

ECHOGRAPHIC RESEARCH ON HEALTHY DOGS AND DOGS WITH BENIGN PROSTATIC HYPERPLASIA IN CONNECTION WITH THE BIOLOGICAL POTENTIAL OF SPERMATOZOA

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ABSTRACT

Ultrasound examinations of the prostate gland, testis and epididymis have been performed to diagnose benign prostatic hyperplasia (BPH) in dogs, and a search has been sought for changes in the basic spermological parameters of the gametes. Ultrasound analyzes show that BPH leads to changes in testicular and prostatic echogenicity and the presence of one or more hypoechoic cystic structures. Sperm Computer Assay (CASA) proves that dogs with BPH have changes in the basic biological parameters of sperm, with a significantly increasing percentage of low-motile and static sperm at the expense of fast-moving ones. An important morphometric marker is the Head area index (μm^2) of sperm. In dogs with BPH, the difference with healthy dogs was significantly demonstrated and the Head area was 20.89 ± 2.34 , while in healthy dogs this value was 29.11 ± 6.21 ($p < 0.001$).

Key words: benign prostatic hyperplasia, dogs, CASA.

Introduction

Benign prostatic hyperplasia (BPH) is a common non-cancerous disease that occurs initially with almost no clinical symptoms. This condition is accompanied by enlargement of the prostate size by hyperplasia of prostatic stromal and epithelial cells. The disease is common in dogs and less frequently in other mammalian species. BPH is a typical disease for older dogs and develops with advancing age. This fact determines the view that BPH is a physiological state of the body associated with changes in endocrine regulation and is mainly associated with changes in testosterone levels. According to a number of authors, BPH is most commonly observed in uncastrated male dogs after 6-8 years of age (1; 2; 3). The disease itself is not deadly, but there is information that it affects the quality of life of dogs. Diagnosis of BPH at the earliest stage of development and manifestation is of great importance. By conducting primary clinical trials and additional specific analyzes or tests, a timely diagnosis can be made, allowing timely prevention of the disease. These are important and relevant issues that depend on accurate diagnosis and treatment [4-9]. In addition in recent years, there has been some interest in whether the disease BPH affects the reproductive potential of dogs used for breeding. To address these issues, it is necessary to develop and implement new reproductive biotechnology for controlled reproduction, especially needed in cases where there are valuable or rare donors.

The purpose of this study is to perform a primary ultrasound analysis of the prostate gland, testis and epididymis, as well as a comparative evaluation of the biological potential of sperm from ejaculates of healthy dogs and dogs diagnosed with BPH.

Materials and methods

Studies were conducted on asymptomatic sexually mature male dogs (n = 51), aged 1.8 to 7 years, of different breeds. The studies were carried out for period of three years at the Central Veterinary Clinic, Sofia, in compliance with all the animal welfare requirements and laws.

Imaging studies. Imaging was performed by ultrasound examination to demonstrate the presence of BPH. All 51 patients were submitted to ultrasound prostate imaging using MyLab 70 (Esaote) and Mindray DC 7 and convex 10 MHz transducer ultrasound systems.

CASA analysis. The qualitative characteristics of sperm were investigated by means of sperm-computer analysis in the laboratories of IBIR, BAS. Used CASA System Sperm Class Analyzer® (Microptic®, Spain), a software analytics module "Motility and concentration". The analysis is performed by initially adjusting the sperm analyzer software for the dog breed. The operating protocol is as follows: a well-cleaned defatted slide is placed on a special microscope thermal plate and the temperature indicator is expected to reach 37°C. A drop of 8 µl of semen was added dropwise and a 20x20 mm glass cover was carefully placed on it. The analysis is performed on a minimum of 1000 sperm in a minimum of 5 fields. The following parameters were determined: Sperm concentration ($\times 10^6$ / ml); Sperm motility and progression (%) (static, progressively motile, non-progressively motile); Sperm velocity (%) (sperm with fast, medium, and slow speed); Head area (μm^2) – The area of the sperm head (total and in individual sperm populations - static, slow, medium and fast) and Kinematic parameters (total and in individual sperm populations - static, slow, medium and fast).

Statistical analysis. Statistics were performed on MS Excel and through the CASA software product. All results are presented as means \pm standard deviation. Statistical significance was determined by Student's t-test.

Results and discussion

Primary ultrasound analyzes performed after ejaculation showed a change in the echogenicity of the prostate tissues in the direction of hyperechogenicity. The results of the transverse and longitudinal sections of the prostate in healthy patients indicate that the two parts of the prostate gland have symmetrical shape and size, normal echogenicity and homogeneous structure of the parenchyma (Fig. 1 A and B).

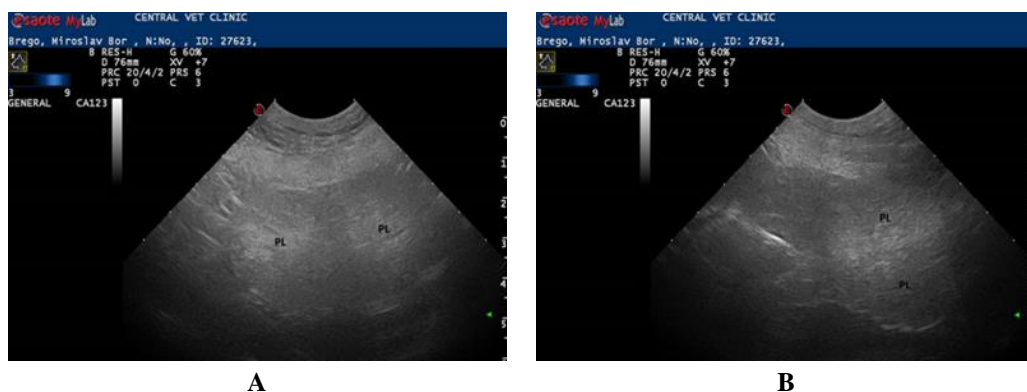


Figure 1: A - Ultrasound of the prostate from a healthy dog (cross section) (PL – prostate); B – Prostate ultrasound from a healthy dog (longitudinal section) (PL – prostate).

In the presence of BPH, our studies show that the two prostate lobes have symmetrical diffuse hyperechogenicity, most often with the presence of one or more hypoechoic cystic structures (Fig. 2 A and B).

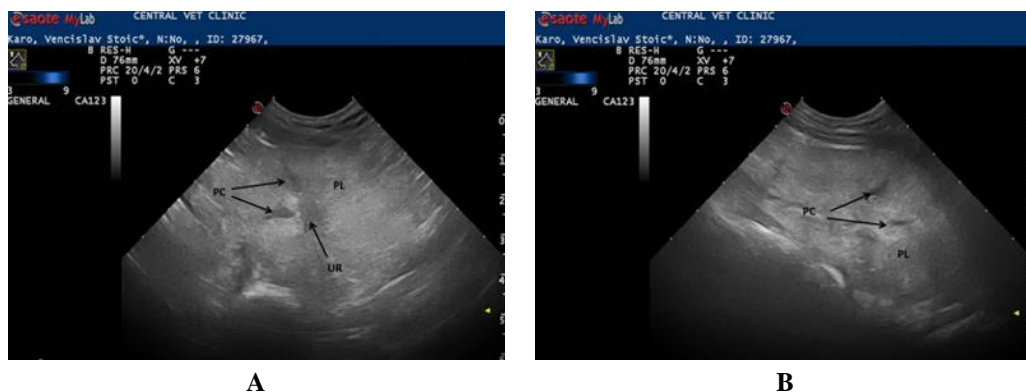


Figure 2: A – Prostate ultrasound of a dog with BPH (cross section) (PL – prostate; PC - prostate cyst; UR – urethra); B – Prostate ultrasound of a dog with BPH (longitudinal section) (PL – prostate; PC – prostate cyst).

All patients underwent testicular ultrasound to search for/or demonstrate ultrasound changes. Patients examined showed: In healthy dogs - normal testicular structure – Fig. 3 A; For dogs with suspected BPH - structure abnormalities – Fig. 3 B.

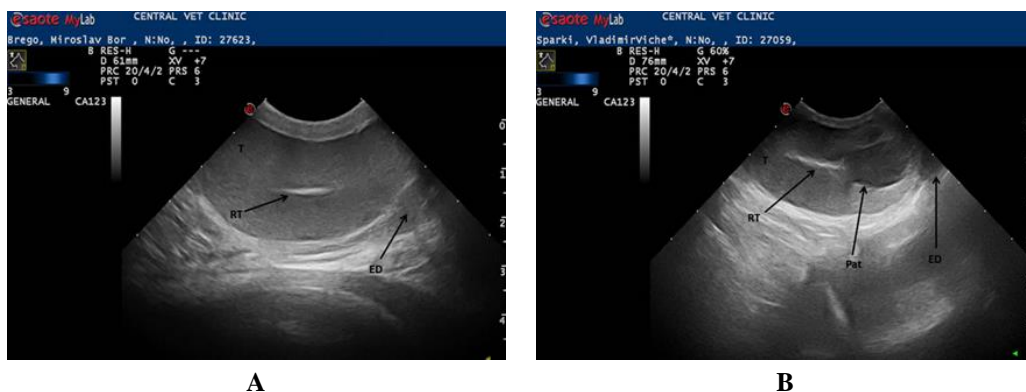


Figure 3: A – Healthy dogs. Ultrasound of normal testis and epididymis from a dog (T – testis; RT – rete testis; ED – epididymis); Figure 3 B – Dog with BHP. Ultrasound testis and epididymis of a dog with hypoechoic abnormal structure (T - testis; RT - rete testis; ED - epididymis; Pat - pathological structure).

The end results showed the presence of cysts in or peristrophically located (7%), neoplasia (3%), acute or chronic prostatitis (15%) and abscessal prostate (3%), BPH in 72% of the patients studied.

Comparative CASA analysis of velocity parameters of sperm movement revealed specific and significantly significant differences between the two groups of dogs studied – Fig. 4 A.

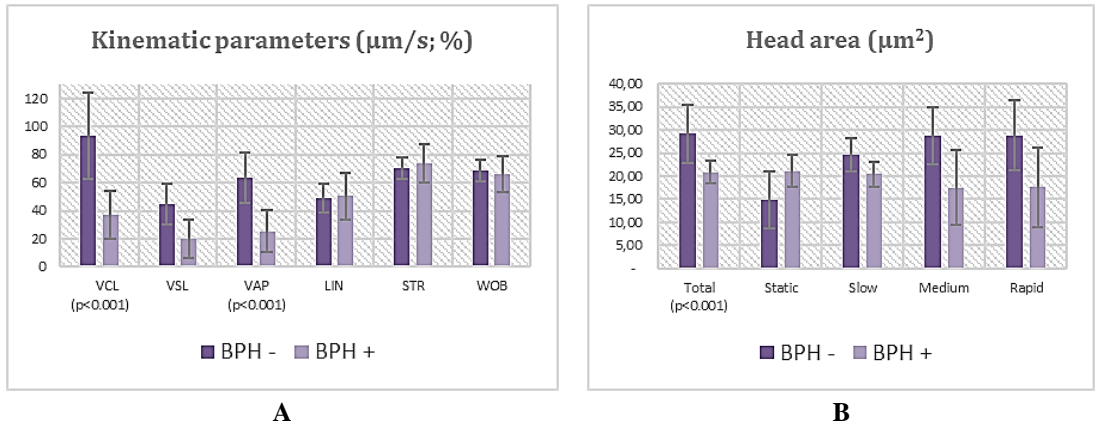


Figure 4: Comparative CASA analysis of speed sperm movement and head area in healthy DPH- and DPH + dogs.

The percentage of static sperm was significantly higher in dogs with BPH compared to healthy dogs (40.22 ± 19.66 vs. 3.22 ± 1.15 in healthy dogs ($p < 0.001$). Significant differences were found in the kinematic parameters of the sperm. In DPH dogs, sperm movement reflected by VCL and VAP was significantly lower ($p < 0.001$) compared to healthy dogs. The results of the Head area analysis of the sperm head are interesting – Fig. 4 B. The value of this parameter was shown to be significantly lower in dogs with BPH compared to healthy dogs ($p < 0.001$). Data from current studies indicate that the disease DPH affects the reproductive status of dogs and leads to changes in the basic biological parameters of sperm.

Conclusion

The results of the present studies show that benign prostatic hyperplasia - BPH is a disease that leads to changes in the homogeneity of prostate gland structure and testicular echogenicity. In dogs with proven BPH, both prostate lobes were found to have symmetrical diffuse hyperechogenicity. In dogs with BPH, one or more hypoechoic cystic structures may be observed. Our analysis of ejaculates from healthy and patients with BPH conducted by CASA showed changes in basic parameters of sperm. The percentage of static sperm is significantly higher in dogs with BPH, with a high degree of confidence of differences ($p < 0.001$). The percentage of sperm with progressive movement and fast and medium velocity in male dogs with BPH was significantly lower than in healthy subjects. We assume that the data we have obtained suggest a change in the energy potential of sperm, which in dogs with BPH has lower values, reported by kinematic parameters. Reduced motility of sperm is known to be a factor affecting their fertilizing potential (8). Whether this is an effect of the presence of specific proteins in the sperm plasma separated from the prostate, or whether it is related to other factors, such as changes in ejaculate volume and pH, remains to be investigated.

In conclusion the results of present study showed that BPH can be a problem in dogs when such individuals engage in breeding activity.

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