HISTOLOGICAL OBSERVATIONS ON THE CAUDA EPIDIDYMIS OF SAMBAR DEER (*Cervus unicolor*)

Received - 25.04.2014
Accepted - 10.10.2014

Even though the morphological fea tures and functional peculiarities of the reproductive organs in many species have already been reported, there are still many empty spaces mostly in the wild animals especially in the areas of morphometric studies. The deer serves as a uniquely well-characterized ruminant model system. The investigations on the sex organs of the deer are few. The structure of the epididymis in particular has received little attention. Since, the data regarding the detailed morphological description of cell types in the epididymis are not available in deer. The target of this study was to elucidate the cellular composition of the cauda epididymis of the species, with a view to provide exact morphometric values so as to form the base line data on the subject area.

The cauda epididymis was collected during the month of October from ten Sambar deer aged six years during caudectomy conducted at Wild Animal Rescue Centre, Kodanad. The tissue was fixed in 10 per cent neutral buffered formalin for 48 hours and processed by routine histological procedures. Sections of 5 µm thickness were cut and stained with Haematoxylin and eosin and Masson's trichrome for histological studies. The slides were examined under the light microscope and the following measurements were taken: epididymal tubular diameter, epididymal luminal diameter and epididymal epithelial height. For each parameter, ten measurements were made per section using a calibrated ocular micrometer.

The epithelium was pseudostratified columnar and consisted of principal cells, basal cells and goblet cells (Fig. 1). Similar to seminiferous tubules, the epididymal ducts had spaces between the tubules and were filled with interstitial tissue rich in collagen fibres and blood vessels (Fig. 2). This was in conformity with earlier reports on the histology of the epididymis in mammals (Oke, 1982).

The principal cells were tall with stereocilia (Fig.1). According to Maneely (1959) in domestic animals, the cilia were long branched nonmotile microvilli and these cells had well developed Golgi apparatus, indicating an increased secretory activity.

Small basal reserve cells with spherical nucleus and clear cytoplasm were located on the basal lamina (Fig.1). Goblet cells (clear cells) were scattered among the lining epithelium. The thin propria-submucosa was represented by the thin layer of interstitial connective tissue with blood vessels. There were layers of smooth muscles outside the epithelium (Fig. 2) arranged in three layers: circular, oblique and longitudinal. Schön and Blottner (2009) reported that these muscle layers exhibited peristalsis and propelled the sperms along the epididymis.

Tissue examination revealed viable sperm in the lumen of the cauda epididymis indicating active spermatogenesis during the month of October. Dyce *et al*. (2002) opined that mature spermatozoa were found more in the cauda epididymis than in the corpus epididymis but rarely in the caput epididymis. Moreover, the epididymis in periods of gonadal regression showed a significant decrease in luminal diameter and epithelial height in cauda, while the thickness of the lamina propria increased (Eurell and Frappier, 2006).

The occurrence of viable sperms in the lumen indicated that the month of October

was the breeding season. Masuda (1992) also reported that in wild male Ezosika deer (*Cervus nipponyesoensis*) sexual maturity occurred in October of the second rutting season after birth, at the estimated age of 16 months, following repeated seasonal changes in the reproductive organs and accessory reproductive organs. From May to October, the weight of the testis and seminalvesicles including the diameter of the seminiferous tubules and ductus deferens increased. Likewise, there was an increase in the number of primary spermatocytes and the height of the glandular epithelium. In the October rutting season (estimated age 16 months), spermatogenesis in the testis was initiated with an increase in the concentration of seminal fructose. From the estimated age of about 16 months, the weight of the testis and seminalvesicles, diameter of seminiferous tubules, and the concentration of seminal fructose declined to a low level in May. Spermatogenesis was arrested and non-motile sperms were collected from the cauda epididymis in May. Spermatogenesis increased again from July or August and reached peak development in the October rutting season. Spermatozoa from the cauda epididymis also showed high motility in this season.

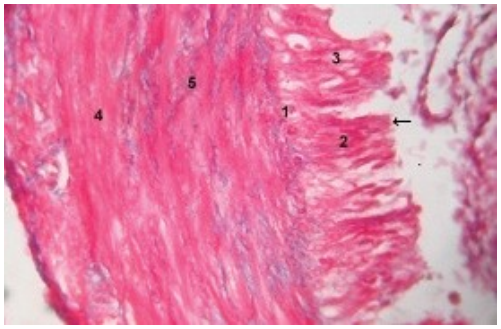

Fig.1. C.S. of the cauda epididymis of Sambar deer showing cilia (arrow). Masson's TrichromeX400.

1. Basal cell, 2. Principal cell, 3. Goblet cell, 4. Smooth muscle, 5. Connective tissue

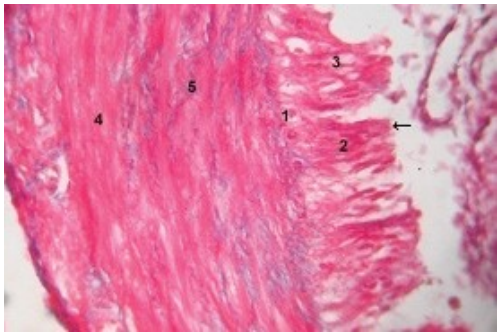

Fig. 2 C.S. of the cauda epididymis of Sambar deer showing cilia (arrow). Masson's Trichrome X 100.

1. Interstitial connective tissue with blood vessels 2. Circular muscle layer 3. Oblique muscle layer 4. Longitudinal muscle layer 5. Sperms in the lumen

The mean luminal diameter and epithelial height were 360 ± 10.01µm and 72 ± 02.06µm respectively. However, Olukole and Obayemi (2010) observed that in the cane rats the pattern of the dimensions of the epithelial height across the three segments,viz. caput, corpus and cauda of the epididymis were different from those of the ductal and lumen diameters. According to Olukole and Obayemi (2010) in the domesticated adult African great cane rat (Thryonomysswinderianus), there was a low positive correlation (0.0420) between the diameter of the tubule of the epididymis and its epithelial height; indicating that with an increase in epithelial height the relative increase in tubular diameter is low. There was a high negative correlation (-0.7958) between epithelial height and lumen diameter meaning that with a decrease in the height of the epithelium, the lumen increased significantly. This relationship could be attributed to function rather than structure as the cauda epididymis has the widest lumen since it stores spermatozoa. This explains why more spermatozoa mass were found in the cauda than in the corpus epididymis.

The mean ductal diameter of the cauda epididymis was 536± 20.06µm. As per earlier reports, the ductal diameter of the cauda epididymis of the African giant rat was reported to vary between 216.45µm and 242.82µm while that of the male fox was 352.3 ± 46.10µm (Blom, 1968). Schön and Blottner (2009) also found that the duct with its surrounding tissue expanded towards rutting season. In the caput this enlargement of the duct was primarily caused by the growth of the epithelial compartment, whereas in the cauda it was predominantly attributed to the dilatation of the lumen, filled with testicular and epididymal fluid and spermatozoa towards the rut. This leads to distinct changes in the tissue composition of samples taken from the three main regions of the epididymis at different times of the year.

Summary

Histomorphology of the epididymis in deer was studied using specimens collected from ten adult deer having an average age of six years. The epithelium was pseudostratified

columnar and consisted of principal cells, basal cells and goblet cells. The principal cells were tall with stereocilia. Small basal reserve cells were sitting on the basal lamina. There were layers of smooth muscles outside the epithelium arranged in three layers: circular, oblique and longitudinal. Viable sperms were observed in the lumen of the cauda epididymis indicating active spermatogenesis.

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