Histomorphology study of kidneys in Hoopoe Iraqi bird (*Upupa epops*)

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Abstract

The present work was designed to investigate the anatomical and histological structure of the kidney in adult Hoopoe Iraqi bird ten birds from the local breed of Babel market for the sale of birds used for the anatomical and histological study of kidney.study recorded the mean weight of bird (79.71±0.05gm), the mean weight of left kidneys (6.88±0.055gm) and right kidneys (5.14±0.03gm) and The mean length of body birds(26.5±0.03cm) and the mean length the left kidney (2.98±0.05cm) and right kidneys about (2.1±0.033cm) and mean thickness of Right cranial, middle. Caudle lobe is (0.33±0.033, 0.4±0.037, 0.54±0.02) while the mean thickness of left carinal, middle. The caudle lobe is (0.49±0.01, 0.58±0.03, 0.7±0.05) The anatomical results appeared flattened and located in retro-peritoneal organs embedded in the ventral surface of the synsacrum bone. The color of the kidney varies from brownish red to dark red and the semi rounded cranial lobe with elongated somewhat middle division and the expanded irregularly shaped and the histological result of kidneys capsule fine thickness with measure thickness is (1.34±2.45 um) at 4X power magnification composed of fine collagen and reticular fibers. and no any demarcation between the cortex and medulla the cortex which occupied by large part of tube has two types of glomerulis the mammalian and reptilian type the vein appears more development in kidneys. The PCT appeared lined by tall cuboidal epithelial cell while the DCT lined by low cuboidal epithelia cells. The collecting tubule lined by one layer of pale cells with cuboidal to low columnar shape while collecting lined by simple cuboidal in smallest collecting ducts then appeared lined by simple columnar duct appear elongated and surrounded by epithelia cell located in medulla.

Keywords: Hoopoe, Bird, *Upupa epops*, Kidneys, Reptilian type

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Introduction

The avian urinary organs consist of a pair kidneys and ureters, which transport urine to the urodeum of the cloaca birds, without urinary bladder exception of Ostrich and Rheas have a urinary bladder The external appearance is an elongated, somehow irregularly shaped of a dark brown color and fragile in texture They are also considerably larger in comparison to those of mammals and reptiles (Carpenter, 2003; Ritchison, 2008). Each kidney is made up of three divisions, often called lobes, designated as cranial, middle and caudal (These divisions are primarily due to the position of the major blood vessels that pass through the kidney (Yocota *et al.*, 2005). The line of demarcation separating the cranial and middle divisions has been described as the groove occupied by the femoral artery whilst that separating the middle and caudal divisions is generally considered to the groove containing the sciatic artery. In domestic fowl, the divisions of each kidney are distinct, but in Passerines the middle division is not well defined being largely fused to the caudal one (Al-Ajeely, 2012)

The avian kidney lies within a cavity formed by ventral surface of the synsacrum, extra peritoneal deep in the recesses of the renal fossae so closely attached of the pelvis that their dorsal surface fits into the depression and ridges of the median part of ventral pelvic surface Radiographically. Welle (2001) showed that the avian kidneys occupy the dorsal body cavity caudal to the acetabula which lie in pockets of the bone on the ventral surface of synsacrum the cranial division bulges out ventrally and can be seen most easily on the lateral. Histologically, the kidney of birds have been nephrons are dividing into cortical (reptilian) type which is a shortest type and locate in renal cortex more numerous, but lack henel's loop, whereas, the second nephrons named medullary (mammalian) type, it has a longest type and has henel's loop, this type of nephrons is less numerous than cortical nephron and extended to medulla (Dhyaa *et al.*, 2014). The current study is aimed to histomorphological description of kidneys in Hoopoe Iraqi bird (*Upupa epops*).

Material and method

ten adult Hoopeop bird were used in this study, all birds were collected during the breeding season between the fifth and sixth months of the Babel market for the sale of birds and then transferred to the laboratory of anatomy and histology of the faculty of veterinary medicine of Qasim Green University, experimental birds were anesthetized by using chloroform inhalation in closed champers and then the necropsy were applied to remove the kidneys. All histological processing were occur then the histological slides were stained by Hematoxylin and Eosin and Masson trichromstain (Aboodd, 2022). An ocular micrometer were used to measure the The body weight and length of bird, then the kidney weight, thickness and length of kidney were recorded

immediately after obtaining the kidneys from the sacrificed Hoopoe. A balance was used for body weight and kidney weight, the length and the width of each kidney were measured using vernier – calipers to an accuracy of ±0.1cm. All measurements were taken at the same location for all kidneys. Length measurements were taken from the anterior tip of the cranial division to the most posterior tip of the caudal division. Width measurements were taken from the lateral to the medial side of the caudal division, since this division showed the maximum width of the kidneys (Casotti, 2001).

Result and discussion

Weight and dimensions of kidney

These observations data presented in the tables; it is appeared from the Table 1 that Mean± Standard deviation to Mean weight the bird about (79.71±0.05 gm) and Mean weight the right kidneys bird a (5.14±0.03 gm) and Mean weight the left kidneys bird about (6.88±0.05 gm) a result appear the left kidney is heavier weight than the right kidneys this result agree with Michalek *et. al.,* (2016) in Pigeon.

There is a higher average of left kidneys may be flowing the blood to left kidney from the left external iliac vein compared to the right vein. and mean length the bird about (26.5±0.03 cm) and mean length the right kidney about(2.1±0.033cm) with thickness of right cranial lobe(0.33±0.033 cm) and middle (0.4±0.037) and caudal (0.54±0.02 cm) while the left about (2.98±0.05 cm) and thickness of left cranial lobe about (0.49±0.01 cm) and middle(0.58±0.03 cm) while caudal about (0.7±0.05 cm) according to Tables 2 and 3 and the result appear that the length and width of the left kidney is taller and wider than the right kidney.

Table 1: The mean weight of birds, right and left kidney (gram), (n=10, M±S.E).

Anatomical parameters	Mean± S.E
Mean weight the birds	79.71±0.05
Mean weight the right kidney	5.14±0.03
Mean weight the left kidney	6.88±0.055

Table 2: The mean length of body birds, right and left kidney cm, (n=10, M±S.E)

Anatomical parameters	Mean ± S.E
Mean length the birds	26.5±0.03
Mean length the right kidney	2.1±0.033
Mean length the left kidney	2.98±0.05

Table 3: The mean thickness of cranial, meddle and caudal lobe in both right and left kidney cm (n=10), (M±S.E).

Anatomical parameters	Mean ± S.E
Mean thickness of right cranial lobe	0.33±0.033
Mean thickness of right middle lobe	0.4±0.037
Mean thickness of right caudal lobe	0.54±0.02
Mean thickness of left cranial lobe	0.49±0.01
Mean thickness of left middle lobe	0.58±0.03
Mean thickness of left caudal lobe	0.7±0.05

Morphological description of kidney in an adult hoopoe bird

The kidney in an adult hoopoe appeared flattened and located in retro-peritoneal organs embedded in ventral surface of synsacrum bone and reached synsacrum end caudally and cranially related to the lungs, occupied the renal fossae of ilium. This result is supported by researchers (Welle, 2001) The color of kidney in adult hoopoe appeared variable from brownish red to dark red and this is Similar to the other studies discussed by Al-Azawy (2005) in fowl and geese. Discussed that the color of kidney in fowls and geese varies according to the amount of blood they contain from pink to brownish Each kidney consists of completely attached lobes; a appear the cranial lobe is lobe, a small middle and a caudal lobe is somewhat larger than the middle and cranial lobe (Figs.1 and 2). This disagrees with AL-Agele (2012) in chicken who's each kidney is divided into three divisions, the semi rounded cranial lobe, the elongated somewhat appear middle division and the expanded and irregularly shaped caudal division, but gross anatomy of this study is similar to what was described by Casotti and Braun (2000) in *sparrows*, it is appeared to be fusion caudally between the right and left kidneys.

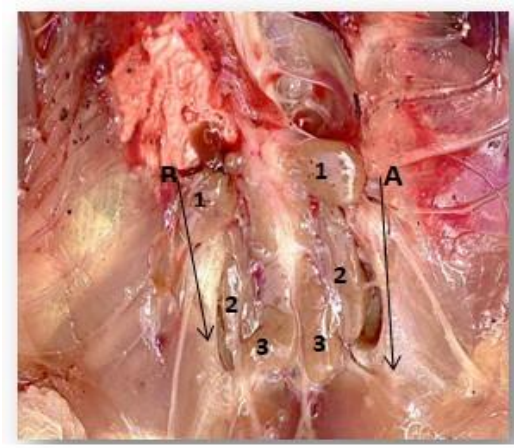

Figure 1: Showing the anatomical kidneys of hoopoe bird. A. Left kidney: 1) Cranial lobe, 2) Middle lobe, 3) Caudal lobe; B. Right kidney: 1) Cranial lobe, 2) Middle lobe, 3) Caudal lobe.

The principal division of the kidney the middle and caudle are complete embede in sanysacrum fossa Our noted was agreement with AL-Agele (2010) who was described the caudal lobe of kidney in racing pigeon is the largest three parts but disagree with him when described the middle as the caudal lobe in size and our results also not similar with Dauod and Israa (2021) in coot bird and the kidneys of hooepoe Iraqi bird does not fully housing the available space of their respective renal fossae.

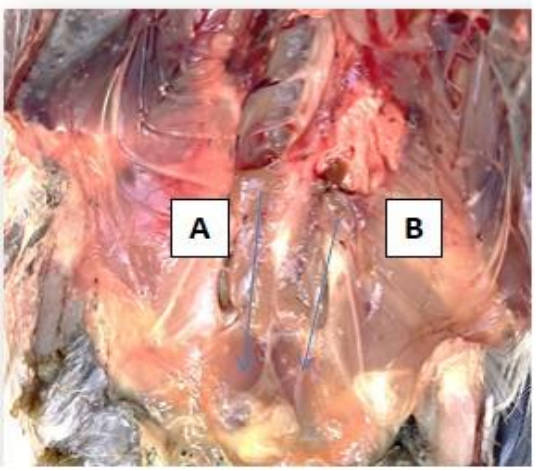

Figure 2: Showing the anatomical kidneys of hoopoe bird, A: left kidneys, B) Right kidneys.

This is not in agreement with the results of the current study in squab pigeon due to that the kidney appeared very large beyond the housing area but it is parallel with Havenga (2015) in mature fowl, duck and gees where the principal segments of the kidneys do not fully occupy their renal fossae. However, mentioned that the modification of the osseus pelvis influences the morphology of the kidney in domestic birds such that in the gallinaceous birds the kidneys are short while in water fowl they are elongated (Fig. 3).

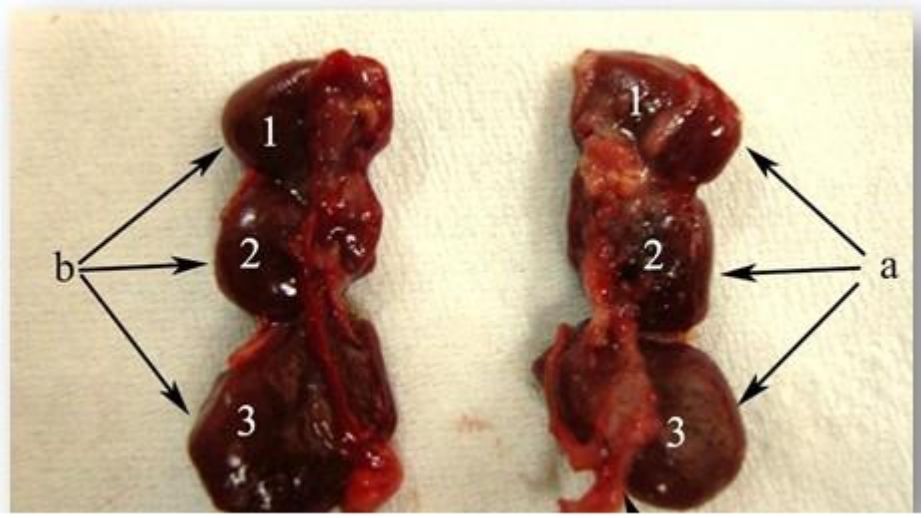

Figure 3: Anatomical view showing kidneys of hoopoe bird. a) Left kidneys: 1) Cranial lobe, 2) Middle lobe, 3) Caudal lobe. b) Right kidney: 1) Cranial lobe, 2) Middle lobe, 3) Caudal lobe.

Result histological section of kidneys appears the capsule in cross section of kidney Hoopoe birds appear fine thickness with measure is (the histological section of testis show capsule with thickness about (1.34±2.45 um) at 4X power magnification composed of fine collagen and reticular fibers (Fig. 4).

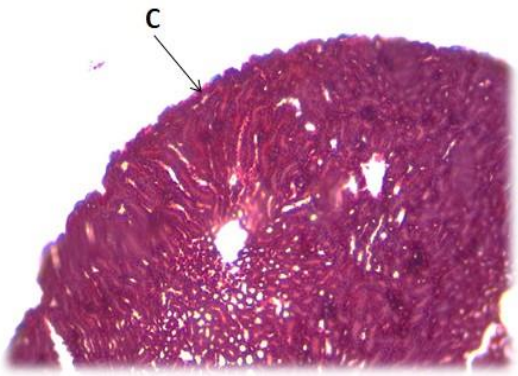

Figure 4: Showing the kidneys of hoopoe bird (C) capsule (H&E, 20X).

This is supported by Al-Azawy (2005) in domestic fowls and geese, who noticed that the capsule appeared consisting of smooth muscle with some of reticular fibers, while Alkafagy *et. al.* (2019) in disagrees this finding especially in honeyeater birds. The parenchyma of kidneys appears irregular in shape and no any demarcation between the cortex and medulla, which observed pass structures with each other, the parenchyma devised by venues. However, the lobule consists of a large peripheral cortical area and a smaller medullary area The current study observed that no boundaries between cortex and medulla as kidney (Fig. 5) and this result agree with Baragoth (2015) in mammals Japanese Quail (*Conturnix coturni*). The cortex which appears occupied by large part of the lobule its proximal convoluted tubules, distal convoluted tubules, Bowman's capsule with their glomeruli and among them numerous numbers of small size glomeruli which appeared in this area also can showing the many and different tube present in this area while the medulla less tube present comparative with cortex (Fig. 6). These results agree with (AL-Taai and Nasif, 2020).

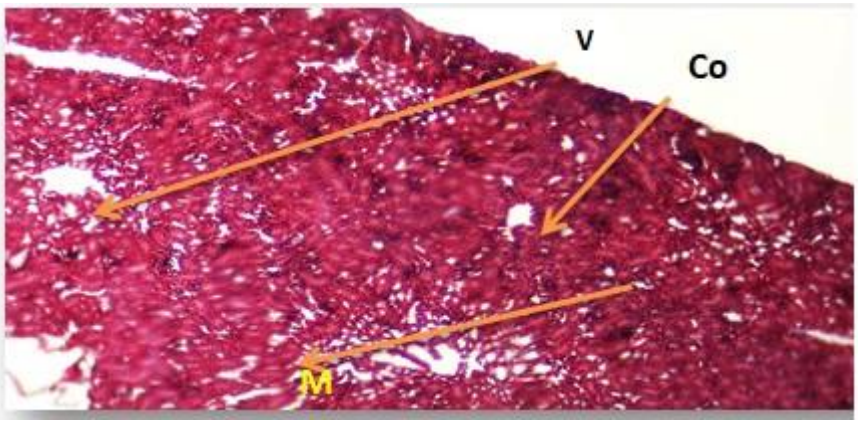

Figure 5: Showing the kidneys of hoopoe bird (CO) cortex. (M) medulla. (V) Central vein (H&E, 20X).

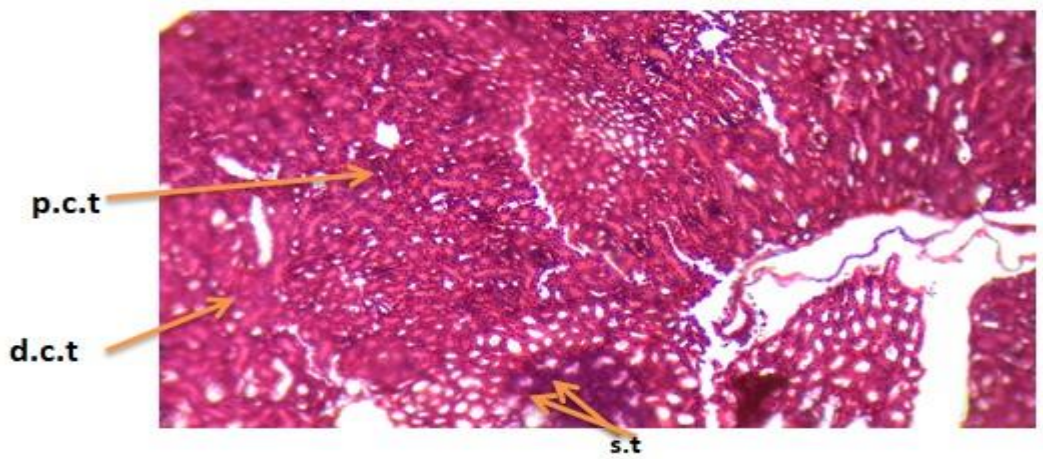

Figure 6: Showing the kidneys of hoopoe bird: (p.c.t) proximal convoluted tube, (d.c.t) distal convoluted tube, (s.t) small tube (H&E,20 X).

The kidneys of hoopoe bird has two type of glomerulis the first was the mammalian type which had large renal glomeruli showed well developed loop of Henle with thin and thick segments, the second type was the reptilian type which had small renal glomeruli and characterized dark area of glomerulis while the vein appear more development in kidneys (Fig. 7). The PCT appeared in kidney of hoopoe lined by tall cuboidal epithelial cell had narrow elongated lumen with well-developed brush border and the epithelium characterized by high cuboidal cells while the distal convoluted tube appear in sections was lined by low cuboidal epithelia cells. More cells lined these tubules and appear the lateral borders observed more clearly de fined than the PCT with lumen appear wider in d.c.t from p.c.t and more size (Fig. 8). These results were accepted with whom said that Baragoth (2015) which described renal tubules and collecting duct in Quail and Green-Winged Teal.

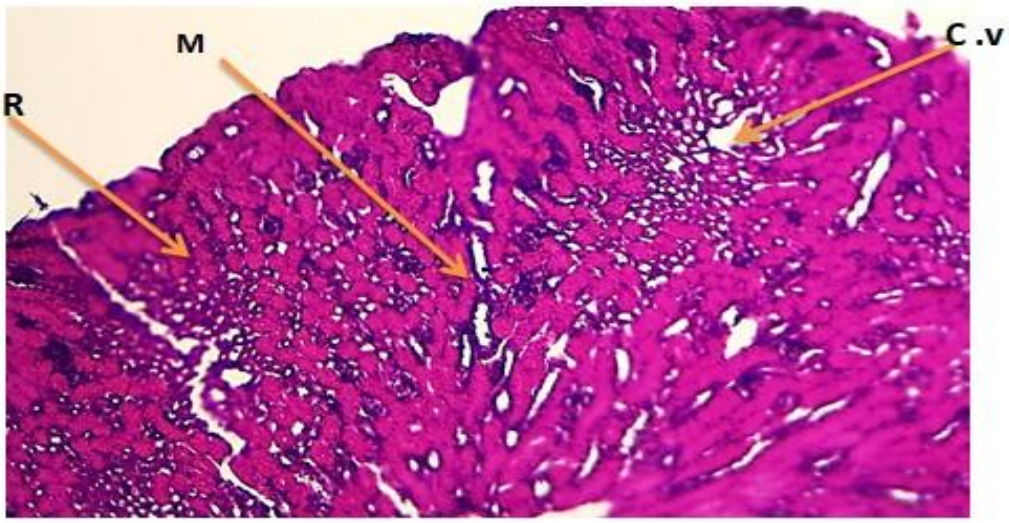

Figure 7: Showing the kidneys of hoopoe bird. R) Reptilian kidney, M) mammalian kidneys, C.v) central vein. Reptilian kidneys (H&E, 40X).

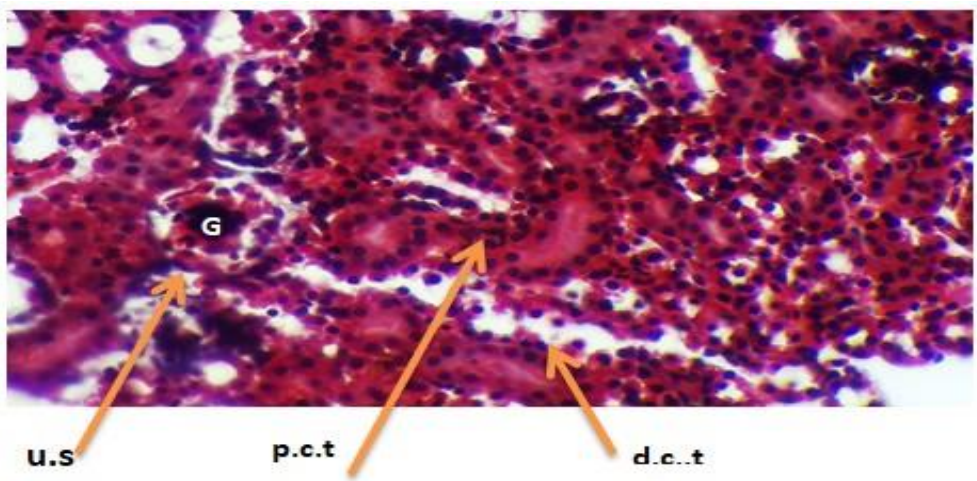

Figure 8: Showing the kidneys of hoopoe that glomeruli (G), Urinary space (us), Proximal convoluted tube (p.c.t), distal convoluted tube (d.c.t) (H&E, 20X).

The collecting tubule lined by one layer of pale cells with cuboidal to low columnar shape and stained lightly with routine stain. The nucleus appears large and cell borders were distinct form and located in cortex. It observed intermediate in size between PCT and DCT while collecting lined by simple cuboidal in smallest collecting ducts then appeared lined by simple columnar duct appear elongated and surrounded by epithelial cell and located in medulla the (Fig. 9) our data wasconcords with (Nabipour *et. al.*,2009) in avian.

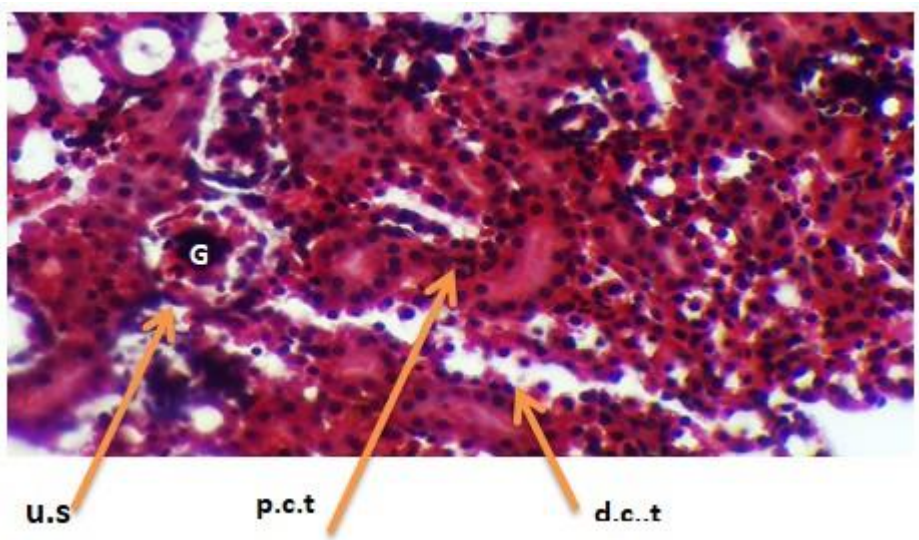

Figure 9: Showing the kidneys of hoopoe bird. Glomeruli (G), Proximal convoluted tube (p.c.t), Collecting duct (.c.t), Collecting duct (c.d), Cuboidal cell (C.c), Columinar cell (Co.c) (H&E, 40X).

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