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Study of Anatomical Description and Histological Structure of the kidney in Iraqi Birds.

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دراسة الوصف التشريحي والتركيب النسجي للكلى في الطيور العراقية

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Abstract

Background:

The current study aims to identify the morphological description and histological structure of kidney in bird. Morphologically the kidney consist of three lobes represented by the cranial, medial and caudal taking into account the difference in the shape and size of the lobes.

According to histology, the kidney is surrounded in a delicate connective tissue capsule. The kidney's primary structural component is the lobule, which is made up of cortical and medullary tissue in each lobule. There are two parts to the kidney medulla and cortex. The cortex is larger than the medulla and has glomeruli, proximal convoluted tubules, and distal convoluted tubules, whereas the medulla has thin and thick segments of Henle's loop, collecting tubules, and collecting ducts.

Conclusion:

The kidneys in Iraqi birds are morphologically and histologically different.

Key words: Bird, kidney, Morphological description, Histological structure.

الخلاصة

المقدمة: هدفت الدراسة الحالية الى التعرف على الوصف المظهري والتركيب النسجي للكلى في الطيور. من الناحية المظهرية تتألف الكلى من ثلاث فصوص ممثلة بالفص القحفي والوسطي والذيلي مع الأخذ بنظر الأعتبار الأختلاف في شكل وحجم الفصوص.

نسجياً تكون الكلية محاطة بمحفظة رقيقة من النسيج الضام. إن الوحدة الأساسية للكلية هي الفصيصات كل فصيص مكون من نسيج قشرة ونسيج لب.

تتالف كل كلية من منطقتين هي القشرة واللب وتحتل القشرة مساحة أكبر من اللب تحتوي القشرة على كبيبات ونبيبات ملتوية دانية ونبيبات ملتوية قاصية، بينما يحتوي اللب على القطعة النحيفة والسميكة من عروة هنلي والنبيبات الجامعة والأقنية الجامعة.

الاستنتاجات : تكون الكلى في الطيور العراقية مختلفة من الناحية المظهرية والنسجية.

الكلمات المفتاحية : الطيور، الكلية، الوصف المظهري، التركيب النسجي.

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Introduction

Diverse classes of animals have different kidney morphologies. In contrast to other vertebrates, mammals and birds have both cortex and medulla in their kidneys. It is not unexpected that the only vertebrate classes that can produce concentrated urine are birds and mammals because the renal medulla makes this possible [1].

Like the kidneys of other vertebrates, the function of a bird's kidneys is filtration, excretion or secretion, and absorption. The kidneys are crucial for reabsorbing necessary nutrients and preserving water [2].

The kidney is a key organ in maintaining the constancy of the internal environment in both mammals and birds. It does this by ensuring a balance between glomerular filtration, renal tubular secretion volume, osmolarity, ionic content, and pH of the bodily fluid [3 and 4].

The nephron, which functions as the kidney's functional unit, has wide structural variation among vertebrates. It also exhibits a range of species-specific structural variances. In birds, the kidney has two different types of nephrons: a mammalia type with large size and long or intermediate length loops, and a reptile type with small size and no loops of Henle [5 and 8].

Anatomical Description of kidney in bird

Each kidney in a bird consists of a cranial, middle, and caudal lobe and is flattened and embedded in the ventral surface of the synsacrum bone [9 and 13]. Many researches have taken the study of the kidney in birds with more interest, The researcher [14] studied the kidney in rock pigeon, where the researcher mentioned that the kidney in rock pigeon is divided in to three lobes cranial lobe, middle lobe and caudal lobe. The caudal lobe is the largest of these lobes. The researcher [15] cited that the kidney lobes in chickens are represented by a rounded cranial lobe , a medial cylindrical and an irregularly enlarged caudal, and this was confirmed by the researcher [16] Another researcher [17] mentioned in his study of the kidney in steppe buzzard. The bird under study possesses a pair of large oblong kidneys located symmetrically in the synsacrum and reaching the lungs from the front, consisting of three lobes, cranial, medial and caudal, dark brown in color.

The kidney in the coot bird is divided into three parts: a large cranial portion, a small caudal portion, and a middle portion, according to another researcher who examined the kidney in the coot bird [11]. The kidney is divided into three lobes, with the caudal lobe being the largest and widest of the others, according to the researcher who examined the kidney in hatching and adult racing pigeons [12].

The kidney is divided into three lobes, according to another researcher who looked at golden eagle kidneys [18]. The caudal lobe appeared to be similar to the middle lobe but slightly smaller than it, and the cranial lobe was the biggest and wider than the other two lobes.

Members of most orders of birds with the exception of the order of passerines, in which the kidney lobes are clearly separated ,while the middle lobe is not clearly distinguished and

merged with the caudal lobe in the members of the passerines , and this was confirmed by previous studies [12, 16, 19 and 20].

The researcher [21] reported in her study of the kidney in two types of Iraqi birds, barn owl and Iraqi black partridge that the kidney in barn owl represented by a cranial lobe, which is the largest of the kidney lobes and appears oval and more full than the rest of the lobes. The second lobe is the median lobe and it is the smallest of the kidney lobes and takes an oval to relatively narrow cylindrical shape. As for the third lobe, it is the caudal lobe, which is larger than the median lobe, morefull and smaller than the cranial lobe and takes an almost oval shape.

As for the kidney in the Iraqi black partridge it is composed of a cranial lobe, which is the largest of the kidney lobes and appears closer to an oval shape. It is wide at its front end and gradually narrows at its rear end. The median lobe appears narrow and elongated, Its lower half is wider than its upper half, The caudal lobe is roughly triangular in shape and is the shortest of the kidney lobes.

A different researcher examined the kidneys of a harrier, chicken, and mallard duck [22]. There were three lobes-the cranial, middle, and caudal-in each kidney. The sizes and shapes of the kidney lobes varied. In the harrier, the cranial lobe was larger and had an elongated shape as opposed to the middle and caudal lobes, which were triangular in shape. The kidney's cranial lobe in mallards was small and round or oval in shape. The caudal lobe was the largest and most elongated, while the middle lobe was also longer. The cranial, middle, and caudal lobes of chickens exhibit relatively large size.

Another researcher [23] talked about the study about the kidney in two Iraqi birds (Quail and Green – Winged Teal). This researcher also mentioned that the kidney in both birds composed of three lobes.

In his study of flamingos, another researcher [24] noted that the kidney was divided into three separate lobes: the cranial, middle, and caudal. The cranial lobe had an oval shape and was obliquely bent. The caudal lobe appeared to be the largest and most irregularly shaped, while the middle lobe was narrow and elongated in shape.

Other researcher [25] studied the kidneys of different species of birds, these researchers stated that the avian kidney consist of three separated lobes.

Of the investigation of the kidney in white-breasted kingfishers, another researcher [26] noted that the kidney was divided into three lobes: the cranial, middle, and caudal lobes. Other researchers [27] examined the kidney of an Iraqi falcon, which had three lobes: the cranial, middle, and caudal lobes.

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Histological structure of kidney in bird

A thin capsule of connective tissue protects the kidney in birds, as shown by studies on the subject of the kidney in birds [12, 17, 21, 23, 26 and 27].

Lobules are the main structural component of the kidney. Each lobule is made up of medulla and cortical tissue. Numerous studies [16, 17, 21, 22, 23, 24, 25, 26, 27 and 28] support this.

The cortex tissue in birds takes up more space than the medulla. This is agreement with many studies [11, 17, 21, 22, 24 and 26].

In the region of the cortex there are glomeruli as shown in the sections of proximal convoluted tubules and distal convoluted tubules. This is agreement with many studies [11, 12, 14, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26 and 27].

Birds' glomeruli are spherical in shape, with mesenchymal cells making up their central portion. Each glomerulus is encased in a bilayer capsule known as a Bowman's capsule. The parietal layer, which is the first layer of this capsule and is made up of simple squamous epithelial tissue, and the visceral layer, which is the second layer, are separated by a space in the capsule known as Bowman's space.

This is confirmed by studies that dealt with the subject of kidney in birds [14, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26 and 27].

Vascular pole and urinary pole are the two poles that each glomerulus possesses. The vascular pole area has a structure called the juxtaglomerular apparatus, which is made up of juxtaglomerular cells in contact with the macula densa. Numerous researchers have noted that juxtaglomerular cells have elliptical nuclei [11, 16, 18, 21, 23, 24, 26 and 29].

A review of the source indicate that there is a variance in the type of proximal convoluted tubule in different vertebrates and this contrast ranges from simple squamous epithelial tissue to simple columnar epithelial tissue. But the majority of studies indicate that the lining is composed of simple cuboidal epithelial tissue and the free surface of the cell is provided with a brush border these cells based on a basement membrane and cell nuclei are circular and centrally located. This is agreement with many studies [4, 16, 30 and 31].

According to numerous studies [3, 8, 15, 16 and 19] the free surface of the distal convoluted tubule is devoid of the brush border and is lined with simple cuboidal epithelial tissue based on a basement membrane.

Henle's loop is found in both thin and thick segments in the medulla, along with collecting tubules and ducts, which is in accordance with numerous studies [11, 12, 14, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26 and 27].

Henle's loop's thin and thick segment was lined with plain cuboidal epithelial tissue. The cuboidal cells in the thick segment of Henle's loop appear thicker than the thin section, and the

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nuclei of the cells are circular and centered. Several investigations [11, 16, 20, 21, 23, 26 and 28] support this agreement.

The nuclei of the cells are located more near the base than the center of the collecting tubules, which are lined with a simple cuboidal to columnar epithelium. This finding is consistent with several research findings [14, 16, 21 and 26].

Conclusions

According to histology, the kidney in birds is divided into three lobes: the cranial, medial, and caudal. The cortex and the medulla are the two areas that make up the kidney. Glomeruli, proximal convoluted tubules, and distal convoluted tubule sections can all be found in the cortex. Henle's loop, collecting tubules, and collecting ducts are all found in the medulla.

Conflict of interests.

There are non-conflicts of interest.

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