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# Anatomical and Histological Study of Kidney in Giraffe

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**Abstract:** ***Giraffe are the tallest living animal on earth. Kidney function of giraffe appears to be very peculiar due to the height of the animal and an unusual difference in the height between the heart and the head, the blood pressure of giraffe is substantially higher a feature that is possible due to very thick and strong capsule surrounding the kidney. Parenchyma was surrounded by a connective tissue capsule and composed of darkly stained cortex and lightly stained medulla. Renal cortex comprised of numerous renal corpuscles of different sizes, segments of proximal and distal convoluted tubule, limb of henle. In medulla segments of ascending and descending loop of henle were seen. An 18 month old female giraffe kidney was collected in 10 percent neutral buffered formalin for its anatomical and histological study.***

**Keywords:** Giraffe, Kidney, Anatomy and histological study

## 1. Introduction

Kidney is a vital organ of the mammalian body.It is primary target organ in pre-clinical studies. Nephron is the functional unit of kidney. Kidneys serve essential functions such as filtration and excretion of metabolic waste products from the blood stream, regulation of necessary electrolytes and stimulation of red blood cell production. They also serve to regulate blood pressure by the use of a resin angiotensin-aldosterone system, controlling reabsorption of water, maintaining the correct ph level as well as chemical balance and intravascular fluid status of the body. The kidneys also reabsorb glucose and amino acids which may have involved in regulation of hormonal functions via erythropoietin, calcitriol and vitamin D activation. Glomerular corpuscle is a spherical structure in the renal cortex. The glomerular elements are a capillary network linked by a thin layer of endothelial cells, a central region of mesangial cells and a surrounding mesangial matrix, the visceral epithelial cells and the parietal epithelial cells of bowman'scapsule with associated basement membrane. Urine is the wastage of by-product formed through excess water and waste molecules during the metabolic process of renal system filtration.

## 2. Materials and Methods

An 18 month old female giraffe kidney was collected in 10 percent neutral buffered formalin and kept for 48 hours for fixation for the anatomical study, for histological study small pieces of tissues of kidney were collected and preserved in 10 percent neutral buffered formalin, bouin's fluid and zemker's fluid for 48 hours, 15 hours and 18 hours respectively and processed for light microscopy by paraffin of melting point 58-60 degree Celsius. The paraffin blocks were sectioned to obtain 5-6micrometer thick sections which were stained with the following routine and special histological stains to demonstrate different components of kidney

1) Haematoxylin and eosin stain for routine observation (Singh and sulochana, 1997)
2) Gomori's method for reticular fibres (Luna, 1968)
3) Masson's trichrome method for collagen fibres (Singh and sulochana, 1997)
4) Periodic acid Schiff for glycogen (Singh and sulochana, 1997)
5) Weigert's stain for elastic fibres (Luna, 1968)

## 3. Results and Discussion

**Anatomical study**

The right and left kidneys of giraffe are alike, both kidneys were smooth externally without any superficial lobulation. Both kidneys were bean shaped or C-shaped (fig 1)

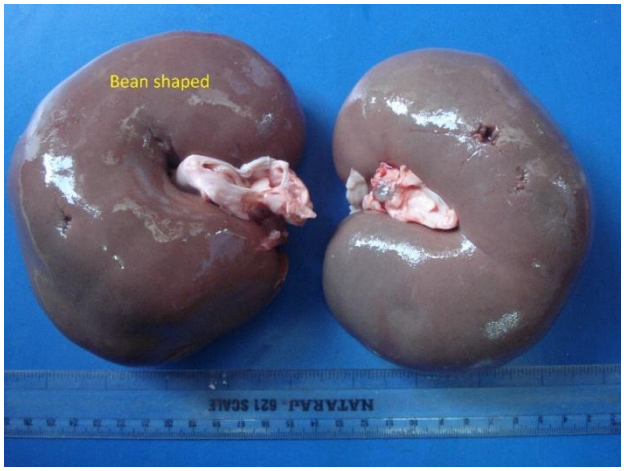


**Figure 1:** Anatomical study of kidney in giraffe

Reddish brown in colour as it was observed by (Mayura et al., 2018) in sheep. The convex border is lateral. Renal capsule was covered externally by a layer of fat that is infiltrated by a network of small blood vessels, none of which penetrate the capsule similar to that of albino rat (Fourman and Moffat 1971). Kidneys of giraffe had no external lobulation (fig 1). There is no fat between the renal capsule and parenchyma. Renal parenchyma was composed of darkly coloured cortex and lightly coloured medulla (fig 2)

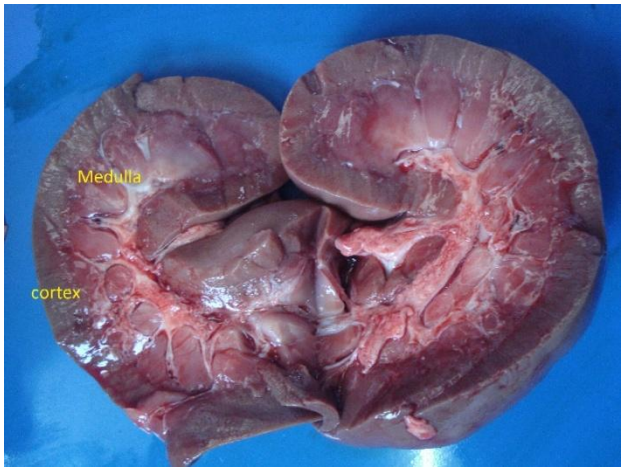


**Figure 2:** Cross section of giraffe kidney

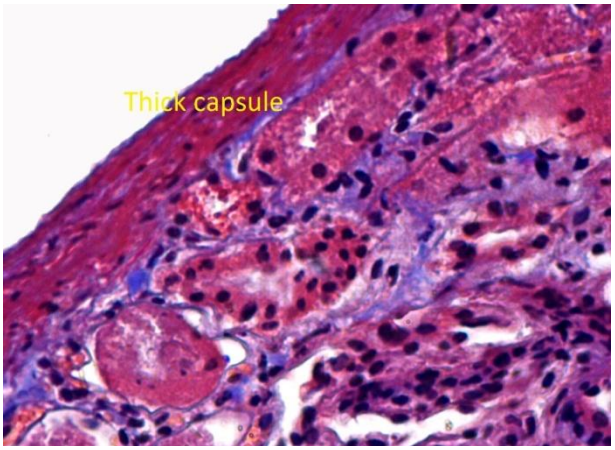


**Figure 3:**Massonstrichrome stain 40 X

**Histological study**

**Renal capsule**

Kidney is enveloped by a tough, thick, translucent and in extensible collagenous renal capsule(fig 3)

Thick renal capsule as it was reported by (Maluf 2002) in giraffe.

**Cortex**

The cortex envelops the kidney without interruption (fig2). Cortex tends to be thickest wherearcuatevessels project from the vascular processes unlike human, porcine and bovine kidneys, giraffe kidney had no intrusions of cortex that completely separate the medulla into compartments as it was reported by (Maluf ., 2002) in giraffe (fig 4).

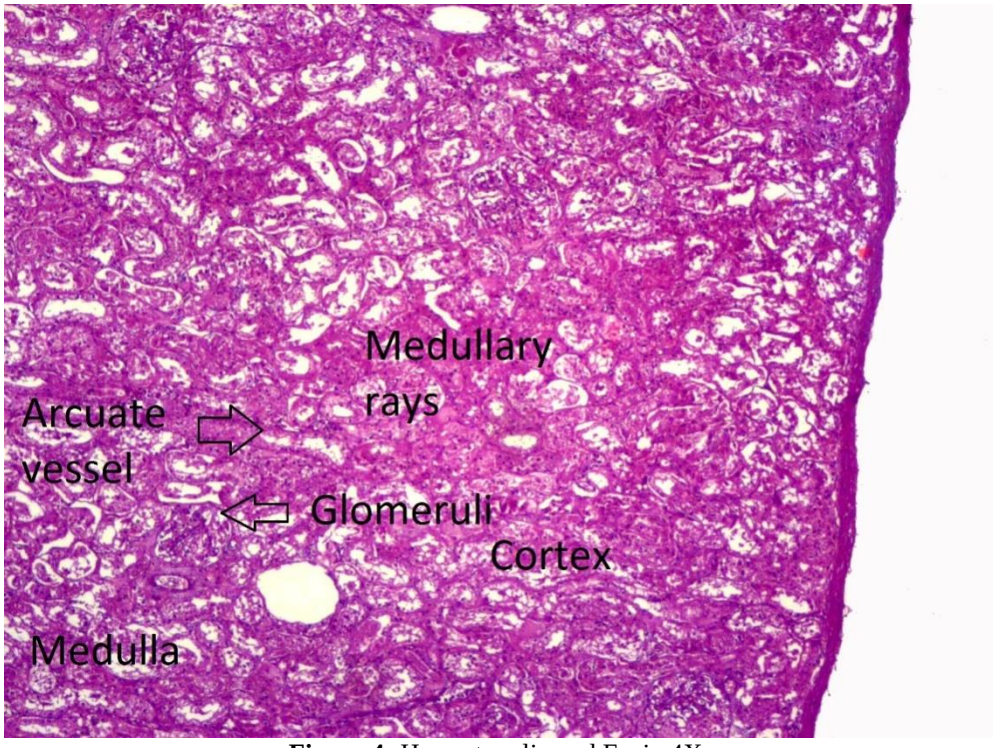


**Figure 4:** Haematoxylin and Eosin 4X

Minor intrusions of the cortex into the medulla, where the interlobular vessels become arcuate vessels, suggest internal transverse location even when there is no outward evidence of lobation(fig 1).

**Glomerulus**

Glomeruli occasionally contact the renal capsule and in many places the distance between the glomerulus and the renal capsule can accommodate only 2 tubules in cross section, thus not have a uniform cortex (fig 4). The interlobular arteries and veins occur with in the labyrinthine compartments of the cortex (Maluf2002) in giraffe, as is the case with mammals (Bertin1744). There are ectopic glomeruli within the fibro muscular tissue ( ig 4) which surrounds the arcuate vessels as it was reported by (Maluf 2002) in giraffe. The medullary Ray's of the cortex are composed of the descending and ascending medullary loops of henle and the collecting ducts ( fig 4) Cortical loop of henleis within the medullary rays as it was observed by (Maluf 2002) in giraffe.

**Medulla**

Medulla is the crest type, the terminal collecting ducts open at the truncated end of the longitudinally elongated ridge (fig 5)

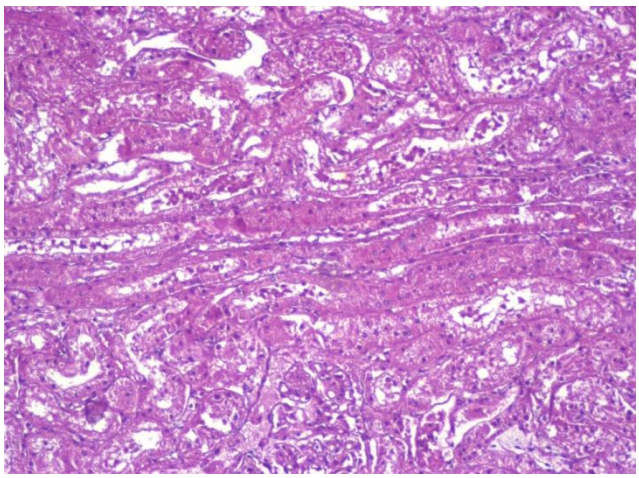

**Figure 5:** Haematoxylin and Eosin 10X

that project into the cavity of the renal pelvis as it was mentioned by (Maluf 2002) in giraffe. The crest follows the c-curvature of the kidney (fig 5) and the truncated end is the area cribrosa long axis of the orifice is parallel with the long axis of the crest as it was observed by (Maluf 2002) in giraffe. The interlobular arteries and veins, their branches within the vascular process are associated with extension of the renal pelvis as it was observed by (Maluf 2002) in giraffe.

## 4. Conclusion

This present study conclude that the anatomical and histological study of kidney of giraffe is similar to that of small ruminants.

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