

Some morphological studies on Prostata (Prostate gland) of buffalo bull (*Bos bubalis* L.)

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ABSTRACT

The objective of this research was to describe the anatomical and histological structure of the prostate gland in buffalo bulls. This study was carried out on the prostate gland of 25 animals. The gland consisted of two parts; Corpus prostatae and Pars disseminate prostatae. The shape of the former part was variable (band like, two lobed connected by an isthmus (Isthmus prostatae) and three lobed gland). It was situated transversally on the dorsal aspect of the pelvic urethra just caudal to the dorsal fibrous cord of the vesicular gland. Pars disseminata prostatae occupied in the entire length of the pelvic urethra. Microscopically, the capsule of the gland was fiberomuscular in nature. Fiberomuscular septa arose from the capsule dividing the gland into lobes. The latter septa gave rise fiberoelastic septulae, which dividing the lobes into lobules. The prostatic secretory end-pieces were of tubulo-alveolar type, which were lined with simple cuboidal epithelium. These cells reacted positively with PAS and alcian blue stains. The intralobular ducts were lined with simple cuboidal epithelium, changed into simple columnar in the interlobular ducts and transitional type in the main excretory ducts, at their opening in the pelvic urethra.

INTRODUCTION

Buffaloes are distributed all over the world. It is worthy of note that the present world buffalo (*Bubalus bubalis*) population is actually about 168 million head; 3 717 million are in Africa, almost entirely in Egypt (2.24 percent). They are dual purpose animals and are good for meat, milk, leather and other by-products (1).

Prostate gland has a major contribution in the seminal fluid which plays important role in male fertility. Its functional significance lies in neutralizing the seminal plasma and to initiate active movement of the ejaculated spermatozoa (2). The morphological studies on the prostate gland of buffalo bull were rare (3-5). So, the aim of the present work to throw some light on the anatomical and histological structure of the prostate gland of buffalo bull.

MATERIAL AND METHODS

The present study was carried out on isolated pelvic urethra of 25 adult buffalo bulls. Just after slaughtering and evisceration. The pelvic urethra with the accessory genital glands were collected from apparently healthy adult bulls, from Hehia and Zagazig slaughter houses. The specimens were treated with normal anatomical and histological technique.

RESULTS

Prostata of buffalo bulls consisted of two parts; Corpus prostatae and Pars disseminate prostatae. The former part was absent in 20% of the specimens. The shape of Corpus prostatae was variable (band like, two lobed connected by an isthmus (Isthmus prostatae) and three lobed gland). The former

one was the most common shape. It was situated transversally on the dorsal aspect of the pelvic urethra just caudal to the dorsal fibrous cord of the vesicular gland (Figs. 1&2). Corpus prostatae was about 1.77 (± 0.124) cm in length, 0.755 (± 0.031) cm width and 0.430 (± 0.039) cm thickness.

Pars disseminata prostatae occupied in the entire length of the pelvic urethra, with different forms in the cranial, middle and caudal levels. In the cranial level, it was ill

defined ventrally and completely encircled the pelvic urethra in its middle and caudal levels. The glandular tissue of middle level was thicker than that of the cranial and caudal ones, especially in its dorsolateral area (Fig.3).

The openings of Ductuli prostatici were minute and arranged in six longitudinal rows in the inner surface of the pelvic urethra, between the mucosal folds which extended caudally from Colliculus seminalis (Figs. 4&5).

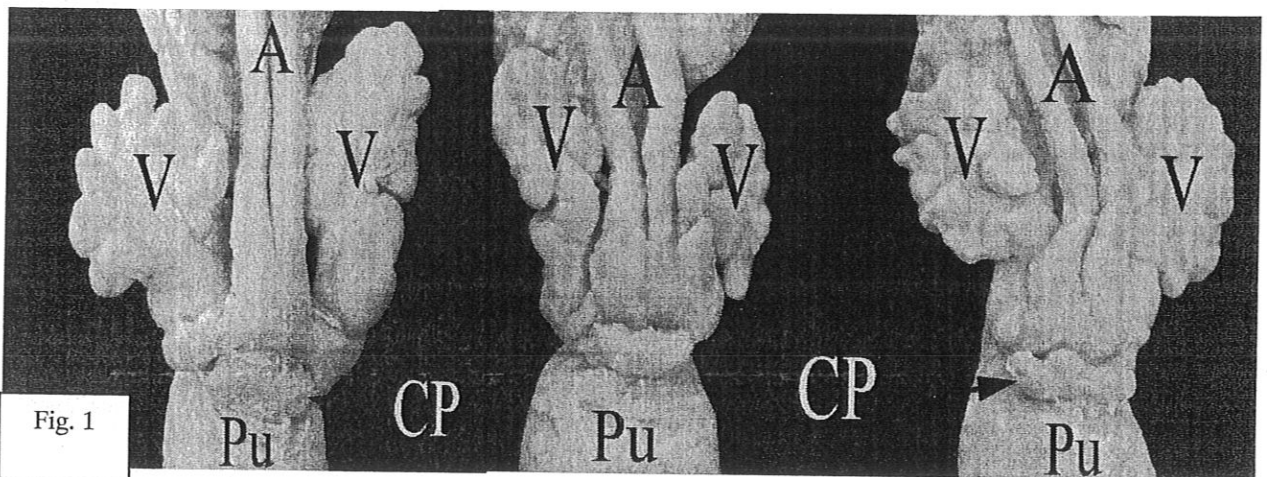


Fig. 1

Fig. 1. A photomicrograph showing the dorsal view of Corpus prostatae (CP) of adult buffalo bulls, with clear Ampulla ductus deferentis (A), Glandula vesicularis (V) and pelvic urethra (Pu).

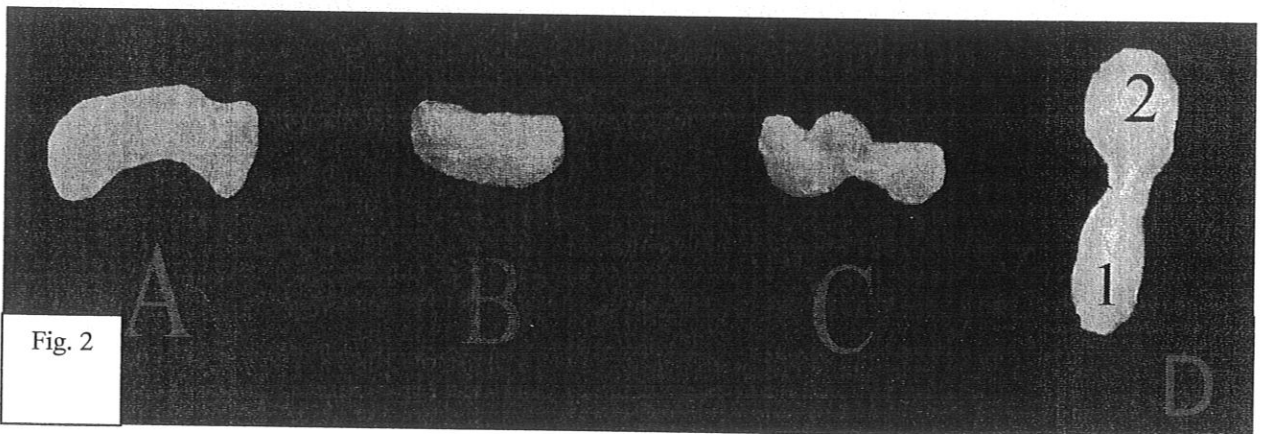


Fig. 2

Fig. 2. A photomicrograph showing the variable forms of Corpus prostatae; band like in (A) and (B) three lobed in (C) and two lobed (D); lobus dexter (1) and lobus sinister (2) connected by Isthmus prostatae (arrow).

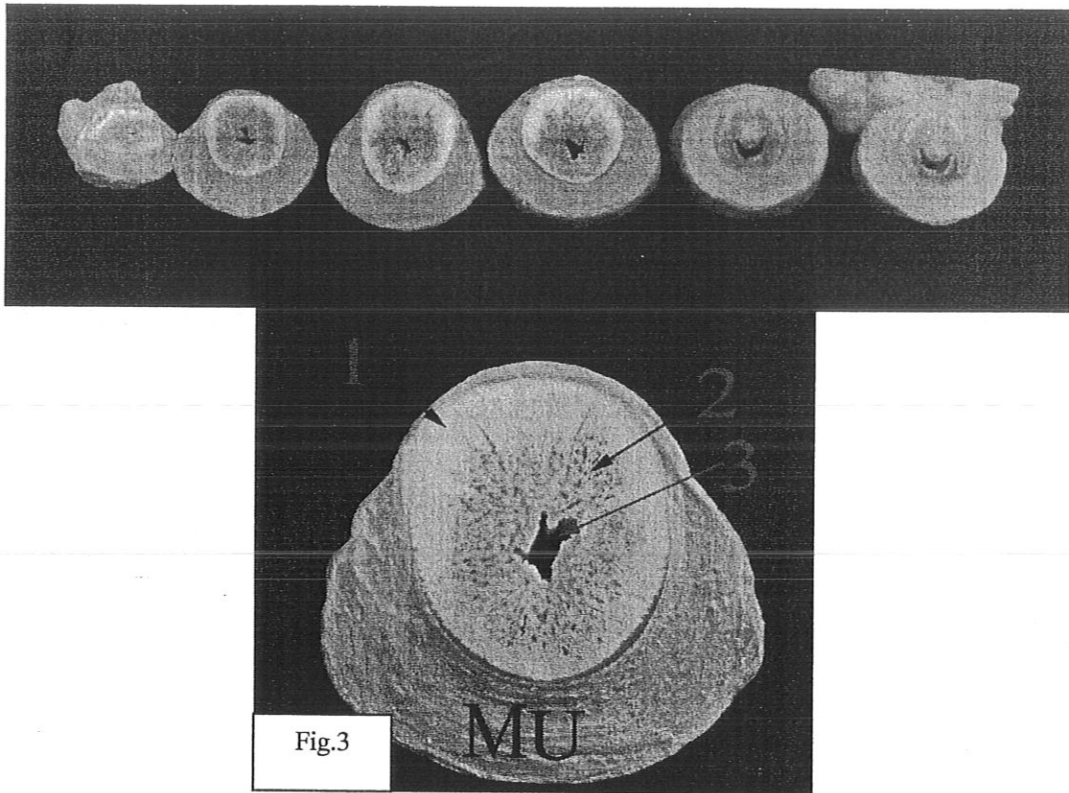


Fig. 3. A photomicrograph of cross sections of the pelvic urethra of adult buffalo bull with higher magnification of its middle level, showing Pars disseminata prostatae (1), Stratum spongiosum (2), pelvic urethra (3), and Muscle urethralis (MU).

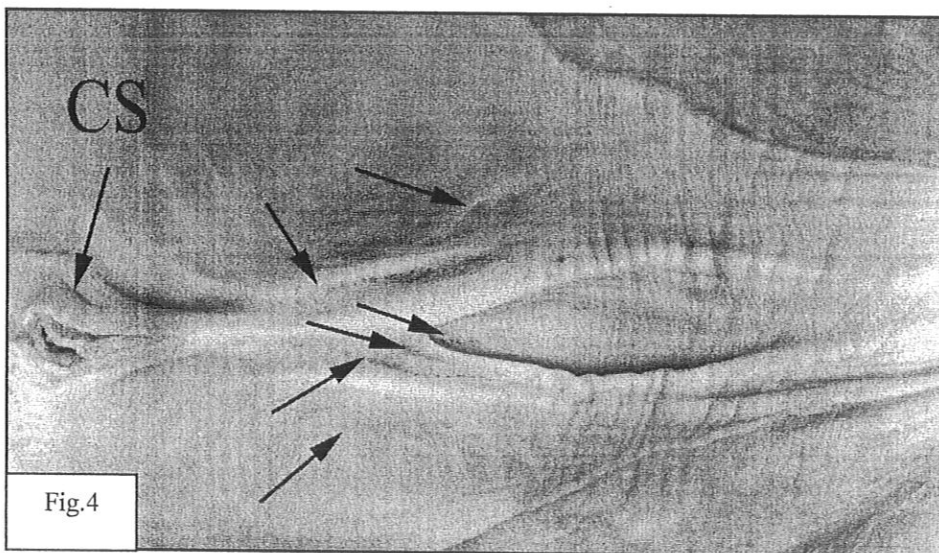


Fig. 4. A photomicrograph of the inner surface of the pelvic urethra, showing Colliculus seminalis (CS), and orifices of Ductuli prostatici (arrows).

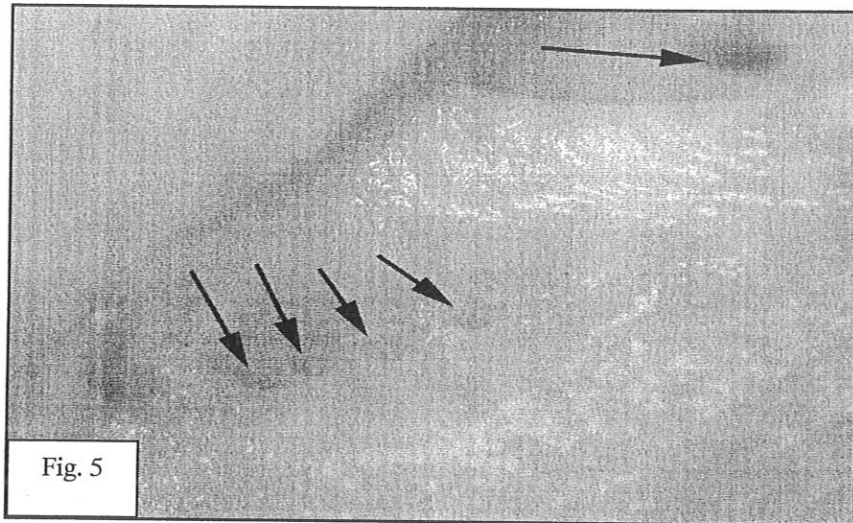


Fig. 5

Fig. 5. A photomicrograph showing the orifices of one row of Ductuli prostatici (arrows) presented in the inner surface of the pelvic urethra (stereomicroscope X1.6).

Microscopically, Corpus and Pars disseminata prostatae of the gland were separated from each other by a fibrous capsule (Fig. 7). The glandular capsule was formed of highly vascular dense irregular connective tissue of mainly collagen fibers and few elastic fibers. The capsule contained an abundant smooth muscle fibers. The capsule sent large septa with clear invasion of smooth muscle fibers, dividing the gland into lobes. The gland was subdivided into lobules by collagenic fibers and elastic fibers septulae, coming from the interlobar septa (Figs. 6,8&9).

The prostatic secretory end-pieces of Corpus prostatae were of tubulo-alveolar type. The acini were mucous in nature, lined with simple cuboidal cells with basally situated nuclei (Fig. 10). The secretory cells contained granules in their cytoplasm, that reacted positively with PAS and alcian blue stains. Some cells had nonalcianophilic cytoplasm (Figs. 11&12).

Pars disseminata prostatae was arranged in the wall of the pelvic urethra as mucosal, submucosal and main glands (Fig. 13). The acini of the mucosal and submucosal parts were similar to that of Corpus prostatae. On the other hand, the main part of pars disseminata was deeply located, close to tunica muscularis. The cytoplasm of their acini was over distended with secretory granules, that reacted positively with PAS and alcian blue stains. These granules narrowing the lumen of the acini and their nuclei became flattened in shape (Figs. 14,15&16).

The initial portion of the duct system was intralobular ducts which were lined with simple cuboidal epithelium (Figs. 17&20). The lining epithelium changed into simple columnar in the interlobular ducts (Figs. 18&21) and transitional type in the main excretory ducts (Figs. 19&22).

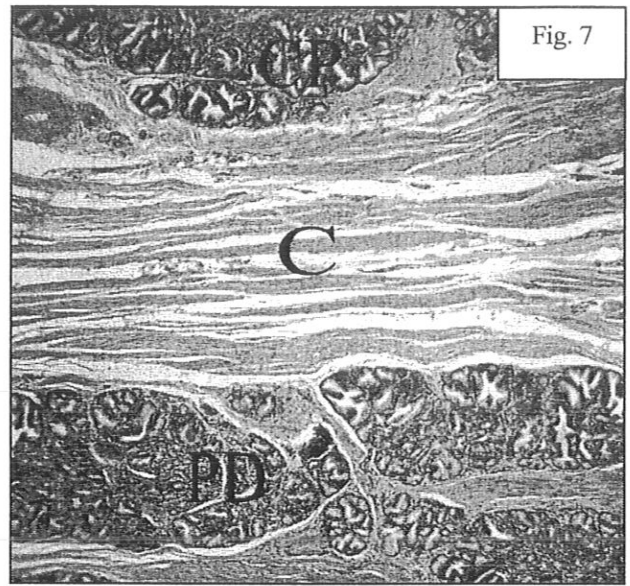
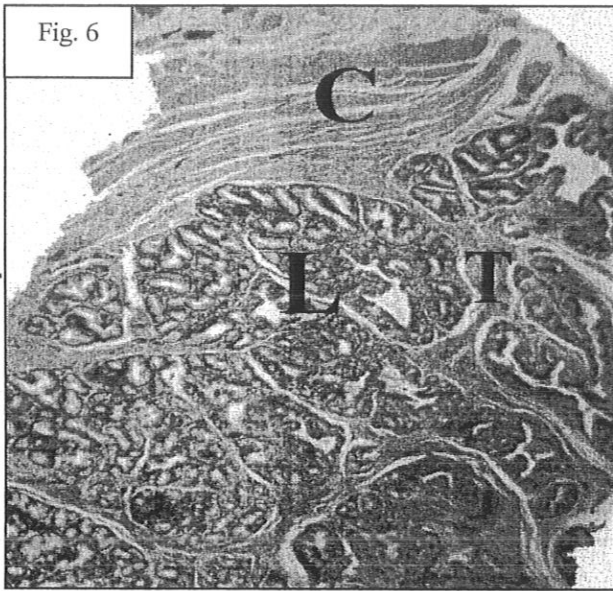


Fig. 6. A photomicrograph of a cross section in Corpus prostaticae of adult buffalo bull showing capsule (C), septa (T) and lobe of the gland (L). H&E stain. Obj. X 4.

Fig. 7. A photomicrograph showing the two parts of the prostate gland Corpus prostaticae (CP) and Pars disseminata prostaticae (PD) which were separated from each other by fibrous capsule (C). H&E stain. Obj. X 4.

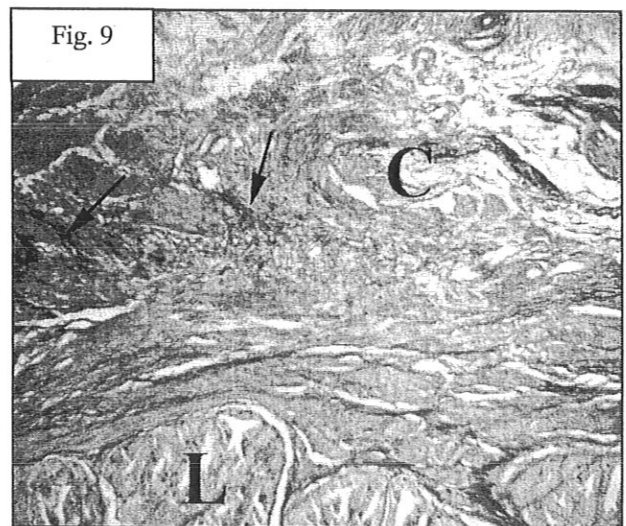
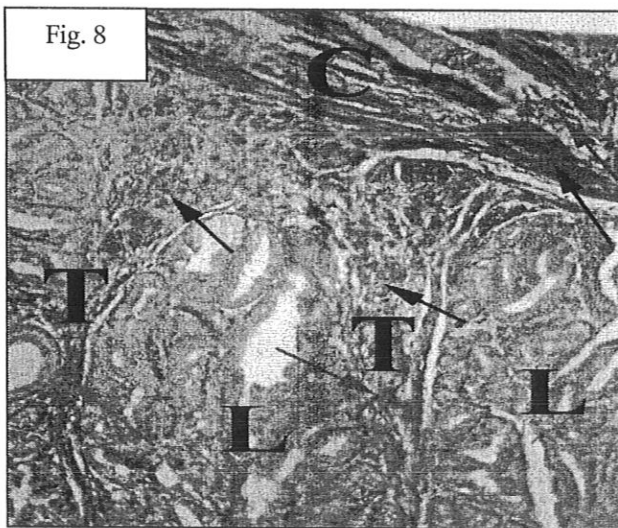


Fig. 8. A photomicrograph of a cross section in Corpus prostaticae of adult buffalo bull showing the distribution of the collagen fibers (red arrows) through capsule (C) and septa (T), and smooth muscles (black arrows) in the capsule and trabeculae, also showing lobes of the gland (L). Crossmon's trichrome stain. Obj. X 4.

Fig. 9. A photomicrograph showing the distribution of the elastic fibers (arrows) in capsule (C) of Corpus prostaticae, also showing lobe of the gland (L). Weighert's elastic and Van Gieson's stains. Obj. X 10.

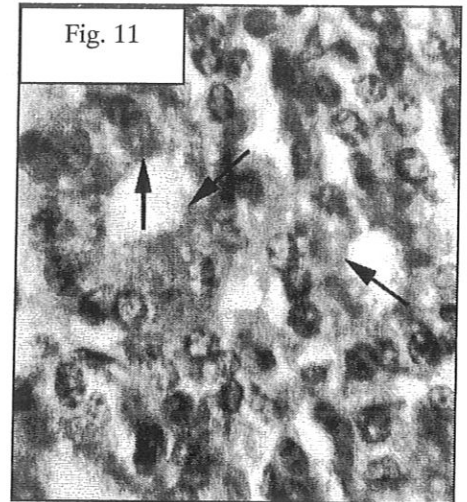
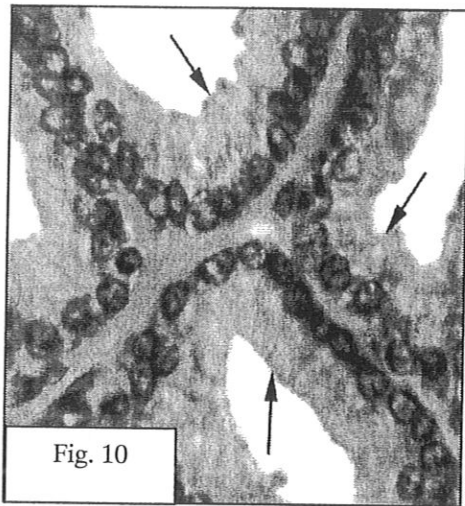


Fig. 10: A photomicrograph showing the simple cuboidal cells (arrows) lining the glandular acini of Corpus prostaticae. H&E stain. Obj. X 100.

Fig. 11: A photomicrograph showing PAS positive reaction in the cytoplasm of the secretory cells (arrows) of Corpus prostaticae. PAS stain. Obj. X 100.

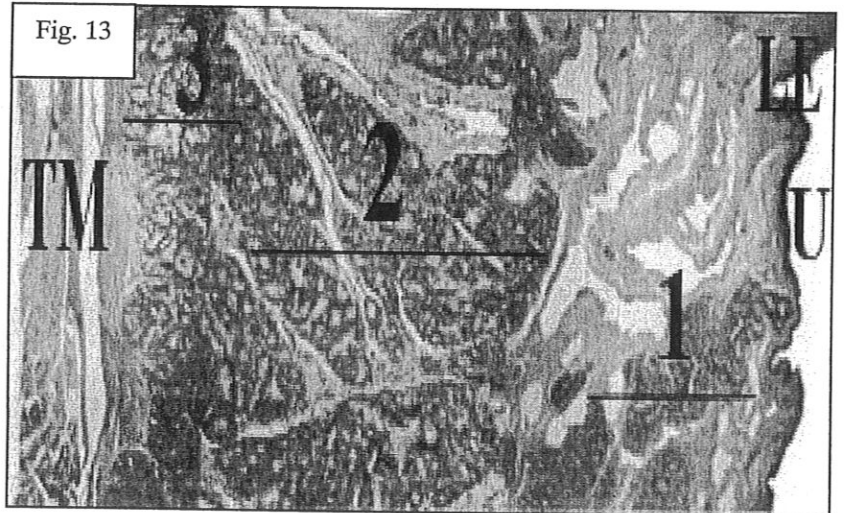
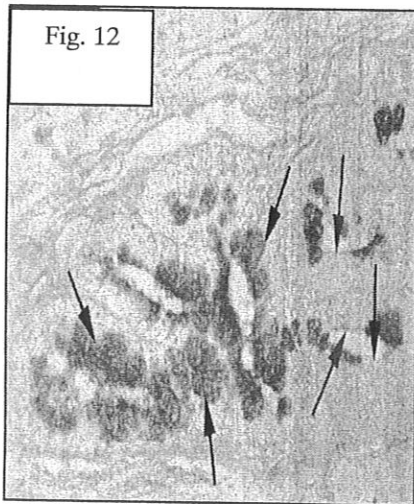


Fig. 12. A photomicrograph showing Alcian blue positive reaction in the cytoplasm of the secretory cells (black arrows) of Corpus prostaticae, also showing some cells had nonalcanophilic cytoplasm (red arrows). Alcian blue stain. Obj. X 40.

Fig. 13. A photomicrograph of a cross section in the middle level of the pelvic urethra showing the three parts of pars disseminata prostaticae; mucosal (1) which located near Lamina epithelialis (LE), submucosal (2) and main (3) part which located near Tunica muscularis (TM). Also, showing the lumen of the pelvic urethra (U).H&E stain. Obj. X 4.

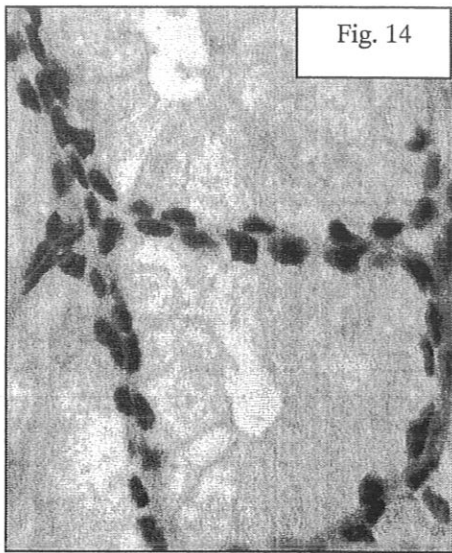


Fig. 14. A photomicrograph showing the simple cuboidal cells of the glandular acini of the main part of pars disseminata with their cytoplasm over distended with secretory granules, surrounding narrow lumen with flattened basally situated nuclei. H&E stain. Obj. X 100.

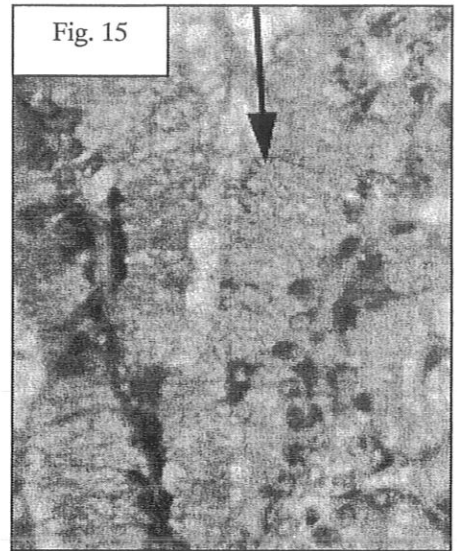


Fig. 15. A photomicrograph showing PAS positive reaction in the cytoplasm of the secretory cells (arrow) of (Fig. 14). PAS stain. Obj. X 40.

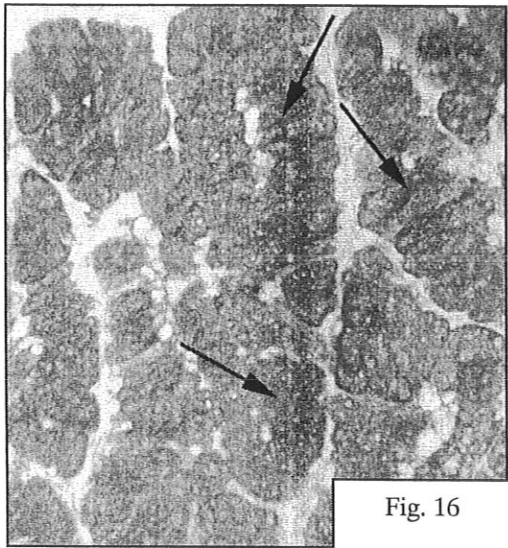


Fig. 16. A photomicrograph showing Alcian blue positive reaction in the cytoplasm of the secretory cells (arrows) of (Fig. 14). Alcian blue stain. Obj. X 10.

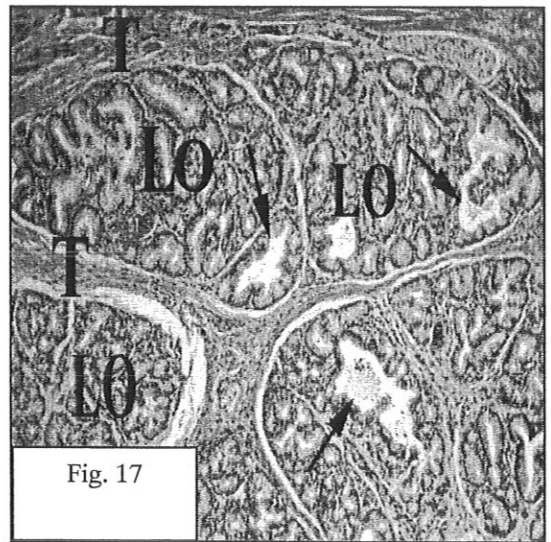


Fig. 17. A photomicrograph of a cross section in Corpus prostaticae showing the intralobular duct (arrows) situated within glandular lobules (LO) with clear septa (T). H&E stain. Obj. X 10.

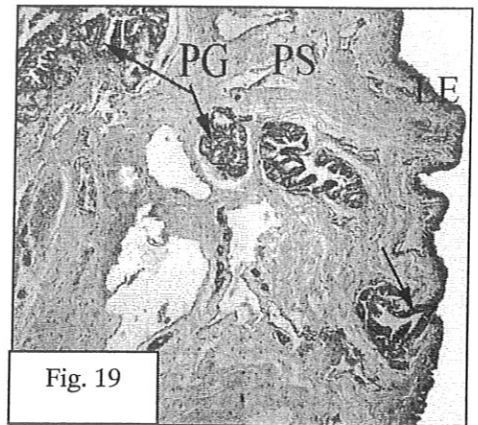
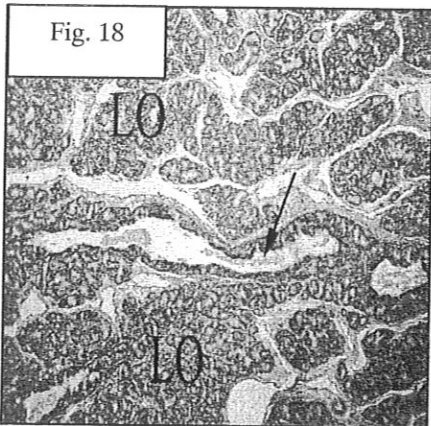


Fig. 18.A photomicrograph of a cross section in pars disseminata prostatae showing the interlobular duct (arrow) which situated between the glandular lobules (LO). H&E stain. Obj. X 4.

Fig. 19.A photomicrograph of a cross section in the pelvic urethra showing the main excretory duct (arrow) of pars disseminata prostatae (PG) which located in propria- submucosa (PS) and opened in Lamina epithelialis (LE) of the urethra. H&E stain. Obj. X 4.

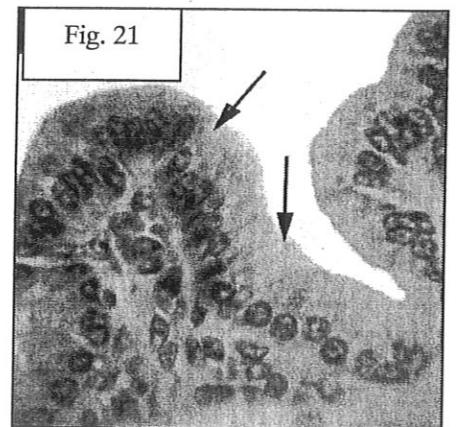
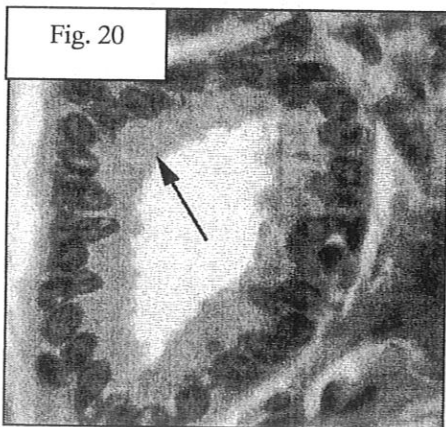


Fig. 20.A photomicrograph showing the simple cuboidal cells (arrow) lining the intralobular duct of Corpus prostatae. H&E stain. Obj. X 100.

Fig. 21.A photomicrograph showing the simple columnar cells (arrows) lining the interlobular duct of pars disseminata prostatae. H&E stain. Obj. X 100.

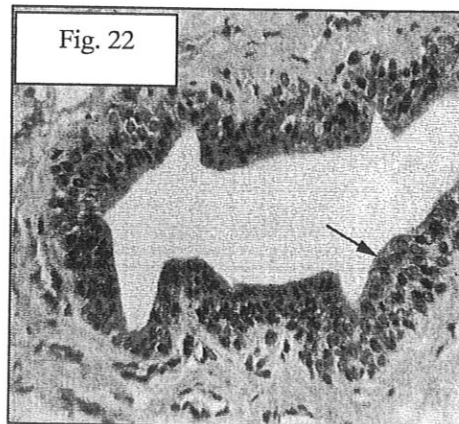


Fig. 22.A Photomicrograph showing the transitional epithelium (arrow) of the main excretory duct of pars disseminata prostatae. H&E stain. Obj. X 40

DISCUSSION

The prostate gland of buffalo bulls consisted of two parts; Corpus prostatae and Pars disseminata prostatae, as described in buffalo bull (3) and in bovine (6,7).

Corpus prostatae had variable forms; band like, two lobes connected by an isthmus (Isthmus prostatae) and three lobed gland. The former one was the most common shape. This result agreed with that of (4) in the buffalo bull and (7) in bull whom found that, the gland formed of two lobes. The former authors added the presence of an isthmus between them. In this respect, (8) in the camel described that, Corpus prostatae was discoid in shape, soft and grayish in colour. However (9) in Gaddi Goat found that, the corpus prostatae was distinct white colour band. As well as, the prostate gland of the donkey consisted of right and left prismatic-shaped lobes connected with isthmus (10,11).

Regarding the position of Corpus prostatae, it was situated transversally on the dorsal aspect of the pelvic urethra just caudal to the dorsal fibrous cord of the vesicular gland. Similar result was recorded by (9) in Gaddi goat. However, (8) in camel clarified that, it was situated on the dorsal aspect of the urethra and overhanging the neck of the urinary bladder. Whereas the cranial two thirds were almost free, the caudal third was fused with the prostatic urethra.

Corpus prostatae of buffalo bulls was about 1.77 (± 0.124) cm in length, 0.755 (± 0.031) cm width and 0.430 (± 0.039) cm thickness. But, (3) in the same animal reported that, it had an average length and breadth of 0.84 and 1.94 cm. respectively.

Concerning Ductuli prostatici, the openings of these ducts were minute and arranged in six longitudinal rows between the mucosal folds, which extended caudally from Colliculus seminalis. On the other hand, (4) in the buffalo bull reported that, the ducts of Pars disseminata were arranged in 8-10 longitudinal rows and each row contains from 12-16 orifices. While, (8) in the camel and (10) in the donkey recorded that, there were 15-20

prostatic ducts. Some of these ducts opened within Colliculus seminalis and others opened lateral to it. In the present study, Corpus prostatae was separated from Pars disseminata prostatae by means of fibrous capsule, as described in Gaddi goats (9). It was noticed that, the glandular capsule was formed of highly vascular dense irregular connective tissue of mainly collagen fibers and few elastic fibers with abundant smooth muscle fibers. So, the capsule of the gland could be described as fiberomuscular in nature. This structure was emphasized in buffalo bull by (4), whom stated that, the external part of the prostate gland was covered by a loose connective tissue capsule, the inner part of which was fiberomuscular in nature. This result was also confirmed by (8,12) in the camel.

The present work concluded that, the fiberomuscular septa dividing the gland into lobes while, the septulae dividing the latter into lobules were fiberoelastic. On the contrary to this observation, (4) in buffalo bull demonstrated that, the trabecular system of the prostate gland was mainly fibroelastic in nature. However, (5) in buffalo bull stated that, a dense connective tissue with occasional smooth muscle fibers constituted the periglandular stroma. On the other hand, (8) in camel found that, fiberomuscular trabeculae extended into the glandular parenchyma.

The prostatic secretory end-pieces were of tubulo-alveolar type. Similar observation was recorded by (4,5) in buffalo bull, (13) in ram, (8,12) in camel and (10) in donkey. But, (14,15) in goat found that, it was branched tubular in structure.

Concerning the glandular epithelium of the gland, it was simple cuboidal cells and contained numerous secretory granules, similar histological findings were reported in the inactive prostatic units that devoid of cytoplasmic granules (4) in buffalo bull and (16) in bull. On the contrary to this observation, in buffalo bull (4), in buck (15), in camel (8) and in Gaddi goats (9) found that, the acini were lined with simple columnar cells.

In buffalo bull, the secretory cells contained granules in their cytoplasm, that react positively with PAS and alcian blue stains. Some cells had nonalcianophilic cytoplasm. Similar result, were recorded by (9) in Gaddi goats.

Pars disseminata prostatae was arranged in the wall of the pelvic urethra as mucosal, submucosal and main glands. This result was similar to that mentioned by (17) in human.

In Gaddi goats, the excretory ducts were lined by transitional epithelium in pubertal animals (9). While in bull (16), and in buffalo bull (4), the duct lined with low columnar, or even cuboidal cells. This duct was the major collecting duct for each lobe. On the other hand, (18) in goat found that, the intralobular ducts lined by simple cuboidal. The ducts merged with each other to form a large interlobular duct lined with columnar. The main excretory duct was lined with cuboidal or stratified cuboidal. These findings were in a line with that observed in the present investigation.

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الملخص العربي

بعض الدراسات المورفولوجية على البروستاتا في ذكر الجاموس

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الهدف من هذا البحث هو توصيف التركيب التشريحي و النسجي لغدة البروستاتا. وقد أجريت هذه الدراسة على غدة البروستاتا في ٢٥ من ذكور الجاموس البالغة. ووجد أن الغدة تتكون من جزأين ؛ خارجي و داخلي. أما الجزء الخارجي فيختلف في الشكل من (شريطي ، فصين متصلين بواسطة برزخ أو ثلاثة فصوص). وقد وجد هذا الجزء من الغدة بشكل عرضي على السطح الظهري للإحليل الحوضي، أسفل الحبل الليفي الظهري للغدة الحويصلية. أما الجزء (الداخلي) للبروستاتا فيوجد بطول الإحليل الحوضي. وعند الفحص المجهرى ، لوحظ أن المحفظة التي تحيط بالغدة تتكون من نسيج ليفي وعضلي، والتي يمتد منها ألياف فاصلة (حواجز) من نفس نسيجها ، تقسم الغدة إلى فصوص. من هذه الحواجز يمتد حويصلات ليفية تقسمها إلى فصيصات. وعند فحص التركيب النسجي للوحدات الإفرازية للغدة، ظهر أنها من النوع الانبوبي الحويصلي و تبطنها خلايا بسيطة مكعبة الشكل وهى إيجابية التفاعل مع صبغات الشف بيرايودك الحامضية والألشيان الأزرق. أما القنوات الإخراجية للغدة فقسمت الى قنوات داخلية فصيصية مبطنة بخلايا بسيطة مكعبة و قنوات بينية فصيصية مبطنة بخلايا بسيطة عمودية أما القنوات الرئيسية للغدة مبطنة بطبقة انتقالية عند فتحها فى الإحليل الحوضي.