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Histological Study of the nephron in One Humped Male Camel (Camelusdromedarius)in two season at AL- Muthanna Province

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Abstract. The goal of this study was to compare the structure and operation of the one-humped male camel's kidneys in the summer and winter. For this experiment, ten mature male camels connected to the Al-Samawa abattoir had their kidneys removed. Kidneys were separated for histological examination using H&E and PAS stains, among other histological methods.The kidneys of dromedaries and camels have enormous vasa recta and loops of Henley in abundance, as well as huge numbers of juxtamedullary nephrons. The loops of Henley in the medulla of the nephrons are also well-developed. There were more masses in the inner medulla than the outer, and sections made it clear that the vasa recta were nicely organized into vascular bundles most of the time in the outer medulla region, which then branched off into the bundles of Henley and collecting tubules.Observations made at the microscopic level revealed that the crescent pelvis expands upward to produce cup-like structures that extend to the summit of the (20–24) renal pyramids. Other characteristics showed that the kidney of the one-humped camel has a high reabsorption rate, which led to the generation of highly concentrated urine.

1. INTRODUCTION

The structural and operational unit of the kidney is the nephron. Nephron counts vary depending on the animal's species and are over a million per kidney (1). Nephron is divided into six morphologically unique segments: 1-The renal corpuscle 2- The straight and 3- The convoluted sections of the proximal tubules, 4- The thin segment of the Henley 5- Straight and 6-convoluted distal tubule sections(2)

The renal corpuscle is surrounded by the proximal and distal convoluted tubules, which are found in the cortex. The nephron's loop, as described by Henley, is formed by the thin segment and the straight section of the proximal and distal tubules. The skinny segment of the nephron is made up of the skinny descending and ascending limbs(3)

Therefore, the purpose of this study to investigate the histological difference in camel kidney between winter and summer in al-muthanna province to serve as foundational evidence for future research and to supply fundamental information that can be incorporated into subsequent studies.

3.MATERIALS AND METHODS

3-1 Experimental animals

In this study, ten animals from healthy adult male camels were bought from local slaughterhouse of Al-Samawa respectively, all sample collection in summer and winter at the morning, their ages are between (2-3) years.Under the supervision of the veterinarian, samples from the Samawa Governorate massacre were taken for a histological examination of the camels' kidneys after being evaluated for disease safety.

3.2 Histological Studies

Ten animals (male camels) were used for thehistological observations. The kidneys were cut into small pieces (1) cm, and were taken from the cortex and medulla, Where they wereimmediately

fixed in 10% formalin for 48 hours. The formalin solutionis prepared by the addition of 10 ml from 37.9% formalin to 90 ml of tap water (17).

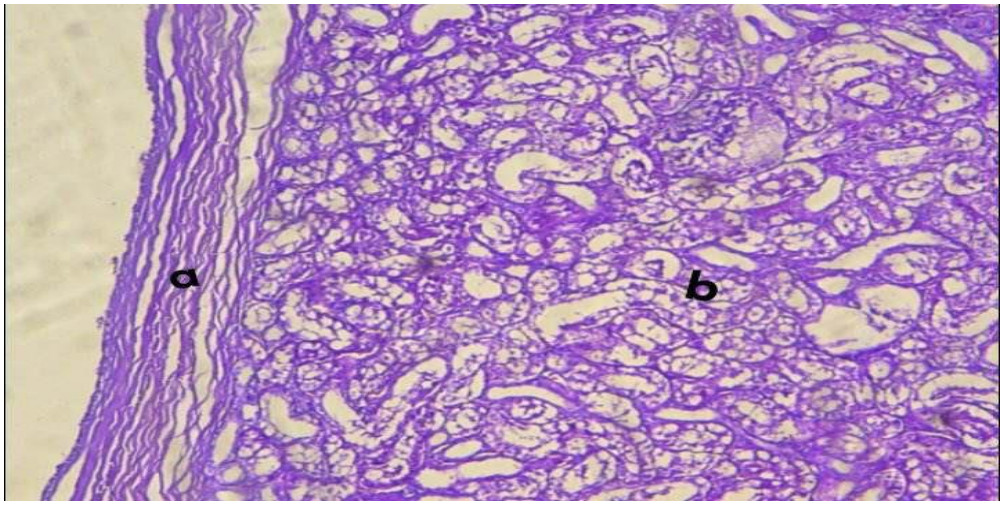
4. RESULT

4.1 Histological study

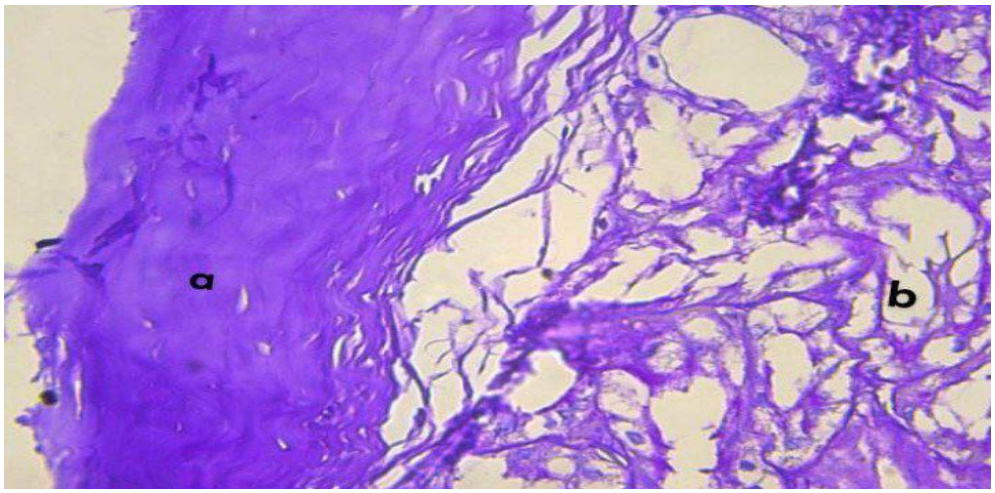
The results showed that camels had a thick renal capsule in winter comparative with summer (1,2). The subscapular region had few renal corpuscles, but their numbers increased as they moved toward the midcortical and juxtamedullary regions(3,4). Furthermore, the camel kidney possesses a large proportion of Henley nephrons with long loops and a low proportion with short loops. The renal corpuscle sizes between the midcortical and juxtamedullary sections did not differ significantly ($p>0.05$)

The sizes of the renal corpuscles were, however, significantly (p0.05) reduced in the subcapsular region. The renal corpuscles are also divided into two layers, each of which has a cluster of capillaries. The proximal convoluted tubules (PCTs) have broad lumens and spherical nuclei in addition to cuboidal epithelial cells (CuECs). CuECs with apical spherical nuclei (ASN), which were smaller and lighter than those seen in PCTs, were present in the distal convoluted tubules (DCTs).simple columnar epithelial cells (COECs) with large lumens(7,8). Furthermore, the basement membrane of the renal corpuscles responded highly well to PAS staining.

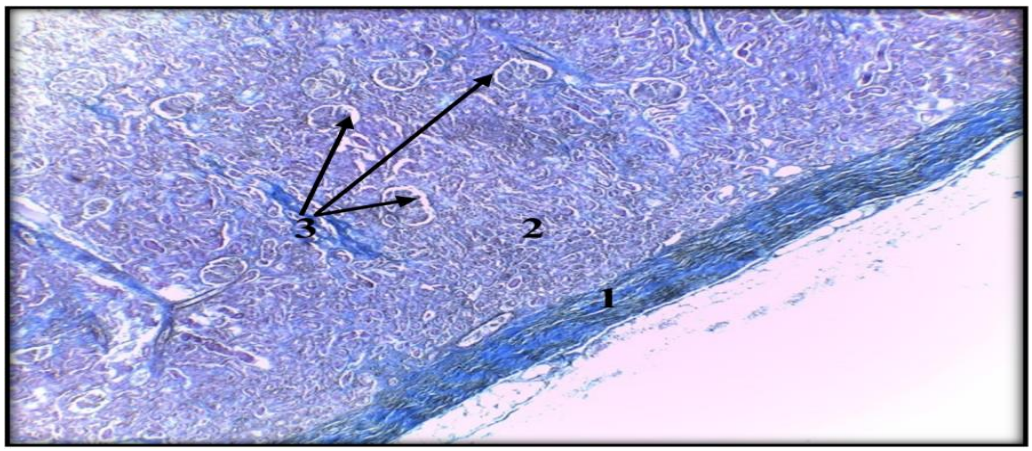
Henley and collecting tubuleslining with simple cuboidal epithelium with clear crowded ovoid nuclei and thick trabecular or septa separating these ducts fig (8,9).



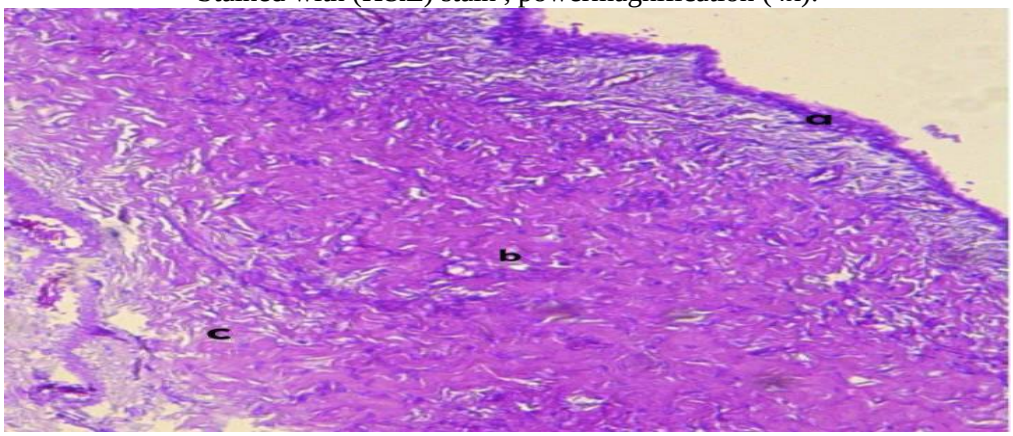
FIGURES(1): Cross section of kidney in summer showed ; renal fibrous capsule with fatty tissue (a) renal cortex parenchyma,(b) renal corpuscles with fine septa separated each. Stained with (H&E) stain , power magnification (20x).



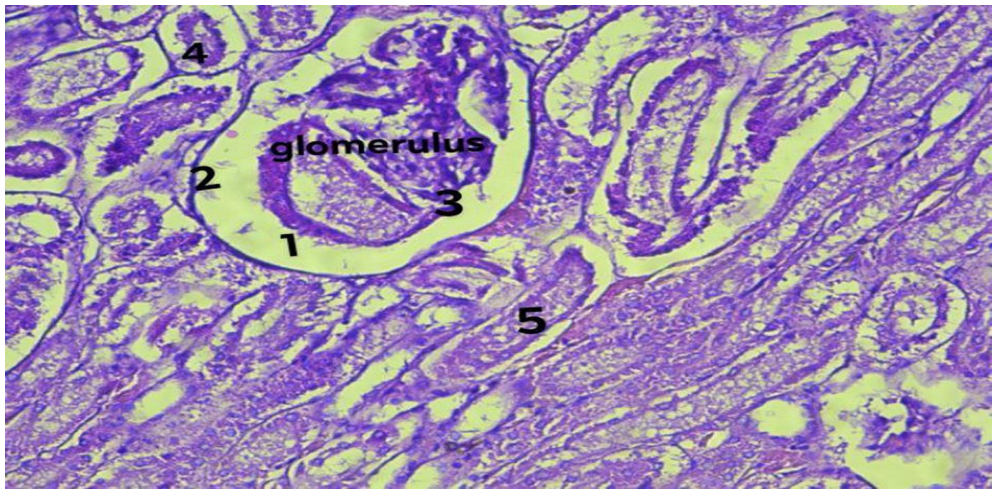
FIGURES(2): Cross section of kidney in winter showed ;renal fibrous capsule with fatty tissue (a) renal cortex parenchyma,(b). Stained with (H&E) stain , power magnification (4x).



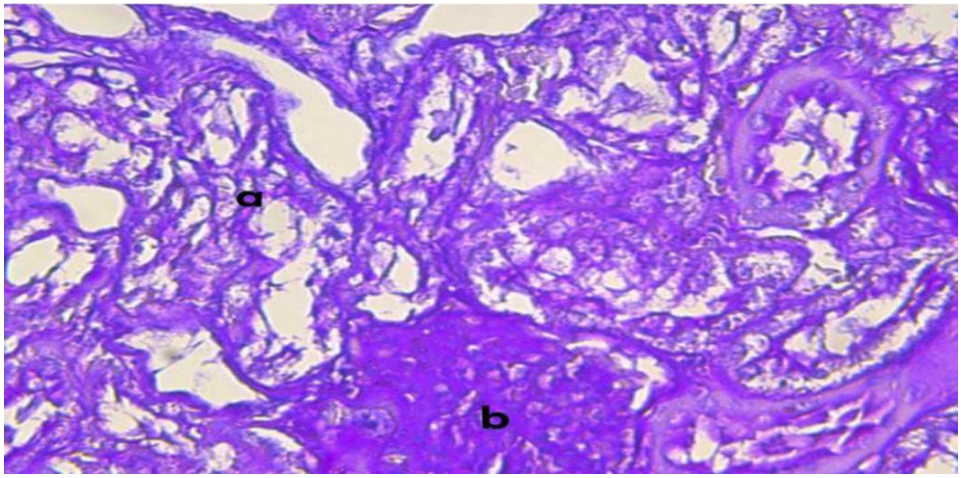
FIGURES(3):Cross section of kidney in summer showed (1) renal fibrous capsule with fatty tissue,(2) renalcortex parenchyma, (3) renal corpuscles with fine septa separated each. Stained with (H&E) stain , powermagnification (4x).



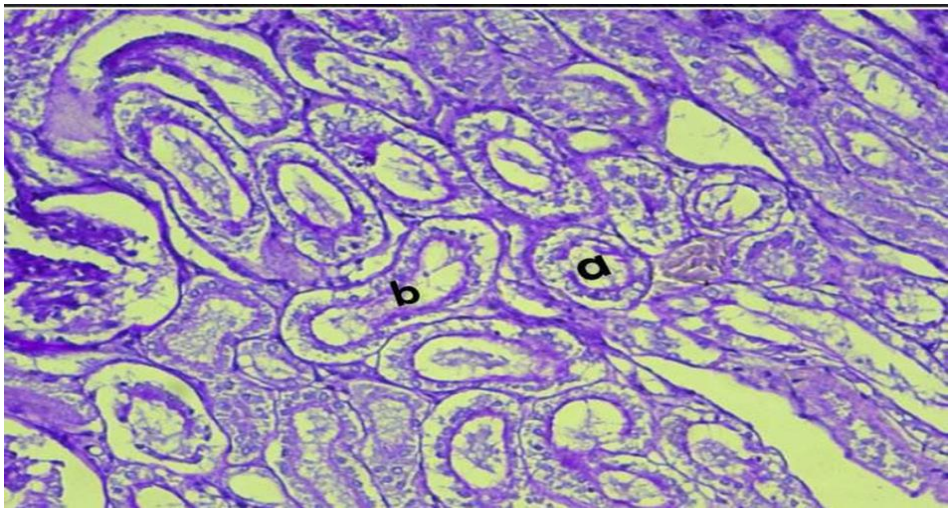
FIGURES(4): Cross section of kidney in winter showed ; renal fibrous capsule (a), renal cortex parenchyma,(b)renal medulla(c) . Stained with (H&E) stain , power magnification (4x).



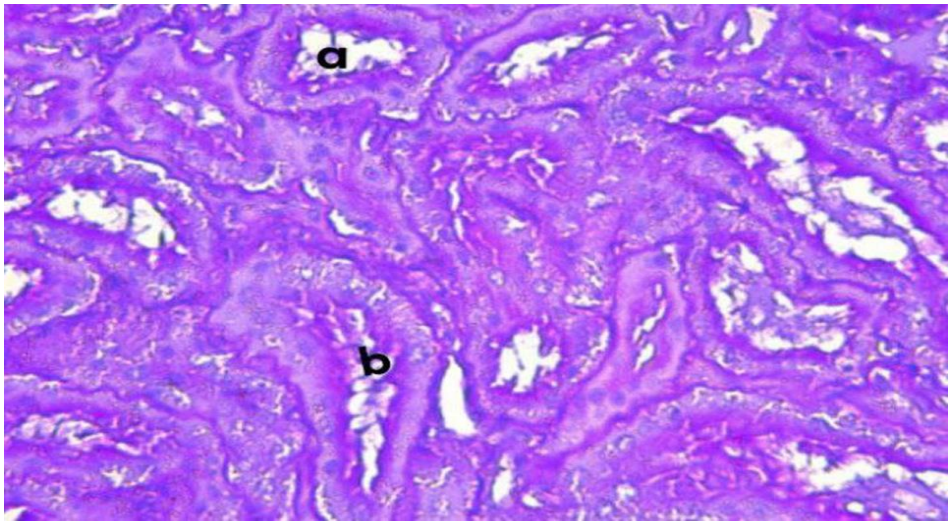
FIGURES (5): Section in normal camel kidney in summer showed a renal corpuscle containing a glomerulus, the Bowman space (1), the parietal layer (2), the visceral layer (3), the proximal tubule (4), and the distal tubule (5), (40x). Stained with(H&E).



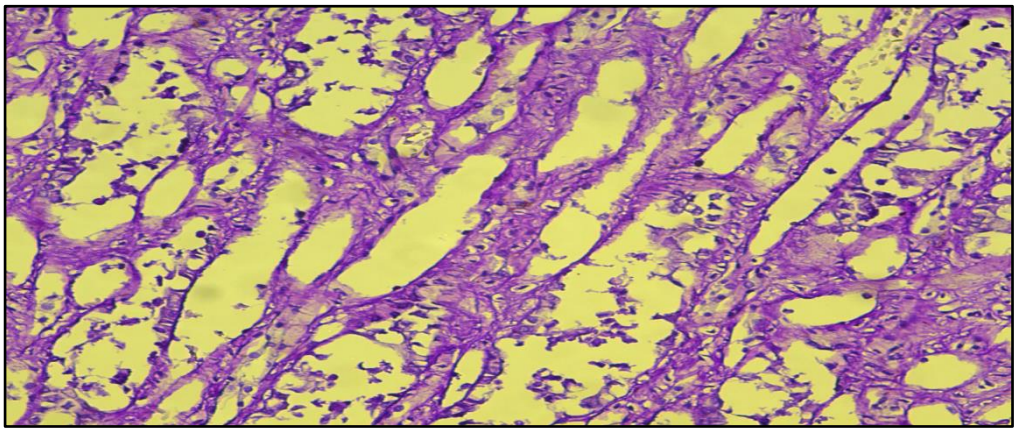
FIGURES (6): Section in normal camel kidney in winter showed ; renal cortex(a). a renal corpuscle containing a glomerulus(b) the Bowman space and the parietal layer and the visceral layer not clear, (40x). Stained with(H&E).



FIGURES (7): Cross section in normal kidney the cortex region at the summer , revealing proximal convoluted tubules (a) and distal convoluted tubules the (b). stained with(PAS).



FIGURES (8): Cross section in normal kidney in winter the cortex region , revealing proximal convoluted tubules (a) and distal convoluted tubules the (b). stained with(PAS).



FIGURES (9) : Cross section in kidney showed normal medulla displaying the collecting dilated ducts lining with simple cuboidal epithelium with clear crowded ovoid nuclei ,(40x),(H&E) stain.

5. DISCUSSION

The kidneys used in this study had a bean-like shape, a smooth surface, and were multilobar and unipapillary. The left kidney was smaller and located lower in the belly, with a weight-to-body ratio of 0.6%, making them more resistant to external impacts and acting as a trustworthy barrier.According to (5), who claimed that a dog's kidney weighed 25 g, different animals' kidney weights and proportions to body weight differed. One goat kidney weighs around 32.08 grams, making the ratio 0.2 percent, according to research (11).

These results support those of (15), who found that african rats' kidneys have a reduced ability to conserve water, resulting in the generation of highly concentrated urine. According to (2), the cortex to medulla ratio was discovered to be 1:4.

This supported the conclusion that the henley loops in a camel's kidney were exceptionally long in (7). The medulla of a camel's kidney's ability to reabsorb water is measured by its thickness.

Citing this discovery, it may be concluded that the inner layer of the pig renal capsule is composed of dense fibrous connective tissue and smooth muscle fibers. This conclusion was supported by the discovery that collagen and smooth muscle fibers are extensively spread throughout the renal capsule of a single camel(16).

Despite the fact that we discovered collagen fibers in the canine renal capsule(18). discovered that rats and rodents' renal capsules lacked smooth muscle fibers. This result was consistent with (8) and revealed that the camel's kidney's reabsorption function may be significantly influenced by the thickness of the capsule. They found that the kidney's parenchymal tissue was easily damaged and that the removal of its capsule had reduced the kidney's capacity to filter blood. The renal cortex's center was mostly made up of big renal corpuscles.

Camels had larger and more numerous renal corpuscles than do humans. Cells of desert animals' proximal convoluted tubules include microvilli that help with water absorption. The modifications that animals have made to cope with water scarcity have been highlighted by numerous studies, including (8,13,12). The circulatory system is closely linked to the collecting ducts, especially the henley loops. The flat lined epithelium substantially facilitates the transmission of water and electrolytes. (9), for example, explained why this makes people urinate so frequently.

He found that fenestrated blood capillaries and internal veins may passively transport plasma and renal interstitial connective tissue. The kidney's ability to filter waste materials and generate concentrated urine is significantly influenced by its lengthy inner and outer medulla (14). Everything showed that the camel kidney was capable of producing extremely concentrated urine and large amounts of water storage.

5-CONCLUSIONS

Through the histological study of the camels nephrons during the winter and summer seasons, the following was found:

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It turned out that camels have a kidney with a thick capsule in the winter compared to the thickness of the capsule in the summer. The renal glomeruli in camels were also distinguished by being oval in shape and larger in size in the summer and with high blood supply compared to their counterparts in the winter and with larger diameters.

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