INVESTIGATION OF PROSTATIC DISEASES BY CLINICAL, RADIOGRAPHICAL, ULTRASONOGRAPHICAL AND LABORATORY EXAMINATIONS IN GERIATRIC DOGS*

Geriatrik Köpeklerde Prostat Hastalıklarının Klinik, Radyolojik, Ultrasonorafik ve Laboratuar Muayeneleri ile Araştırılması

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Summary : *The aim of this study was to investigate the possible diagnostic alternatives and to define prevalance of prostate disorders in geriatric dogs, and therefore, to shed light to new researches. 20 male intact healthy and 20 male geriatric dogs were included into the study. Their body weights were 13.5 to 42.7 kg (mean 21.21) and 15 to 48.8 kg (mean 23.46) respectively. The age were ranged from 2.5 to 5 years (mean 3.47) for healthy dogs and 7 to 12 years (mean 8.1) for geriatric dogs. Eleven of the 20 geriatric dogs had prostate pathology determined by minimal or noninvasive diagnostic techniques. The prevalence of prostate pathology was calculated as 55-65% in geriatric dogs. In conclusion, various prostate diseases in intact male geriatric dogs with various ages were defined using minimal or non-invazive diagnostic techniques.*

Keywords: *Dog, geriatric, prostate*

Özet: *Bu çalışmada geriatrik köpeklerde prostat hastalıklarının prevalansını belirlemek, muhtemel diagnostik alternatifleri araştırmak ve böylece yeni araştırmalara ışık tutmak amaçlandı. Yirmi adet sağlıklı (kontrol grup) ve 20 adette geriatrik kısırlaştırılmamış köpek (geriatrik grup) çalışmaya dahil edildi. Köpeklerin vücut ağırlığı sağlıklı köpekler için 13,5 ile 42,7 kg (ortalama 21,21) olup, bu değer geriatrik köpekler için 15 ile 48,8 kg (ortalama 23,46) olarak belirlendi. Sağlıklı köpeklerin yaşı 2,5 ile 5 yıl (ortalama 3,47) arasında değişirken bu değer geriatrik köpeklerde 7 ile 12 yıl (ortalama 8,1) yıl olarak değişti. Köpeklerin, 11 adedinde minimal ve invaziv olmayan diagnostik tekniklerle belirlenen değişik prostat patolojileri saptandı. Geriatrik köpeklerde prostat hastalıklarının prevelansı %55-65 arasında belirlendi. Sonuçta, geriatrik köpeklerde çeşitli prostat hastalıklarının teşhisi minimal ve non-invazif diagnostik metotlar kullanılarak tanımlanmıştır.*

Anahtar kelimeler: *Köpek, geriatrik, prostat*

New diagnostic and treatments methods provide longer life period in geriatric pet population. Individual sensitivities to various disease increase in geriatric animals in their life. Prostate disease is a common problem in old sexually intact male dogs (1). The gland usually turns into hyperplastic stage between 6 and 10 years due to hormonal imbalances. This is normally physiological but can be pathological stage when reaches to an extreme degree in size (2). In addition, cancer incidence increase in geriatric dogs (3). Diseases and disorders observed in prostate gland in dogs are benign prostatic hyperplasie (BPH), prostatic squamous metaplazia (PSM), prostatic cyst (PC), paraprostatic cyst (PPC), acute prostatitis (AP), chronic prostatitis (CP), prostatic abscess (PA), and prostatic neoplasia (PCa) (4-7).

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Geliş Tarihi : 19.03.2012 Kabul Tarihi : 24.04.2012

****Bu çalışma Erciyes Üniversitesi Bilimsel Araştırma Projeleri Birimi tarafından TSY.08.348 nolu proje ile desteklenmiştir.***

Prostatitis is an urological disorders frequently seen in old and intact dogs (8, 9). It can occur in acute and chronic form (10) but more frequently chronic form is encountered, which turns in time to suppurative or abscess formation (4). It can be in conjunction with the other urinary tract infection and can be septic or nonseptic but the most common type is bacterial prostatitis (10, 11).

Minimal or non-invazive application, clinical and laboratory methods can be used for the diagnosis of prostate disease. Measurement of prostate size using B-mod ultrasonography (12) have been found potential application in the field of prostate pathology investigation (13). Aggressive nature of malignant tumors can be determined by micro vessels dansity using Doppler ultrasonography (14). Apart from ultrasonography, direct and indirect radiography, computed tomography, magnetic resonance imaging, and elastography techniques can also be used for diagnosis (4, 15, 16).

Cytologic evaluation of the prostate fluid is also important for the determination of various prostate disease. Sampling and histopathology of prostate tissue may be necessary in some time (10). Normally, prostatic fluid flows in to bladder and therefore, heamaturia, pyuria and bacteriuria can be detected by the samples taken by cystocentesis (4, 10, 17).

The aim of this study was to investigate the possible diagnostic alternatives such as minimal or non-invasive methods for the diagnosis of prostate disease, to define availability of prostate disorders in geriatric dogs and therefore, to shed light to new researches.

MATERIAL AND METHODS

20 male intact healthy and 20 male geriatric dogs were included into the study. Their body weights were 13.5 to 42.7 kg (mean 21.21) and 15 to 48.8 kg (mean 23.46) respectively. The age were ranged from 2.5 to 5 years (mean 3.47) for healthy dogs and 7 to 12 years (mean 8.1) for geriatric dogs.

Clinical examinations were carried out with abdominal palpation and digital rectal examination. Poskom brand, 35 mA power portable x-ray machine was used for radiological examination. Plain radiographic examination of the each dog was made on latero-lateral position. Sonosite 180 model ultrasonographic machine with a 4-7 MHz curved array prob was used for the ultrasonographic examination. Prostatic blood flow was evaluated by Doppler US.

For the each case, 10 ml of blood drained from the cephalic vein was taken into tubes with EDTA for hematological examination. Alterations in leukocyte number were determined by conventional methods (Giemsa) and evaluated according to reference level as published by Turgut (18) and Yavru (19). Urine samples taken were obtained by cystocentesis. Moreover, prostate fluid (PF) was drained by urethral catheterisation according to technique by Johnston et al. (8). Two ml amount of physiological fluid was administered through the urethra by 10-12 Fr urethral catheter and withdrawn by a negative pressure using a syringe. Urine and PF samples were subjected to the blood agar with 7% of defibrine sheep blood for culture tests (LabM) and incubated at 37 ˚C for 24 -48 hours in aerobic conditions. The colonies were reproduced according to their morphology. Primer identification tests (gram staining, catalase, oxidase, oxidation fermentation) were carried out for the izolate. Izolates detected as Gr (-) bacil in Gram stain were added in Eosine methylene blue agar and McConcey agar, monitoring their production. Polimerase Chain Reaction (PCR) procedure was performed for identification of the isolates.

The prevalance of prostatic disease in geriatric dogs was calculated according to formula published by Erganis (20) as:

Prevalance= number of patients between investigated animals/total number of animals x100. Discriptive statistics were used for evaluation of datas.

RESULTS

Disorders were determined for the geriatric dogs such as high temperature for the dogs numbered as two, five, eight, nine, 13, 14, 17, vomiting for one and eight, anorexia for two, three, four, six, eight, 10, 16 and 17, depression for nine and lethargy for dogs numbered as three. Furthermore, there were abdominal pain for the dogs numbered as four and 16, tenesmus for three, six and 11, hematuria for six, nine and 11 and preputial discharge for the dogs two, four, five, six and 17. Detectable high temperature ranged from 39.2 to 40.2 ˚C. All findings of prostate disorders were recorded during the digital rectal examination.

Radiographic examinations indicated that all dogs had intrapelvic prostate except for a dog (number17), which had prostamegalia (Figure 1).

Ultrasonographic examination indicated that 3 dog had assimetric prostate gland (Figure 2). Bilobular gland texture disappeared in a dog. Moreover, significant fecal echogenic alteration in eight dogs and diffuse mix echotecture for 10 dogs were determined sonographically. Five of the dogs had diffuse hypoechogenic prostate parenchyma while eight dogs had hyperechogenic appearance (Figure 3).

Vascular structure of the paranchymal tissue for the geriatric and control group of the dogs was determined by prostate blood flow analyses using color Doppler ultrasonography (CDU). There were no hypervascular areas for any of the dogs except for a geriatric dog (Figure 4).

Neutrofilia was encountered in five dogs (dogs eight, 12, 16, 30, and 32). Left shift provided us to asses the inflammatory stage. Young-mature neutrofilia numbers were in normal level for the dogs three, 14, and 15, which indicated that excessive consumption from the acute inflammatory reaction. A dog (case 15) neutropenia determined had also lymphocytosis, indicated that possible infection was in early stage. Monocytosis, usually occurs in septic pyrogranulamatous, necrotic, malignant, hemolytic, haemoragic and immun disorders, was encountered in the dogs (case three, seven, 10, 14, and 23). Neutropenia was available also in dogs three and 14, suggested that is condition was in accordance with compensation monocytosis.

Normal macroscopic findings were detected in the examination of urine for all dogs except for dog six, nine and 11, which had fuzzy and red colour of urine. Cell analysis of urine indicated an elevation of leukocyte (WBC) for four dogs, red blood cell (RBC) for three dogs. Neutrophilia and monositosis were encountered in five dogs. Mild level of proteinuria was detected in 12 dogs.

Gram (+) cocci were observed in the I10, I12, and PS7 while gram (-) cocci were detected in the other isolates. Gram (-) cocci were identified as *Staphylococcus sp.* according to primer identification test while gram (-) cocci to be *Enterobacteriacea* according to growing in primer identification tests, McConkey agar and EMB agar. Identification *Staphylococcus sp.* and *Enterobacteriacea* isolates were carried out according to basis of *Staphylococcus* and *Enterobacteriacea* specific PCR respectively.

From the prostatic fluid and urine samples, *E. coli* and *Staphylococcus sp.* were determined for the dogs (case eight and three). *E. coli* specific PCR tests were carried out for different colonies belonging to I5, I9, I11, I17, PS5, PS6, PS8, PS17 izolates. Colonies of I4, I6 and PS2 izolates with various morphology produced *Staphylococcus sp.* according to primer identification tests, but these were not *Staphylococcus aureus* by specific PCR test. A band of 1381 bp long occurred in positive controlled test (Figure 5).

Eleven of the 20 geriatric dogs had prostate pathology determined by minimal or noninvasive diagnostic techniques. Two dogs had a suspicion of PCa, therefore, further diagnostic test was considered to be suitable. The prevalence of prostate pathology was calculated as 55-65% in geriatric dogs (Table I).

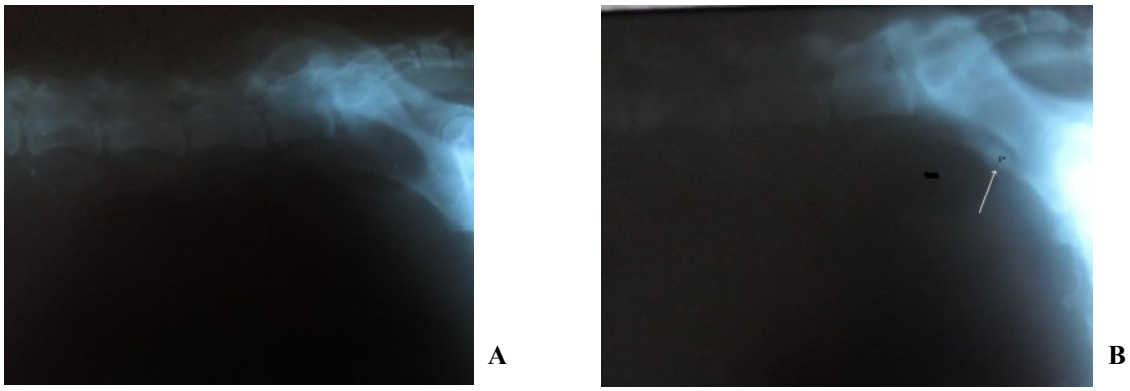


Figure 1. Shows intrapelvic prostate location for a dog (A) and prostamegalia in a dog (B, case 17).

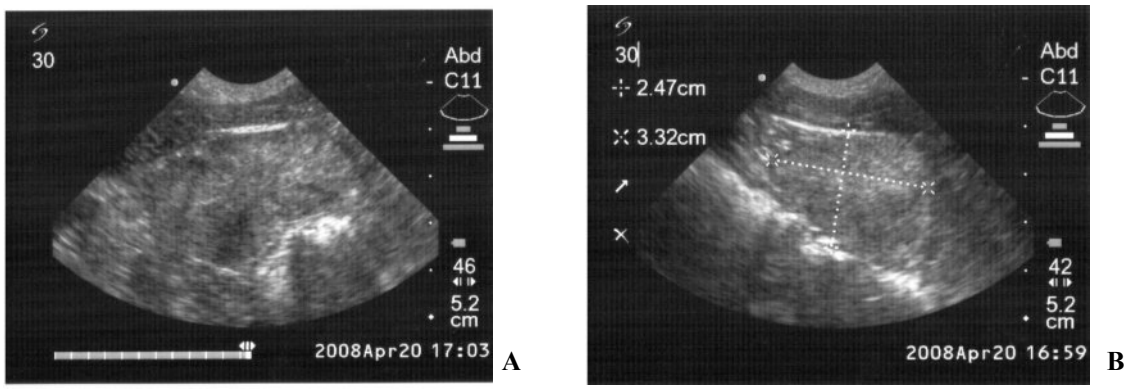


Figure 2. Transversal ultrasonography of a dog (case 30) (A). Expansion of the right lobe of the prostate cause an asymmetric appearance (white arrow). Longitudinal ultrasonogram of the right lobe of prostate is changed, which is in accordance in transversal image (B).

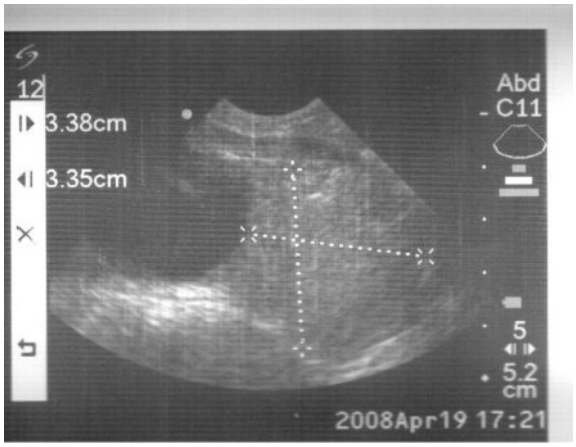


Figure 3. Longitudinal prostate ultrasonography of a dog (case 12). A visible hyperechoic area at the ventral part of the gland. The volume of the gland is increased significantly.

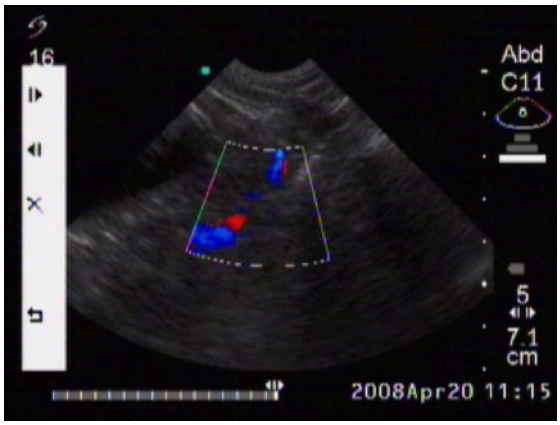
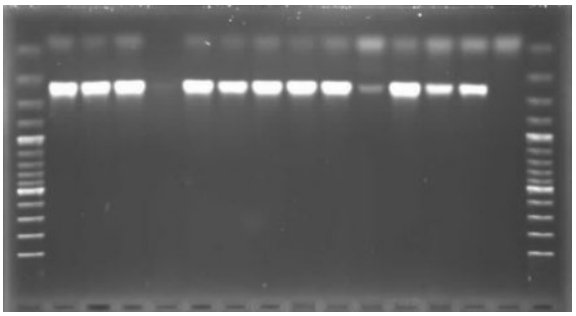
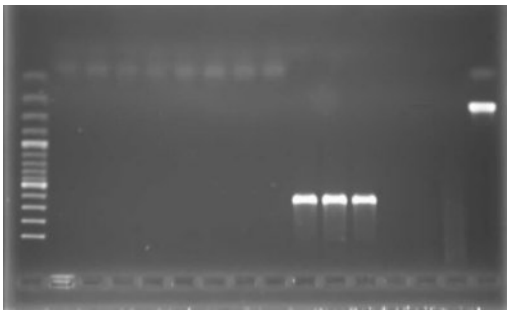


Figure 4. CDU images of a dog (case 16). Currents upcoming to the probes is seen as red, currents away from probe is codded as blue (A). Determination of flow velocity of the vessel in the hypervascular area (B).



A



B

Figure 5. Isolates of samples I5, I9, I11, I17, PS5, PS6, PS8, and PS17 that received from the geriatric dogs, presented a band of 232 bp long by *E. coli* specific PCR process (A). Isolates belongs to I4, I6, and PS32 samples presented 1318 bp long bands by *Staphylococcus aureus* specific PCR process, which was determined negatively in positive control test (B).

Table I. Prevelance values of prostate pathology in dogs concerning the age.

Prostatic Disease	n	Number	Case no	Prevalance (%)	Mean age (year)
BPH	20	1	3	5	7
PSM	20	0	-	0	-
PC	20	2	1, 7	10	8.5
PPC	20	0	-	0	-
AP	20	6	2, 4, 5, 8, 9, 17	30	8
CP	20	1	6	5	7
PA	20	1	11	5	8
PCa (suspicous)	20	2	14, 16	10	8
General	20	13	-	65	7.92

BPH: benign prostatic hyperplasie, PSM: prostatic squamous metaplasia, PC: prostatic cyst, PPC: paraprostatic cyst, AP: acute prostatitis, CP: chronic prostatitis, PA: prostatic abscess, PCa: prostatic neoplasia.

DISCUSSION

Most commonly encountered prostate disease in dogs are BPH, prostatitis, PSM and PN (2). The signs of benign prostatic hyperplasia in mature dogs may be determined by macroscopic examination as 75.4% and microscopic examination as 89.7% (21). In our study, one dog had clinical sign of BPH, consisting of 5% of the cases. In this respect, the clinical chances in patients with BPH were recorded as compatible with the prevalence. BPH often occurs together with the other prostatic disease as published by Johnston et al. (22). In parallel to the report by Johnston et al. (22), this study revealed that 25% of the geriatric dogs with prostatomegaly had some inflammatory disease such as AP, CP, and PA except one dog with BPH.

General condition of 17 (58%) from the 29 dogs with various prostatic disease deteriorated due to inflammatory bacterial prostatitis as published by Paclíková et al. (23). The percentage of bacterial prostatitis was 40% for 10 of the 25 dogs examined by Powe et al. (24). In this study, inflammatory reaction due to bacterial prostatitis was also 40% for eight of the 20 geriatric dogs, which was in parallell to the the study reported by Powe et al. (24).

In geriatric and intact dogs, prostatitis is seen frequently as an urological disorders (9, 22). It can occur in acute or chronic form (10) but more frequently chronic form is encountered, which turns in time to suppurative or abscess formation (4). It can be in conjunction with the other urinary tract infection and can be septic or nonseptic but the most common type is bacterial prostatitis (10, 22). Our laboratory findings indicated that lower urinary tract microflora composed of *E. coli* and *Staphylococcus sp*, which might be prominent after BPH predisposition. Additionally, this is important since all cases with prostatemegaly have a various type of prostate pathology.

Juodžiukynienė ve Aniulienė (25) have investigated the effect of aging on BPH in 126 dogs. They determined that half of the dogs aged 10 years and over had prostate hyperplasia and high prevelanse of atrophic prostate (21). In our study, atrophic prostate prevalence was found to be 55% in geriatric dogs. A further investigation on atrophic prostates revealed that three dogs had acute bacterial prostatitis, one had PC and 2 had a

suspicion of PCa . As a result, 46.15% of prostate pathology occurred in geriatric dogs as atrophic prostate, which may be considered that prostate pathology can always be encountered in geriatric dogs in spite of senile prostate atrophy.

Prostatic cyst formation occurs in large breed of dogs aged between three and 11 years (mean 8 years) as published by Stowater et al. (27) and Johnston et al. (8) have reported that. The age of a dog with prostatic cyst was also eight years in our study, which was in accordance with those of the finding as published by Johnston et al. (8).

According to some authors, the frequency of PPC formation is rare compared to single or multiple retention cyst (4, 9, 25, 28). In our study, no sign of pathology regarding PPC appearance was encountered, which is also in accordance with the other studies (4, 9, 25).

A noticeable palpable prostatomegaly may be seen for the 45% of the dogs with PCa and moreover, 32% of these prostates was asymmetric as published by Johnston et al. (22, 26). In our study, prostate in two dogs with suspicious of PCa was atrophic detected with ultrasonographic examination. The lobus of the prostate in both dogs had hipoechoic area and CDU signals increased in one of the cases. These findings were in accordance with those of the findings as published by Johnston et al. (8).

Biopsy samples should be taken for the cases where non-invasive techniques are not adequate for the diagnosis of prostate disease as published by Paclíková (9). Moreover, prostate biopsy is necessary if there is a suspicious of prostate neoplasia (29, 30, 31). In our study, the prostate glands of the two dogs with a suspicious of PCa should thought evaluating histologically.

In the present study, minimal or non-invasive methods, clinical examination, digital rectal examination, direct radiography, B-mod or color Doppler techniques, and laboratory analysis such as blood and urine analysis, urine and PF culture, determination of bacterial agent by PCR were carried out for the evaluation of prostate pathology. It was hoped that the obtained information may help for furthure investigations of prostate disease in geriatric dogs.

In conclusion, in this study, various prostate diseases in intact male geriatric dogs with various ages were defined using minimal or non-invazive diagnostic techniques. Furthermore, clinical and ultrasonographic findings, some laboratory analysis such as urine and PF culture were important to confirm the diagnosis of prostate disease in geriatric dogs.

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