

What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

History

A 9-year-old 41.9-kg sexually intact male Labrador Retriever was referred for evaluation of intermittent hematuria of a 5-month duration. No stranguria, polyuria, polydipsia, or inappropriate urination was reported by the owners. Five months prior to presentation, the first episode of hematuria occurred while the patient was boarding at the primary veterinarian's facility. Results of a CBC, serum biochemical analyses, and thyroxine measurement were unremarkable. Analysis of urine obtained via cystocentesis revealed a urine specific gravity of 1.002 (reference range; 1.025 to 1.035), pyuria (> 50 WBCs/hpf; reference limit, 0 WBCs/hpf), hematuria (> 50 RBCs/hpf; reference limit, 0 RBCs/hpf), and suspected bacteriuria. Urine bacterial culture was not performed. Ciprofloxacin (18.5 mg/kg, PO, q 12 h) was prescribed, and the hematuria resolved. Urinalysis was not repeated. The second episode of hematuria was noted 5 months later, again while the patient was at a boarding facility. Abdominal radiography was performed (**Figure 1**). The hematuria resolved without treatment, and at this point, the dog was referred to the University of Georgia.

Findings on referral physical examination were unremarkable, with no penile nor palpable urethral lesions noted. The prostate could not be reached on digital rectal examination. The testicles were symmetric and appropriate in size. Serum biochemical analysis revealed a mildly high alkaline phosphatase activity (98 U/L; reference range, 13 to 95 U/L), mild hypophosphatemia (2.3 mg/dL; reference range, 2.7

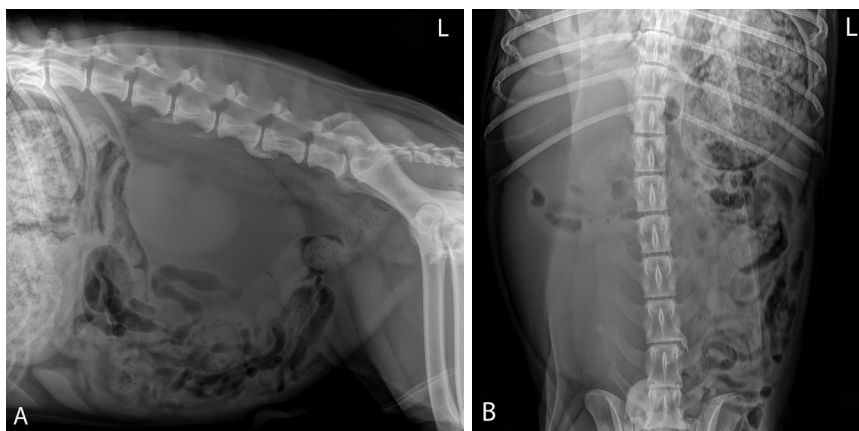


Figure 1—Left lateral (A) and ventrodorsal (B) caudal abdominal radiographic views of a 9-year-old 41.9-kg sexually intact male Labrador Retriever with intermittent hematuria of a 5-month duration.

to 5.2 mg/dL), and mild hypercholesterolemia (368 mg/dL; reference range, 109 to 345 mg/dL). Results of a CBC were unremarkable. Analysis of urine obtained via cystocentesis revealed a urine specific gravity of 1.010 (reference range, 1.025 to 1.035), 1+ proteinuria, mild hematuria (< 10 RBCs/hpf), rare WBCs, and no bacteriuria. Urine bacterial culture results were negative.

Formulate differential diagnoses, then continue reading.

Diagnostic Imaging Findings and Interpretation

Abdominal radiography revealed a large, lobular soft tissue opaque structure with well-defined cranial, dorsal, lateral, and caudal convex margins extending through most of the right dorsolateral aspect of the abdomen (**Figure 2**). The structure caused moderate ventral and left lateral displacement of the small intestines and colon. Retroperitoneal detail remained radiographically normal; however, midabdominal serosal detail was mildly reduced, attributed to crowding. A normal right renal silhouette was not identified, and the left renal silhouette was normal in size, shape, and margination. On the lateral image, the urinary bladder was small and the prostate gland was moderately enlarged and smoothly margined, consistent with intact reproductive status. No mineralization was identified associated with the

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urinary tract. The enlarged structure in the right lateral aspect of the abdomen was suspected to have been the right kidney and ureter, and primary differential diagnoses for its appearance included renal neoplasia or severe hydronephrosis and hydroureter of unclear cause. Abdominal CT was recommended to further characterize the structure and any possible associated underlying etiologies.

Abdominal CT revealed a right ectopic intramural ureter that appeared to terminate within the urethra cranial to the prostate, with secondary severe right hydronephrosis and hydroureter (**Figure 3**). The distalmost extent of the right ureter appeared mildly dilated and was first identified tunneling through and expanding the wall of the urethra cranial to the prostate and the wall of the urinary bladder from the trigone region to the level of the expected location of the right ureterovesicular junction, consistent with an intramural ectopic ureter, where the right ureter separated from the urinary bladder and then became progressively more tortuous and dilated toward the renal hilus. The right kidney had minimal normal-appearing cortical tissue remaining, presumed cortical atrophy due to the severe long-standing hydronephrosis. Renal dysplasia was an alternative consideration. Only a small amount of contrast medium accumulated in the severely dilated renal pelvis on the pyelogram-phase images, and contrast medium did not reach the dilated ureter even by an 8-minute postcontrast delay series CT. No strictures or intraluminal material was identified within the right ureter, however; there was markedly more severe dilation of the proximal portion, compared with the distal half, which had a much more tortuous course. The left kidney, left ureter, and urinary bladder were normal, with a normal-appearing left ureterovesicular junction. There was no evidence of retroperitoneal effusion or intra-abdominal lymphadenomegaly.

Treatment and Outcome

On exploratory celiotomy, the right kidney and ureter were confirmed to have been markedly distended with fluid, with the proximal portion of the ureter measuring approximately 6 cm in diameter and 10 cm in length. No peristalsis was seen in the proximal two-thirds of the ureter. The distal third of the ureter was tortuous in

appearance and approximately 3 cm in diameter. Right nephroureterectomy and prophylactic gastropexy were performed. Castration was declined by the owners.

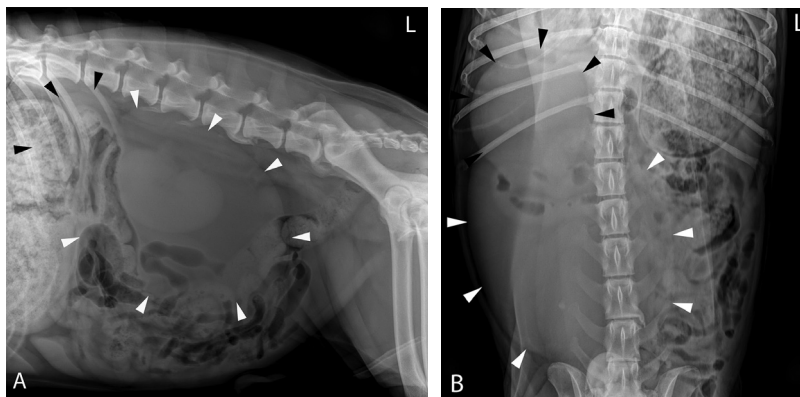


Figure 2—Same images as in Figure 1. A large, lobular soft tissue opacity structure (outlined with arrowheads) extends throughout most of the right dorsolateral aspect of the abdomen. The cranial (black arrowheads) and caudal (white arrowheads) portions of the mass correspond with the severely hydronephrotic right kidney and dilated right ureter, respectively, seen on CT.

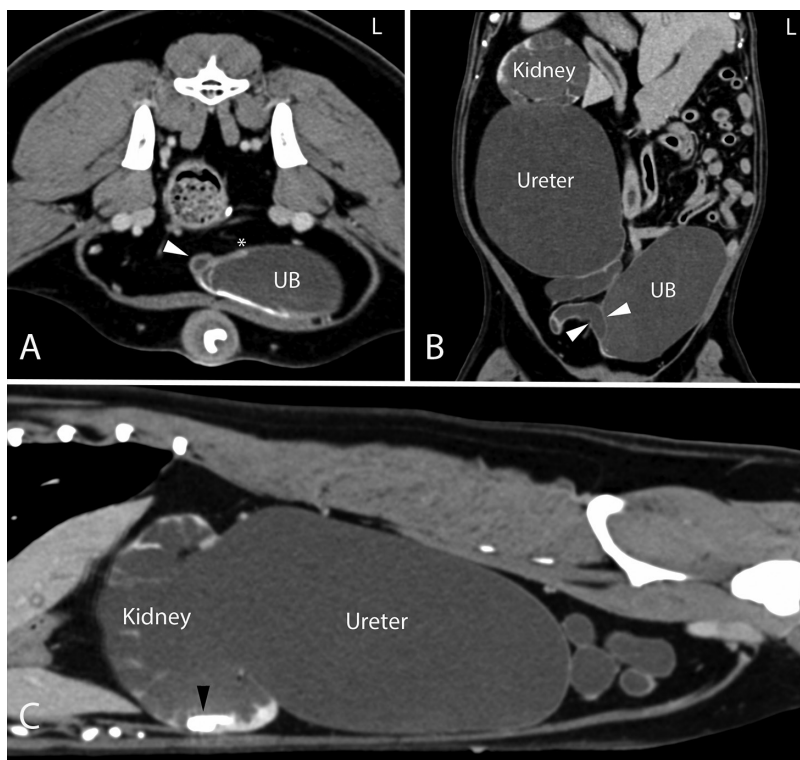


Figure 3—Transverse plane (A) and reconstructed dorsal (B) and sagittal (C) plane delayed phase CT angiographic images of the abdomen of the dog described in Figure 1. The dilated intramural portion of the right ectopic ureter (white arrowheads) is evident near the normal left ureterovesicular junction (asterisk), from which a small stream of iodinated contrast medium emerges and accumulates dependently within the urinary bladder (UB). Only a small amount of iodinated contrast medium is seen accumulating within the renal pelvis (black arrowhead) of the right kidney, suggesting reduced renal function. The images are displayed in a soft tissue window (window width, 300 HU; window level, 40 HU), with a 2-mm slice thickness. A and B—The dog's right is to the left of the images. C—Cranial is to the left.

The dog was maintained postoperatively on IV crystalloid fluid therapy, which was gradually tapered. No azotemia or electrolyte abnormalities were noted postoperatively. Results were negative for bacterial culture performed on a urine sample taken at the time of surgery. Histopathology revealed diffuse hydronephrosis and hydroureter with no evidence of renal dysplasia or other predisposing causes, aside from the known intramural ectopic location of the ureter. Follow-up with the referring veterinarian and owner 12 months postoperatively revealed the patient was doing well with no reported hematuria or renal dysfunction. A urinalysis had not been repeated postoperatively.

Comments

The dog of the present report had untreated intramural ectopic ureter that had progressed and had appeared as a large, space-occupying soft tissue structure identified on initial radiographic examination. Although neoplasia was an initial differential diagnosis, particularly considering the dog's age, advanced imaging with CT was instrumental in obtaining a diagnosis of an ectopic ureter with severe hydroureter and hydronephrosis. Findings on CT for the severely hydronephrotic right kidney and distended right ureter corresponded with the cranial and caudal portions, respectively, of the soft tissue mass seen on the radiographic images.

For our patient, we suspected that with progressive dilation of the right kidney and proximal ureter secondary to the ectopic entrance of the ureter into the bladder, the distal portion of the ureter developed a tortuous pathway, ultimately kinking and further worsening the dilation in the proximal portion. Similar to detrusor atony seen with chronic distension of the urinary bladder, it was plausible, but speculative, that severe distension of the proximal portion of the ureter damaged the smooth muscle typically responsible for peristalsis, further contributing to dilation. Regardless, the right kidney had minimal functional-appearing cortical tissue remaining, and the severe ureteromegaly and hydronephro-

sis predisposed this patient to recurrent ascending infections, necessitating removal.

Ectopic ureters are congenital in etiology, with an intramural location being diagnosed in the majority of dogs.¹ Ectopic ureters are up to 20 times as likely to be diagnosed in female dogs as in male dogs.² In 1 study,² 81% (13/16) of male dogs with ectopic ureters were presented for evaluation of incontinence; however, none of the dogs in that study were presented with hematuria, unlike our patient. In the same study,² 85.6% (11/13) of the dogs were presented prior to 2 years of age. The owners of the dog of the present report did not observe incontinence, which likely explained the delay in diagnosis of the condition and subsequent severity of the pathology. Although treatment of the intramural portion of the ureter via neoureterostomy may have relieved the obstruction, the severe dilation of the kidney and ureter, minimal contrast uptake within the renal cortex on CT, and lack of peristalsis in most of the ureter on visual inspection raised concern for lack of functionality of the affected kidney and ureter. Therefore, nephroureterectomy was performed. The dog had a low urine specific gravity prior to surgery that caused concern for renal insufficiency, which could be worsened with nephroureterectomy. Despite this concern, renal values remained normal on follow-up examination, consistent with the normal appearance of the left kidney on diagnostic imaging preoperatively. The cause of the decreased urine specific gravity in this patient was unknown.

This case highlighted an interesting presentation of an ectopic ureter in an older male dog. Imaging was instrumental in confirming the diagnosis in this patient and ruling out more malignant etiologies such as renal neoplasia.

References

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