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HISTOLOGY AND HISTOMETRY OF DIFFERENT PARTS OF URINARY BLADDER IN *Camelus dromedarius*

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ABSTRACT

6 adult male one humped camels aged between 7–11 years start. Tissue samples of apex, body and the neck of urinary bladder were obtained from. The sections were stained with haematoxylin and eosin (H&E), Masson's trichrome and Verhoff staining. In histological studies, the wall of urinary bladder consisted of tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa. Urinary bladder was covered by folded transitional epithelium on mucosal surface. The collagen and elastic fibres, many artery and lymphatic vessels in lamina properia were also seen. Lamina muscularis mucosa was composed of longitudinal bundles of smooth muscles. Tunica muscularis was consisted of smooth muscles in different directions. Tunica adventitia was composed of areolar connective tissue with blood and lymphatic vessels and nerves endings. Our data analysis indicated that, the mean width of epithelium as well lamina propria in neck of urinary bladder were greater than other parts and the difference was significant (P> 0.05). There was no significant difference between other parameters of urinary bladder.

Key words: Dromedary camel, histometry, urinary bladder

Extensive studies on the urinary system of many animals are available in the literature (Wolf *et al,* 1996 and Liu, 1962). However, scarce histological studies on urinary bladder of camel were found in available literature (Tayeb, 1948). The objective of this work was to study the histology of urinary bladder in adult male dromedary camels.

Materials and Methods

Six adult male one humped camels (*Camelus dromedarius*) aged between 7–11 years were used to collect urinary bladder. Tissue samples were obtained from the midpoint of 3 parts , i.e. apex, body and the neck and then the fragments were fixed in 10% neutral-buffered formalin for light microscopy. The samples were embedded in paraffin and 5 µm thick, sections were stained with H&E. Masson's trichrome staining was used for collagenous and muscle fibres and Verhoeff staining was used for elastic fibres. After tissue preparation and staining, histological layers of urinary bladder such as tunica mucosa, submucosa and muscularis were recognised and total width of urinary bladder, thickness of urothelium, lamina propria, muscle layer and tunica adventitia with micrometry method were measured. All of the variables between 3 parts of urinary bladder were compared using one way ANOVA and t-test statistical analysis (Norusis, 1993).

Results and Discussion

The wall of the urinary bladder consisted of tunicae mucosa, submucosa, muscularis and serosa. Tunica mucosa consisted of epithelium, lamina propria and lamina muscularis mucosa. In most of animals, urinary bladder has a similar histologic organisation that includes a tunica mucosa of transitional epithelium up to 8 cells deep; an underlying loose connective – tissue layer (propria – submucosa); a tunica muscularis of smooth muscle forming inner longitudinal, middle circular, and outer longitudinal layers; and a tunica adventitia of loose connective tissue or a tunica serosa of mesothelium and connective tissue when visceral peritoneal covering is present (Banks, 1993; Eurell and Frappier, 2006).

Urinary bladder was covered by flat folded transitional epithelium on mucosal surface. The thickness of epithelium was increased in neck part. It was consisted of 5 to 7 cell layers. Mucous glands were absent in the urinary bladder. The outermost layer was characterised by cuboidal cells with apical pillow shape. The most of cells had

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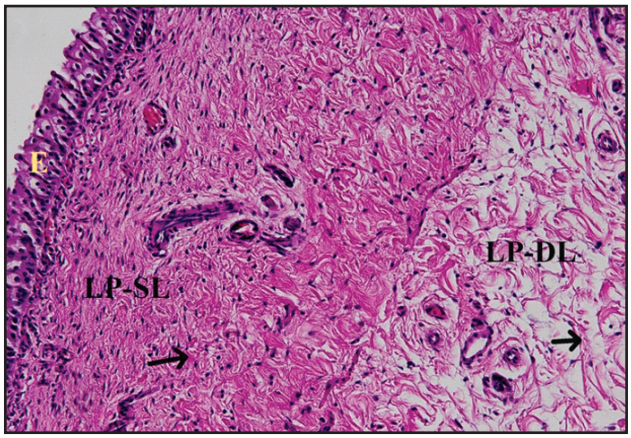

Fig 1. Photomicrograph of camel urinary bladder in apex part showing tunica mucosa with dens and loose collagen fibres (Arrows).

EP:Epithelium, LP-SL:Lamina propria –Superficial layer, LP-DL:Lamina propria –Deep layer, Hematoxylin and Eosin stain,×320.

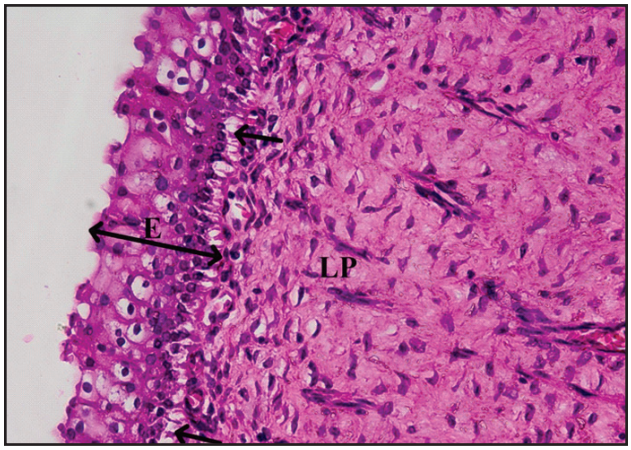

Fig 2. Photomicrograph of camel urinary bladder in apex showing transitional epithelium(E), The most of cells have clear and vacuolated cytoplasm (VC), Basal cells located in a regular row(Arrows), LP: Lamina propria, Hematoxylin and Eosin stain,×640.

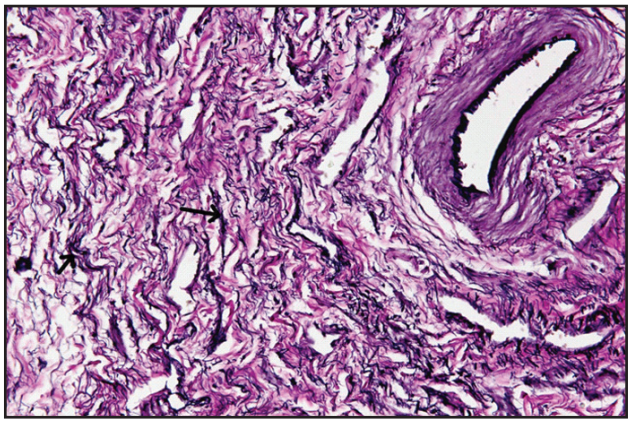

Fig 3. Photomicrograph of camel urinary bladder in body part showing collagen (*) and elastic(Arrows) fibres in tunica submucosa, Verhoff stain,×320.

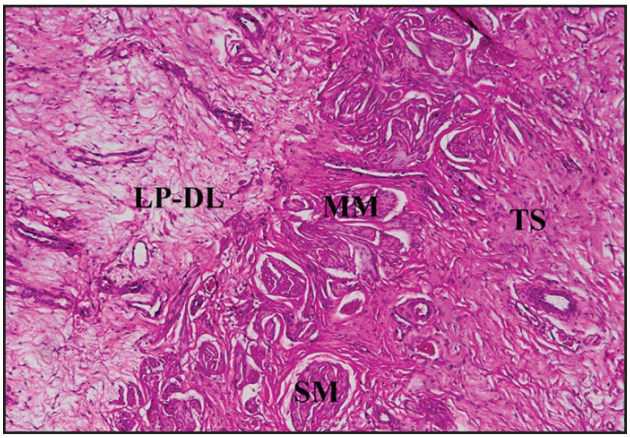

Fig 4. Photomicrograph of camel urinary bladder in apex part showing lamina muscularis mucosa (MM) composed of bundles of smooth muscles(SM), LP-DL: Lamina propria deep layer, TS: Tunica submucosa, Hematoxylin and Eosin stain,×160.

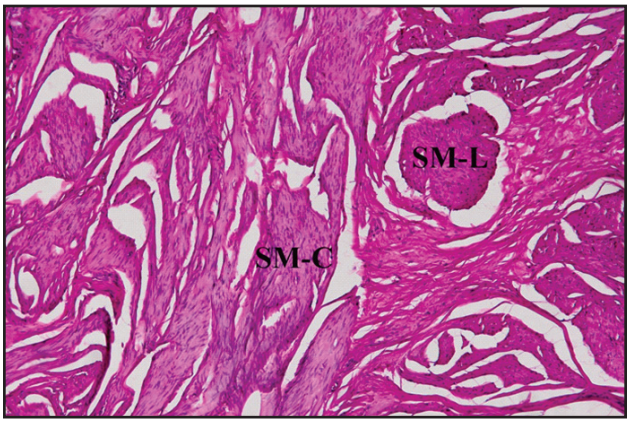

Fig 5. Photomicrograph of camel urinary bladder in apex part showing tunica muscularis composed of two smooth layers: circular smooth layer (SM-C) and longitudinal smooth layer (SM-L)but two layers were mixed and intermingeled. The muscle fascicles separated with collagen fibres. Hematoxylin and Eosin stain,×160.

clear and vacuolated cytoplasm. First cell layer of epithelium was arranged irregular by and all the cells had vacuolated cytoplasm (Figs 1 and 2). When the urinary bladder is relaxed, the superficial cells contain extensive intracytoplasmic membrane tubulovesicles that are believed to be inserted into the plasma membrane when the bladder is distended. The superficial transitional cells have extensive basolateral plasma membrane infolding that interdigitate with the plasma membrane of underlying transitional cells. Adjacent transitional cells are connected by numerous desmosomes with long intermediate filaments that extend into the cytoplasm; the desmosomes and intermediate filaments are believed to maintain the epithelial integrity as it stretches and flattens during bladder distension (Dellmann, 2006). Lamina propria

Table 1. Comparison histological layers of three parts of urinary bladder in six dromedary camels (Mean ± SEM), n=30.

Variable (µm)	Total wall	Epithelium	Lamina propria	Tunica submucosa	Tunica muscularis	Tunica serosa
Apex	8128.3±282.41	91.25±3.93	991.67±78.52	1844.2±62.33	5071.3±46.65	583.33.±46.16
Body	8304.0±237.92	87.08±2. 61	729.17±53.83	1479.2±71.28	5322.9±207.83	693.75±83.21
Neck	7708.3±171.63	226.67±58.52	1887.5±168.70	NA	5033.3±58.39	716.67±32.79
P. Value	NS	**	**	NS	NS	NS

NA=Not available *P ≤ 0.05; **P ≤ 0.01; NS = P > 0.05.

was very extensive and composed of collagen and elastic fibres but collagenous fibres were predominant. It was divided to superficial and deep parts. In superficial part, there was dense connective tissue but in deep part it was loose connective tissue (Fig 1). Lamina muscularis mucosa was seen and composed of longitudinal bundles of smooth muscles that separated with collagen fibres. Tunica submucosa was composed of collagen and elastic fibres with blood vessels (Figs 3 and 4). A lamina muscularis mucosa of small, isolated bundles of smooth muscle is present in horses, ruminants, dogs and pigs, but is absent in cats (Dellmann, 2006). Tunica muscularis was consisted of smooth muscles. These muscles were arranged in 2 layers: circular and longitudinal but 2 layers were mixed and intermingeled. Collagen and elastic fibres were seen between the muscles. Circular layer was thicker than longitudinal layer. Longitudinal layer composed of bundles that were located between the circular muscles (Fig 5). The smooth muscle of tunica muscularis, called the detrusor muscle, is composed of ill- defined layers of smooth muscle (Dellmann, 2006). The main function of the tunica muscularis is making peristalsis movement which propels the urine. Tunica adventitia was composed of areolar connective tissue with blood, lymph vessels and nerves. Comparison between histological layers of 3 parts of urinary bladder were shown in table 1.

The histology of the urinary bladder of the camel has been studied previously (Tayeb, 1948). The urinary bladder of the camel is small. A 300 kg camel watered daily excretes an average of 3 to 4 litres of urine per day, but under half a litre when deprived of water (Mukasa-Mugrewa, 1981). The camel's ability to concentrate its urine enables it to tolerate water and plants with a high salt content. Richard (1973) reported that the camel is capable of secreting urine with a salt content higher than that of sea water.

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