Diagnostic Imaging of the Canine Prostate Gland

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A B S T R A C T

Common canine prostatic disorders include benign prostatic hypertrophy (BPH), prostatitis, prostatic cysts and prostatic adenocarcinoma. The purpose of this study was to determine the accuracy of transabdominal ultrasound in estimating the volume and weight of the canine prostate gland, to derive a simple formula from actual and ultrasonographic prostate measurements for estimating prostate volume and weight, and to evaluate the reproducibility of ultrasonographic measurements of linear prostate dimensions. Transabdominal ultrasonographic evaluation was carried out to estimate prostatic size in 20 adult male dogs of two different breeds. Adult German shepherd dogs had a mean prostatic volume and weight of 27.58±1.62 cm³ and 23.92±1.58 g respectively. While the prostatic volume and weight in case of adult Cross breed was observed to be 26.32±2.55 cm³ and 24.01±2.66 g respectively. The study confirmed that age and body weight of the animal had a positive correlation with prostatic volume and weight.

INTRODUCTION

The canine prostate is an androgen-dependent, ovoid-shaped, bilobed gland composed of glandular and stromal elements, which encircles the urethra of the male dog caudal to the neck of the urinary bladder. The prostate contributes fluid to the first and third fractions of the ejaculate [12]. Prostatic fluid is secreted continuously in intact male dogs, and flows retrograde into the urinary bladder or antegrade out the external urethral orifice in volumes ranging from a few drops to several milliliters, dependent on prostate size. Prostatic growth and secretion are mediated by dihydrotestosterone, a metabo- lite of testosterone formed in the presence of the enzyme, 5α-reductase. Canine prostatic size decreases by 50% within 3 weeks of castration, and by 70% within 9 weeks of castration [3]. Estimation of size of prostate is important in the diagnosis of prostatic diseases and in monitoring the response of such conditions to treatment. There are several clinical methods to evaluate prostatic size in the dog including rectal palpation, radiography, ultrasonography etc. The caudal-dorsal aspect of the prostate in most dogs can be palpated per rectum. The normal gland is not easily seen in survey radiographs, but can be identified using retrograde contrast urethrocystography with bladder distension or by ultrasonography [4]. Hyperplastic prostates usually are visible radiographically, Transabdominal or transrectal ultrasonography provides a reproducible and accurate method of measuring prostatic dimensions. It provides information on the shape, dimensions, lobular structure and echo texture of the gland parenchyma. Hence the present study was carried out to estimate the prostatic size in different breeds of dogs using ultrasonography.

MATERIALS AND METHODS

The study included 20 male dogs of German Shepherd (10), and crossbreds (10), breeds, aged between 4 to 10 years, and with a body weight of 18-43 kg. The animals were presented for radiologic and ultrasonographic evaluation with a history of recurring signs of urinary hesitancy and a difficult defecation or urinary tract infection. The urinary bladder of the examined dogs was moderately filled with urine. The prostate gland of the animals was examined rectally and by means of radiography and ultrasonography. The lateral right-sided radiographic images were taken. The obtained radiograms served to evaluate the prostate’s location and the character of its margins. In case when the prostatic length measurements could not be taken, the length or depth of the gland was measured from radiographic images. The measurements were performed with a measuring tape with an accuracy of 1 mm. The gland’s size was determined using the Feeney et al. [5] model, i.e. the prostate length or depth was compared to the distance between the front rim of the sacral bone and pubic brim.

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Transabdominal ultrasonographic imaging of the prostate and measurement of prostatic dimensions were based on the protocol established by Atalan et al. (1999b). For the purpose of examination, the dog was positioned in dorsal or dorso- lateral ecumbency and for imaging the gland, the probe was placed against the ventral abdominal wall cranial to the pubis. Standard longitudinal and transverse sections were obtained and prostatic volume and weight were estimated using the formulæ suggested by Atalan et al. (1999b):

Prostatic volume (in cm³) = 0.487 × L × W × (DL + DT) / 2 + 6.38
Prostatic weight (in g) = 0.508 × L × W × (DL + DT) / 2 + 3.21

[L = maximum length (cm) in longitudinal section, DL = maximum depth (cm) in longitudinal section, W = maximum width (cm) in transverse section, DT = maximum depth (cm) in transverse section].

Data obtained were compiled and analyzed using standard statistical procedures.

RESULTS AND DISCUSSION

The measurements of the prostate gland on the radiograms gave evidence of gland enlargement in 17 dogs (Fig.1). The full assessment of the entire prostate gland shape, margin, and contours was made on the basis of the radiographic studies of all the animals. In all the animals, the implementation of the ultrasound transrectal modality allowed for a detailed analysis of the caudal-dorsal prostate image. The scans obtained from the transrectal examination showed good image definition and quality of echo details of the whole parenchyma and prostate capsule in all the patients. Among German shepherd, the mean prostatic volume and weight arrived upon by using the formula was 27.58±1.62 cm³ and 23.92±1.58 g respectively. The mean prostatic volume and weight among cross breed dogs were 26.32±2.55 cm³ and 24.01±2.66 g respectively. There was positive correlation (p<0.01) between age and prostatic volume and prostatic weight in German shepherd and cross breed breeds. Similarly there was positive correlation (p<0.01) between body weight and prostatic volume and prostatic weight in both the breeds.

Fig. 1: Lateral radiograph of the caudal abdomen.
Enlarged and displaced cranially prostate.

Conclusion and Suggestions:

The current body of radiologic literature evidences that radiology has been the first-choice imaging modality available to assess the general size, location, and contour of the prostate gland [1, 5]. The authors mentioned above, agree that the evaluation of the gland’s dimensions, margin, and contour is easiest when the prostate is visualised on the lateral radiographic view in the case of the gland being localised in the posterior portion of the abdominal cavity. The present findings are consistent with the observations of Feeney et al. [5] and Johnston et al. [7] who found that the cranial prostatic margin can be identified very quickly. A good image contrast of this region is attributed to the presence of fat between the cranial prostatic border and the urinary bladder and abdominal cavity wall [14]. The present investigations have shown that if the caudal portion of the prostate is obscured by pelvic bones to a small or high extent, the evaluation of the posterior prostatic margin is significantly hindered. Therefore, the estimation of the prostatic gland size should also include the measurements of the gland depth, which was acceptable to Feeney et al. [5]. Recent clinical and radiographic studies emphasised the potential obstructive voiding signs associated with prostate enlargement [9, 10]. The analysis of the radiographic studies obtained from the dogs with the enlarged gland revealed that the narrowing of the rectal lumen pushed dorsally by the enlarged gland...
was detected only in the animals whose enlarged prostate was localised in the pelvis. This fact implies that the narrowing of the rectal lumen due to the prostate gland enlargement is mainly related to the localisation of the enlarged prostate. The current research reporting the discussions about the ultrasound estimation of the prostate gland are predominantly based on transabdominal imaging that provides relatively easy access to the posterior part of the abdominal cavity [1, 10]. This technique was applied to estimate, among others, the prostate dimensions [4] and volume [8]. There was presented a relationship between the size of the prostate gland and the animal’s body weight [3], as well as the correlations of the ultrasonographic image with the morphological changes identified in the gland parenchyma [6]. In only a few cases did the transabdominal ultrasound used to image the prostate gland appear to present potential confusion in evaluating the caudal margin echogenicity of the gland, i.e. the case of intrapelvic prostate location [4,11]. The present findings however, have shown that in 66.6% cases of patients with a normal prostate gland, the reported accuracy for the caudal prostatic border assessment was limited. In the case of the enlarged prostate displaced cranially, the ultrasound evaluation should rely on the TAUS imaging, which is a routinely used diagnostic tool. However, the use of dual modality transabdominal and transrectal ultrasound imaging techniques may be necessary to establish the appropriate diagnosis.

REFERENCES