizing, by changing sides of lens, the lens covered from its front part which is lying under capsule, an one layer from simple epithelium cells which called (epithelium subcapsulay) that described with its cube shape or down column, and it contains spherical nuclei or irregular shape figure{10,11}, but the rear part to lens it composes form lens fibers tall and flat, and it's with a shape as polygonprism cells, it has thick ends and pinning arranged with parallel shape to optic axis of eye, but the old fibers(former) lose their nuclei, figure {9,12}.

The consider as diurnal birds with shape looking which made of seldom composition to conformations basic eye, as the lens which distinguished with it's high transparency and flexibility which produced of its contain on full cavities with liquids it's called (Lens vesicular) which is lie between annular pad and Lens center, it has hydrostatics mechanical to remove pressure from ciliary muscles to lens center to facilitate process of adaptation, and also, gives high flexibility to lens and contributed as control of the light refraction and concentration on surface of net, via fast change to shape of lens, to make it more convexity or flat, which it gave the bird ability to creation a picture more clear for bodies at looking from high distances[11],as the transparent lens it makes as filter to yellow light, which cut wave length less than(400) nanometer, and then extract the ray over violet[4]. The arrangement of fibers with a ray shape at the annular pad, and it's a zone which contact with it, zonular fibers, responsible for lens adaptation, make it later high ability dominant pressure through the process of fast adaptation, there is a pure relationship between size of annular pad and adaptation degree [12].

In the day birds, annular pad is big and huge, as in falcon, and small size in the nocturnal birds, and it be smaller size at the coast birds, and very small at the wander birds, like (Apteryx birds) as in birds of anteater (palaeognathae) birds, and there is no annular pad at the Australian goose [3].

The sizes of eyes are various in different vertebrates, [13] , that there is relationship between eye size and animal size, e.g, may the eye it appears as big size, in comparison with head size, also the night animals, usually have big eyes, to obtain more quantity of light at the darkness, there are many vertebrataes and all mammals have approximately spherical eyes in shape, as found in many day birds have flat oval eyes, [13].
The *(Rhinotophus capensis)* lens appears nearly spherical, and it's so big as a way at the rest nocturnal animals, and it occupies, about half measure of length axis to eye-ball and it's probably bigness of lens size and its spherical shape, indemnify of absence central hole which responsible about looking sharp, for this reason its gives, high refraction degree, as a result of keeping distance between lens and retina, an increase of lens convexity [14].

The lens composed of (60-70%) water, and (35%) solved and dissolved protein, and also glass liquid feeding the lens with oxygen and glucose and sodium [12,16] but in a bat we used little bats which exist in Iraq *(Rhinotophus capensis)* that it's depend on Echo-location more than its depend on looking to get food and fix it's way, because they have small eyes, narrow forming, and it's eyes be active at the weak light, and it's less action to look range away [17,18] and it's consider from (Nocturnal), activate at night and sleep during the day, some kinds of bats are resort during cold months to (Hibernation), [19,20]. The eyes of newborn it be closed at start and not ripe until it becomes the age of little from one day to ten days, according to kind of bats [21].

The eye-ball of bat it be almost spherical and the lens it rather big, it occupies nearly half measure of length axis to eye-ball [22], and this what certain done by researcher [15,23] at study of Turkey bird eyes it composes as tissue from the same general layers at mammals, and the lens composes in it from capsule and annular pad, the lens hanging through it with ciliary cicatrixes by parallel fibers and equal of length which formed from zone of net contact with ciliary body [23].

Because there are no studies about tissue composition to lens of Zajel pigeons and comparison lens of bat, so we are preferred to make this study. The results of this study are agreed with the results which are done by two researchers [15].

Through the results which included this study, it became possible to conclude the following:-

- The results of study are showed that lens of Zajel pigeons, has transparency and high flexibility and it's nearly spherical in shape, the front surface is more flat from reare surface.
- The Zajel pigeons have area called annular pad which makes (1/7) from all size of lens and is responsible for the degree of good forming of this birds.
- The line of ciliary muscles are responsible about adaptation of lens at the *Taphozous kachhensis* and shortage of distance between lens and lattice, due to bigness of lens size and increase of lens convexity, which made later to decrease the ability of eye
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for looking as a result to increase degree of rays light refraction which passed through the lens.

- Anatomical and histological study and tissue to accessories of eye at *Taphozous kachhensis* and Zajel pigeons as lacrimal gland, muscles, nerves and blood vessels which feeding to eye and study the tissue composition for ear and it's relationship with looking.
- Using Electron-microscope to study this research.

![Figure - 1: Show the shape of Zajel pigeons](image1)

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![Figure - 2: section through eye lens of Zajel pigeons (Anterior view) show: 1. Capsule 2. Lens body 3. Lens fibers (Harris Haematoxin-Eosin) stain 200 x](image2)

Figure - 2: section through eye lens of Zajel pigeons (Anterior view) show:
1. Capsule 2. Lens body 3. Lens fibers (Harris Haematoxin-Eosin) stain 200 x

![Figure - 3: Section through the eye lens of Zajel pigeons (posterior view) show: 1. Corona 2. Capsule 3. Lens body (H&E) 400x](image3)

Figure - 3: Section through the eye lens of Zajel pigeons (posterior view) show:
1. Corona 2. Capsule 3. Lens body (H&E) 400x
Figure -4: Section through eye lens of Zajel pigeons show:
1. Annular pad  2. Lens body (H&E) 200x

Figure -5: Section through eye Lens of Zajel pigeons show:
1. Annular pad  2. Lens body  3. Capsule (H&E) 400x

Figure -6: Section through eye Lens of Zajel pigeons show:
Extensions of annular pad from lens (H&E) 400x

Figure -7: Section through eye lens of Zajel pigeons show:
1. Extension of annular pad  2. Capsule  3. Lens body (H&E) 200x
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Figure -8: Section through eye lens of Zajel pigeons show:
1. Extension of annular pad  2. Lens body (H&E) 400x

Figure -9: Show abdominal view of *Taphozous kachhensis*

Figure -10: Section through eye lens of *Taphozous kachhensis* in region of ciliary body show:
Figure -11: Section through eye lens of *Taphozous kachhensis* show:
1. Sclera  2.Corona   3.Capsule with nuclei   4.Lens body 5.lens fibers   (H&E) 400x

Figure -12: Section through eye lens of *Taphozous kachhensis* (Anterior view) show: 1.Corona   2.Iris  3.Capsule  4.Lens body (H&E) 200x

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