What Is Your Diagnosis?

In cooperation with

Figure 1—Right lateral (A) and ventrodorsal (B) full-body radiographic views of a 17-year-old female Asian small-clawed otter taken during anesthesia for a routine physical examination.

History

A 17-year-old female Asian small-clawed otter (*Amblonyx cinereus*) was anesthetized for a routine physical examination. Prior to induction of anesthesia, the otter was bright, alert, and responsive and its mentation, appetite, and activity level were normal according to zookeepers. On physical examination, the otter was in good body condition, with no overt external abnormalities. Abdominal palpation revealed 2 small firm kidneys, with the right smaller than the left. Serum concentrations of urea nitrogen (32 mg/dL; reference range, 6 to 64 mg/dL; mean, 23 ± 9 mg/dL) and creatinine (0.9 mg/dL; reference range, 0.3 to 2.0 mg/dL; mean, 0.8 ± 0.3 mg/dL) were within reference limits when compared with International Species Information System values.[1] Urinalysis was performed on a urine sample that was collected by cystocentesis. The urine was clear yellow with a specific gravity of 1.016. Erythrocytes and leukocytes (9 to 10/hpf), 1+ bacteria, and calcium oxalate monohydrate crystals were identified. Urine was subsequently submitted for bacteriologic culture and susceptibility testing. Full-body orthogonal digital radiography was performed (**Figure 1**).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

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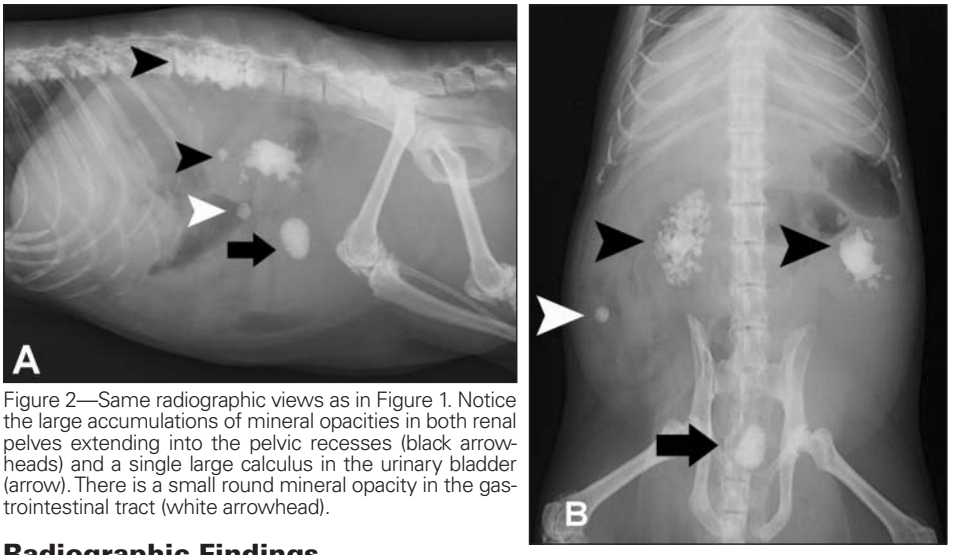

Figure 2—Same radiographic views as in Figure 1. Notice the large accumulations of mineral opacities in both renal pelves extending into the pelvic recesses (black arrowheads) and a single large calculus in the urinary bladder (arrow). There is a small round mineral opacity in the gastrointestinal tract (white arrowhead).

Radiographic Findings and Interpretation

On the right lateral radiographic view (**Figure 2**), there are large accumulations of mineral opacities in both renal pelves that extend into the pelvic recesses (staghorn calculi). The right kidney is superimposed over the vertebral column and contains more mineral opacity than the left kidney. In the urinary bladder, there is a single large calculus. There is a small, round mineral opacity ventral to the left kidney at the level of the fifth lumbar vertebra that appears to be located in the gastrointestinal tract. The ventrodorsal radiographic view was helpful in confirming the presence of calculi in the kidneys and urinary bladder. The small, round mineral opacity is in the right side of the abdomen, but it is not possible to determine in which segment of gastrointestinal tract the opacity is located. These radiographic findings, in conjunction with results of the physical examination and urinalysis, are compatible with a diagnosis of urolithiasis and bacterial cystitis.

Comments

Urolithiasis is a common finding in the captive population of Asian small-clawed otters.[2] One retrospective survey[3] reviewed data on 79.8% (95/119) of the living or dead Asian small-clawed otters listed as comprising the captive North American population. Fifty-six of the 95 (58.9%) had been radiographed or necropsied; renal calculi were detected in 37 (66.1%) and cystic calculi in 13 (23.2%).[2] Both males (19/34 [55.8%]) and females (18/25 [72%]) were frequently affected.[2] Renal disease was the cause of, or a contributing factor in, the deaths of 5 of 5 of the geriatric (≥ 10 years old) otters whose necropsy reports were reviewed.[2] The most common component of the uroliths was calcium oxalate monohydrate, although calcium carbonate and sodium or ammonium acid urate have been reported.[2,4-7]

This otter's renoliths were first noticed on radiographs obtained to screen for urolithiasis at 4 years of age. At that time, only a few mineral opacities were evident in each renal pelvis. Orthogonal radiography performed numerous times during the next 13 years revealed gradual deposition of additional renoliths in the renal pelves; however, at no time did the otter have clinical or laboratory evidence of urinary tract disease. The cystic calculus was a new finding, and its presence was likely responsible for the development of secondary bacterial cystitis by causing inflammation.[8] Bacteriologic culture and susceptibility testing yielded group D *Streptococcus* sp, which was susceptible to amoxicillin. A 1-month course of this antimicrobial was subsequently prescribed. A routine cystotomy was performed to remove the calculus in the urinary bladder. Analysis revealed that it was composed of 100% calcium oxalate. Follow-up urinalysis revealed that the bacterial cystitis had resolved.

Few studies have been performed to elucidate the pathomechanism of urolithiasis in this species. A genetic predisposition must be considered as a factor given the familial relationships of some affected animals.[5] Increased endogenous oxalate production and subsequent hyperoxaluria, an unusually efficient intestinal mechanism for absorption of dietary calcium that evolved in the face of a natural diet based on calcium-poor foodstuffs such as shellfish, and hypersensitivity to urinary crystalloid concentrations that would not be expected to promote calculogenesis in domestic carnivores have all been suggested.[5,7] Because uroliths appear to be uncommon in the wild population of Asian small-clawed otters, it is likely that some aspect of captive husbandry, management, or diet contributes to lithogenesis.[9] Currently, there is little information on the role of diet and whether following dietary recommendations for domestic carnivores with calcium oxalate uroliths prevents or slows the progression of the disease in otters.[2,5,7,9] Radiography was critical in this case because it assisted in detection of the large calculus in the bladder and documented its complete removal after cystotomy. Radiography was also an invaluable tool for regular monitoring of the severity and progression of this otter's disease.

Abdominal ultrasonography was used in this otter to confirm radiographic findings but did not alter the diagnosis or treatment plan. The fourth mineral opacity was presumed to be a stone or other mineral foreign body ingested from the otter's exhibit that was eventually passed, as it was not evident on subsequent radiographic views and caused no clinical abnormalities.

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