

Histomorphological and histochemical studies on the ductus deferens of guinea pig

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Received: 10 October 2007; Accepted: 10 June 2008

Key words: Ductus deferens, Guinea pig, Histochemistry, Histomorphology

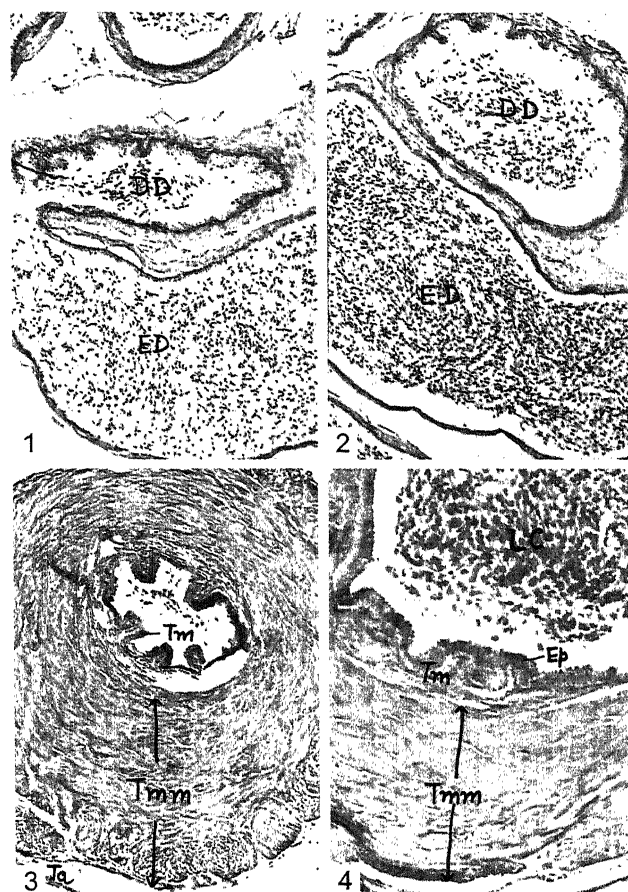
Some of the studies were reported on the histology of ductus deferens in rabbit (Flickinger 1975), rat (Hamilton and Cooper 1978) and guinea pig (Hoffer and Greenberg 1978). But the detailed information on the histomorphological and histochemical observations on the ductus deferens of guinea pig is still lacking. So the present study was conducted with the aim to elucidate the detailed structural morphology of ductus deferens in guinea pig.

The study was made on the ductus deferens from four guinea pigs of 3–4 months of age and 400–500 g in weight. The tissue samples were collected from the most proximal and middle part of both the right and left ductus deferens. After fixation in 10% neutral buffered formalin and processing by acetone benzene technique (Luna 1968), the paraffin sections of 5–7 μ m were stained with hematoxylin and eosin to observe routine histomorphology, Masson's trichrome for collagen fibres (Luna 1968), periodic acid Schiff for neutral mucopolysaccharides and Alcian blue for acid mucopolysaccharides (Sheehan and Hrapchak 1973), Sudan black B for lipids (Chayen *et al.* 1969) and bromphenol blue for basic proteins (Pearse 1972).

Histomorphological studies

The ductus deferens was made up of 3 layers, i.e. tunica mucosa, muscularis and adventitia.

Tunica mucosa: In the proximal part the lining epithelium of ductus deferens varied from simple columnar to pseudostratified columnar type. The cranial most part of ductus deferens was seen in continuation with the epididymal tubules as both could be seen in a single section (Fig.1). In other sections, some mucosal folds were observed in lumen of ductus deferens on one side, while the most of the part did not show any folding. The lumen appeared smooth on 2/3rd part and mucosal folds on 1/3rd part (Fig. 2). However Flickinger (1975) reported the highly folded mucosa with many cytoplasmic projections in the proximal part of vas deferens of rabbit, which may be related to seasonal variation



Figs 1–4. 1. Section of proximal part of ductus deferens in a guinea pig showing the continuation of epididymal duct with the deferent duct. 2. Section of proximal part of ductus deferens in a guinea pig showing the separation of epididymal duct from the deferent duct. 3. Section of middle part of ductus deferens in a guinea pig showing the tunica mucosa (Tm), tunica muscularis (Tmm) and tunica adventitia (Ta) and lumen (L). 4. Section of middle part of ductus deferens in a guinea pig showing the pseudostratified epithelium (Epi) in tunica mucosa (Tm), circular and longitudinal layers of smooth muscles in tunica muscularis (Tmm) and lumenal contents (LC).

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in the activity of epithelium.

In the middle part, the lamina epithelialis of ductus deferens was pseudostratified columnar type with mucosal folds (Fig. 4). The epithelium along with underlying connective tissue of lamina propria was thrown into these folds which are believed to allow for expansion of ductus deferens during ejaculation. The lumen of ductus deferens decreased in size than the proximal part. The epithelium contained mainly columnar cells and basal cells with scattered lymphocytes. The lamina propria mucosae and tunica submucosa were considered as a single layer known as propria submucosa due to absence of lamina muscularis mucosae.

Tunica muscularis: The proximal part of ductus deferens had a thin coat of circular muscle fibres only. The middle part showed a bilayered arrangement of muscle fibres, i.e. inner circular and outer longitudinal layers. The inner circular layer was thicker than the outer longitudinal one (Fig. 3). Similarly, Khan *et al.* (2003) reported two layers of smooth muscles in the ductus deferens of rabbit. They further noticed that the inner circular layer was less developed and the outer longitudinal layer was well developed, which is contrary to our findings. The thick muscular coat by its peristaltic action is said to be responsible for its pumping action during ejaculation. However, Khan *et al.* (2003) also observed that the tunica muscularis was well developed as trilaminar in human and rat, however, the inner longitudinal layer was ill-defined in goat, buffalo and rabbit.

Tunica adventitia: It is a loose connective tissue layer along with blood vessels, nerves and lymphatics (Fig. 3). It is thin in the proximal part than the middle part of ductus deferens in guinea pigs. The increased blood supply in the middle part of this layer provides a nutritional support to the different tunics of ductus deferens.

Lumen of ductus deferens: The accumulation of dense material with vesicles, granules, dense bodies and spermatozoa were observed in the lumen of ductus deferens. It was more in its proximal part as compared to middle part of ductus deferens. The spermatozoa were mostly noticed in the process of degeneration. Cooper and Hamilton (1977)

reported similar observations in the cauda epididymis and proximal part of vas deferens in rats, mice, hamsters and guinea pigs.

Histochemical studies

The localization of various histochemical moieties, viz. acid and neutral mucopolysaccharides, lipids and basic proteins has been demonstrated in different tunics of ductus deferens in guinea pig and summarized in Table 1.

SUMMARY

The histomorphological and histochemical studies conducted on the proximal and middle parts of ductus deferens in guinea pigs revealed that the lining epithelium varied from simple columnar to pseudostratified columnar non-ciliated epithelium. The number of mucosal folds was lesser in the proximal part than the middle part. In the proximal part, only the circular layer of smooth muscles was observed, whereas both the circular and longitudinal layers of tunica muscularis could be seen in the middle part. The lumen of ductus deferens contained vesicles, granules, dense bodies, spermatozoa etc. and showed a strong reaction for basic proteins which may be due to the disruption of spermatozoa by the precipitation of proteins. A moderate to strong reaction for neutral and acid mucopolysaccharides was seen in the tunica mucosa whereas other layers were weakly positive. However, reverse pattern of distribution for lipids and basic proteins was observed in different layers of ductus deferens.

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Table 1. Distribution pattern of various histochemical moieties in the ductus deferens of guinea pig

Structure	Neutral muco-polysacch-arides	Acid muco-polysacch-arides	Lipids	Basic proteins
Tunica mucosa	++/+++	++	0/+	+ /++
Tunica muscularis	+	+	0/+	+
Tunica adventitia	0/+	0/+	++/+++	+ /++
Luminal contents	+ /++	0/+	+ /++	++/+++

0 negligible, + weak, ++ strong, +++ intense.