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What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

History

An 8-month-old 25.7-kg sexually intact male Standard Xoloitzcuintli was referred for evaluation of persistent bacterial urinary tract infections. The dog was acquired at 5 months of age from a breeder and had at that time recently completed a course of antimicrobials for a urinary tract infection. After adoption, pollakiuria and inappropriate urination indoors were noted. The dog was presented to the referring veterinarian, and results of urinalysis on a urine sample obtained via cystocentesis were consistent with a urinary tract infection (cocci and WBC in the sediment). The dog was prescribed amoxicillin-clavulanic acid (13.4 mg/kg, PO, q 12 h for 14 days). Twenty-one days later, results of urinalysis were suggestive of a persistent urinary tract infection, and treatment with cefpodoxime (9.4 mg/kg, PO, q 24 h for 14 days) was initiated. Twenty-nine days later, urinalysis showed ongoing evidence of a urinary tract infection. Treatment with cefpodoxime was resumed at the same dose for 7 days, and the dog was started on a prescription urinary diet. Also at that visit, a CBC, serum biochemical profile, and abdominal radiography were performed, and results were unremarkable. Bacterial culture performed on a sample of urine yielded growth of a multidrug-resistant (MDR) *Escherichia coli*. Trimethoprim-sulfamethoxazole (32.8 mg/kg, PO q 24 h for 3 weeks) was prescribed based on results of the susceptibility panel. Forty days later, repeated bacterial culture on a urine sample showed continued presence of an MDR *E coli,* and the dog was referred for further evaluation.

On initial referral examination, the dog was bright, alert, and responsive and had vital signs within reference limits and unremarkable physical examination findings. A CBC was performed, and results were unremarkable other than a mild, mature neutrophilia (9.875 X 10^3 neutrophils/µL; reference range, 2.7 to 8.5 X 10^3 neutrophils/µL). Results of a serum biochemical profile were unremarkable. Urinalysis was performed on urine obtained via cystocentesis, and the gross appearance of the urine was yellow and cloudy, urine specific gravity was 1.042 (reference range, 1.015 to 1.045), and urine pH was 6.5 (reference range, 5.5 to 8.5). Examination of the sediment revealed 10 to 50 RBCs/hpf (reference limit, < 3/hpf), 10 to 20 WBCs/hpf (reference limit, < 3/hpf), few sperm cells, and moderate bacteria. Urine was also submitted for aerobic culture and susceptibility testing, and the dog then underwent abdominal ultrasonography **(Figure 1)**.

Formulate differential diagnoses, then continue reading.

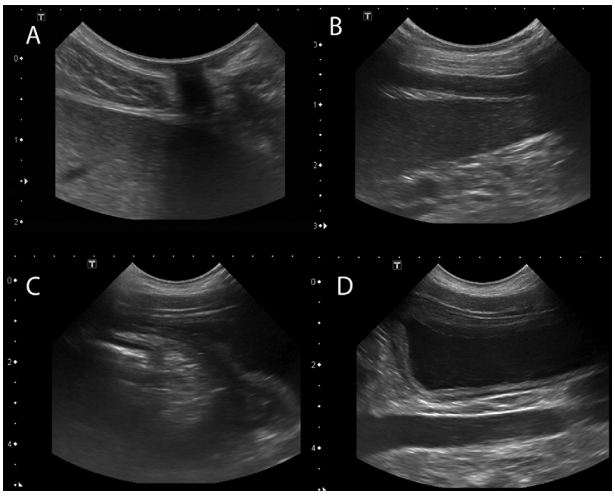

Figure 1—Transverse plane (A) abdominal ultrasonographic images at the level of the umbilicus and sagittal plane (B, C, and D) abdominal ultrasonographic images obtained sequentially from the caudal aspect of the umbilicus to the level of the urinary bladder of an 8-month-old sexually intact male Standard Xoloitzcuintli evaluated for persistent urinary tract infections. Cranial is to the left on all images.

Diagnostic Imaging Findings and Interpretation

On abdominal ultrasonography, the urinary bladder wall was diffusely thickened with an irregular mucosa **(Figure 2)**. Thickening was most severe (6 mm) at the apex of the urinary bladder. A urachal remnant that was approximately 3 to 5 mm in diameter extended from the urinary bladder apex to the level of the umbilicus. Several small multifocal pockets of fluid were in the urachus along its length. The

Meenakshi Rajeev, DVM[1]; Michael Perlini, DVM[2]; Daniel J. Adams, VMD[1]; Janet A. Grimes, DVM, MS[1]*

[1]Department of Small Animal Medicine and Surgery, College of Veterinary Medicine, University of Georgia, Athens, GA
[2]Department of Large Animal Medicine, College of Veterinary Medicine, University of Georgia, Athens, GA

*Corresponding author: Dr. Grimes (jgrimes@uga.edu)

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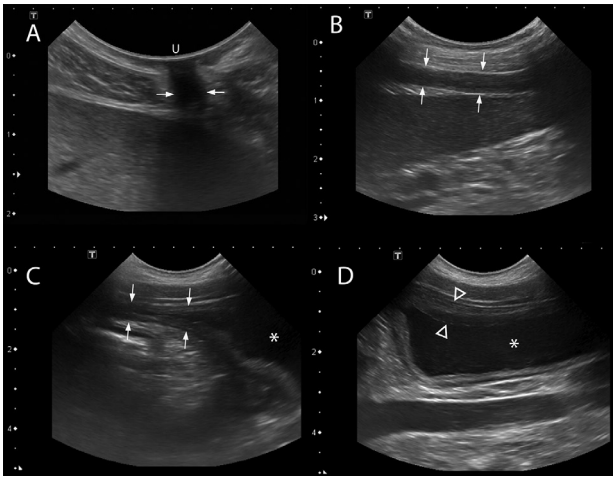

Figure 2—Same image as in Figure 1. Extending from the level of the umbilicus (U) is an anechoic, fluid-filled, tubular structure (arrows) that connects with the urinary bladder (asterisk) at its apex, consistent with a urachal anomaly. The urinary bladder wall is thickened most severely at the apex (arrowheads), consistent with the history of chronic cystitis.

kidneys were ultrasonographically normal in echogenicity, size, and contour and measured 7.7 cm in length. The ureters were ultrasonographically normal in size and entered the urinary bladder appropriately at the level of the trigone region. The prostate was approximately 2.5 cm in diameter and mildly heterogeneous in echogenicity. The testicles were ultrasonographically normal in size and echogenicity. Mesenteric and medial iliac lymph nodes were prominent in size with ultrasonographically normal shape and echogenicity. All other abdominal structures were ultrasonographically normal in appearance. These findings were consistent with a congenital urachal anomaly, chronic cystitis, and possible mild prostatitis, which correlated with the dog's history of persistent urinary tract infections.

Treatment and Outcome

The dog underwent surgical correction of the urachal anomaly. At surgery, the umbilicus was found to be inverted; probing with a mosquito hemostat revealed a shallow blind cutaneous pouch. Caudal exploratory celiotomy was performed from the umbilicus to the level of the midprepuce, with the skin incision encircling the umbilicus. An approximately 8-mm-diameter, firm, pink to white, tubular structure extended from the apex of the urinary bladder to the umbilicus, consistent with a urachal remnant. When gentle tension was applied to the structure, inversion of the skin occurred at the umbilicus. The umbilicus was excised while preserving its attachment to the urachal remnant. The urinary bladder and urachal remnant were isolated from the abdomen with laparotomy sponges and impermeable drapes. A partial cystectomy of the apex of the urinary bladder was performed to excise the urachal remnant; the urinary bladder wall was moderately thickened. A sample of the bladder mucosa was excised for bacterial culture and susceptibility testing, and the cystectomy site was closed with 3-0 poliglecaprone 25 suture with 2 simple continuous layers. Closed castration was performed. The dog recovered uneventfully from surgery and was discharged the following day for continued home care. Marbofloxacin (3.8 mg/kg, PO, q 24 h for 14 days) was prescribed based on isolation of an MDR *E coli* (urine and bladder mucosa) and *Enterococcus faecalis* (bladder mucosa). Repeated bacterial culture on urine was recommended following the completion of antimicrobial treatment. Four months following surgery, the owners were contacted by telephone, and they reported the dog had full resolution of clinical signs associated with lower urinary tract disease. Sixteen months following surgery, the dog remained free of urinary disease based on telephone conversation and medical records from the referring veterinarian.

Comments

The urachus is a fetal structure that connects the fetal urinary bladder and the allantoic sac.[1–3] The urachus normally atrophies at birth; however, the process by which this occurs has not been fully elucidated.[1] Congenital urachal anomalies are rare in veterinary species and have been typically characterized into 4 categories: persistent urachus, urachal cyst, urachal sinus, and vesicourachal diverticulum.[1–3] The urachal remnant found in the dog of the present report was a long tubular structure that was most consistent with a persistent urachus due to its length; however, there was no communication between the urachal remnant and umbilicus.[1,2]

Urachal anomalies are most often associated with clinical signs of chronic cystitis such as pollakiuria, hematuria, and stranguria.[2,3] The persistent urachus in the dog of the present report likely served as a nidus for infection, leading to persistent bacterial cystitis. Ultrasonography was a useful, minimally invasive diagnostic tool for the diagnosis of a congenital urachal anomaly in the dog of the present report. Additional imaging modalities, such as positive-contrast cystography and cystoscopy, could be considered if ultrasonography does not reveal an abnormality.[2] In this patient, the urachus was larger in diameter at surgery (8 mm) than noted on ultrasonography (3 to 5 mm). This difference in measurement could have been due to the urachus being a distensible tube. If the urinary bladder was more distended at surgery, the urachus may also have been more distended. Additionally, pressure from the placement of the ultrasound probe on the abdomen may have led to compression of the underlying urachus and a slightly lower diameter measurement. Despite the difference in size measurements between that obtained on ultrasonography and that observed at surgery, ultrasonography remained a useful diagnostic tool for this dog. Congenital urachal anomalies should be considered as a differential diagnosis in any young dog with persistent bacterial cystitis or other lower urinary tract signs. In dogs with evidence of a congenital urachal anomaly and lower urinary

tract disease, partial cystectomy has been shown to eliminate or reduce clinical signs in 91% (30/33) of affected dogs,[4] as was the case for the dog of the present report.

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