

MICROMETRICAL STUDY OF EPIDIDYMIS IN BUFFALO FOETII

ANIL SHARMA, NEELAM BANSAL*, VARINDER UPPAL and ANURADHA
Department of Veterinary Anatomy, College of Veterinary Sciences
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141 004, India

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ABSTRACT

The present study was conducted on 30 buffalo foetii ranging from 2.5 cm to 98 cm curved crown rump length (CVRL) (40 - 295 days). Based on the CVRL the foetii were divided into three groups viz. group I (CVRL between 0–20 cm); group II (CVRL 20–40 cm) and group III (CVRL above 40 cm). The micrometrical parameters of efferent ductules such as tubular diameter, luminal diameter, tubular cross sectional area, luminal cross sectional area and height of epithelium and cilia increased with the foetal age, but the thickness of peritubular cell layers decreased with advancement of foetal age. The micrometrical parameters of ductus epididymis increased with the increased fetal age, but the thickness of peritubular cell layers first increased in group II and then decreased in group III. All the micrometrical observations increased from caput to cauda whereas the height of epithelium decreased from caput to cauda within the group.

Key words: Buffalo, epididymis, foetii, micrometry

The epididymis is an essential male reproductive organ required for maturation of spermatozoa. Research work has been done on the epididymis during postnatal life (Goyal and Dhingra, 1975; Singh, 1989). But very limited literature is available on prenatal studies especially in buffalo. Hence the present research was conducted on micrometrical study of the epididymis during prenatal life of buffalo foetii.

MATERIALS AND METHODS

The present study was conducted on epididymis in 30 Indian buffalo foetii ranging from 2.5 cm to 98 cm curved crown rump length (CVRL). The samples were collected from pregnant non-descript buffaloes slaughtered at the slaughter house, Delhi and from the Veterinary Clinic, GADVASU, Ludhiana. The age of foetii was determined by measuring the CVRL as a curved line in cm using an inelastic thread along the vertebral column between the most anterior parts of frontal bone to the rump at ischiatic tuberosity as described by Edward (1965). The approximate age of the foetii was calculated using formula given by Soliman (1975).

$$Y = 28.66 + 4.496 X \text{ (CVRL} < 20 \text{ cm)}$$

$$Y = 73.544 + 2.256 X \text{ (CVRL} \geq 20 \text{ cm)}$$

where Y is the age in days and X is the CVRL in cm. Depending on the CVRL, the samples were divided into 3 groups viz. Group I = CVR length between 0-20 cm; Group II = CVR length between 20-40 cm and up to 40 cm and Group III = CVR length above 40 cm

Immediately after collection, the tissue samples were fixed in 10% neutral buffered formalin. After the fixation, the tissues were processed for paraffin blocks preparation by acetone benzene schedule (Luna, 1968) and the sections of 5-6 μ were cut. The micrometrical observations were recorded on hematoxylin and eosin stained sections with the help of filar and ocular micrometer duly calibrated with stage micrometer. The data was analyzed statistically (Snedecor and Cochran, 1994)

RESULTS AND DISCUSSION

Different micrometrical parameters of epididymis of buffalo foetii like tubular diameter, luminal diameter, thickness of peritubular smooth muscle cell layers and height of epithelium and cilia of different age groups were recorded.

Efferent Ductules (ED): Mean tubular diameter of ED increased progressively from group I to group III (64.92 \pm 3.35 μ , 72.97 \pm 4.07 μ and 84.45 \pm 5.27 μ in groups I, II and III, respectively). The luminal diameter of ED was found to be 12.10 \pm 1.87 μ in group I, 13.61 \pm 1.48 μ in group II and 20.95 \pm 1.54 μ in group III. The height of epithelium and cilia was recorded to be almost same in group I (15.64 \pm 0.49 μ and 6.36 \pm 0.11 μ , respectively) and group II (15.91 \pm 0.57 μ and 6.95 \pm 0.25 μ , respectively) which increased in group III as 18.27 \pm 1.20 μ height of epithelium and 7.61 \pm 0.43 μ height of cilia (Fig. 1). Similar pattern of increase in height of epithelium and cilia was also observed in bull (Hemeida *et al.*, 1978; Pal and Bhardwaj, 1989; Khurana, 2000).

*Corresponding author: bansal.neelam@rediffmail.com

Table 1
Mean±SE (μ) of tubular and luminal diameter of ductus epididymidis/ mesonephric duct

Group	Tubular diameter			Luminal diameter		
	Caput	Corpus	Cauda	Caput	Corpus	Cauda
Group I*	96.07±11.15	-	-	15.39±0.84	-	-
Group II	115.91±5.23	131.76±5.33	144.98±7.89	25.13±0.17	30.70±3.72	35.42±5.16
Group III	125.96±7.99	134.15±9.18	177.79±14.08	40.45±3.23	45.35±6.38	66.32±10.49

*In group I, mesonephric duct was not differentiated into caput, corpus and cauda

The cross sectional surface area of tubules and their lumen was recorded to be 3334.64±346.34 μm² and 122.12±34.25 μm² in group I that increased to 4227.23±473.36 μm² and 150.58±33.35 μm² in group II and 5708.32±678.51 μm² and 353.89±45.62 μm² in group III, respectively. This increase in the surface area may be due to an increase in the luminal area, parallel to diameter of efferent ductules and their luminal diameter (De Miguel *et al.*, 1998).

The thickness and number of peritubular smooth muscle cell layers/ mesenchymal cell layers surrounding the ED showed a decreasing pattern from group I to group III. The thickness of peritubular layer was 16.65±1.31 μ in group I which decreased to 13.28±0.77 μ in group III. Mohamed (2005) observed the number of peritubular mesenchymal cell layers surrounding the efferent ductules was 4 in bovine fetus of 10-13 cm CRL which reduced to 2-3 layers of smooth muscle cells at 90 cm CVRL.

Epididymal Duct: In present study the mesonephric duct was not differentiated into ductus epididymidis in group I, whereas it was divided into caput, corpus and cauda in groups II and III. Therefore, micrometrical observations were recorded from mesonephric duct (as one part) in group I, while in groups II and III from caput, corpus and cauda.

It was observed that the mean tubular diameter progressively increased from group I (mesonephric duct) to group III. Similarly luminal diameter increased from group I to group III (Table 1). It may be concluded that the tubular and luminal diameters gradually increased from caput to cauda within the group (in groups II and III). Our findings were supported by the findings of Singh (1989) who also reported that the tubular and luminal diameters of epididymis of buffalo calf gradually increased from caput to cauda. The cross sectional surface area of tubules and lumen also increased in similar pattern as in case of tubular and luminal diameter.

The height of epithelium was 13.50±1.68 μ in group I (mesonephric duct) which increased in group II as 17.58 ±1.43 μ, 16.56±1.22 μ and 13.69±0.21 μ, and in group III

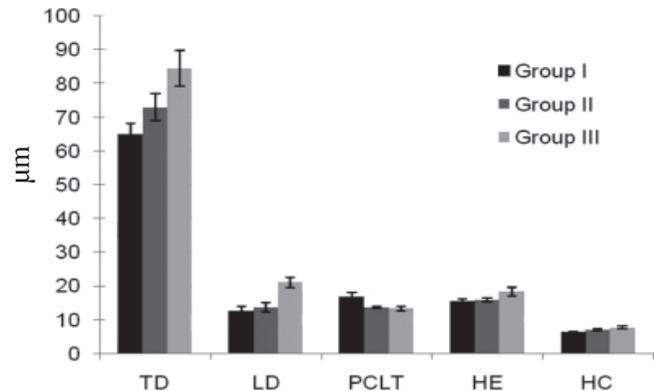


Fig 1. Diameter (mean±SE) of tubule and lumen (TD and LD), thickness of peritubular cell layers and height of epithelium and cilia (HE and HC) of efferent ductules in different age groups of buffalo foetii

as 18.41±1.87 μ, 17.12±0.69 μ and 16.68±1.31 μ in caput, corpus and cauda, respectively. Thus this study revealed that the height of epithelium gradually decreased from caput to corpus in groups II and III. Goyal and Dhingra (1975) and Singh (1989) had also reported that in buffalo bull the epithelium was the highest in head region and the lowest in tail region.

The thickness of peritubular smooth muscle cell layers/ mesenchymal cell layers was recorded to 29.25±3.24 μ in group I which increased to 30.09±2.24 μ, 38.00±4.76 μ and 41.80±3.55 μ in caput, corpus and cauda, respectively of group II whereas it decreased to 21.82±0.93 μ, 24.37±1.35 μ and 28.67±1.36 μ in caput, corpus and cauda, respectively in group III. The thickness of peritubular smooth muscle cell layers increased gradually from caput to cauda in groups II and III. This increase in thickness may be due to increase in number of peritubular smooth muscle cell layers from caput to cauda. Such an increase in thickness and number of peritubular smooth muscle cell layers had been also reported earlier in buffalo calves by Singh (1989).

REFERENCES

- De Miguel, M.P., Mariño, J.M., Martínez-García, F., Nistal, M., Paniagua, R. and Regadera, J. (1998). Pre and post-natal growth of the human ductus epididymidis. A morphometric study. *Repro. Fer. Dev.* **10**(3): 271-277.

- Edward, M. J. (1965). Observations on the anatomy of reproductive organs of cow. *New Zealand Vet. J.* **13**: 25.
- Goyal, H.O. and Dhingra, L.D. (1975). The postnatal histology of the epididymis in buffalo (*Bubalus bubalis*). *Acta Anatomica* **91(4)**: 573-582.
- Hemeida, N.A., Sack, W.O. and McEntee, K. (1978). Ductuli efferentes in the epididymis of boar, goat, ram, bull, and stallion. *American J. Vet. Res.* **39(12)**: 1892-1900.
- Khurana, D. (2000). Histomorphological and histochemical study on post-natal changes in ductuli efferentes and effect of androgen on ductuli efferentes and epididymis of the buffalo (*Bubalus bubalis*). M.V.Sc. thesis, Punjab Agricultural University, Ludhiana, India.
- Luna, L.G. (1968). Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology. (3rd edn.), McGraw Hill Book Company, New York, USA.
- Mohamed, A. (2005). Glycohistochemical, immunohistochemical and ultrastructural studies of the bovine epididymis. Ph.D. thesis, Ludwig-Maximilians-Universität, Munchen, Germany.
- Pal, C. and Bharadwaj, M.B.L. (1989). Age associated changes in histology and histochemistry of the ductuli efferentes in buffalo. *Indian J. Vet. Anat.* **1(1-2)**: 9-13.
- Singh, B. (1989). Histological and histochemical studies on epididymis of Indian buffalo (*Bubalus bubalis*). M.V.Sc. thesis, Punjab Agricultural University, Ludhiana, India.
- Snedecor, G.W. and Cochran, W.G. (1994). Statistical Methods. (8th edn.), Iowa State University Press, Ames, Iowa.
- Soliman, M.K. (1975). Studies on the physiological chemistry of the allantoic and amniotic fluid of buffalo at various periods of pregnancy. *Indian Vet. J.* **52**: 111-117.

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