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## Age related changes in morphometrical studies on ductus deferens of guinea fowl (*Numida meleagris*)

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**ABSTRACT:** This work was carried out on ductus deferens reproductive system of 54 apparently healthy male guinea fowl (Pearl variety) at different age groups from Day old, 2, 4, 8, 12, 16, 20, 24 and 28 weeks at monthly intervals. The ductus deferens was paired extended from caudal end of epididymis to opening of urodeum. The convolutions first appeared from 20 weeks from caudal to cranial end. Morphometrical studies revealed that the weight of right and left ductus deferens of guinea fowl increased from 4 to 28 weeks of age. The length of right and left ductus deferens increased gradually from 2 weeks to 28 weeks and the width of right and left ductus deferens of guinea fowl increased significantly ( $p \leq 0.05$ ) from 8 to 28 weeks of age.

**Key words:** Age, ductus deferens, guinea fowl, morphometry

Poultry industry provides supplementary income and employment as well as nutritional security to a large number of poor and small farmers in developing countries of Asia (Sathe, 2002). The term “guinea” fowl is the common name of the seven species of gallinaceous birds of the family *Numididae*, which is indigenous to Africa. Guinea fowl is a promising genetic resource for evolving a low input-grain saving poultry alternative for production. Koney (1993) reported that the guinea fowls have a higher dressing percentage and are leaner than chickens. They also yield firmer and tastier meat than chickens. Guinea fowl deserve priority research attention to help the smallholder rural poultry production. They are also more resistant to heat stress, and this enhances their adaptive capabilities to various climatic conditions (Ikani and Darfwang, 2004). Ductus deferentia are the essential part of male reproductive organs, which are involved in sperm transportation and storage. Artificial insemination has nowadays become an essential part of poultry farm reproduction. Its adoption in poultry sector has lead to increased popularity, particularly in the field of research and commercial purposes (Dobrinski, 2005). Hence, the present study was undertaken to provide gross morphological feature of ductus deferens of guinea fowl.

### MATERIALS AND METHODS

The present study was carried out on ductus deferens of Guinea fowl in the Department of Veterinary Anatomy, College of Veterinary and Animal Sciences, G.B. Pant

University of Agriculture and Technology, Pantnagar-263145, Uttarakhand. The study was carried out on 54 apparently healthy male Guinea fowl birds (Pearl variety) at different age groups viz., Day old, 2, 4, 8, 12, 16, 20, 24 and 28 weeks. The birds were procured from the Instructional Poultry Farm (IPF), Nagla, GBPUA&T, Pantnagar.

The live body weight of the birds was recorded by using weighing balance immediately after procurement. Then the birds of specified age groups were sacrificed as per the guidelines of CPCSEA/ IAEC by severing common carotid artery. The abdomen was opened and dissected carefully to locate out male reproductive organs and general morphology and topography of ductus deferens was recorded in situ in relations with adjacent organs and photography was done. The organ was dissected & removed from the abdominal cavity, washed in normal saline. The organ was mopped and weight was recorded. Length and width of organs were recorded using vernier caliper and values expressed in Centimeter (cm). Volume of the organs was measured by Archimedes' Principle of water displacement method and the results were recorded in cubic centimeter (cc) (Bath and Chaudhari, 2002). The collected data were statistically analysed using IBM- SPSS Statistics version 20 software. ANOVA and Tukey's test were also used to find significant difference. The differences between right and left variables were determined using paired “t” test.

## RESULTS AND DISCUSSION

### LOCATION

In guinea fowl the ductus deferens arises from caudal end of epididymis without any clear line of differentiation (Fig 1). They are paired, tubular organs as earlier reported by Nickel *et al.* (1977) in domestic birds, Aire *et al.* (1979) in guinea fowl and Carvalho *et al.* (2014) in greater rhea. Up to 2 weeks of age, the ductus deferens was very indistinct and became wavy in outline at 4 to 12 weeks of age as reported earlier in guinea fowl by Aire *et al.* (1979). In all the age groups, the ductus deferens continued from caudal end of epididymis, runs backwards medial to ureter up to caudal lobe of kidney, where it crossed lateral to ureter

ran in parallel fashion up to cloaca region, where they opened as a small papilla lateral to ureter in urodeum (Fig 2). These findings concur with the observation of Aire *et*

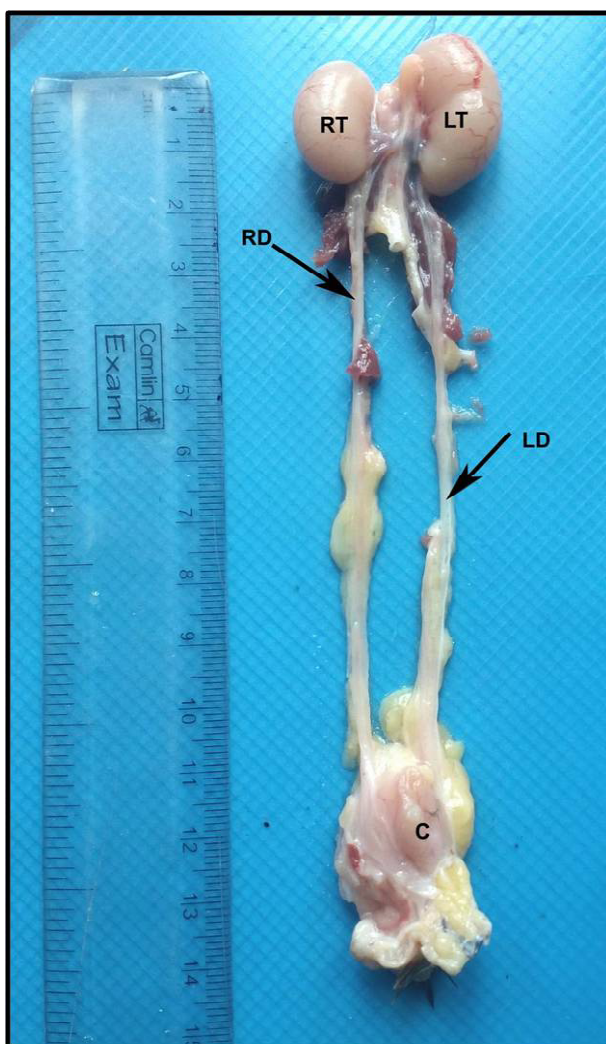


Figure 1: Showing male reproductive organs of 28 weeks of old Guinea fowl. Left testis (LT), Right testis (RT), Left ductus deferens (LD), Right ductus deferens (RD) and Cloaca (C)

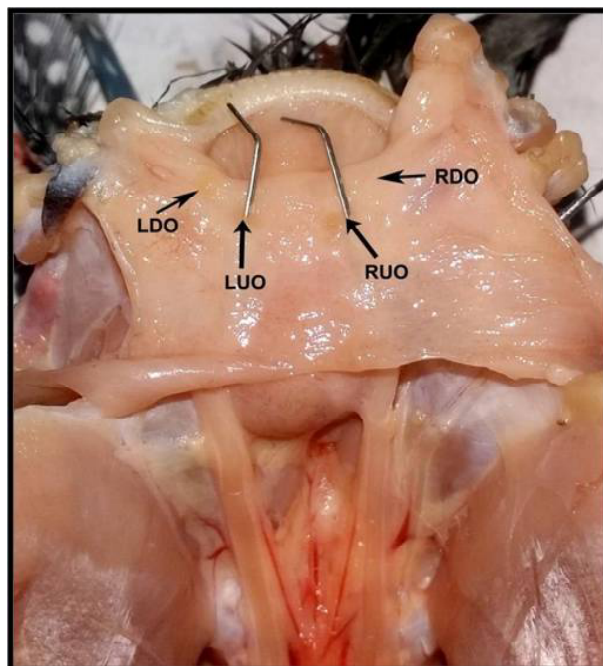


Figure 2: Showing opening of Ductus deferens and ureter (Pins been inserted in the opening of ureter) in cloaca of 16 weeks old Guinea fowl. Left ductus deferens opening (LDO), Right ductus deferens opening (RDO), Left ureter opening (LUO) and Right ureter opening (RUO)

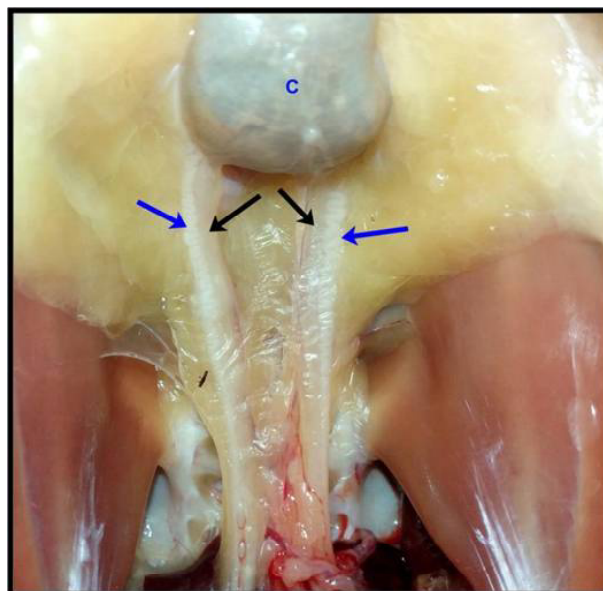
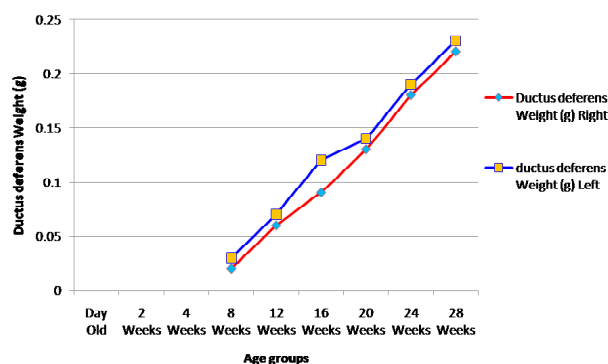
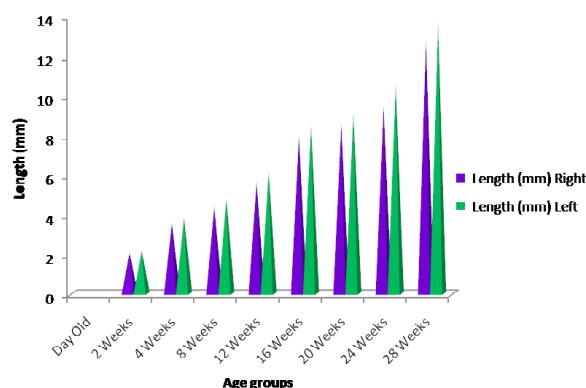


Figure 3: Showing convolutions of ductus deferens in 28 weeks old Guinea fowl. Ductus deferens (Blue arrows), Ureter (Black arrows) and Cloaca (C)



**Figure 4: Showing changes in weight of ductus deferens at different age groups in guinea fowl**



**Figure 5: Showing changes in length of ductus deferens at different age groups in guinea fowl**

*al.* (1979) in guinea fowl, Frey and Goymann (2009) and Bull *et al.* (2007) in domestic fowl and Carvalho *et al.* (2014) in greater rhea. The distance between right and left ductus deferens was initially very narrow but gradually widens from about mid-way along its length in guinea fowl as opined by Aire *et al.* (1979).

The convolutions of ductus deferens were observed from 20 weeks of age in guinea fowl (Fig 3), the convolutions started from caudal to cranial end. At the age of 28 weeks, the coiling of ductus deferens was observed at the level of middle lobe of kidney upto caudal opening. From 24 weeks of age, caudal third of ductus deferens was surrounded by abundant fat tissue.

## SHAPE AND COLOUR

At early age groups of guinea fowl, the ductus deferens was very thin upto 2 weeks, then wavy in outline from 4 to 12 weeks, hence very difficult to identify and dissect, but as the age advanced; the ductus deferens became distinct duct. The ductus deferens was white in colour in

all the ages of guinea fowl.

## MORPHOMETRY

The weight of right and left ductus deferens of guinea fowl increased from 4 to 28 weeks of age but significant increase ( $p \leq 0.05$ ) was observed from 12 to 28 weeks of age (Fig 4). At 4, 8, 12, 16, 20, 24 and 28 weeks of age the weight of ductus deferens were recorded as  $0.01 \pm 0.00$ ,  $0.02 \pm 0.002$ ,  $0.06 \pm 0.01$ ,  $0.09 \pm 0.003$ ,  $0.13 \pm 0.003$ ,  $0.18 \pm 0.004$  and  $0.22 \pm 0.001$  g in right ductus deferens and  $0.01 \pm 0.001$ ,  $0.03 \pm 0.002$ ,  $0.07 \pm 0.01$ ,  $0.12 \pm 0.01$ ,  $0.14 \pm 0.01$ ,  $0.19 \pm 0.002$  and  $0.23 \pm 0.01$  g in left ductus deferens respectively.

The length of right and left ductus deferens showed gradual increase from 2 weeks to 28 weeks where as increased significantly ( $p \leq 0.05$ ) from 12 to 28 weeks of age (Fig 5). At 2, 4, 8, 12, 16, 20, 24 and 28 weeks of age the average length were recorded as  $2.09 \pm 0.02$ ,  $3.60 \pm 0.17$ ,  $4.45 \pm 0.10$ ,  $5.70 \pm 0.12$ ,  $8.01 \pm 0.14$ ,  $8.60 \pm 0.11$ ,  $9.49 \pm 0.14$  and  $12.82 \pm 0.24$  cm in right and  $2.19 \pm 0.02$ ,  $3.86 \pm 0.16$ ,  $4.84 \pm 0.24$ ,  $6.18 \pm 0.05$ ,  $8.55 \pm 0.12$ ,  $9.15 \pm 0.02$ ,  $10.63 \pm 0.28$  and  $13.69 \pm 0.19$  cm in left ductus deferens respectively.

The width of right and left ductus deferens of guinea fowl at cranial, middle and caudal regions significantly increased ( $p > 0.05$ ) from 8 to 28 weeks of age respectively. In present study at 8, 12, 16, 20, 24 and 28 weeks of age, the average width at cranial, middle and caudal regions of right ductus deferens were observed as  $0.01 \pm 0.002$ ,  $0.01 \pm 0.003$ ,  $0.02 \pm 0.004$ ,  $0.11 \pm 0.01$ ,  $0.12 \pm 0.01$ ,  $0.13 \pm 0.01$ ,  $0.12 \pm 0.01$ ,  $0.14 \pm 0.01$ ,  $0.15 \pm 0.01$ ,  $0.13 \pm 0.004$ ,  $0.15 \pm 0.01$ ,  $0.15 \pm 0.01$ ,  $0.14 \pm 0.01$ ,  $0.15 \pm 0.004$ ,  $0.16 \pm 0.004$ ,  $0.17 \pm 0.004$ ,  $0.19 \pm 0.01$  and  $0.22 \pm 0.01$  cm respectively.

At 8, 12, 16, 20, 24 and 28 weeks of age, the average width at cranial, middle and caudal regions of left ductus deferens were observed as  $0.01 \pm 0.002$ ,  $0.02 \pm 0.003$ ,  $0.02 \pm 0.004$ ,  $0.11 \pm 0.01$ ,  $0.12 \pm 0.003$ ,  $0.13 \pm 0.004$ ,  $0.13 \pm 0.01$ ,  $0.13 \pm 0.01$ ,  $0.14 \pm 0.01$ ,  $0.17 \pm 0.003$ ,  $0.17 \pm 0.004$ ,  $0.18 \pm 0.003$ ,  $0.18 \pm 0.003$ ,  $0.18 \pm 0.004$ ,  $0.19 \pm 0.01$ ,  $0.20 \pm 0.01$ ,  $0.23 \pm 0.003$  and  $0.24 \pm 0.003$  cm respectively. Among right and left ductus deferens, the left was higher than right in all the parameters in all age groups.

Parker *et al.* (1942) reported that in white leghorn and New Hampshire cockerel's undissected length of ductus deferens was about 10 cm and diameter progressively, reached a maximum of about 3.5 mm just before it entered the cloaca. Also, Hess *et al.* (1976) reported in turkey that the ductus deferens was approximately 20 cm long, and



gradually increased in diameter as it passed caudally to the cloaca.

At 12, 16, 20, 24 and 28 weeks of age the volume of ductus deferens were recorded as  $0.12 \pm 0.003$ ,  $0.19 \pm 0.002$ ,  $0.21 \pm 0.003$ ,  $0.24 \pm 0.002$ ,  $0.29 \pm 0.003$  cc in right ductus deferens and  $0.13 \pm 0.003$ ,  $0.21 \pm 0.003$ ,  $0.24 \pm 0.002$ ,  $0.28 \pm 0.002$  and  $0.31 \pm 0.003$  cc in left ductus deferens respectively. The weight and volume of ductus deferens of adult birds was mostly in accordance to earlier report of Deshmukh (2011) who recorded weight as 0.83 to 1.42 gm and volume as 0.9 to 1.45 cc in Vanaraja breed of poultry.

## CONCLUSION

The ductus deferens in guinea fowl were paired ductular organ originating without any clear line of demarcation from the caudal end of respective epididymis. Upto 2 weeks of age, the ductus deferens was very indistinct, became wavy in outline at the age of 4 to 12 weeks of age. The convolutions of ductus deferens were observed from 20 weeks of age in guinea fowl, the convolutions started from caudal to cranial end. The weight of right and left ductus deferens of guinea fowl increased from 4 to 28 weeks of age but significant increase ( $p \leq 0.05$ ) was observed from 12 to 28 weeks of age. The length of right and left ductus deferens increased gradually from 2 weeks to 28 weeks and significantly increased ( $p \leq 0.05$ ) from 12 to 28 weeks of age. The width of right and left ductus deferens of guinea fowl at cranial, middle and caudal regions significantly increased ( $p \leq 0.05$ ) from 8 to 28 weeks of age respectively.

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