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Macroscopic analysis on the kidneys of guinea fowl (*Numida meleagris*)

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Abstract

The present experiment was conducted on 12 healthy Guinea fowl birds without sex discrimination. The Guinea fowl bird possesses two kidneys which were reddish-brown and retroperitoneally placed symmetrically on either side of the vertebral column in the depression of synsacrum and iliac fossa. The Guinea fowl kidney had two surfaces viz. dorsal and ventral along with three structural components viz. cranial, middle and caudal. These three components were observed demarcated by oblique groove present on ventral surface of the kidney. The cranial component of both kidneys was smallest and caudal surface was largest. The maximum length and width of the right and left kidney was measured as 54.23 ± 1.206 mm & 53.21 ± 1.226 mm and 12.73 ± 0.514 mm & 13.39 ± 0.37 mm respectively. Weight and volume of the right and left kidney was measured 4.78 ± 0.119 gm & 4.75 ± 0.169 gm and 4.34 ± 0.12 ml & 4.14 ± 0.156 ml respectively.

Keywords: Kidney, guinea fowl, macroscopic, analysis

Introduction

Kidneys are the organ which plays an essential role in excreting of nitrogenous wastes, excess water, inorganic salts and toxic substances produced during the process of metabolism of the body. It involved into the production of certain hormones along with the regulation of optimum osmotic balance of body fluid.

Avian urinary system consists of two elongated kidneys and two ureters but devoided of urinary bladder, so each ureter open into urodeum of the cloaca where urine leaves the body^[1, 2]. The ureter enters into cloaca as an oblique angle as mucosal duct and forms a sac-like pocket in the mucosal wall, which functions as a pseudo-sphincter^[3]. Guinea fowl is that bird which also possesses two elongated reddish-brown kidneys as left and right. Both these kidneys situated retroperitoneally at either side of the vertebral column in the depression of synsacrum and iliac fossa^[4]. The kidney of Guinea fowl possesses two surfaces as to dorsal and ventral with three components as cranial, middle and caudal which bifurcated after oblique groove present on the ventral aspect on each kidney^[5, 6].

The physiology of the kidneys of birds is well documented as it performs for water conservation, blood filtration, metabolism of wastes and reabsorption of the recyclable material. Therefore the morphological studies on the kidney of Guinea fowl (*Numida meleagris*) is undertaken to have the confirmation on documented studies till now and also to get the newer research findings at its macroscopic level.

Materials and Methods

The present investigation on gross features on the kidney of Guinea fowl (*Numida meleagris*) was carried in the Department of Anatomy and Histology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur.

A total of 12 pairs of Guinea fowl kidneys samples were procured from various meat shops located in and around the City of Udaipur. The procured fresh and unfixated specimens were carried to the laboratory on ice for investigating their macroscopic features. The morphometrical measurements were recorded with the help of Digital Vernier Caliper (0-150 mm), weight with the help of digital weighing machine and volume of each kidney was taken by measuring cylinder. All the collected data of measurements were statistically analyzed to know their average, standard deviation and the standard error^[7].

Results and Discussion

The Guinea fowl bird possesses left and right kidneys which were reddish-brown in colour and retroperitoneally located symmetrical on either side of the vertebral column in the depression of synsacrum and iliac fossa (Fig.1). A similar finding was reported various researchers in barn owl, breeding Emu and Great flamingo [4, 8, 9].

The kidney had two surfaces viz. dorsal and ventral with three demarcated structural components as to cranial, middle and caudal after the oblique groove present on the ventral aspect on each kidney by different researchers in Seteppe Buzzard, Harrier, Mallard and Chickens [6, 10]. The dorsal surface of the kidney was in close contact with synsacrum and iliac fossa thereby the impression of lumbosacral mass was visible. At the ventral surface there were external iliac and ischiatic arteries located between the groove of the cranial & middle and middle & caudal component of the kidney respectively as mentioned in Chicken [11]. The cranial component of both kidneys was smallest and caudal surface was largest (Fig. 2 and 3). The cranial component extended with the caudal segment of the lungs. This outcome of the present examination was in accordance to the close consent discovered in Steppe buzzard and Coot birds by the research community [10, 12].

In male, the ventral surface of the cranial part was communicating with testis and middle & caudal components of both kidneys were communicated with gizzard, intestine, ureter, vas deference and oviduct (Fig.1). The present findings has shown the caudal component largest with the smallest cranial element of the kidney which was completely in disagree mode with the observations submitted against Coot bird and in Golden eagle (*Aquila Chrysaetos*) [12,5]. They were reported the largest cranial lobes which was wider than the other two lobes. The maximum length and width of right and left kidney was measured with Vernier caliper as 54.23 ± 1.206 mm & 53.21 ± 1.226 mm and 12.73 ± 0.514 mm & 13.39 ± 0.37 mm respectively. Volume and weight of right and left kidney was measured 4.78 ± 0.119 ml & 4.75 ± 0.169 ml and 4.34 ± 0.12 gm & 4.14 ± 0.156 gm respectively. The average weight of right and left kidneys in relation to total body weight of bird was 0.27 ± 0.009 and 0.25 ± 0.008 respectively (Table-1). These

findings were somewhat correlating with the findings of Reshag [9].

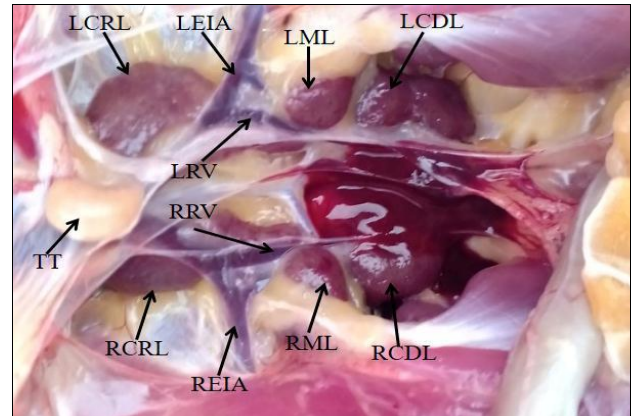


Fig 1: Showing the different structural components of Guinea fowl kidney. viz. RCRL- Right cranial lobe, RML- Right Middle Lobe, RCDL- Right Caudal Lobe, LCRL- Left Cranial Lobe, LML- Left Middle Lobe, LCDL- Left Caudal Lobe, REIA- Right External Iliac Artery, LEIA- Left External Iliac Artery, RRV- Right Renal Vein, LRV- Left Renal Vein and TT- Testis.

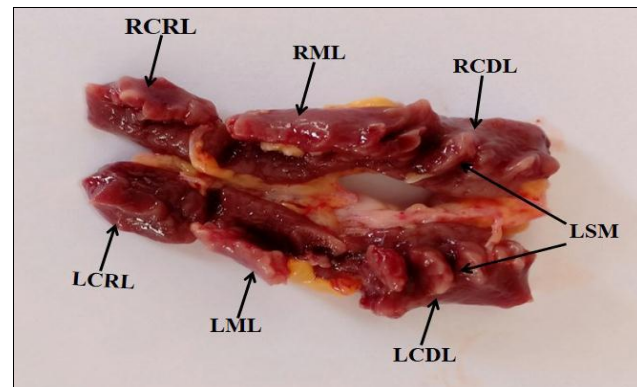


Fig 2: Showing the different structural components in dorsal view of Guinea fowl kidney. viz. RCRL- Right Cranial Lobe, RML- Right Middle Lobe, RCDL- Right Caudal Lobe, LCRL- Left Cranial Lobe, LML- Left Middle Lobe, LCDL- Left Caudal Lobe and LSM- Lumbosacral masses.

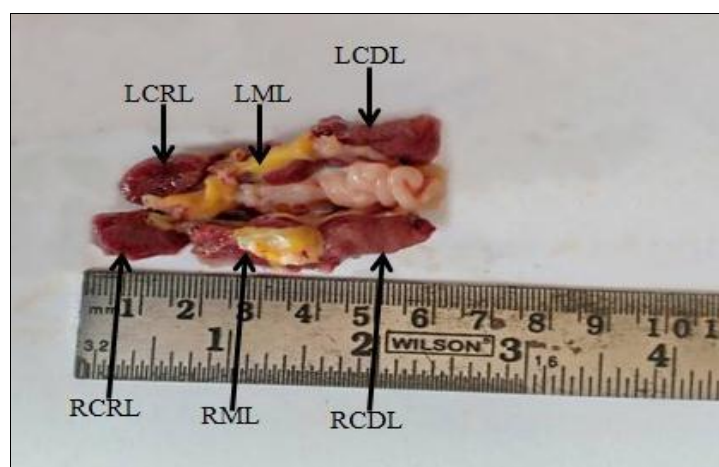


Fig 3: Showing the different structural components in ventral view of Guinea fowl kidney. viz. RCRL- Right Cranial Lobe, RML- Right Middle Lobe, RCDL- Right Caudal Lobe, LCRL- Left Cranial Lobe, LML- Left Middle Lobe and LCDL- Left Caudal Lobe.

Appendix

Table 1: Different micrometrical observations with respect to the samples of kidneys

Samples	Total body weight of bird (K.g)	Length of kidney (mm)		Width of kidney (mm)		Volume of kidney (ml)		Weight of kidney (gm)		Weight of kidney (percent) in relation to total body weight	
		Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
Sample 1	1.478	53.43	47.72	11.7	12.10	4.0	3.5	3.808	2.826	0.26	0.19
Sample 2	1.628	62.43	60.29	11.56	16.46	4.9	5.9	4.459	4.562	0.27	0.28
Sample 3	1.737	51.63	58.35	15.11	13.15	5.0	4.5	3.885	3.919	0.223	0.225
Sample 4	1.560	57.24	55.60	9.59	13.90	4.8	5.0	4.998	4.395	0.320	0.281
Sample 5	1.648	61.79	59.40	11.55	12.26	4.5	5.0	4.52	4.55	0.274	0.276
Sample 6	1.720	52.09	51.99	12.60	13.41	4.5	5.2	4.27	4.22	0.248	0.245
Sample 7	1.428	50.94	49.55	15.41	13.20	5.5	4.3	4.889	4.395	0.342	0.307
Sample 8	1.659	55.04	52.40	12.99	13.90	4.6	4.9	4.193	4.461	0.252	0.268
Sample 9	1.470	51.79	49.40	11.20	12.47	5.2	4.9	4.261	4.062	0.289	0.276
Sample 10	1.731	53.09	51.92	15.04	12.96	5.2	4.3	4.808	4.490	0.277	0.259
Sample 11	1.681	51.74	52.75	12.55	14.90	4.4	5.0	4.326	4.498	0.257	0.267
Sample 12	1.430	49.55	49.23	13.55	12.05	4.8	4.6	3.706	3.354	0.259	0.234
Average	1.5975	54.23	53.2167	12.7375	13.3967	4.78333	4.75833	4.34358	4.14433	0.27258	0.259
SD	0.1188	4.180792	4.24785	1.783618	1.28228	0.413045	0.588462	0.418303	0.542338	0.032245	0.031174
SE	0.0343	1.2068906	1.226247	0.514886	0.370162	0.119236	0.169874	0.120754	0.156559	0.009308	0.008999

Conclusion

The present study on Guinea fowl has shown two reddish-brown coloured kidneys which were located retroperitoneally symmetrical on either side of the vertebral column in the depression of synsacrum. Both the kidneys have revealed three structural components viz. cranial, middle and caudal which were identified by oblique groove on ventral surface of the kidney. The cranial component of both kidneys was smallest while caudal surface was the largest. The length of right kidney was observed larger on the tune of 54.23 ± 1.206 , however the width of left kidney was also larger as on the tune of 13.39 ± 0.37 . The weight and volume indicated the size of kidney which was higher in right than the left. The kidneys of Guinea fowl were contributing about 0.52% of body weight.

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