

## RADIOLOGY

### A DOG WITH HEMATURIA

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#### HISTORY

A thirteen year-old intact, male mixed-breed dog was presented to the Koret School of Veterinary Medicine, Hebrew University of Jerusalem, Israel Teaching Hospital due to a recent onset of hematuria and stranguria. Eighteen months previously the dog was treated for urethral obstruction and severe cystitis and had undergone surgery for removal of multiple urinary bladder and urethral calculi. Recovery, at the time, was complete and confirmed by urinalysis and a negative urine culture. The dog was continually treated with thyroxine since being diagnosed with hypothyroidism two years earlier.

A lateral abdominal radiograph (Figure 1) was obtained on admission.



Are additional imaging studies required?  
Determine your diagnosis and turn the page.

### Radiological Findings and Interpretation:

Several intestinal loops containing gas and a feces-filled descending colon and rectum are demonstrated (Figure 2). Cranial to the pelvis a rounded, slightly elongated soft tissue opacity is noted, representing the prostate. Just cranial to it and superimposed on the colon is an elongated, circumferential, irregular structure composed of thick, lucent walls bordered by thin soft tissue opaque lines. The structure resembled intestinal loops but was diagnosed to be a thickened, gas containing, urinary bladder wall.

A small elliptical opacity of bone density was located just proximal to the os penis, likely representing urethral calculi. A rounded area of increased soft tissue density was noted ventral to the last lumbar vertebrae and dorsal to the colon. Enlarged sub-lumbar lymph nodes are a likely possibility. In addition, spondylosis with ventral bridging of the seventh lumbar vertebra and the sacrum was evident.

A urinary catheter was inserted into the bladder and an additional lateral x-ray was taken. The catheter passed through the prostate and into the bladder, confirming the diagnosis of an emphysematous cystitis. (Radiographs figures 3 and 4).

On abdominal ultrasound examination the bladder wall was hyperechogenic with multiple reverberation artifacts resulting from gas accumulation within the urinary bladder wall (Figure 5). The relatively large amount of gas throughout the whole bladder wall circumference interfered with proper visualization of urinary bladder content.

Sub-lumbar lymphadenopathy was also clearly demonstrated (Figure 5)

### Comments:

Emphysematous cystitis is a condition in which gas producing bacteria infect the bladder causing gas accumulation within the bladder wall and occasionally bladder lumen. It is a relatively rare form of cystitis and has been reported mainly in diabetic dogs (4, 6) with some cases documented in non-diabetic animals (1,3,5).

In the case described here urine analysis revealed reddish, turbid urine containing numerous RBC's, WBC's and bacteria without evidence of glucosuria. Blood glucose levels were also normal.

*Klebsiella spp.*, sensitive to Fluoroquinolones and Amoxicillin/Clavulanic acid, was isolated from the urine. Treatment with Ofloxacin and Amoxicillin/Clavulanic acid, initiated before culture and sensitivity results were obtained,

was continued. The owners declined surgery for removal of the calculi. On follow-up exam four days later urine color was normal and stranguria had resolved. No further urinalysis or radiological follow-up has been performed.

Microorganisms isolated in previous cases of canine emphysematous cystitis are *E.coli*, *Aerobacter aerogenes*, *Proteus spp.* and *Clostridium spp.* (1,3-6). To the best of my knowledge this is the first report of *Klebsiella spp.* isolated in canine emphysematous cystitis. It has been cultured in human cases of emphysematous cystitis (2). While bacterial fermentation of urinary glucose is the source of gas in emphysematous cystitis of glucosuric dogs, it cannot be the case here. Gas production in urine devoid of glucose is thought to be a result of bacterial urine albumin breakdown (2).

Abdominal radiographs may be sufficient for diagnosis of emphysematous cystitis when gas opacity is demonstrated within the urinary bladder wall. Free intraluminal air, providing it has not been introduced iatrogenically, is also diagnostic.

In this dog ultrasonography revealed a hyperechoic, thickened urinary bladder wall with multiple reverberation artifacts ascribed to intramural gas accumulation. Similar findings have been documented in previous cases (1, 5) with a report of four cases showing that ultrasonography was advantageous to plain radiography for detection of gas within the bladder wall. This advantage may be especially pronounced in cases where gas containing intestinal loops are superimposed on an emphysematous bladder.

### REFERENCES

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## LEGENDS FOR FIGURES

**Fig. 2:**

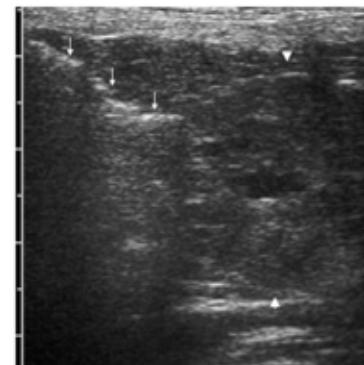
Lateral abdominal radiograph. Gas opacity is seen in the thickened urinary bladder wall (white arrows). Suspected sub-lumbar lymphadenopathy (dashed ellipse) and urethral calculi (black arrow).

**Fig. 4:**

Ventro-dorsal view of radio-opaque urinary catheter terminating in emphysematous bladder.

**Fig. 3:**

Radio-opaque urinary catheter terminating in emphysematous bladder.

**Fig. 5:**

Ultrasound image showing hyperechoic bladder with reverberation artifacts (indicated by white arrows) and adjacent prostate (arrow heads).