



## ENDOSCOPIC REMOVAL OF A VAGINAL CALCULUS IN A DOMESTIC RABBIT (*ORYCTOLAGUS CUNICULUS*)

Danielle K. Tarbert, DVM, and Ricardo de Matos, LMV, Dip. ABVP (Avian), Dip. ECZM (Avian, Small Mammal)

### Abstract

A 6-year-old female spayed domestic rabbit (*Oryctolagus cuniculus*) was evaluated for stranguria and pollakiuria. A large calculus was presumed to be in the urethra based on radiographic images; however, the rabbit retained the ability to urinate. An ultrasound examination was performed, which revealed a  $0.8 \times 0.6 \times 0.8 \text{ cm}^3$ , round, hyperechoic foci with strong acoustic shadowing in the pelvic region. A small amount of anechoic urine was present in the urinary bladder and the urethra was normal, extending from the urinary bladder to pelvis. It could not be determined ultrasonographically whether the structure of interest was in the urethra or vagina. Based on these findings, vaginoscopy was performed under general anesthesia, which confirmed the calculus was present in the proximal vagina rather than the urethra. The calculus was removed endoscopically using a retrieval basket. Calculi within the vagina should be considered as a differential diagnosis for female rabbits presenting with stranguria and pollakiuria, especially if clinical, radiographic and ultrasonographic findings are not consistent with urinary obstruction. Vaginoscopy is a rapid, noninvasive tool for diagnosis and removal of vaginal calculi. Copyright 2016 Elsevier Inc. All rights reserved.

**Key words:** domestic rabbit; endoscopy; vaginal calculi; stranguria; pollakiuria

**A** 6-year-old female spayed Dutch domestic rabbit (*Oryctolagus cuniculus*) weighing 2.9 kg was referred to the Cornell University Hospital for Animals (CUHA) (Ithaca, NY USA) for further management of recurrent urolithiasis including a presumptive urethral stone. Radiographic images performed earlier in the day by the referring veterinarian had revealed the presence of an approximately 0.8 cm stone in the region of the pelvic urethra. Previous surgical history included an ovariectomy at 6 months of age, as well as 2 cystotomies to remove uroliths. Additional medical history was unremarkable aside from the need for regular tooth trimming approximately every 3 months. The rabbit's diet consisted of mixed grass and legume hay, free-choice alfalfa pellets, apples, other fruits, and oatmeal. A spool vitamin and mineral block were provided at all times in the cage. The rabbit was the only pet in the household.

The rabbit's first cystotomy had been performed by the patients' regular veterinarian 3 months before the referral presentation. The diagnosis of urinary calculi was obtained via radiographic images after a change was observed in the behavior of the rabbit, most notably lying in her litter box

on repeated occasions. The stone was removed by routine cystotomy; analysis of the stone revealed it was composed of 100% calcium carbonate (Minnesota Urolith Center, Department of Small Animal Clinical Sciences, College of Veterinary Medicine, University of Minnesota, Saint Paul, MN

From the Department of Clinical Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY USA.

Address correspondence to: Danielle K. Tarbert, DVM, Department of Clinical Sciences, College of Veterinary Medicine, Cornell University, VMC, Box 25, Ithaca, NY 14850. E-mail: [dkt42@cornell.edu](mailto:dkt42@cornell.edu)

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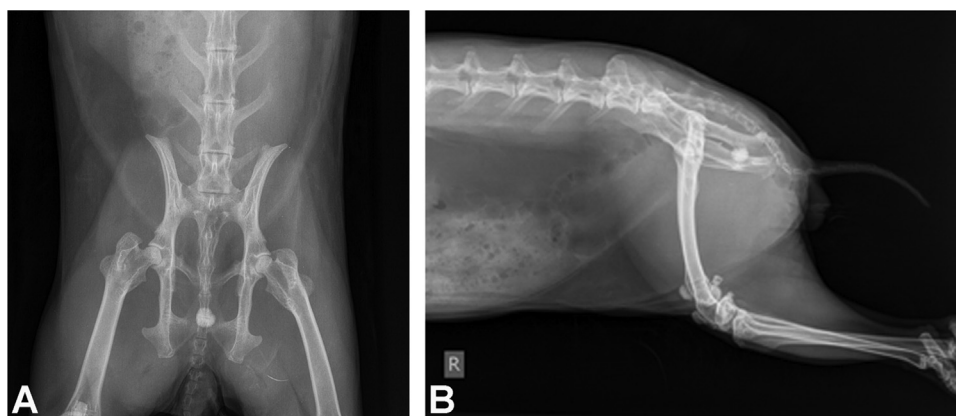
USA). The client elected referral to CUHA after recurrence of clinical signs and radiographic evidence of cystic urolithiasis 2.5 months following the first surgery.

Physical examination on presentation to CUHA was unremarkable aside from an overweight body condition (body condition score 8 of 9) and a firm object palpable in the region of the bladder. Results of a plasma biochemistry panel revealed a total hypercalcemia (16.6 mg/dL, reference interval: 5.6 to 12.5 mg/dL), elevated alkaline phosphatase (88 U/L, reference interval: 4 to 16 U/L), and mild hyperglycemia (188 mg/dL, reference interval: 75 to 155 mg/dL).<sup>1</sup> Results of a complete blood count (CBC) were unremarkable. The second cystotomy was performed routinely and without complications; stone analysis revealed recurrence of a 100% calcium carbonate urolith (Minnesota Urolith Center). No gross abnormalities of the bladder were visualized during the second cystotomy procedure. Bladder wall biopsies were collected for aerobic and anaerobic culture. Recovery of the patient from the second cystotomy procedure was rapid and without complication. Postoperatively the rabbit received a 14-day course of meloxicam 0.52 mg/kg, orally every 24 hours (Metacam; Boehringer Ingelheim Vetmedica, St. Joseph, MO USA) to decrease inflammation in the bladder, a 10-day course of enrofloxacin 16 mg/kg, orally every 24 hours (Baytril; Bayer Pharmaceuticals, Whippany, NJ USA) pending bladder wall culture, and a 5-day course of tramadol 2.1 mg/kg, orally every 12 hours (Ultram; Janssen Pharmaceuticals Inc., Titusville, NJ USA) for additional analgesia. Long-term therapy with sodium citrate 27 mg/kg, orally every 12 hours (Bicitra; Baker Norton Pharmaceutical Inc., Miami, FL USA) and lactated Ringer solution 28 mL/kg, subcutaneous weekly

(Lactated Ringers Injection USP; Hospira Inc., Lake Forest, IL USA) was also instituted. Alterations were made to the rabbit's diet including a transition from an alfalfa-based pellet to a timothy hay product, reduction in the amount of pellets fed daily to no more than one-fourth cup per day, sweetening of the water with applesauce to encourage consumption, and cessation of a salt and mineral spool supplement. Bladder wall aerobic and anaerobic culture detected no growth.

The rabbit did well at home while these changes were instituted, and radiographic images obtained 7 days after the second surgery revealed presence of bladder sludge, but no stones. However, 20 days after the second cystotomy, the rabbit was again presented to the referring veterinarian for a sudden onset of abnormal behavior, including lying in her litter box, kicking, and labored respiration. Radiographic images revealed the presence of a round mineral opacity object in the pelvic region, presumed to be in the urethra. Buprenorphine 0.026 mg/kg, subcutaneous (Buprenex; Reckitt and Colman Pharmaceuticals Inc., Richmond, VA USA) was administered and the case was immediately referred to CUHA.

Upon presentation, physical examination was unremarkable aside from urine staining on the caudal ventrum and persistent overweight body condition. The bladder was small and nonpainful, and the rabbit was observed passing small amounts of urine. Supportive care was provided with lactated Ringer solution 30 mL/kg, subcutaneous every 12 hours and buprenorphine 0.03 mg/kg, subcutaneous every 8 hours. Diazepam 0.5 mg/kg, intravenous (Diazepam Injection USP; Hospira Inc., Lake Forest, IL USA) was administered for sedation and relaxation of the urethra. Orthogonal radiographs of the caudal abdomen and pelvis were repeated to ensure that



**FIGURE 1.** Ventrodorsal and right lateral pelvic radiographs of a rabbit with stranguria and pollakiuria demonstrating a 0.8-cm presumptive urethral calculus.

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