

## Canine subclinical prostatic disease: histological prevalence and validity of digital rectal examination as a screening test

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### ABSTRACT

The present study investigated the histological prevalence of subclinical prostatic disease in a canine mixed-breed population. The reliability of digital rectal examination (DRE) as a screening test for subclinical prostatic disease was also evaluated. DRE was performed on 500 male dogs (age range 1 to 21 years) before the dogs died of diseases not related to the prostate. Necropsies of these dogs were performed and prostates were collected for histological evaluation. The overall prevalence of subclinical prostatic disease was 75.6%. The most prevalent subclinical prostatic diseases were benign prostatic hyperplasia (BPH) (44.8%), prostatitis (23.6%) and prostatic neoplasia (3.6%). The prevalence of subclinical BPH and prostatic neoplasia increased with age but that of prostatitis was not influenced by age. The prevalence of subclinical BPH and prostatitis were higher in intact than castrated dogs. DRE had a high specificity (75%) and positive predictive value (87%), but a low sensitivity (53%) and negative predictive value (34%).

**Key words:** canine prostatic disease, digital rectal examination, prevalence.

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### INTRODUCTION

The prostate gland is the only accessory sex gland in the genital tract of dogs. It is important in canine reproduction as it contributes fluid to the first and third fractions of the canine ejaculate. Clinical prostatic disease in dogs is rare<sup>6</sup> and most of the diseases, especially neoplasias, are diagnosed only after they are advanced. The most important clinical diseases are prostatitis, prostatic cyst, benign prostatic hyperplasia and prostatic neoplasia.

Canine prostatic diseases are symptomless in their early stages and therefore, difficult to diagnose. In men, the increase in the incidence of prostatic disease is largely due to improved detection of subclinical cases (defined here as prostatic diseases with no clinical symptoms). This is a result of improved diagnostic techniques<sup>9</sup> such as the serum prostate-specific antigen (PSA) test. These diagnostic tests cannot readily be applied to dogs. At present, the prevalence and incidence of subclinical prostatic disease in

dogs is not known.

Digital rectal examination (DRE) of the prostate gland is generally recognised as the least invasive and most convenient early detection method for prostatic disease. Studies aimed at determining the value of DRE for the detection of canine prostatic disease are rare, mainly because the examinations required to confirm the diagnosis are expensive. A definitive diagnosis usually requires prostatic biopsy, which is complicated by the relative inaccessibility of the prostate gland<sup>2</sup>.

The present study investigated the prevalence of prostatic disease (histology on *post mortem* examination) in dogs not showing clinical signs of prostatic disease. This study also investigated the validity of DRE as a screening test for prostatic diseases confirmed with histology.

### MATERIALS AND METHODS

#### Case materials

Clinical examination and DRE of prostates were performed on 500 mixed-breed dogs presented at University of Zimbabwe Veterinary Teaching Hospital for complaints not related to prostatic disease. The dogs had no clinical signs of prostatic disease based on general clinical

examination and on history from the owners. DRE was carried out by one of the authors by simultaneous rectal and abdominal palpation of the prostate so as to evaluate the craniodorsal aspect as well as the caudal part of the prostate gland. Attention was paid to the size of the gland, symmetry, movability and presence or absence of pain on palpation. A prostate was regarded as 'abnormal' on DRE if there was evidence of nodularity, indurations, asymmetry or pain on palpation. These dogs died 1 or 2 days later from diseases not related to the prostate, or the dogs were euthanased because of other debilitating conditions.

#### Necropsy and histological examination

A complete necropsy was performed on all 500 dogs and gross lesions in the prostate glands were noted. Prostate glands were collected from each dog and fixed in 10% buffered formalin for histological examination. Samples of the prostate glands were routinely processed and sections cut from them were stained with haematoxylin and eosin. Histological examination was performed to identify lesions from the tissues and classify the prostatic diseases.

### RESULTS

#### Clinical observations

Of the 500 dogs examined, 400 were intact and 100 were castrated, and ages ranged from 1 to 21 years. The demographics of the dogs sampled in this study are shown in Table 1. The presenting complaints included vomiting and diarrhoea,

Table 1: Demographics of 500 mixed-breed dogs sampled for subclinical prostatic disease.

Age (years)	No. of cases	Percentage
1–4	198	39.6
4–7	102	20.4
7–10	60	12.0
10–13	57	11.4
13–16	43	8.6
>16	40	8.0
Total	500	100

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neurological signs, ectoparasitism and various tumours. Of the 500 dogs, 280 died naturally and 220 were euthanased.

Of the 500 dogs, 231 (46.2 %) had abnormal prostates on DRE, and 269 (53.8 %) had normal prostates. The abnormalities included enlarged prostates, asymmetrical lobes, presence of nodules and mild pain on palpation.

### Necropsy and histological findings

At necropsy, 208 prostates were grossly enlarged but symmetrical, 72 were grossly enlarged and asymmetrical, 15 had nodules on the surface, 7 had petechial haemorrhages on the surface and 198 had no gross lesions.

Prostates of 378 dogs (75.6 %) had histological evidence of prostatic disease. Different types of histological prostatic disease (inflammation, neoplastic and degenerative diseases) or a combination of these were found. Benign prostatic hyperplasia was the most prevalent disorder (44.8 %) and its prevalence was higher in intact (55.3 %) than castrated dogs (3.0 %). Prostatitis was the second most prevalent disorder (23.6 %) and its prevalence was higher in intact (28.5 %) than castrated dogs (4.0 %) (Table 2). Prostate neoplasia was the third most prevalent (3.6 %) subclinical disease and its prevalence was almost the same in both intact (3.5 %) and castrated dogs (4.0 %) (Table 2). The most common prostate neoplasia was prostatic adenocarcinoma (77.8 %), and other neoplasias found included transitional cell carcinoma, undifferentiated carcinoma and high-grade prostatic intraepithelial neoplasia. Other less common diseases found on histological examination of the prostates included prostatic cysts, calculi and squamous metaplasia of prostatic epithelial cells.

The age-specific prevalence of prostatic diseases detected by DRE and by histology is presented in Table 3. There was an increase in the prevalence of prostatic disease as the animal grew older. Age-specific prevalence for the most common diseases showed that the prevalence of subclinical prostatitis was not associated with age, but the prevalence of subclinical BPH and neoplasia increased with age (Table 4).

Two-hundred dogs identified by DRE as having prostatic diseases had subclinical disease, and 91 dogs identified by DRE as having no prostatic disease had no subclinical disease. Based on these results, the sensitivity of DRE as a screening test for prostate disease was 53 % and the specificity was 75 %. The positive predictive value for DRE was 87 % and the negative predictive value was 34 %.

Table 2: Prevalence of the most common prostatic diseases diagnosed by histology in 500 mixed-breed dogs sampled for subclinical prostatic disease.

Disease	Prevalence in all dogs	Prevalence in castrated dogs	Prevalence in intact dogs
BPH	44.8	3.0	55.3
Prostatitis	23.6	4.0	28.5
Prostatic neoplasia	3.6	4.0	3.5

BPH = benign prostatic hyperplasia

Table 3: Age-specific prevalence of prostatic disease detected by DRE and histology in 500 mixed-breed dogs.

Age (years)	Prevalence of prostatic diseases per age group (%)	
	DRE	Histology
1-4	25.3	40.0
4-7	47.1	87.3
7-10	60.0	88.3
10-13	63.2	96.3
13-16	69.7	95.3
>16	77.5	97.5

Table 4: Age-specific prevalence of subclinical (histological) BPH, prostatitis, and prostatic neoplasia in 500 mixed-breed dogs.

Age (years)	Prevalence of prostatic diseases per age group (%)		
	BPH	Prostatitis	Prostatic neoplasia
1-4	16	23	0
4-7	41	25	2
7-10	60	23	3
10-13	67	26	5
13-16	93	23	11
>16	92	23	15

### DISCUSSION

Histological examination of prostates from dogs without a history or clinical signs of prostatic disease showed a high prevalence (76.0 %) of subclinical prostatic diseases that increased with age. A significant proportion (44.8 %) of the subclinical canine prostatic disorders was due to BPH. The reported incidence of clinical canine BPH is low<sup>6</sup>, compared with the high prevalence of the subclinical disease found in the current study, suggesting that BPH does not always progress to cause clinical signs. Only in some dogs does the enlarged prostate cause clinical signs, such as micturition problems, defaecation abnormalities, or pain in the hind quarters<sup>6</sup>. In humans, histological evidence of BPH is present in approximately 55 % of men aged between 60 and 70 years<sup>11</sup>. The onset of BPH in dogs may occur as early as 2 years of age<sup>4</sup>, but it occurs with high frequency in old dogs<sup>3,7</sup>. Microscopic BPH was observed in all beagles after 6 years of age<sup>7</sup>.

Prostatitis was the second most preva-

lent subclinical disease in this study. In men, prostatitis is a histological finding in almost every set of prostate biopsies, even when there are no signs of clinical prostatitis<sup>10</sup>. Clinical bacterial prostatitis is the most common clinical prostatic disease in dogs, and has been diagnosed in more than 38 % of dogs with identifiable clinical prostatic disease<sup>6</sup>. Infection of the prostate gland might be a result of haematogenous spread of bacteria from other sites of infection such as in cystitis, nephritis, orchitis or epididymitis. In this study, histologically evident prostatitis was more common in intact (28.5 %) than in castrated (4.0 %) dogs and this is consistent with a study by Barsanti and Finco<sup>1</sup>. The low prevalence of both subclinical and clinical prostatitis in castrated dogs is probably due to atrophy of the prostate gland which occurs after castration.

Canine prostatic neoplasia was the third most prevalent (3.6 %) canine subclinical prostatic disease. The most common clinical prostatic disease is prostatitis, followed by prostatic cyst, prostatic neoplasia, and BPH<sup>6</sup>. Canine prostatic

neoplasia was identified as the third most common clinical canine prostatic disease ahead of BPH, suggesting that most subclinical prostatic neoplasia progresses to clinical disease. The prevalence of histologically evident canine prostate neoplasia increases with age. In humans, after age 50 years, both prevalence and mortality rates from prostate neoplasia increase at an exponential rate<sup>8</sup>.

In this study, few cases of prostatic cysts were found on histology and most of them were associated with BPH. Prostatic cysts were found to be the second most common clinical canine prostatic disease ahead of neoplasia and BPH<sup>6</sup>. This can be explained by the fact that most prostatic cysts are large, and grow fast, causing clinical signs such as straining during defaecation.

This study revealed that DRE has a high specificity and positive predictive value (PPV), but a low sensitivity and negative predictive value (NPV). These findings suggest that DRE is an important test for screening subclinical prostatic disease. However, the low NPV may limit the usefulness of DRE in clinical practice. Therefore, there is a need to combine DRE with other more sensitive techniques for diagnosis of subclinical canine prostatic disease. In men, the use of serum markers such PSA, and the use of transrectal ultrasonography (TRUS) has facilitated

the diagnosis of subclinical prostatic disease<sup>5</sup>. Unfortunately, the PSA test is not applicable to dogs<sup>2</sup>, while TRUS is too expensive for routine use in general veterinary practice. Transabdominal ultrasonography is less sensitive than TRUS in the diagnosis of prostatic disease; however, it is useful for evaluating prostate size, and diseases such as cysts and abscesses.

In conclusion, our findings showed a high prevalence of subclinical prostatic diseases, with BPH, prostatitis and neoplasia as the most common subclinical diseases, and that age is an important risk factor for BPH and neoplasia. We also concluded that although DRE appears to be a good test to screen subclinical prostatic disease, there is a need to develop other more specific techniques, which can be used in combination with DRE.

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