

HISTOMORPHOLOGY OF PROSTATE GLAND IN DOGS

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ABSTRACT

Prostate gland is the accessory sex gland found in dog. The gland was collected from apparently healthy six sexually mature dogs. The prostate gland was bilobed exocrine gland. Histologically, the prostate gland consisted of stroma and parenchyma. The stroma consisted of capsule, septa and interstitial connective tissue. Parenchyma was enclosed by a thick capsule with outer thin fibrous and inner thick fibromuscular layer. The capsule contained blood vessels, myelinated nerve fibres and nerve ending like meissner's corpuscle, pacinian corpuscle. Fibromuscular septa entered the parenchyma and divided it into lobes and lobules of different shapes and sizes. Paraenchyma of the prostate gland was consisted of glandular portion and collecting ducts. The gland was compound tubuloalveolar in type. Parenchyma of prostate gland was divided into lobules with many glandular follicles. The glandular follicles showed two zones namely outer and inner zones. The glandular follicles were lined by simple columnar epithelium with oval dark staining nucleus at the basal part and eosinophilic staining part apically. The duct system was ordered into tertiary, secondary and primary ducts. The secretory glandular portion entered into the tertiary duct, to secondary duct and finally to the primary duct. The primary duct then opened into prostratic sinus. The primary, secondary and tertiary collecting ducts and prostratic sinus were lined by simple cuboidal epithelium, simple cuboidal or columnar epithelium and stratified cuboidal epithelium. The prostatic urethra were lined by transitional epithelium.

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INTRODUCTION

Prostate gland is the accessory sex gland found in all mammals. Most

mammals have seminal vesicle, cowpers gland along with prostate gland. Dog has only prostate gland as accessory sex gland in the male reproductive system. Prostate gland is morphologically similar in

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different species but differ biochemically. In man and rodents, it had 4-6 lobes but in dogs it was single lobed which showed two lateral divisions. But in prairie dogs, the accessory sex gland was single lobed dorsal prostrate and paired seminal vesicle (Anthony, 1953). In rats, it was of three paired lobes (Cole and Cuppus, 1959). Rabbit prostate gland was four lobed in structure (Parker and Haswell, 1982). The gland was located ventral to the urethra.

MATERIALS AND METHODS

The present work was conducted in six sexually mature dogs of different breeds collected from the Post-Mortem samples. The gland was cleaned and morphology was recorded. Then the gland was cut into small pieces and fixed in 10% neutral buffered formalin. The fixed tissue was then dehydrated in ascending series of alcohol, cleared in xylene and embedded in paraffin. The paraffin block was cut into 5 micron thick sections using manually operated Leica Microtome. Then the sections were stained by H & E technique. The slides were examined under microscope and photographed using Lynx Trinocular microscope with imaging system software.

RESULTS AND DISCUSSION

In the present study, the prostate gland was bilobed exocrine gland as stated by Sisson (1962) in dogs and Abou-Elhamd *et al.* (2013) in donkey. It

was creamy yellow in colour. But, it was white in colour in rat and was yellowish white in rabbits (Parker and Haswell, 1982). In rat and rabbit, it was oval in shape (Sharma *et al.*, 2008) and in donkey it was prismatic in shape (Abou-Elhamd *et al.*, 2013). Dorsally, it was in contact with the rectum, ventrally in contact with the pubic symphysis, laterally associated with the abdominal wall and cranially with the urinary bladder. But, in donkeys, it was located on the neck of the bladder dorsolaterally (Abou-Elhamd *et al.*, 2013). Prostate gland in rat, man and rabbit was recorded without lobulation (Sharma *et al.*, 2008) as in the present study. But microscopically, rat prostate gland showed 3 pairs of lobes (Sharma *et al.*, 2008).

Histologically, the prostate gland consisted of stroma and parenchyma. The stroma consisted of capsule, septa and interstitial connective tissue. Parenchyma was covered by a thick capsule which had two layers namely outer thin fibrous and inner thick fibromuscular layer (Fig. 1). Similar observations were also recorded by Kainer *et al.* (1967) in bulls, Sudhakar *et al.* (1985) in buffalo and Abou-Elhamd *et al.* (2013) in donkeys. The outer fibrous layer of capsule contained the collagen fibres and the inner fibromuscular layer consisted of collagen and smooth muscle fibres whereas Abou-Elhamd *et al.* (2013) found few elastic fibres along with collagen and reticular fibres in the capsule of prostate in donkey. In camel,

the septa were less fibrous and more muscular (Sudhakar *et al.*, 1985) as in the present study. The capsule also contained blood vessels, myelinated nerve fibres and nerve ending like meissner's corpuscle, pacinian corpuscle (Fig. 2). From the capsule, fibromuscular septa entered the parenchyma and divided it into lobes and lobules of different shapes and sizes. The septa contained connective tissue fibres and muscle fibres (Fig. 3). Similar observations were also recorded by Ali *et al.* (1978) in camel and Abou-Elhamd *et al.* (2013) in donkeys. Blood vessels also found in the septa. Interstitial tissue was mainly consisted of connective tissue fibres and smooth muscle fibres (Fig. 4).

Abou-Elhamd *et al.* (2013) mentioned that the thickness of interstitial tissue varied among seasons which was not observed in our present study as the work was not conducted on different seasons.

Paraenchyma of the prostate gland consisted of glandular portion and collecting ducts. In the present study, the gland was compound tubuloalveolar in type. Similar type was recorded in rabbits, dogs, bulls, camels, buffalo bulls and donkeys (Bern, 1949; Arcadi, 1952; Kainer *et al.*, 1967; Nasr and Moustafa, 1988; Chandrapal and Bharadwaj, 1993; Abou-Elhamd *et al.*, 2013). But in rams, it was compound tubular (Aitken,

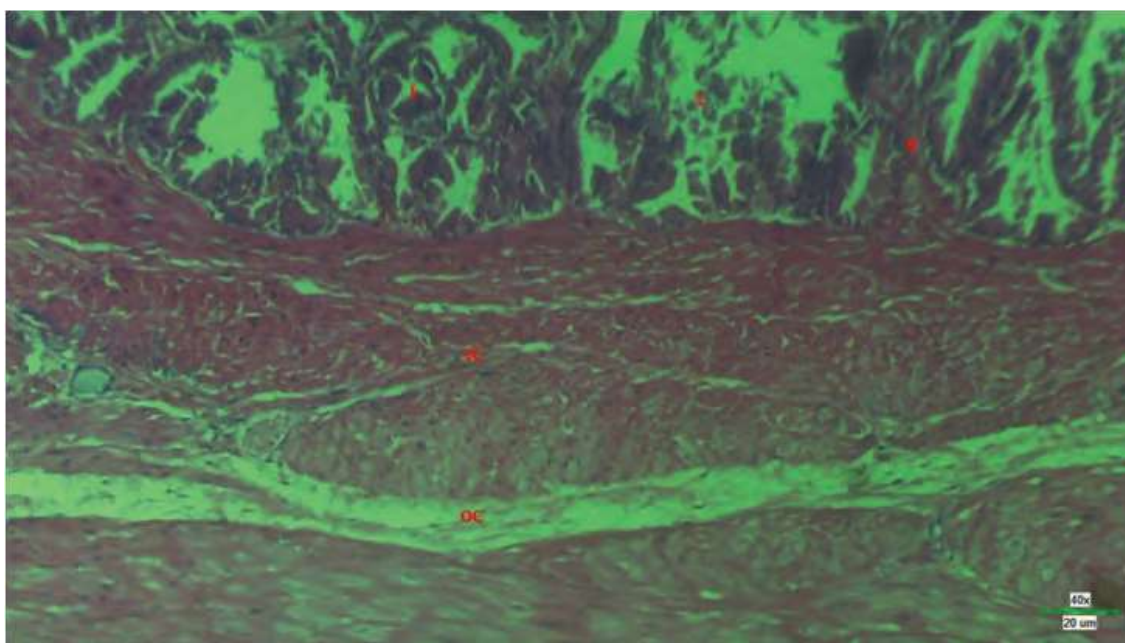


Fig. 1. Photomicrograph of prostrate of dog showing the outer capsule (OC) and inner fibromuscular capsule (IC) (H &E x 100); L – Lobes; S – Septa

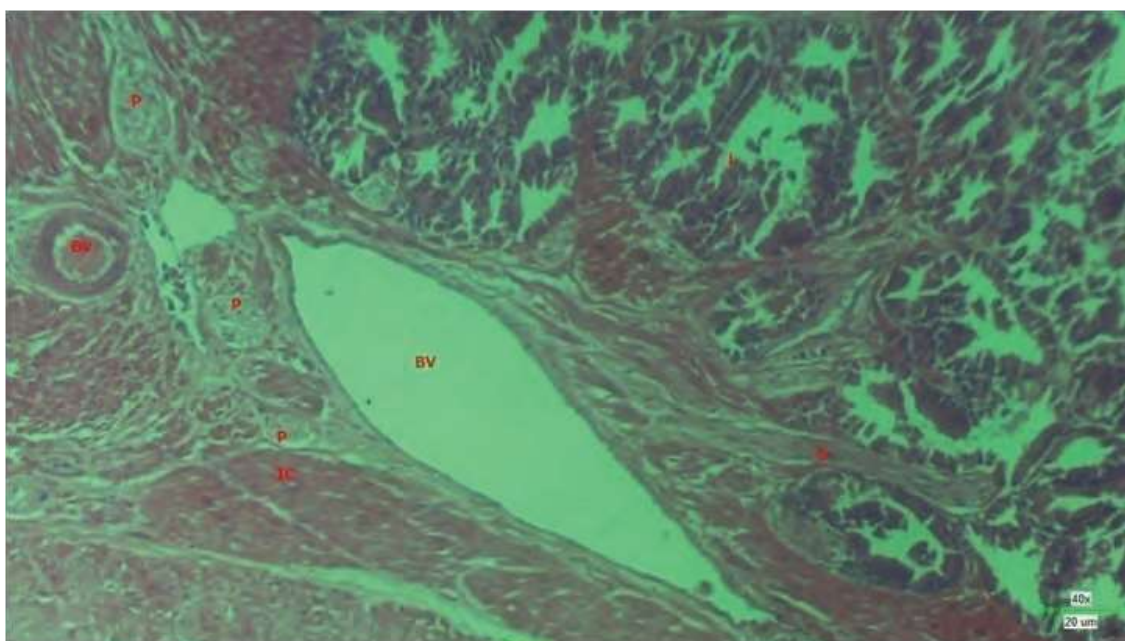


Fig. 2. Photomicrograph of prostate of dog showing the inner capsule (IC) with blood vessels (BV), and Meissner's corpuscles (P) (H & E x 100); L – Lobes; S – Septa

1959) and in red deer and bucks, it was branched tubular (Selim, 1974). The gland was bilobed with two lateral lobes and common capsule. Parenchyma of prostate gland was divided into lobules. The lobule contained many glandular follicles (Fig. 3). The glandular follicles showed two zones namely outer and inner zones. Each zone showed further division of lobules. Similar observations were reported in man (Sharma *et al.*, 2008).

The glandular follicles were lined by simple columnar epithelium with oval dark staining nucleus at the basal part and eosinophilic staining part? apically (Fig. 3). Similar lining epithelium was

recorded in rabbits, camels and buffalo bulls (Bern, 1949; Nasr and Moustafa, 1988; Chandrapal and Bharadwaj, 1993). In man and dogs, the lining epithelium of follicles was pseudostratified columnar at some areas and stratified columnar in others (Sharma *et al.*, 2008). In the present observation, the lining epithelium had principal cells and few occasional basal cells (Fig. 3). Similar results were also observed in dogs, domestic animals and donkeys (Arcadi, 1952; Wrobel and Dellmann, 1993; Abou-Elhamd *et al.*, 2013). But in bucks, camel and buffaloes, the lining epithelium was cuboidal to columnar (Selim, 1974;

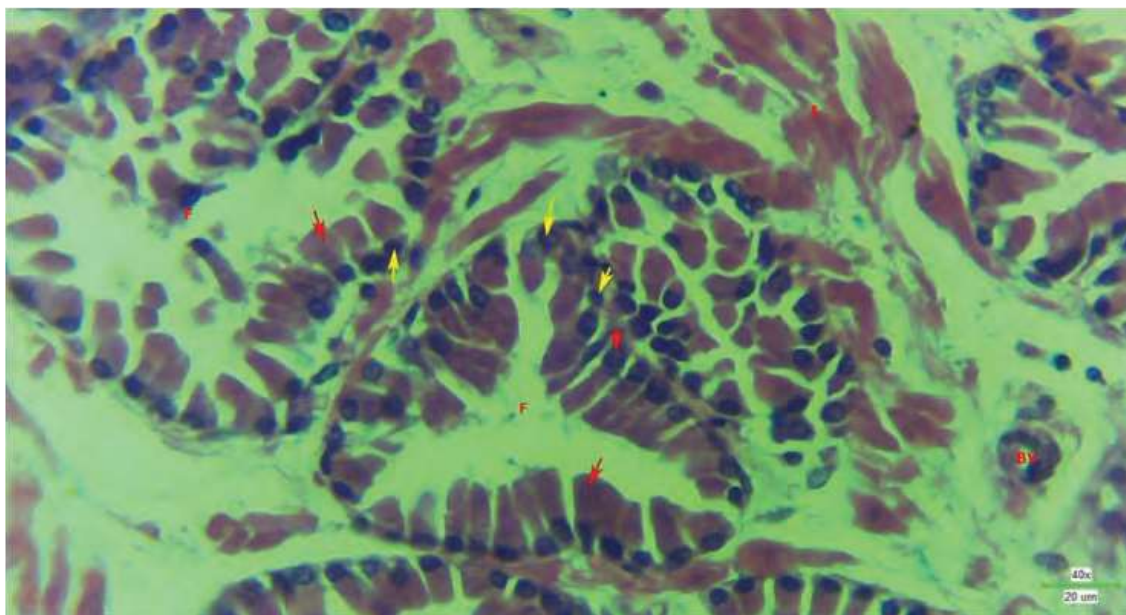


Fig. 3. Photomicrograph of prostrate of dog showing interstitial tissue (I) with blood vessels (BV) (H &E x 400); F – Follicles; Red arrow – Principal cells; Yellow arrow – Basal cells

Nasr and Moustafa, 1988; Chandrapal and Bharadwaj, 1993) Zuckerman and Groome (1937) described that the lining epithelium was an indication of the functional state of the prostrate in dogs which was tall columnar during sexually active period. Fine dark yellow brown granules were found within the cytoplasm of acinar cells in donkeys (Abou-Elhamd *et al.*, 2013) which was not observed in the present study. This may be due to species differences. The principal cells did not show any projections on its apical surface in the present study whereas in camels, the principal cells showed apical projections (Nasr and Moustafa, 1988). This may be

due to species differences. This showed that the secretion was merocrine. Similar observations were also found in dogs and bucks (Hohbach and Ueberberg, 1982; Marei *et al.*, 2004).

A large rounded, ovoid or pyramidal shaped basal cells were found between the lining cells of the follicles of donkeys, dogs, camels, men and buffalo bulls (Abou-Elhamd *et al.*, 2013) which were also observed in the present study and was irregular triangular in shaped basal cells with dark staining cytoplasm and oval to flat nuclei (Fig. 3). The follicles showed many epithelial folding into the lumen. Some follicles without

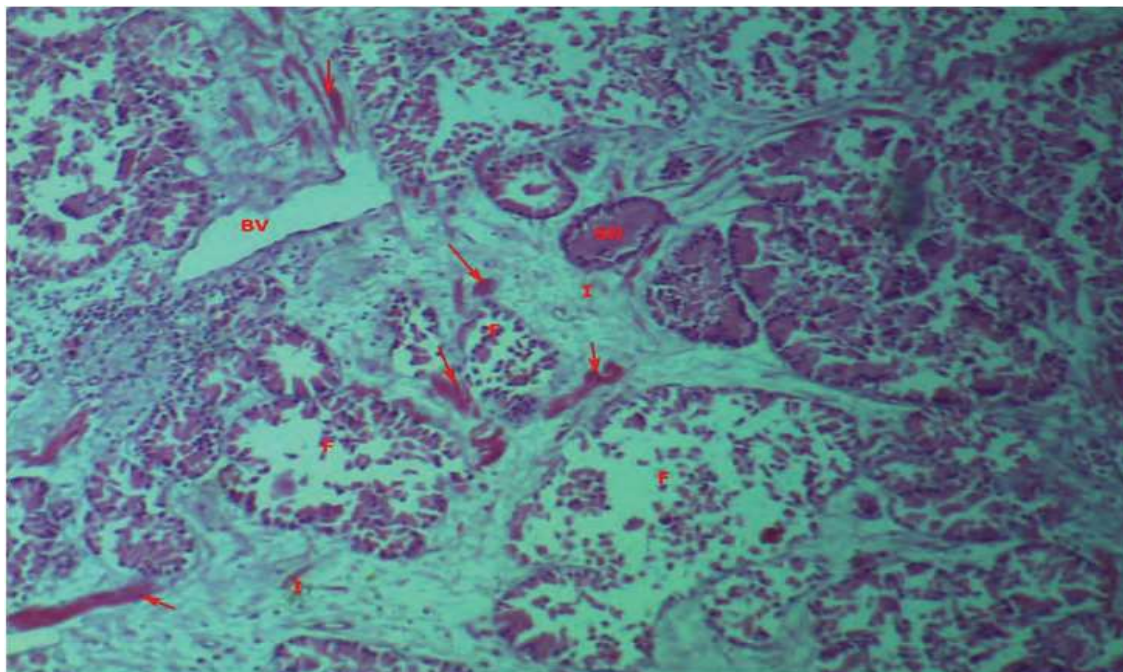


Fig. 4. Photomicrograph of prostrate of dog showing follicles (F) with interstitial tissue (I) showing muscle fibres (red arrow) (H & E x100); SD – Secondary duct; BV – Blood Vessels

folding showed wide lumen and follicles with folding showed narrow lumen. Similar findings were observed in rat and man (Sharma *et al.*, 2008). But in rabbit, the prostate gland was four lobed and the lining epithelium of glandular follicles were pseudostratified columnar in three lobes and simple columnar in the fourth lobe (Sharma *et al.*, 2008). Hebel and Stromberg (1976) mentioned the lining epithelium of the follicles only as simple cuboidal to columnar. In the present study, secretions in the lumen of follicles were not found (Fig. 3) whereas eosinophilic

material called corpora amylacea was found in the lumen of donkeys, rat, man, dog and rabbit prostrate follicles (Abou-Elhamd *et al.*, 2013). This may be due to age and species differences. In between the follicles, collecting ducts were found.

The duct system of prostate gland in the present study was ordered into tertiary, secondary and primary ducts as in prostrate of donkeys (Abou-Elhamd *et al.*, 2013). But in horses and bulls, the prostate gland had intercellular canaliculi (Trautmann and Fiebiger, 1957) and in camels, prostate gland had connecting

ducts, collecting sinus and interlobular ducts (Mosallam, 1981) The secretory glandular portion entered into the tertiary duct, to secondary duct and finally to the primary duct. The primary duct then opened into prostatic sinus. Prostatic ducts were found in the parenchyma of the gland at the level of urethra. The Primary collecting ducts were lined by simple cuboidal epithelium. The secondary ducts were lined by simple cuboidal or columnar epithelium (Fig. 4). The tertiary duct and prostatic sinus was lined by stratified cuboidal epithelium. The prostatic urthra were lined by transitional epithelium. All the collecting ducts contained loose connective tissue with fibres and cells surrounding the lining cells. The prostatic duct was lined by simple cuboidal and columnar epithelium as in donkeys and rabbit (Abou-Elhamd *et al.*, 2013). Finally the prostatic duct was opened into the prostatic sinus lateral to the opening of the vas deferens.

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