Received: 14 September 2021 | Revised: 15 January 2022 | Accepted: 12 February 2022

DOI: 10.1111/vru.13095

IMAGING DIAGNOSIS

WILEY

Excretory urographic, ultrasonographic, and cystoscopic characteristics of urinary bladder abscesses in a dog

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Abstract

A 7-year-old male neutered, 6.5 kg, Maltese breed dog was referred with a history of dysuria after undergoing two cystotomies to remove calcium oxalate uroliths. Survey radiographs were inconclusive. Excretory urography allowed visualization of two filling defects in the cranioventral urinary bladder region. Ultrasonography showed urinary bladder sediments, a diffusely thickened wall, and two circumscribed intramural/intraluminal structures with an anechoic interior and a smooth and regular surface. The cystoscopic diagnosis was urinary bladder abscesses and urine cultures were positive for *Escherichia coli*. Antimicrobial/anti-inflammatory therapy was started with good clinical outcomes and negative culture after 21 days.

KEYWORDS
canine, cyst, cystoscopy, drainage

1 | SIGNALMENT, HISTORY, AND CLINICAL FINDINGS

A 7-year-old male neutered, Maltese breed dog with a bodyweight of 6.5 kg was referred with a history of dysuria. The patient had undergone two cystotomy procedures at another institution to remove bladder uroliths analyzed as calcium oxalate (1 year and 2 months ago). During the physical evaluation, the patient was active, and parameters were within the normal levels for the species. Complete blood count, biochemistry (albumin, alanine transaminase, amylase, calcium, cholesterol, creatinine, alkaline phosphatase, lipase, triglycerides, and urea), and urinalysis (collected by cystocentesis) were performed. The results showed alanine transaminase 120 U/L (0-102 U/L), FA (alkaline phosphatase) 754 U/L (0-156 U/L) alterations and the urinalysis showed proteinuria (+++). Based on clinical and laboratory findings, the differential diagnoses were chronic cystitis, cystic calculus, bladder neoplasia, and bladder abscess.

2 | IMAGING, DIAGNOSIS, AND OUTCOME

Radiographic examinations were performed using right lateral and ventrodorsal projections (model XR 6000 and Brivo XR118 digital system, General Electric, Beijing, China, 60 kV and 40 mA technique and abdominal algorithm). Survey radiographs did not show alterations in the upper or lower urinary systems. In order to further assess upper and lower urinary tract structures, excretory urography and abdominal ultrasonography were performed. Excretory urography (600 mg/kg of non-ionic contrast-enhanced IV – Omnipaque) showed two intraluminal filling defects in the cranioventral portion of the bladder, with dimensions 1 × 1 cm and 0.5 × 0.5 cm (Figure 1B). Ultrasonography was then performed (General Electric LOGIQ F6 device, General Eletric Healthcare, Milwaukee, United States, multifrequency linear transducer at a frequency of 9.0 MHz). The patient's abdomen was shaved, and gel was applied prior to the examination. The abdominal scan was carried out in longitudinal (sagittal) and short-axis (transverse) planes, with the patient in dorsal decubitus positioning. The ultrasonographic examination showed moderate bladder distension and a small amount of suspended sediment. The urinary bladder wall appeared diffusely thickened, measuring 0.33 cm. Two, circumscribed, anechoic structures were present within the urinary bladder wall, protruding into the lumen. The structures had a smooth and regular surface, appeared to be adherent to the cranioventral region of the urinary bladder wall, and measured 1 × 1 cm and 0.5 × 0.5 cm of diameter (Figure 1A). Based on these imaging

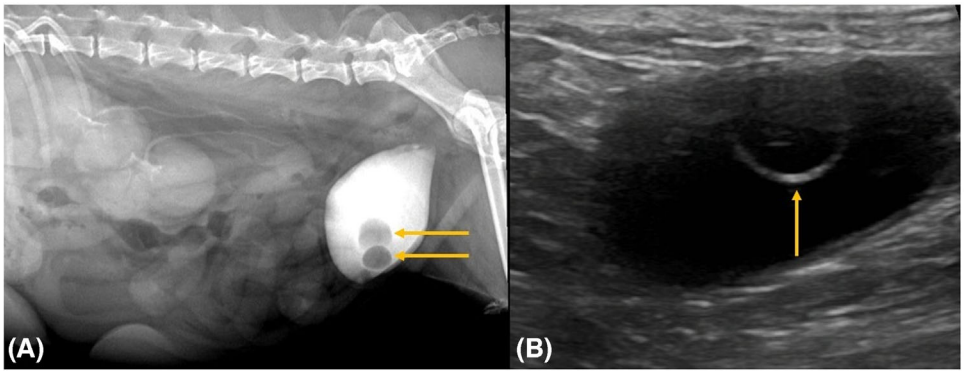

FIGURE 1 Abdominal radiography and ultrasound in a dog with a urinary bladder abscess. A, Excretory urography image demonstrating the presence of two circular filling defects in the cranioventral region of the urinary bladder (yellow arrows). B, Ultrasonographic image of the urinary bladder demonstrating a smooth and regular structure with a hyperechoic wall and anechogenic content in the ventral region. Acoustic enhancement is also evident (yellow arrow). Section thickness artifact limits visibility of the base of the detected structure [Color figure can be viewed at wileyonlinelibrary.com]

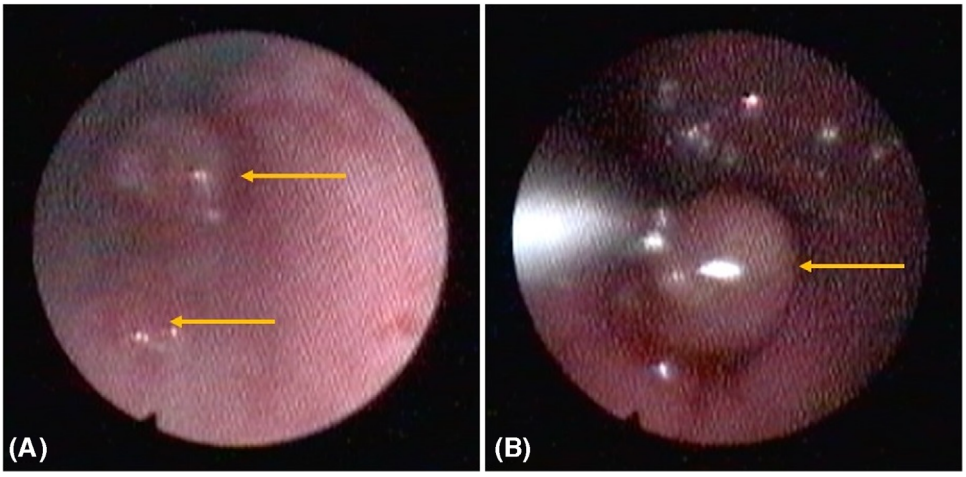

FIGURE 2 Cystoscopic images of the dog's urinary bladder. A, Identification of two intramural/intraluminal ovoid structures (yellow arrow). B, One of the ovoid structures with better definition of contours and edges [Color figure can be viewed at wileyonlinelibrary.com]

findings, differential diagnoses were urinary bladder abscess, cyst, or neoplasm.

Cystoscopy was performed and samples were collected from the walls of the cystic structures for histopathological evaluation, culture, and antibiotic sensitivity testing (Figure 2). Purulent appearing contents were removed and cultures of these contents were positive for *E. coli*. The histopathological diagnosis from cyst wall samples was hemorrhagic cystitis with fibrinoid features and no malignant features. Urine and cyst wall cultures at the time of cystoscopy were negative; however, the previously collected urine culture also identified *Escherichia coli* sensitive to cephalexin. The final diagnosis was therefore chronic cystitis with urinary bladder abscesses. The patient was then treated with cephalexin (22 mg/kg, BID, VO) for 14 days; Firocoxib (5 mg/kg, PO, SID) for 10 days; omeprazole (1 mg/kg, PO, SID) for 20 days; omega 3 (500 mg, PO, SID) for 40 days. Twenty-one days after cystoscopy, the patient returned for reassessment without showing clinical signs, at which point he underwent blood tests, and urine collection for urinalysis by natural urination. There were no hematological and urinary changes.

3 | DISCUSSION

Based on our review of the literature, no previously published reports have described urinary bladder abscesses in dogs. This condition is extremely rare in humans and there is little information about it in the literature.[1,2] In humans, it is known that when abscesses are located in the intramural region of the bladder, they are generally secondary to infectious processes.[2] In this report, excretory urography and ultrasonography identified intraluminal/intramural structures that were confirmed to be urinary bladder abscesses by cystoscopy.

Survey radiography was initially recommended to rule out the presence of urolithiasis in the upper and lower urinary tract, since calculi composed of struvite and calcium oxalate are common in dogs and normally found upon survey radiographic examination due to their mineral opaque properties.[3] However, no radiopaque changes in urinary structures were found. The excretory urography examination was recommended because it is used in human medicine[1,4] and in veterinary medicine[5,6] to improve the investigation of urinary tract alterations.[7] Excretory urography improved treatment planning by demonstrating the size, shape, position, and radiolucency of the abscesses.[8]

The ultrasound examination confirmed the presence of two structures, as seen on the excretory urography. Additional information included the detection of thin walls and anechoic contents compatible with fluid. In general, abscesses can present with various ultrasound characteristics such as hypoechoic, round masses; cavitary lesions with sediments; and posterior acoustic enhancement or complex echogenic masses.[9] This makes for a challenging diagnosis. In human medicine, ultrasound examination can be used to guide drainage collections in liver, spleen, and extrahepatic fluid, and it is useful to monitor the progress of the instituted treatment.[10] Although there was the possibility of collecting material guided by ultrasound, the authors decided not to do so because the patient was not cooperative, which could put the patient at risk for the spread of infection or neoplasia during collection.

Although the radiographic and ultrasonographic exams allowed to rule out certain pathologies, they did not enable a definitive diagnosis due to the absence of literature descriptions for bladder abscesses in small animals. As such, an exploratory cystotomy or cystoscopy was suggested. Due to the two previous surgical procedures, cystoscopy was chosen. This procedure is considered minimally invasive, allowing for the assessment of the lumen structures and sample collection for culture and histopathological analysis.[11] The cystoscopy was crucial to confirm the suspicion of abscesses surveyed during the ultrasound exam. The collected fluid evaluation allowed for the identification of the presence of *Escherichia coli*, which corroborates the human medicine literature that describes that abscesses have fluid inside them in the presence of bacteria.[12,13] In addition, the histopathology complemented the diagnosis, differentiating the mural formation in non-neoplastic alteration by demonstrating cystitis associated with fibrinoid traits.

The abscesses were in the ventral and cranial region of the bladder, where incisions for cystotomy are usually indicated.[14] Full-thickness sutures, with intraluminal projections, the amount of suture material, and the type of suture used (long-term absorbable and non-absorbable) might be factors related to the formation of cystic calculi.[15] In summary, it is believed that the surgical technique previously established in the canine patient, and the suture material used, might have been critical points for an infectious process that culminated in the secondary formation of abscess-like structures.

Findings from the current report supported including urinary bladder abscess in the differential diagnosis list for dogs presenting with these clinical and imaging findings. This patient had a good outcome following cystoscopic drainage of the abscesses and antibiotic therapy.

LIST OF AUTHOR CONTRIBUTIONS

Category 1

a. Conception and Design: Carneiro, Cruz
b. Acquisition of Data: Pereira, Antunes, Feliciano
c. Analysis and Interpretation of Data: Brun, Pozzobon, Feliciano

Category 2

a. Drafting the Article: Carneiro, Pereira, Cruz, Antunes
b. Article Review for Intellectual Content: Brun, Pozzobon, Feliciano

Category 3

a. Final Approval of the Completed Article: Carneiro, Pereira, Brun, Cruz, Antunes, Pozzobon, Feliciano

Category 4

a. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: Carneiro, Pereira, Brun, Cruz, Antunes, Pozzobon, Feliciano

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Carneiro RK, Pereira T, Brun MV, et al. Excretory urographic, ultrasonographic, and cystoscopic characteristics of urinary bladder abscesses in a dog. *Veterinary Radiology & Ultrasound*. 2022;1–4.
https://doi.org/10.1111/vru.13095