

## Ultrasound Diagnosis

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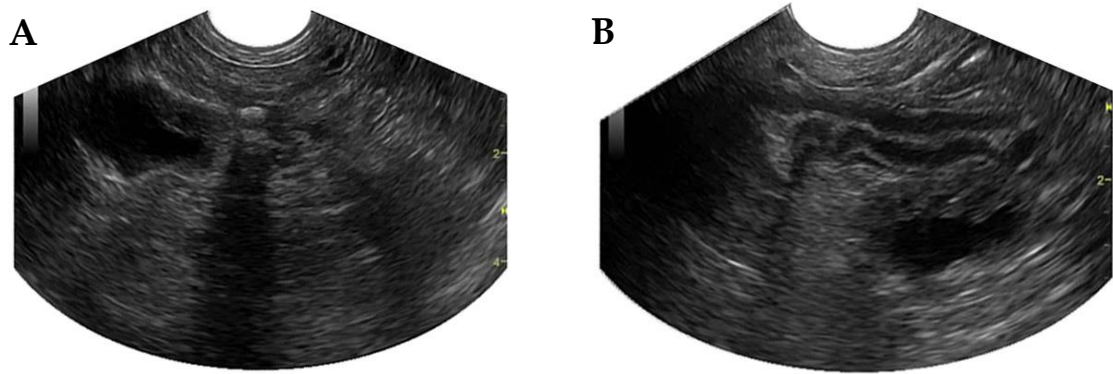
### *History*

A fifteen-year-old, castrated, mixed breed dog was presented at the Chulalongkorn University Small Animal Hospital for a post-surgical follow-up. Since last month, the dog had undergone the second operation of right nephrotomy and ureterotomy for a removal of calcium oxalate calculi. The dog had been food-restricted and had a good appetite. Physical examination including an abdominal palpation revealed no clinical abnormalities. The initial data that was obtained consisted of a complete blood count, a serum biochemistry profile and urinalysis. The only abnormal clinical value was an elevation of serum alkaline phosphatase (305 IU/L). Plain radiographs of the abdomen demonstrated a 1.5-cm radiopaque calculus of the left renal pelvis. An abdominal ultrasonography was performed to obtain more specific information of the urinary tract.

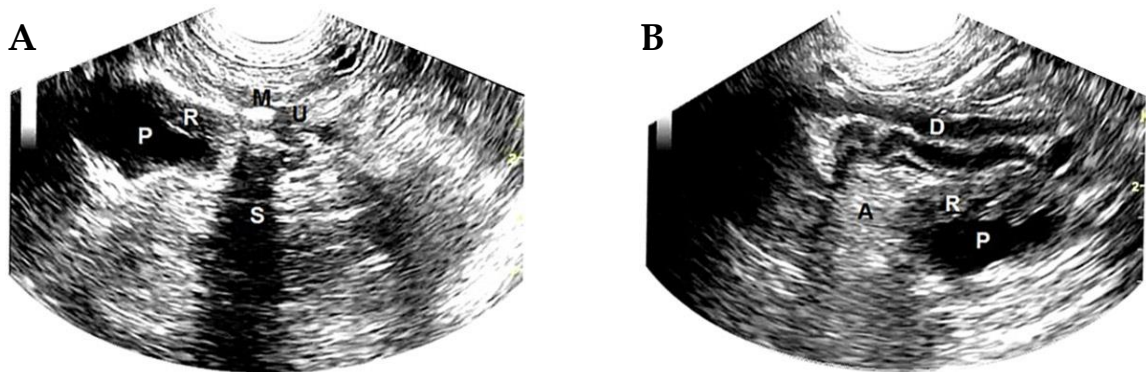
### *Ultrasonographic Findings*

A real-time, ultrasonographic examination of an entire abdomen was performed using an 8 MHz microconvex, phased array transducer with the dog in dorsal recumbency. A mild abdominal pain was detected in the right cranial abdominal region during scanning. The echogenicity of the liver was mildly

hyperechoic relative to the falciform fat. The hepatic parenchyma was heterogeneous with diffuse, 2-8 mm, indistinct nodules, and a 3 mm focus of mineralization, suggesting a chronic hepatopathy. The right kidney was hyperechoic, relative to the liver, and the corticomedullary distinction was attenuated. The renal pelvis and diverticuli were moderately dilated (Figure 1A and 2A). The proximal ureter was mildly dilated and still contained a 6-mm hyperechoic structure associated with acoustic shadowing, as seen on the previous examination, prior to the operation, which was consistent with a dystrophic mineralization of the ureteral wall. A small segment of the adjacent duodenum was mildly corrugated, without any changes of wall layering and thickness. A markedly hyperechoic tissue was notified between this corrugated duodenum and the right kidney, with an absence of the gliding sign of these two structures during inspiration and expiration. These findings were more likely consistent with an adhesion at the surgical site of nephrotomy (Figure 1B and 2B). The left kidney contained a 1.5-cm hyperechoic material, with acoustic shadowing, in the region of the pelvis, consistent with a nephrolith, which was not associated with outflow obstruction. There was also a 2x4 mm, echogenic polyp extending from the mid-ventral urinary bladder wall into the bladder lumen.



**Figure 1** Transverse (A) and longitudinal (B) sonograms of the right kidney and ureter of a fifteen-year-old, castrated, mixed breed dog in dorsal recumbency. A. The renal pelvis and diverticuli were moderately dilated. A 6-mm dystrophic mineralization associated with acoustic shadowing was found at the wall of the dilated ureter. B. Hyperechoic tissue between the right kidney and the mildly corrugated duodenum was consistent with an adhesion at the surgical site of the previous nephrectomy.



**Figure 2** Schematics of the relative positions of the structures scanned in figure 1. R –renal cortex, P –renal pelvis, U –ureter, M –dystrophic mineralization, S –acoustic shadowing, D –corrugated duodenum, A –adhesion tissue.

### Diagnosis

Ultrasonographic diagnosis –A dystrophic mineralization of ureteral wall with a renal adhesion.

### Comments

On ultrasonography, renal or ureteral calculi and mineralization usually produce the same appearance as intense hyperechoic structures, with strong distal acoustic shadowing. This shadowing is more evident when the size and calcium composition of the calculus or mineralization increase. To obtain a clean shadow, it is important to use a high-frequency transducer, to place the transducer perpendicular to the calculus, and to locate the calculus within the focal zone of the transducer (Sommer and Taylor, 1980). Luminal dilatation of the renal pelvis and ureter is supportive of an obstructive urolith, as previously appeared in this dog. All uroliths had been removed during the second nephrotomy and ureterotomy. Only one spot of mineralization remained since it localized in the ureteral wall, not within the lumen.

Ultrasonography can be used for assessing adhesions at the surgical site (Wacker et al., 1998). Adhesions are diagnosed if the focal internal organs are moved as a unit during inspiration and expiration,

or when the gliding sign is absent. In this dog, the focal increase in echogenicity of adhesion tissue accompanied by mild corrugation of the adjacent duodenum was more likely suggestive of a chronic duodenitis. A hyperechoic change of omental and mesenteric fat is indicative of inflammation (steatitis) in dogs and cats. Although bowel wall corrugation, which appears as regular waves of undulated bowel segments, is a nonspecific finding, it can be present with regional enteritis, bowel ischemia, pancreatitis, peritonitis or neoplasia (Moon et al., 2003).

### Reference

- Moon ML, Biller DS and Armbrust LJ 2003. Ultrasonographic appearance and etiology of corrugated small intestine. *Vet Radiol Ultrasound*. 44:199-203.
- Sommer FG and Taylor KJW 1980. Differentiation of acoustic shadowing due to calculi and gas collections. *Radiology*. 135:399-403.
- Wacker CA, Weber UT, Tanno F and Lang J 1998. Ultrasonographic evaluation of adhesions induced by incisional gastropexy in 16 dogs. *J Small Anim Pract*. 39:379-384.