HISTOMORPHOLOGICAL STUDY OF ADRENAL GLAND IN LOCAL ADULT FEMALE DUCK (ANASPLATYHYNCHOS)

Jafar G. A. Al-Jebori*, Ali K.H. Al-Jebori* , **Ahmed O.Hossain , *Zina Sh. M. Al-tamimi

*College of veterinary Medicine, University of Al- Qasim green,Babylon , Iraq

**College of Biotechnology , University of Al-Qasim green,Babylon, Iraq

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ABSTRACT

The study was designed to describe the morphological and histological characteristics of the adrenal gland in female Duck (Anasplatyrhynchos).Ten adrenal glands was used in the study collected from five adult female ducks.The morphological features of glands were described and histological sections were prepared from each sample. The study revealed that theducks have paired glands located in the abdominal cavity at the anterior end of the kidneys.The shape of right gland is semi-circular while, the left elongated or triangular in shape. The mean weight of right gland of duck about (0.39) gram while, the left was (0.41)gram. The mean values of long axis of left adrenal gland about (15.46) mm and the diameter of right gave mean values about (11.30) mm. The histological sections of the adrenal gland revealed in a division of gland into a subcapsular layer (SZ)-(peripheral zone) and central zone (CZ) or inner zone. The subscapular zone (SZ) consisted of groups of cells immediately below the capsule which forms irregularly arranged cords while, there are two types of cells in central zone of gland, the first type of

cells, acidophilic cells and the second type of cells, basophilic cells called chromaffin cells.

INTRODUCTION

The adrenal glands of birds are similar to that in mammals. They are paired organs, yellow- or orange in color and pear or triangle in shape lie near the superior poles of kidneys, embedded in adipose tissue. The interference nature of cortex and medulla components constitutes a major characteristic of avian adrenal medulla (1).

Morphometric facts dealing with the cortex and medulla ratio recordedperviously (2),domestic fowl (3) and guinea fowl (4). The ratio of adrenal cortico – medullary in the fowl showed significanceaccording to breed, sex and age differences. The internal cords of the outer zone were consistently wider than in the inner zone of the adrenal gland of domestic and guinea fowls.While, the proportion of internal tissue was significantly greater in the guinea fowl than in the domestic fowl. However, the medullary tissue, blood vessel and connective tissue revealed no significance difference according to (2).

The adrenal gland is composed of two distinct portions: an outer cortex (mesodermal origin) and an inner medulla (neuroectodermal origin) (5,6). The adrenal cortex composed of three zones (6,7) or four zones (8). The outert zone of cortex called zonaglomerulosa in ruminants and human (6,9) and in a few rodents (10) and is formed of irregular clusters and cords of cells in the horse, donkey, pig and carnivores. (6).adistinctive features of adult female duck attract the interest of researchers; therefore, this studywas designed to study the duck adrenal gland features the anatomical and histological levels.

MATERIALS AND METHODS

Five healthy adult female duck were used to conduct thepresentstudy.The ducks were obtain from local market in Al-Qassim city then ten adrenal glands were collected from adult female ducks.Each duck was anesthetized by injecting 25mg/kg. B.W. of ketamine with 5 mg/kg.B.W. of diazepam in the left thoracic

muscle. The birds leave for 2-5 minutes to complete anesthesia (*11*). Then the bird was killed and fixed in anatomy plate pins in its four extremities to obtain a good position for anatomical work.For the anatomical study, the adrenal gland was removed carefully and the glandweight of glands and dimensions (length, width and thickness) were reported. For the histological study of the adrenal glands, samples were taken directly after killed the birds and fixed in 10% formalin and left for 72 hours. After fixation, specimens were washed by tap waterand processedusing routine histological technique including the following steps: Dehydration, Clearing & embedded and finally cutting & staining by usinghematoxylin and eosin (*12*). A computerized program (SPSS) version 20 was used to calculate statistical operations (*13*). Finally, histological images of different histological sectionswere captured using special digital camera attached to the light microscope and [MEM1300].

RESULTS AND DISCUSSION

Anatomically,the adrenal gland is small, paired organ lying in the abdominal cavity at cranio-medial of anterior pole of kidneys just anterior to the bifurcation of the caudal vena cava adjacent to the gonads.The leftgland isflat to irregular triangular in shape while, right gland pyramidal in shape. Thecolor of the gland are showed variation between greyish-yellow and reddish-yellow or creamy-yellow (figure.1,2)as reported in domestic fowl (*14*) and in ostrich chick (*15*).

The shape and color of adrenal gland in our study were similar to those reported in a previous study in the chicken (16). (16) recorded roughly pyramidal shape with a caudally pointing apex for the right adrenal gland, while the left one is less constant in shape with color variation from grayish –yellow and reddish-yellow.

Weight and dimensions of adrenal glandare appeared at table (1) that represented Mean ± Standard error to both glands(left and right) in duck. The body weight of female ducks about (3.20±0.089)k.g with range between (3 to 3.5)k.g and appeared that the weight of left adrenal gland about (0.41±0.017) gram while, the

right adrenal gland weight (0.39±0.01). The present study incompatible with the results that recorded by (17) in chicken; (18) in gees; (19) in duck who reported that weight of adrenal gland about 97-104 mg, 200-250 mg and 130-140mg respectively. It was very difficult to make any generalization since the weight of adrenal glands varied considerably according to species, breed, age, health and various environmental factors in birds (20).

As a result, the left adrenal gland was heavier than the right one and this might be due to a higher average flow to the kidney from the left external iliac vein and thus into left adrenal gland compared to the right vein. These findings coincide with those reported by (17) who said that the left adrenal gland heavier than the right one.Although, it was appeared that the length of long axis of left adrenal gland about (15.46±0.59) while, the diameter of right adrenal gland about (11.30±0.32).

These differences in the weight and dimension of adrenal gland suggested due to different inspecies, breed, age, health, and various environmentalfactors andthese findings coincide with those reported by(20).

Histologically,adrenal gland are invested by a capsule consisting of dense fibro-elastic connective tissue and thin septa were arising from the capsule ramifying between parenchyma tissues form the interstitial tissue. The interstitial tissue of adrenal gland was rich in blood vessels, collagen, and reticular fiberscontaining sinusoids and more than one type of cells (figure.3, 4). These results are same as the results of (18) in geese who stated that adrenal gland was surrounded from outside by connective tissue capsule that contained collagen fibers and reticular fibers, with very few elastic elements, blood vessels and fibroblasts. In this study, the results revealed that adrenal parenchyma was composed of small flocks or groups of ganglionic nerve cells belonging to the sympathetic system occur near the surface of the gland and inside it (Figure.5).

The result of this study revealed the cortex of the adrenal gland of duck didnot divided into three distinct zones: zonaglomerulosa, zonafasciculata, and zonareticularisas mammals. This result is

incompatible with (20,21) in the guinea pig who mentioned that the cortex is divided into three zones. In addition the results is disagreed with(22)who described the adrenal glands of rat and rodent and approved the presence of two zones.

The results of present study showed that the adrenal gland in duck was divided into a subcapsular layer (SZ) called peripheral zone and central zone (CZ) or inner zone (fig.4). The subscapular zone (SZ) consisted of groups of cells immediately below the capsulewhich forms irregularly arranged cords frequently anastomosing with one another and interspersed with groups of medullary cells.These cells were large, polyhedral to columnar and lightly stained acidophilic cytoplasm with a small, round to slightly oval and eccentrically placed nucleus reset on clear basement membrane (figure.6).

The central zone (CZ) consist of the cords. These cords have a random arrangement of cells and regularly oriented rows of nuclei are placed a little away from the basement membrane. In addition,numerous central sinusoidal vessels were noticed in place of a large central venule (figure.4,5). There were two types of cells in central zone of gland, the first type of cells, acidophilic cells and appear light in color which representeds the high ratio of cells inside central zone (figure.7).

The second type of cells, were basophilic cells called chromaffin cells. these cells were appeared in the form of small dark bluish groups of islets which were concentrated near the sinusoids andlocated among the acidophilic cells (Figure. 10). They were polygonal or rounded in shape with basophilic cytoplasm and contained a dark and large rounded centrally located nuclei, which contained two or even three nucleoiarrange in rows.

The results of this study alsoapproved that the parenchyma of duck gland composed of two types of cells: acidophilic cells and chromaffin cells. These results were compatible with (23) in pigeon, (24) in avian and with (25) in Indian avian species and (18) in geese.

Table (1): Showing weight of birds and gland and dimension of right (R) and left (L) adrenal gland of five adult ducks. Mean ± standard error

Bird number	Weight of birds (kg)	Weight of adrenal land (g)		Long axis/ mm		Diameter/ mm	
		R	L	R	L	R	L
1	3.5	0.40	0.45	– – – -	16.1	11	– – – -
2	3	0.35	0.35	– – – -	13.1	10.2	– – – -
3	3.3	042	0.43	– – –	16.2	12	– – –

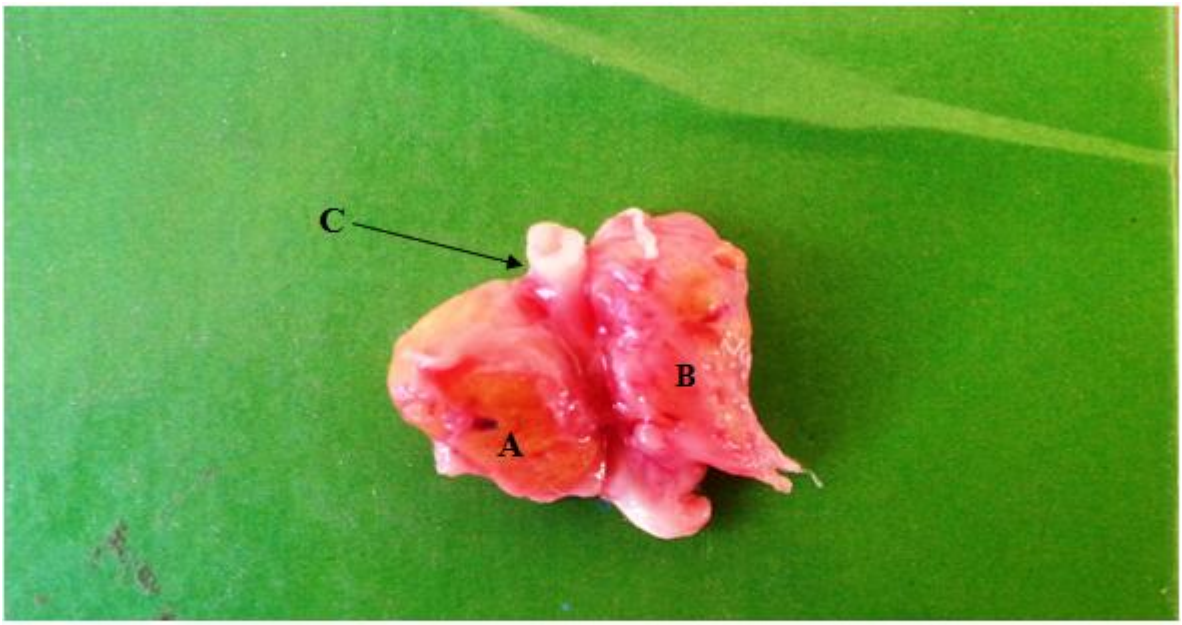

Figure (1) Photograph illustrates anatomical structures of adrenal in female Duck (Anasplatyrhynchos). A-Rightadrenal gland B-Left adrenal gland C- caudal vena cava

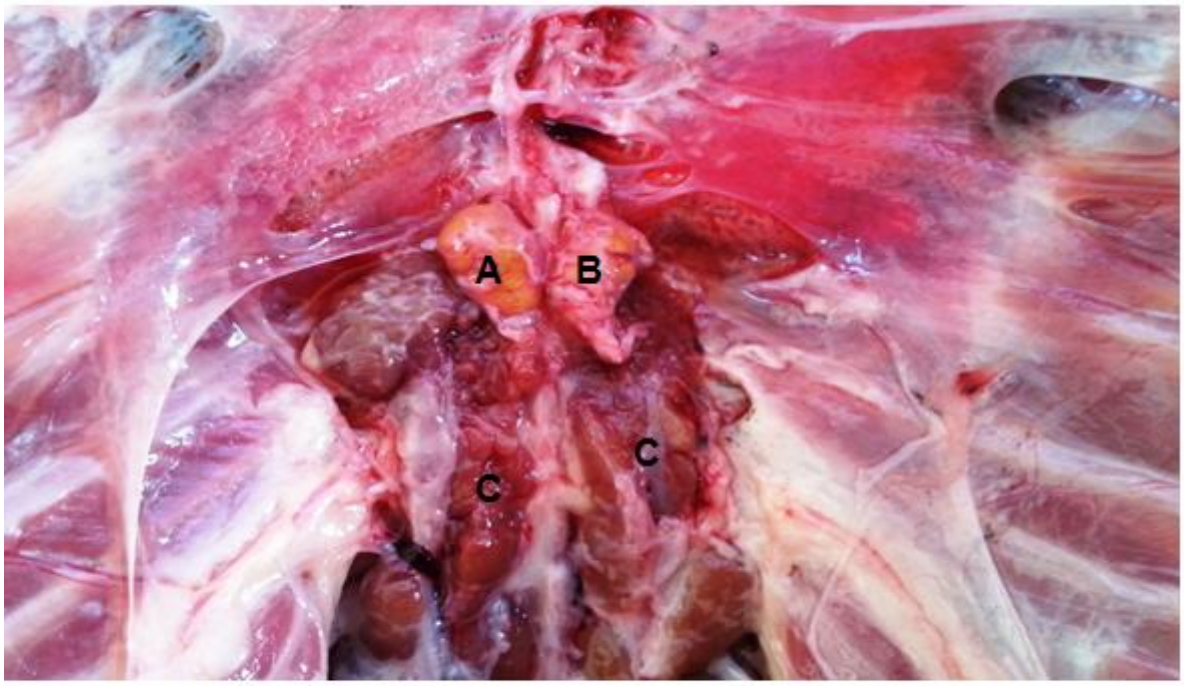

Figure (2) Photograph illustrates anatomical structures of adrenal in female Duck (Anasplatyrhynchos). A-Rightadrenal gland B-Left adrenal gland C- kidneys

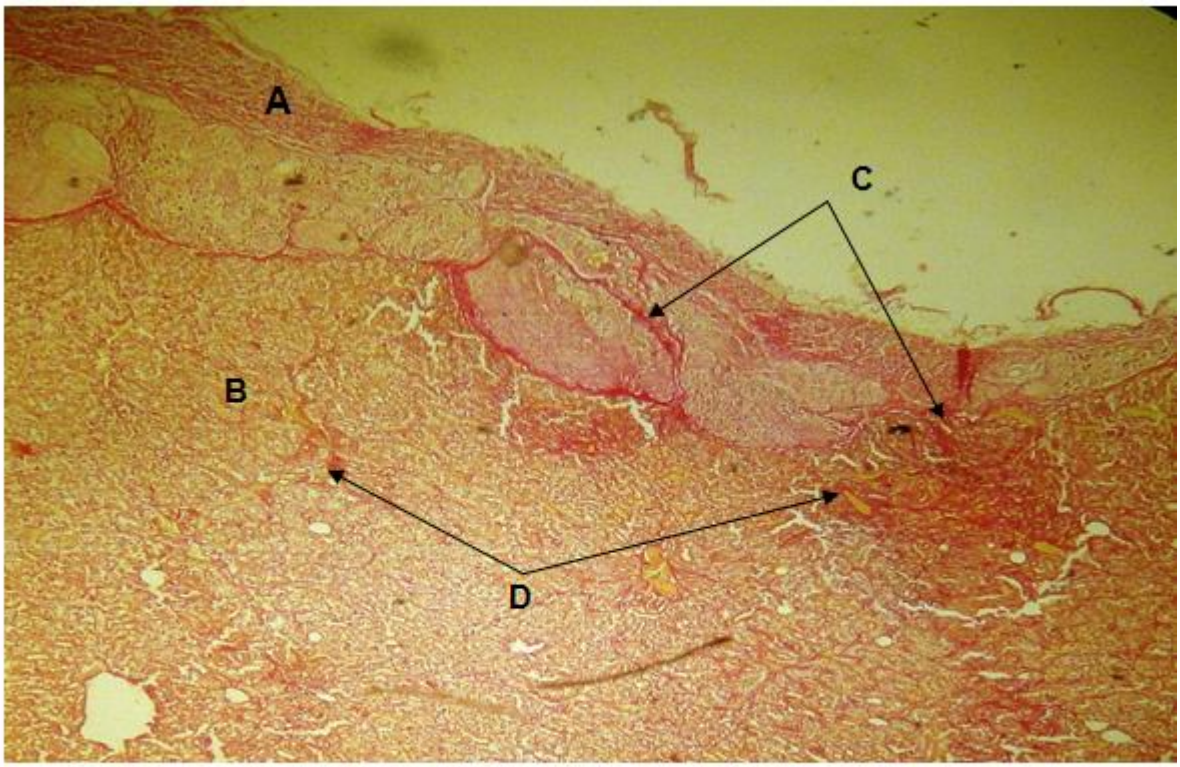

Figure (3) Cross-section of adrenal gland of duck showing. A-thick capsule B-Parenchyma of gland C-collagen fiber D-blood sinusoids **(V.G. X 40)**

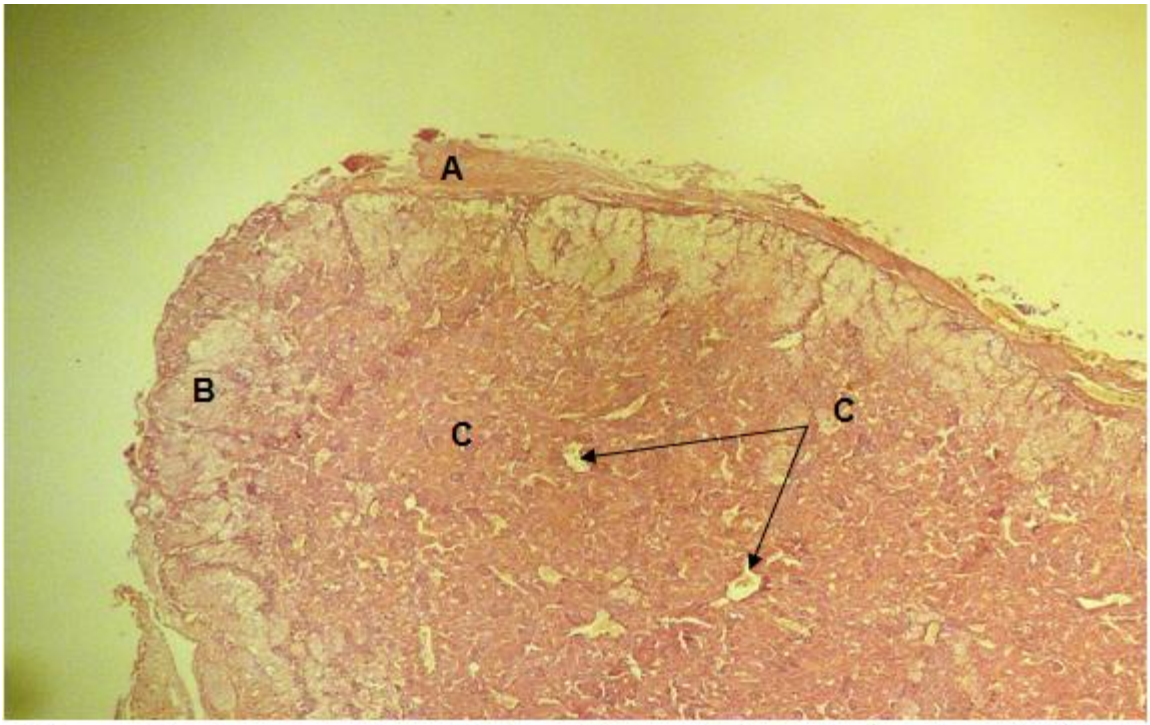

Figure (4) Cross-section of adrenal gland of duck showing. A-thick capsule B-Subcapsular zone C-central or inner zone D-blood sinusoids**(H&E. X 40)**

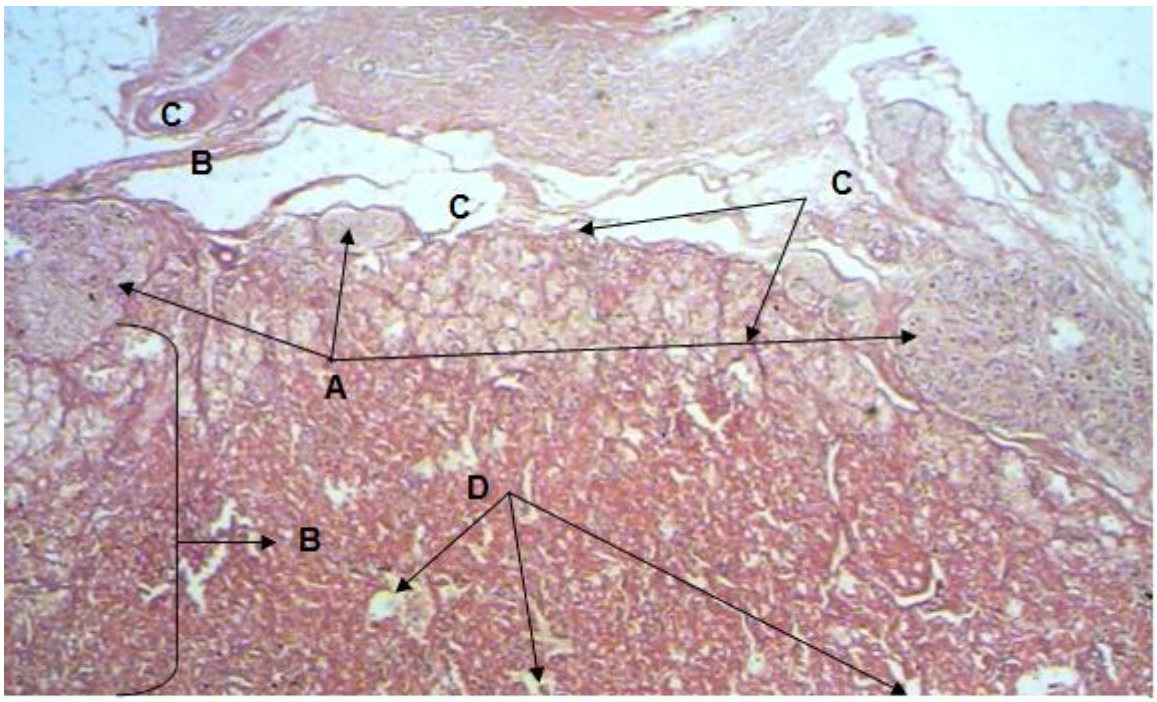

Figure (5) Cross-section of adrenal gland of duck showing.A-ganglionic cells B-Parenchyma of gland C-Blood vessels D-blood sinusoids **(H&E. X 40)**

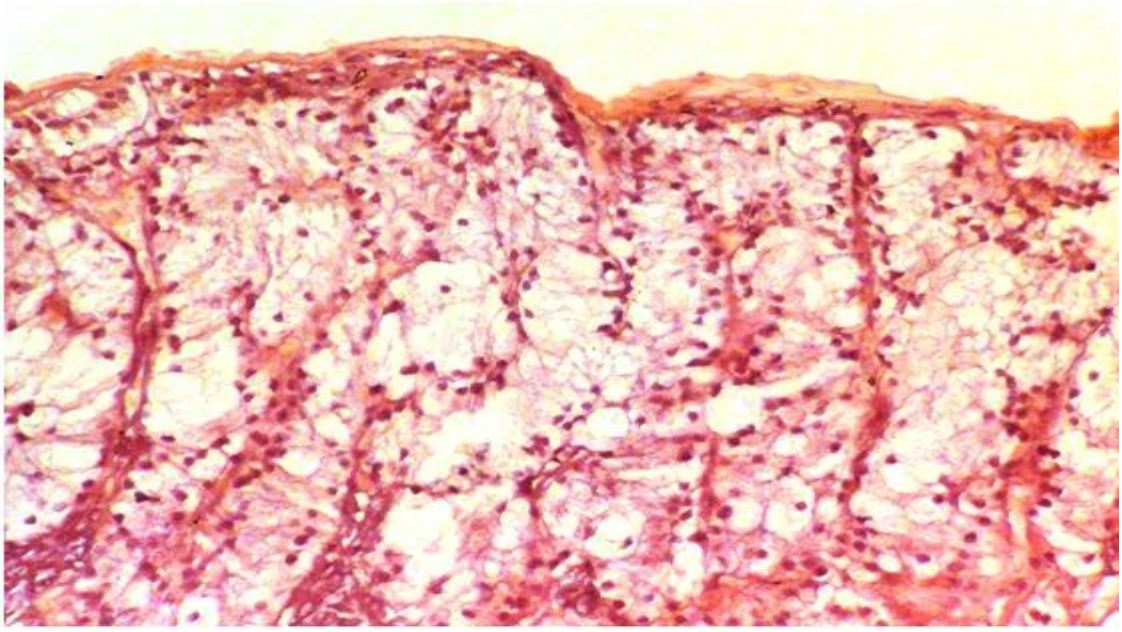

Figure (6) Cross-section of subscapular zone of adrenal gland in duck showing acidophilic cells appear in the form of cords arranged irregularly. **(H&E. X400)**

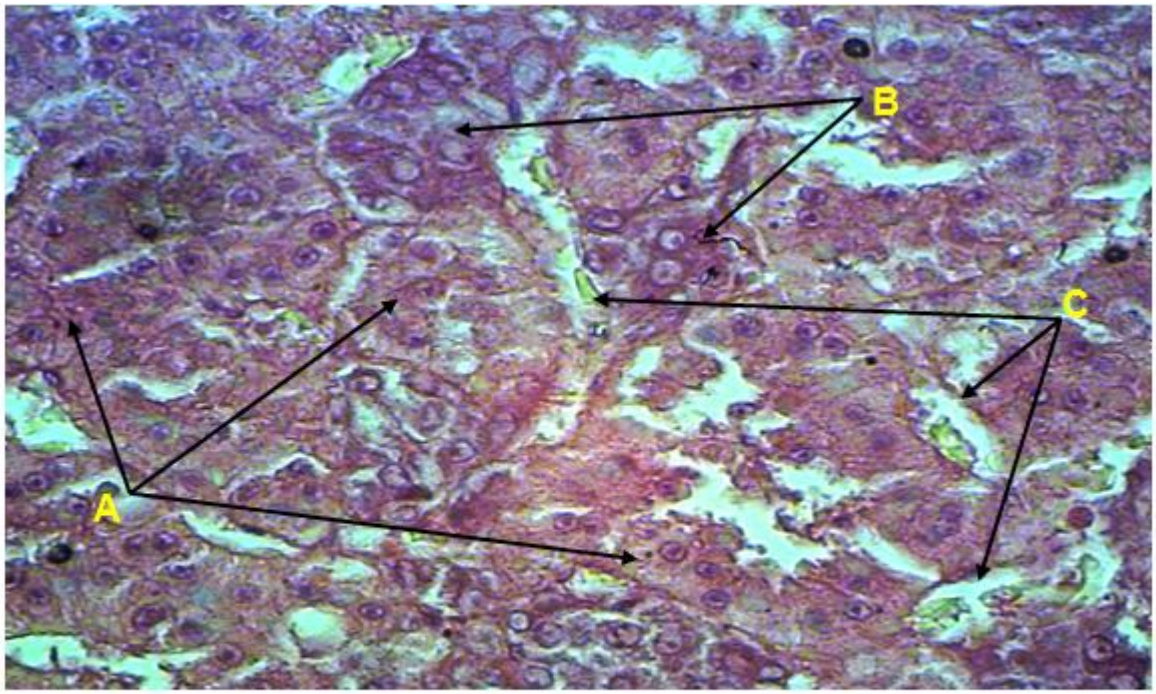

Figure (7) Cross-section of central zone of adrenal gland in duck showing A-acidophilic cells B-chromaffin cells C- blood sinusoids. **(H&E. X400)**

دراسة نسجية مظهرية للغدة الكظرية في اناث البط البالغة (Anasplatyrhynchos)

جعفر غازي عباس، علي كاظم حمادي ، احمد عبيد حسين ، زينة شاكر محمود

كلية الطب البيطري، جامعة القاسم الخضراء،بابل ،العراق

كلية التقانات الإحيائية ، جامعة القاسم الخضراء، بابل ،العراق

الخلاصة

تهدف الدراسة لوصف الخصائص المظهرية والنسجية للغدة الكظرية في اناث البط العراقي حيث جمعت العينات بواقع عشرة غدد من خمسة اناث بط . إناث البط تمتلك زوج من الغدد تقع في الجوف ألبطني في النهاية الأمامية للكلى.يتباين شكل الغدد حيث تكون شبة دائرية في الجهة اليمنى في حين تكون متطاولة او مثلثة او هرمي الشكل في اليسرى ويتراوح وزن اليمنى 0,39غم ووزن اليسرى 0,41غم .تبلغ قيمة المحور الطولي للغدة اليسرى 15,46ملم ونصف قطر اليمنى 11,30ملم . تقسم الغدة الكظرية في البط الى نطاق محيطي ونطاق مركزي او مايسمى النطاق الداخلي. النطاق تحت المحفظي يتكون مجموعة من الخلايا التي تقع مباشرة تحت المحفظة وتكون على شكل حبال غير منتظمة الترتيب بينما يوجد نوعين من الخلايا في النطاق المركزي الاول يسمى الخلايا الحمضة والاخرى تسمى الكروموفين.

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