Prenatal Development of Efferent Ductules in Indian Buffalo (*Bubalus bubalis*)

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ABSTRACT

The present study was conducted on thirty buffalo foetii ranging from 3 to 98 cm CVRL. The efferent ductules appeared as small, luminized and non-luminized set of secondary mesonephric tubules on the dorsal aspect of mesonephric giant corpuscle in buffalo foetii of 9 cm CVRL (69 days). Number and size of efferent ductules increased at 17 cm CVRL (105 days) onwards. Coiling of efferent ductules was observed at 17 cm CVRL and the lobulation was observed at 23 cm CVRL (127 days). The lining epithelium of efferent ductules was low columnar type at 9 to 13.7 cm CVRL (69 to 90 days) which was transformed into simple columnar epithelium having ciliated and non-ciliated cells at 17 cm CVRL (105 days). The typical syncytium of mesenchymal tissue surrounding the efferent ductules was observed at 9 cm CVRL (69 days) which later on condensed to form the peritubular cells.

Key words: Buffalo foetii, Efferent ductules

The efferent ductules not only act as a conduit between testis and epididymis but also take part in sperm maturation. The elongation and morphogenesis of the efferent ductules must be highly co-ordinated with its specialized function of providing an appropriate environment for sperm maturation (Joseph et al., 2009).

The studies on prenatal development of efferent ductules are limited, so the present research work was conducted on the efferent ductules of buffalo foetii.

MATERIALS AND METHODS

The present study conducted on thirty buffalo foetii ranging from 3 to 98 cm curved crown rump length (CVRL) were collected from abattoir and from the Veterinary Clinics, GADVASU, Ludhiana. The age of foetii was determined by measuring the CVRL as a curved line using an inelastic thread along the vertebral column between the most anterior parts of frontal bone to the rump at ischiatic tuberosity. The approximate age of the foetii was calculated by using formula given by Soliman (1975).

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Y = 28.66 + 4.496 \times (CVRL < 20 \text{ cm}) \\
Y = 73.544 + 2.256 \times (CVRL > 20 \text{ cm})
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Where Y is the age in days and X is the CVRL in cm.

Immediately after collection, the caput of epididymis was dissected out and fixed in 10% neutral buffered formalin and Bouin’s fixatives. After the fixation, the tissues were processed for paraffin blocks preparation by acetone benzene schedule. The paraffin sections of 5-6 µ were stained with hematoxylin and eosin for routine morphology and for Masson’s trichrome for connective tissue (Luna, 1968).

RESULTS AND DISCUSSION

In buffalo foetii of 9 cm CVRL (69 days), the efferent ductules (ED) appeared as small, elongated, rounded, luminized and non-luminized set of secondary mesonephric tubules on the dorsal aspect of mesonephric giant corpuscle (MGC) (Fig. 1). Wrobel (2001) and Mohamed (2005) in bovine foetii observed the formation of efferent ductules at day 50 and day 75-80, respectively. The remnant of degenerating primary mesonephric tubules appeared as appendix of epididymis cranial to the developing ED at 12.5 cm CVRL (85 days).

At 12.5 cm CVRL (85 days), few ED were observed in vicinity of large extra testicular rete testes (ETRT). At 13.7 cm CVRL (90 days), the area occupied by ED and ETRT was almost same and most of ED appeared to be rounded and oval tubular structure. Number and size of ED increased at 17 cm CVRL (105 days) onwards whereas that of ETRT reduced. The coiling of these tubules was observed at this stage, however strong coiling of efferent ductules was found at 23 cm CVRL (125 days) as reported in bovine foetus at 24 cm CRL (Mohamed, 2005).
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Fig. 1. Photomicrograph showing origin of efferent ductules (ED) from the dorsal aspect of mesonephric giant corpuscle (MGC) at 9 cm CVRL. H. & E. × 100

Fig. 2. Photomicrograph of efferent ductules (ED) being surrounded by a capsule of mesenchymal tissue and connecting with the testis (T) through extratesticular rete testis (ETRT) at 13.7 cm CVRL. H. & E. × 100

Fig. 3. Photomicrograph showing tunica albuginea (TA) with well distinct septae (S) dividing the mass of efferent ductules (ED) into many lobules at 96 cm CVRL. H. & E. × 40

At 13.7 cm CVRL (90 days), all the efferent ductules were surrounded by a capsule consisting of mesenchymal tissue (Fig. 2). The mesenchymal tissue of capsule was replaced by collagen fibres with some fibroblasts at 17 cm CVRL (105 days). The capsule started invading into parenchyma as septae and divided it into small lobules at 23 cm CVRL (125 days). The size and number of these lobules increased in the buffalo foetii at 23 cm to 96 cm CVRL (127 to 290 days) (Fig. 3). Mohamed (2005) in bovine fetus has reported the lobulation of efferent ductules at 30 cm CRL.

The lining epithelium of efferent ductules was low cuboidal type at 9 to 13.7 cm CVRL (69 to 90 days). A very prominent basement membrane underneath the lining epithelium of efferent ductules was observed at 13.7 cm CVRL. It was transformed into simple cuboidal epithelium having ciliated and non-ciliated cells with rounded to oval nuclei at 17 cm CVRL (105 days). The nuclei of the epithelial cells were arranged in a single line close to the basement membrane giving a darker appearance in the basal area and lighter appearance in the supranuclear area which was clearly evident at 40 cm CVRL (164 days) onwards.

The typical syncytium of mesenchymal tissue surrounding the ED was observed in present study at 9 cm CVRL (69 days) (Fig. 1). After condensation these mesenchymal cells surrounding the ED formed 4-5 layers at 12.5 cm CVRL (85 days). At subsequent growth it was found that the tubules were surrounded by 3-4 layers of differentiating smooth muscle cells at 17-31 cm CVRL (105 to 143 days). At 90 cm CVRL (277 days) the peritubular cells were compactly arranged in 3 layers of smooth muscle cells. It was clearly evident from these findings that the number of peritubular cell layers reduced from 4-5 at initial stage of development to 2-3 at the end of foetal life as reported earlier in bovine fetus by Wrobel (2001) and Mohamed (2005).

REFERENCES


