

## Normal Ultrasonographic Anatomy of the Prostate in Kars Shepherd Dogs

Sadık YAYLA \*  Savaş ÖZTÜRK \*\* Özgür AKSOY \*\* Engin KILIÇ \*\* Savaş YILDIZ \*\*\*

\* Atatürk Vocational Training School of Health Services, University of Kafkas, TR-36100 Kars - TURKEY

\*\* Department of Surgery, Faculty of Veterinary Medicine, University of Kafkas, TR-36100 Kars - TURKEY

\*\*\* Department of Reproduction and Artificial Insemination, Faculty of Veterinary Medicine, University of Kafkas, TR-36100 Kars - TURKEY

Makale Kodu (Article Code): KVFD-2011-4528

### Summary

The purpose of this study is to describe the normal ultrasonographic anatomy of the prostate in Kars Shepherd Dogs and to identify its dimensions. The material of the study comprised ten healthy, intact adult male Kars Shepherd Dogs. The prostate was examined using transabdominal ultrasonography and the findings were evaluated. Statistical assessments of the data were conducted with the simple T test in the Minitab program. During transabdominal ultrasonographic examination, the image of the prostate was determined to be uniformly homogeneous and to have a hypoechoic echotexture compared to the surrounding tissue. Average longitudinal, vertical and transversal dimensions were determined as 5.10 cm, 3.08 cm and 3.78 cm respectively, and the average total volume of the prostate was identified as 28.71 cm<sup>3</sup>.

**Keywords:** Kars Shepherd Dog, Prostate, Ultrasonography

## Kars Çoban Köpeklerinde Prostatın Normal Ultrasonografik Anatomisi

### Özet

Bu çalışmada, Kars Çoban Köpeklerinde prostatın normal ultrasonografik anatomisinin tanımlanması ve prostat boyutlarının belirlenmesi amaçlandı. Çalışma materyalini, erişkin, kastre edilmemiş ve sağlıklı 10 erkek Kars Çoban Köpeği oluşturdu. Gerekli hazırlıkların yapılmasından sonra transabdominal ultrasonografi ile prostat muayeneleri yapılarak elde edilen bulgular değerlendirildi. Verilerin istatistiksel değerlendirilmesi Minitab programında simple T testi ile yapıldı. Transabdominal ultrasonografik muayenede prostatın tüm köpeklerde homojen ve hipoekoik yapıya sahip olduğu belirlendi. Longitudinal, vertikal ve transversal çapları sırasıyla, ortalama 5.10 cm, 3.08 cm ve 3.78 cm olarak tespit edilirken, prostatın total hacmi 28.71 cm<sup>3</sup> olarak tespit edildi.

**Anahtar sözcükler:** Kars Çoban Köpeği, Prostat, Ultrasonografi

### INTRODUCTION

The breeds of shepherd dogs that are most commonly raised in Turkey include Kangal, Akbaş and Kars Shepherd Dogs.

Even though numerous studies have been conducted on Kangal and Akbaş dogs, the first scientific data on Kars Shepherd Dogs, which are raised in the Northeast Anatolian Region, particularly the area of Kars, were presented in 1996 by Nelson<sup>1</sup> and the latter was published in 2004 by Kırmızıbayrak<sup>2</sup>. Kars Shepherd Dogs have a

gray coat with hairs of different lengths. The color of the hair becomes lighter towards the tail and legs<sup>1,2</sup>.

Prostate diseases are common problems in older dogs<sup>3,4</sup>. Normal prostate size varies depending on age, breed, body weight and sexual maturity<sup>3,5-7</sup>. Age is a significant factor in prostate pathology. Even though there are wealth of data related to prostate size and diameter in the studies that have been conducted to date, there is no study that can be recognized with regard to reference limits or



İletişim (Correspondence)



+90 474 2426800/5065



sadikyayla@gmail.com

physiological range<sup>4</sup>.

Prostate disorders include benign hyperplasia, prostatitis, cysts, squamous metaplasia, atrophy and neoplasm<sup>3-6,8,9</sup>. The size of the prostate varies in all of these disorders. If physiological limits were identified for the prostate, enlargements might provide clues regarding prostate disorders<sup>4</sup>.

The most frequently encountered clinical finding in canine prostate disorders is growth of the prostate gland<sup>10</sup>. The gland must be evaluated by physical and imaging methods to diagnose prostate problems. Radiological and ultrasound diagnostic procedures are commonly used to determine whether or not disease is present and its stage<sup>3,8,10</sup>. An ultrasound image of the prostate gland provides information regarding the shape of the prostate, its dimensions, lobular structure and the echotexture of the gland parenchyma<sup>10</sup>. Normal ultrasonographic anatomy of the prostate in an intact dog has a homogeneous parenchymal pattern with a medium to fine texture. Echogenicity is variable, from hyperechoic to hypoechoic, although moderate echogenicity is most common<sup>5</sup>. The prostatic urethra can also be examined with ultrasonography. Furthermore, the capsule of the prostate gland and its relationship to the surrounding tissues can be evaluated<sup>5,10</sup>. One of the most common applications for the ultrasonographical examination of the prostate gland is the ventral transabdominal approach. Other imaging methods are transrectal and transperineal techniques<sup>3,5,11,12</sup>.

The incidence of prostate disorders is known to be higher in heavy and older dogs<sup>3,8,12</sup>. Therefore, it is important to determine the normal ultrasound anatomy of the prostate gland in these dogs.

The purpose of this study is to describe the normal ultrasonographic anatomy of the prostate in Kars Shepherd Dogs and identify the dimensions of the prostate.

## MATERIAL and METHODS

The study was conducted on 10 healthy intact adult male Kars Shepherd Dogs which average weight was 50.5 kg, after obtaining permission of the Kafkas University Animal Experiments Local Ethics Board (KAÜ-HADYEK 2011/004). All dogs had to normal physical examination, no history of urological disorders and no previous hormonal treatment.

The Pie Medical (trophy) brand ultrasound device and 3.5-5 MHz convex probe were used for the ultrasound examination. The ultrasound images were recorded with a thermal printer.

**Preparing the Animal for the Exam:** The animal undergoing ultrasound examination was positioned on a table

in dorsal recumbency. The hair was shaved from the umbilical region towards the pubic bone. After the area was cleaned, ultrasound gel was applied to the skin and the probe.

**Ultrasound Examination:** First of all, an image of the bladder was obtained via ultrasound examination. By moving the probe caudally, an image of the prostate was put on the screen and evaluated. After the prostate's echotexture was evaluated, its longitudinal, vertical and transversal dimensions were measured in three images for each dog and images were recorded. First measurement, the length and height of the prostate were measured in longitudinal section. The second measurement was made in transversal plane. The dimensions of the prostate were calculated by taking the average values of three measurements.

All of the ultrasound examination and measurements were performed by one person experienced.

The formula<sup>4,5,13</sup> used to calculate the total volume of the prostate in cm<sup>3</sup> was [(Longitudinal length X Vertical length X Transversal length)/2.6]+1.8).

**Statistical Evaluation:** The data obtained were statistically evaluated with the simple T test in the Minitab program.

## RESULTS

The average age of the dogs included in the study was 6.9 years (range 4-9 years), and average weight was 50.5 kg (range 45-65 kg).

During the ultrasound examination, an image of the bladder was captured with its thin hyperechoic wall and anechoic lumen. By moving the probe caudally, the prostate was identified immediately caudal to the bladder. These in large dogs, the image of the prostate was determined to be uniformly homogeneous and to have a hypoechoic echotexture compared to the surrounding tissue.

Measurements of the ultrasound images determined that the prostate varied in longitudinal diameter between 4.41-6.21 (average 5.10 cm), in transversal diameter between 3.22-3.70 (average 3.78 cm) and in vertical diameter between 2.27-3.70 (average 3.08) (*Table 1* and *2*)

The total volume of the prostate was calculated as 28.71 cm<sup>3</sup>.

## DISCUSSION

Ultrasonography was used for the first time in 1967 to diagnose prostate disorders in humans, and it has been clinically used in both humans and dogs ever since<sup>11</sup>. Transabdominal ultrasonography is more widely used in practice with smaller animals<sup>14</sup>. The transabdominal

**Table 1.** The age, body weight and prostate dimensions of Kars Shepherd Dogs**Tablo 1.** Kars Çoban Köpeklerinin yaş, vücut ağırlığı ve prostat boyutları

Dog Number	Body Weight (kg)	Age	Longitudinal Length (cm)	Vertical Length (cm)	Transversal Length (cm)	Prostate Volume (cm <sup>3</sup> )
1	45	7	4.41	2.27	3.22	14.19
2	45	7	4.97	2.68	3.35	18.96
3	50	9	6.21	3.70	4.85	44.66
4	65	8	5.89	3.70	4.39	38.59
5	40	4	4.67	3.28	3.38	21.71
6	55	6	5.02	3.21	4.10	27.21
7	50	7	4.84	2.78	3.42	19.49
8	45	6	4.65	3.28	3.34	21.39
9	50	6	4.95	2.56	3.53	49.13
10	60	9	5.48	3.36	4.23	31.75
<b>Average</b>	<b>50.5</b>	<b>6.9</b>	<b>5.10</b>	<b>3.08</b>	<b>3.78</b>	<b>28.71</b>

**Table 2.** Longitudinal, vertical and transversal measurements of the prostate gland with standard deviation (St Dev) and standard error (St Error)**Tablo 2.** Prostat bezinin longitudinal, vertikal ve transversal ölçüleri ile standart sapma (St Dev) ve hatası (St Error)

Scanning	N	Mean	St Dev	St Error
Longitunal	10	5.109	0.575	0.182
Vertical	10	3.082	0.485	0.153
Transversal	10	3.781	0.564	0.178
Total volume	10	28.71	11.90	3.76

approach has been preferred for ultrasound examination of the prostate gland in our study.

It has been reported that ultrasound examination of the prostate in dogs can be conducted quickly and without pain to the patient in lateral or dorsal recumbency and does not require anesthesia<sup>3,11</sup>. All of the animals in our study, including those with an aggressive temperament, were examined in the dorsal recumbency without use of anesthesia or sedative agents.

It has been reported that in cases of benign prostate hyperplasia, infection, inflammation, neoplasia and cysts are observed<sup>12,14-16</sup>. A normal prostate gland in a dog is regular and has a homogenous echotexture that can be defined by the edges, as well as being slightly hyperechoic with surrounding tissues<sup>14,15,17,18</sup>. Furthermore, it has been reported that in cases of inflammation, hyperplasia, and neoplasia, this homogeneity is lost and that there is an increase in echogenicity in almost all prostate disorders; in fact, cysts and abscesses are identified as hypoechogenic and anechogenic roundish structures while inflammation or neoplasia may show hyperechogenic foci<sup>11,13-15,17,18</sup>. Ultrasound images of the prostate gland in all dogs evaluated within the scope of the study were

determined to show a uniformly homogeneous and hypoechoic echotexture compared to the surrounding tissue.

The size of the prostate may vary depending on age, breed, body size, sexual maturity and hormonal factors<sup>5,6,12</sup>.

Atalan et al.<sup>9</sup> reported the size of prostate as 3.5-8.3 cm (mean 5.4 cm), 2.4-7.0 (mean 4.3 cm). Similarly Ruel et al.<sup>6</sup> reported the values as 6.35 cm and 5.98 cm in 50 kg dogs. Our results complice with the previous studies.

In a previous study<sup>4</sup> it was reported that the mean volume of the prostate in German Shepherd dogs was 16.2 cm<sup>3</sup>, 37.7 cm<sup>3</sup> and 40.3 cm<sup>3</sup> for 2-5 years old, 6-10 years old and for dogs older than 10 years old, respectively. In consistence with this study, in the present study we determined that the average total volume of the prostate in the dogs which comprised the material for this study was 28.71 cm<sup>3</sup>.

Bening hyperplasia is an enlargement of the prostate in which glandular hyperplasia or squamous metaplasia. The ultrasonographic appearance of bening prostatic hyperplasia may be subtle inhomogeneity of the parenchyma without obvious enlargement. Often, but not always, the prostate is enlarged, in severe cases four times normal size. The enlargement may be symmetrical or asymmetrical, smooth or nodular, distorting the margin of the gland. The echogenicity of the gland varies. It may be diffusely homogenous and hipoechoic to hiperechoic, but some degree of inhomogeneity is noted most cases<sup>5</sup>. In our study, measurements were similar to the other studies<sup>4,6,9</sup> and inhomogenite has not been determined.

In conclusion, the normal ultrasound image of the prostate in Kars Shepherd Dogs has been described for the first time in this study and average dimensions have been determined.

## REFERENCES

1. **Nelson DD:** A general classification of the native dogs of Turkey. *International Symposium on Turkish Shepherd Dogs*, pp. 19-97, 23 October, Konya - Türkiye, 1996.
2. **Kirmizibayrak T:** Some morphological characteristics of Kars dogs. *Turk J Vet Anim Sci*, 28, 351-353, 2004.
3. **Atalan G, Okumuş Z, Seyrek-İntaş D:** Comparison of transrectal and transabdominal ultrasonography for the estimation of prostate dimensions in dogs. *Vet Cerrahi Derg*, 8 (3-4): 48-51, 2002 (In Turkish).
4. **Korodi G, Colibar O, Cernescu H, Ardelean V, Bonca G, Mircu C, Popovici D:** Study regarding the evolution with age of ultrasound prostate dimensions in German Shepherd Dogs. *Animal Science and Biotechnologies*, 43 (1): 182-184, 2010.
5. **Mattoon JS, Nyland TG:** Prostate and testes. In, Nyland TG, Mattoon JS (Eds): *Small Animal Diagnostic Ultrasound*, 2th ed., pp. 250-265, W.B. Saunders, Philadelphia, 2002.
6. **Ruel Y, Barthez PY, Mailles A, Begon D:** Ultrasonographic evaluation of the prostate in healthy intact dogs. *Vet Radiol Ultrasound*, 39 (3): 212-216, 1998.
7. **Atalan G, Holt PE, Barr FJ:** Ultrasonographic estimation of prostate size in normal dogs and relationship to bodyweight and age. *J Small Anim Pract*, 40 (3): 119-122, 1999.
8. **Oltu K, Kibar M:** Geriatrik köpeklerde prostat hastalıklarının belirlenmesi ve prevalansı. *Sağlık Bilimleri Dergisi*, 18 (1): 25-32, 2009.
9. **Atalan G, Barr FJ, Holt PE:** Comparison of ultrasonographic and radiographic measurements of canine prostate dimensions. *Vet Radiol Ultrasound*, 40 (4): 408-412, 1999.
10. **Debiak P, Balicki I:** Diagnostic imaging of the canine prostate gland subject to its location and size. *Bull Vet Inst Pulawy*, 53, 313-317, 2009.
11. **Paclikova K, Kohout P, Vlasin M:** Diagnostic possibilities in the management of canine prostatic disorders. *Veterinari Medicina*, 51 (1): 1-13, 2006.
12. **Atalan G, Holt PE, Barr FC, Brown PC:** Ultrasonographic estimation of prostatic size in canine cadavers. *Res Vet Sci*, 67, 7-15, 1999.
13. **Johnston SD, Kamolpatana K, Root-Kustritz MV, Johnston GR:** Prostatic disorders in the dog. *Anim Reprod Sci*, 60-61, 405-415, 2000.
14. **Mantis P:** Ultrasonography of the urinary and genital system of the dog and cat. *IJVS*, 63-71, 2008.
15. **Beceriklisoy HB, Ay SS, Kaya D, Agaoglu AR, Kucukaslan I, Aksoy OA, Erunal-Maral N, Findik M, Aslan S:** Treatment of hypersexuality and benign prostatic hypertrophy with delmadinone acetate in intact male dogs. *Turk J Vet Anim Sci*, 34 (1): 25-31, 2010.
16. **Alkan Z:** Veteriner Radyoloji. s.139, Mina Ajans, Ankara, 1999.
17. **Smith J:** Canine prostatic disease: A review of anatomy, pathology, diagnosis, and treatment. *Theriogenology*, 70, 375-383, 2008.
18. **Memon MA:** Common causes of male dog infertility. *Theriogenology*, 68, 322-328, 2007.