

Case report

PENILE FOREIGN BODIES IN DOGS: A RETROSPECTIVE STUDY

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Hematuria, or preputial hemorrhagic discharge, is an extremely common clinical sign; it can be associated with a wide range of diseases, including, even if only rarely, penile foreign bodies.

The aim of this retrospective study was to describe the diagnosis and therapy involving migration from the preputial ostium or penile urethra of a foreign body (awn grass) embedded in the connective tissue surrounding the penis, or in deeper inguinal tissues, in dogs with hematuria or preputial hemorrhagic discharge.

In the selected cases, signaling, history, clinical signs, results of laboratory exams, endoscopic and ultrasonographic evaluation, and the technique used for foreign body removal were evaluated.

Dogs with hemorrhagic discharge consequent to a penile foreign body represented 2% of the entire population considered. At physical examination, the most common features were the presence of swelling of the glans and hyperemia associated with a penile fistula (4/6 dogs), and pain during penile exteriorization (3/6 dogs). Laboratory results showed mild neutrophilic leukocytosis in 2/3 dogs and reticulocytosis in 1/3 dogs. Endoscopy, performed in 2/6 dogs, did not reveal any alterations associated with passage of the foreign body. Ultrasonography was useful in reaching a definitive diagnosis, identifying the position of the grass awn in 6/6 cases and permitting its removal in all dogs using an ultrasound-guided technique.

This case report suggested that penile foreign bodies are a rare, but possible, cause of hematuria or hemorrhagic discharge in male dogs, and that ultrasonography is a useful technique in the making of a differential diagnosis and removal of foreign bodies.

Key words: hematuria; preputial discharge; grass awn; endoscopy; ultrasound;

INTRODUCTION

Hematuria is the presence of an abnormal number of red blood cells in the urine and can be microscopic or occult (if red blood cells are detected only on urine sediment

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analysis), and macroscopic or gross (if the urine is blood stained). In the latter case, the urine can appear red, pink or brown, and can sometimes contain blood clots [1].

Based on the time of hematuria during micturition, three different conditions can be distinguished: total hematuria that indicates the presence of blood during the entire time of micturition and is usually associated with disorders of the kidneys, ureters or urinary bladder rather than severe coagulopathies; terminal hematuria which indicates the presence of blood during the last fraction of voided urine and terminal squeezing of the bladder, generally related to bladder diseases; initial hematuria, that is the detection of blood during the first phase of urination which can be related to urethral or genital tract diseases [1,2]. In the latter case, the loss of blood could be spontaneous and, when it occurs independently of urination, it is defined as hemorrhagic discharge. A differential diagnosis of hemorrhagic discharge includes vaginal or uterine disorders in females, and prostatic or preputial disorders in males, commonly when sleeping [3,4].

A more complex diagnosis is represented by hematuria due to a foreign body embedded in the subcutaneous penile tissue [5]. It often represents a diagnostic challenge due to both the rarity of the event and to the frequent tendency, in the veterinary field, not to carry out a sonographic exam of the penis during a routine urologic ultrasound procedure.

Due to the infrequent reports of clinical cases regarding hemorrhagic discharge caused by penile foreign bodies [5-7], the aim of this report was to carry out a retrospective study by analyzing the hospital database of the last ten years (from 2009 to 2018) (Fenice 4.0, ZakSoft srl, Bologna – Italy). Case reports of male dogs presenting hematuria or sero-hemorrhagic preputial discharge were selected in order to identify the clinical cases caused by the presence of foreign bodies migrating from the foreskin or urethra, and embedded in the subcutaneous penile tissue or in deeper inguinal tissues.

MATERIALS AND METHODS

This retrospective study was carried out by examining the case reports of all male dogs presenting a first case of hematuria or sero-hemorrhagic penile discharge, recorded in the Animal Teaching Hospital's database from 1st January 2009 to 31th December 2018.

Only clinical cases with a defined diagnosis were included and, in the case of dogs with more events during this time period, only the first one was considered.

From the reports selected, dogs with a definitive diagnosis of penile foreign bodies, migrating through the penis from the prepuce or from the penile urethra were identified.

In the cases selected, signalment history (time of symptom onset and duration, and living environment), clinical signs, results of laboratory exams, endoscopic and ultrasonographic evaluation, and techniques used for foreign body removal were reported.

An age comparison between the dogs selected and the original population with hematuria or serohemorrhagic discharge, was carried out using Student's- t test.

Informed consent has been obtained for client-owned animals included in this study and no ethical approval has been requested because it was a retrospective study not related to the use of animals.

RESULTS

Analysis of the Animal Teaching Hospital's database, from 2009 to 2018, produced 476 dogs presenting hematuria or serohemorrhagic discharge, 297 (62.4%) of which were male (49 neutered and 248 intact males). Of the 297 male dogs included, six (2%) met the inclusion criteria for the study.

The dogs included in the study were of different breeds (#1 Border Collie, #2 Irish Setter, #3 Jack Russell, #4 Medium Poodle, #5 Shih Tzu, #6 Toy Poodle), intact males, having a median age of 4.1 ± 2.6 years (range from 2 months to 8 years) (Table 1).

No significant difference in age was detected with respect to other male dogs with hematuria or serohemorrhagic preputial discharge (7.2 ± 4.1 years).

Hematuria or serohemorrhagic discharge appeared on average 38.5 days (from 1 day to 7 months) before the physical examination, associated with a tendency to lick the penis. In some cases, hematuria was spontaneously interrupted a few days before the exam; however, even in these cases, signs of discomfort in the penis persisted.

All the dogs, except for the youngest one (#1) who was 2 months old, had been regularly vaccinated, and had correctly undergone endo- and ectoparasite prophylaxis.

Table 1. Dogs included in the study

Case n°	Breed	Age (months)	Environment	Hair Length	Symptoms duration (days)	Laboratory exams	Endoscopy	Ultrasound
1	Border Collie	2	City	Long	2	No	Yes	Yes
2	Irish Setter	36	Country	Long	10	Yes	No	Yes
3	Jack Russel	60	City	Short	3	No	No	Yes
4	Medium Poodle	96	Country	Medium	210	Yes	Yes	Yes
5	Shitzu	51	Country	Long	1	No	No	Yes
6	Toy Poodle	48	City	Medium	5	Yes	No	Yes

Three dogs lived in an urban environment (#1, #3, #6) while the other three (#2, #4, #5) lived in the countryside or in a residential area adjacent to the countryside; one of the latter was used as a hunting dog (#2).

In 2/6 cases (#1, #5), the clinical history suggested a specific event connected to the onset of clinical signs, such as a walk in the countryside the day before the onset

of symptoms, and all cases were characterized by signs appearing between June and August.

At physical examination, temperature, pulse, respiratory rate and capillary refill time were normal and no peripheral enlarged lymph nodes were detected. In 4/6 cases (#3, #4, #5, #6), a floating, round, non-painful, subcutaneous swelling with a fistula (about 1x2 cm) was present near the glans base close to the *corpora cavernosa* (Figure 1). In the dog in which the symptoms appeared one day before the examination (#5), a penile fistula with a foreign body was evident when the glans was exposed after foreskin pullback (Figure 2). In addition, three dogs (#1, #3, #6) evidenced pain during exteriorization of the penis.

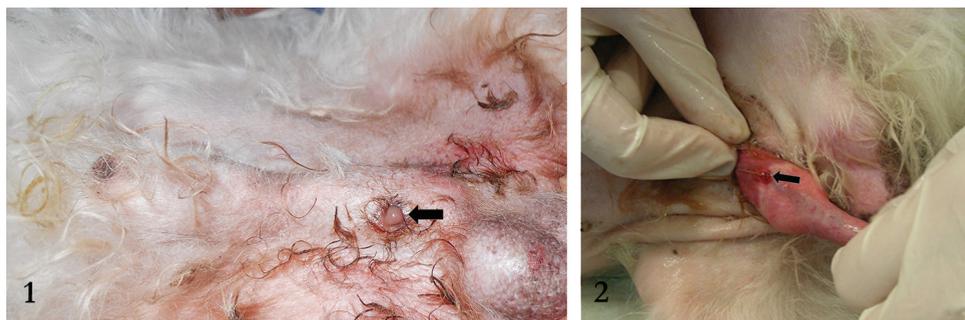


Figure 1. Local suppuration of a round non-painful subcutaneous swelling at the level of the balano-preputial sulcus. Dog #4.

Figure 2. A penile fistula containing a foreign body was evident after foreskin pullback. Dog #5.

Cell blood count, carried out on 3/6 dogs, revealed mild neutrophilia in two dogs (#2, $17.5 \times 10^9/L$; #6, $15.0 \times 10^9/L$, reference interval $3.0-12.0 \times 10^9/L$), and reticulocytosis in one (#4, $145.4 \times 10^9/L$, reference interval $0-60 \times 10^9/L$), with normal red blood cells (RBCs), hematocrit (HCT) and hemoglobin (RBCs $8.01 \times 10^{12}/L$, reference interval $5.5-8.5 \times 10^{12}/L$; HCT 51.6%, reference interval 37.0%-55.0%; hemoglobin 166 gr/L, reference interval 120-180 gr/L). Serum biochemistry, carried out on the same dogs, indicated an increase in alkaline phosphatase in two dogs (#2, $3.5 \mu\text{kat}/L$; #6, $4.17 \mu\text{kat}/L$, reference interval $0.7-3 \mu\text{kat}/L$) and was normal in one dog (#4, $1.62 \mu\text{kat}/L$, reference interval $0.7-3 \mu\text{kat}/L$).

Endoscopic examination of the fornix of the prepuce and penile urethra was performed under general anesthesia in 2/6 dogs (#1, #4) using both flexible and rigid endoscopes (Fiberscope 3 mm and Telescope Hopkins II 3 mm; KARL STORZ Endoscopia Italia S.r.l., Verona - Italy). In order to improve the quality of the image during endoscopy of the preputial sac, the preputial ostium was blocked around the tube, and warm water was introduced instead of air to keep the mucosa in focus (Figure 3). In neither cases were lesions observed in the urethra or in the preputial mucosae.

Ultrasonographic evaluation was carried out with a high frequency linear probe (L9-3 MHz and L18-5 MHz) and curvilinear transducer (C8-5 MHz) (iU22 and Epiq5G

Philips Healthcare, Milano – Italy) and, if needed, copious amounts of coupling gel were applied between the transducer and the skin surface to ameliorate the imaging (Figure 4). The exam revealed a fusiform structure composed of nearly parallel sharply demarcated hyperechoic lines with acoustic shadowing and with variable length (4–15 mm) corresponding to a grass awn in all dogs (Figure 5 and 6); these structures were surrounded by an area containing echogenic fluid corresponding to a superficial abscess.



Figure 3. Endoscopy of the preputial sac by introducing warm water to distend the foreskin. No lesions were detected and the mucosal aspect was regular.

Figure 4. The transverse image at the level of the os penis (recognized as a central hyperechoic structure with distal acoustic shadowing) with copious amounts of coupling gel applied between the transducer and the skin surface. Linear probe L18-5 MHz.

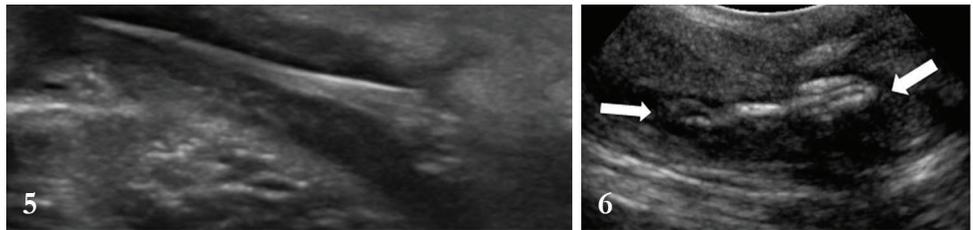


Figure 5. A spindle-shaped grass awn with hyperechoic interfaces is surrounded by an anechoic area corresponding to a superficial abscess in the inguinal region. Dog #1. Linear probe L18-5 MHz.

Figure 6. A grass awn causing acoustic shadowing is visible between the white arrows in the connective tissue surrounding the penis. Dog #4. Curvilinear probe C8-5MHz.

In five dogs (#2, #3, #4, #5, #6), the foreign body (a grass awn) was detected at the level of the balano-preputial sulcus, embedded in the subcutaneous tissue. In one dog (#1), a hypoechoic tubular lesion was observed in the connective tissue surrounding the penis and a migrating grass awn was observed in the inguinal region.

In all the dogs, the foreign body was represented by a grass awn and was removed under general anesthesia after the diagnostic procedure, using an ultrasonographic-guided technique (Figure 7).



Figure 7. Correct position of the probe and clamp during foreign body removal.

DISCUSSION

Hematuria is the loss of blood during micturition; it can appear alone or it can be associated to other clinical signs [1]. When hematuria is a consequence of a genital tract disease, the loss of blood can appear independently of urination and, in this case, it is called hemorrhagic discharge. In particular, hemorrhagic preputial discharge represents a symptom which is often associated with prostatic, urethral or preputial inflammatory or neoplastic diseases [7-9].

An uncommon cause of hemorrhagic preputial discharge is represented by the penetration of a foreign body into the foreskin or the connective tissue surrounding the penis [5,6], a condition which, according to the above mentioned hospital data of the last ten years, was approximately 2% of all cases of the hematuria or hemorrhagic preputial discharge in males.

The penetration occurred from the preputial ostium, as in the case of bladder migration, with slipping of the foreign body into the urethra or towards the deeper part of the foreskin and, from there, into the connective tissue surrounding the penis. Unidirectional movements of the grass awn, consensual to the movement of the penis, favored the movement in depth (#2, #3, #4, #5, #6) or even the migration through the penis to the subcutaneous tissues of the inguinal region (#1). In this case, the penetration preceded the removal by echo-guided route by ten days.

In all the cases reported, the presence of the foreign body and the following inflammatory process explained for the hemorrhagic exudation and the pain, shown by the tendency of the dog to lick the preputial area. It is worth noting that the symptoms

also persisted in those cases in which the fistula appeared healed after the migration of the foreign body into deeper tissues, as in dogs #1 and #2.

When examining the signalment of the dogs included, it can be observed that, unlike previous studies [10] which identified different breeds at risk of developing foreign body diseases, in this report, the small sample size (six dogs) associated with a wide distribution of breeds (all different from each other) doesn't make possible a statistic evaluation in order to identify breeds at higher or lower risk of migration of foreign bodies from the foreskin and urethra, into the connective tissue around penis. The low size breed which characterized 5/6 dogs (#1; #3; #4; #5; #6) could justify the penile penetration of the foreign body.

Comparing the median age of our population (4.1 ± 2.6 years) to the sample of all male dogs with hematuria in the same time period in which the data were extracted (7.2 ± 4.1 years), no statistical differences were observed. This result was not surprising since different causes of hematuria, from an epidemiological point of view, contributed to generating the group of all male dogs presenting hematuria or serohemorrhagic discharge. In fact, the median age at which the hematuria associated with urinary tract infection (even associated with urolithiasis) or benign prostatic hypertrophy appeared was approximately 5 to 10 years [11, 12, 13]; hematuria due to urogenital tract neoplasia was usually more common in middle-aged to older dogs [14] and, finally, prostatic neoplasms seemed to prevail in the geriatric field (>10 years) [15].

Moreover, the median age of the dogs in the present study is similar to that reported for dogs with a bronchial foreign body (4.1 years) [16].

In addition to age, other individual features seemed to be associated with this disease, such as medium/long-haired coat, documented in 5/6 dogs (#1, #2, #4, #5, #6), which could represent a condition which favored the entrance of a grass awn into the preputial ostium, with a mechanism analogous to that reported by Hicks et al. [10].

On the other hand, the environmental anamnesis of the present study population was in contrast with the observations of other retrospective studies regarding the incidence of migrating foreign bodies in dogs [4,10,16-18], suggesting that a rural environment represented a risk factor for the onset of the disease. In the present study, dogs living in the country or those used for hunting (#2; #4; #5) were only half of the population.

It's important to point out that one reason for this discrepancy could be related to the different site of entrance of the foreign body in the present study (preputial ostium) as compared to previous epidemiologic studies which included a larger number of dogs with a localization in other sites, i.e. the skin and outer ear, and in the respiratory tract (nasal cavity and bronchi) [19]. This condition is often associated with common behavior in hunting dogs, such as the tendency to sniff and follow the scent which predisposes to nasal cavity localization, and running with an open mouth which predisposes to bronchial localization.

The onset of symptoms occurred between June and August in all dogs and the relationship with the increased presence of grass awns during the summer season is clear. The duration of symptoms up to the removal of the foreign body was extremely more variable, varying from 24 hours (#5) to seven months (#4), which can be attributed to both the gravity of the symptoms and the ability of the owner to realize there was a problem. On the other hand, the length of time before the dog was brought to the Hospital also represents a useful element for reaching a diagnosis and the correct treatment since it influences the degree of penetration inside the penile structures, as demonstrated in dog #5. In this case, the symptoms appeared the day before the clinic visit, and it was possible to visualize the incomplete penetration of the grass awn in the connective tissue surrounding the penis (Figure 2).

Hematology and biochemistry, carried out in only 3/6 cases, indicated an inflammatory response, with neutrophilia and an increase in alkaline phosphatase in #2 and #6, and an increase of reticulocytes in #4 which, even in the absence of other alterations of RBCs indicated a bone marrow response to an inflammatory stimulus [20].

The lack of an evident lesion in the urethra or the foreskin, viewed endoscopically in dogs with persistent symptoms (#1 and #4), suggested that this imaging technique may not be indicated in reaching the diagnosis of penile foreign body disease.

A more useful imaging diagnostic procedure is represented by ultrasonography [21]. In all the cases included in this study, the latter was accurate and useful for the localization of the foreign body and for its removal.

In fact, ultrasonography is an excellent method for identifying grass awns in the soft tissue, in particular if, as in the penis, they are in direct contact with the surface, as has already been reported in the literature [4], and the image, independently of the tissue examined, is often similar: spindle shaped with 2 or 3 linear echogenic interfaces with acoustic shadowing. Moreover, the soft tissue reaction and the accumulation of fluid around the foreign body are helpful in identifying and visualizing the foreign body itself.

It is useful to remember that correct visualization of the penile structure requires the employment of high-frequency linear ultrasound probes together with copious amounts of coupling gel applied between the transducer and the skin surface (Figure 4).

This is the first report in the literature describing a case series of hematuria secondary to the presence of a penile foreign body.

Although this type of event is rare, the presence of a penile foreign body should be taken into consideration in those cases with preputial hemorrhagic discharge associated with local swelling or pain. In addition, ultrasonography seemed to be the most useful diagnostic imaging procedure for detecting the presence of a foreign body and for removing it easily using a guided technique.

Finally, the time factor represented a key element in resolving the condition since the migration into deeper tissues occurs rapidly.

Authors' contributions

BI wrote the first draft of the paper; GA performed the retrospective analysis; LN executed ultrasound examinations; CM and ZD performed andrological examinations; PA reviewed text; MP coordinated research. All authors have approved the final version of the manuscript.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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