



HISTORY

A 4-year-old, neutered male ferret (*Mustela putorius furo*) presented to the Kansas State University Veterinary Health Center (Manhattan, KS, USA) for suspected urinary obstruction. The owner noticed that the ferret had been straining intermittently for 8 hours with no urine production. Six months earlier the ferret had presented for lethargy and was diagnosed with acute kidney injury due to presumptive pyelonephritis, which resolved with hospitalization and antibiotic therapy. On physical examination, the ferret was depressed and lethargic. Body weight was 1.18 kg with a body condition score of 2/5. Dehydration at 5% to 7% was suspected due to the presence of a delayed skin tent and tacky mucous membranes. Bilaterally generalized symmetric alopecia was noted. The urinary bladder was firm and distended, and the abdomen was markedly painful upon palpation. Blood was collected from the cranial vena cava for diagnostic testing. The complete blood count revealed a leukocytosis (35,000/ μ L, reference range: 3,000 to 16,700/ μ L) with moderate numbers having a hypersegmented nucleus and a monocytosis (5,100/ μ L, reference range: 0 to 500/ μ L).¹ The plasma biochemistry profile results showed increased concentrations of urea nitrogen (BUN, 195 mg/dL, reference range: 13.4 to 47.3 mg/dL), creatinine (2.8 mg/dL, reference range: 0.26 to 0.87 mg/dL), and phosphorous (13.0 mg/dL, reference range: 3.1 to 9.6 mg/dL), and a decreased albumin concentration (1.8 g/dL, reference range: 2.80 to 4.39 g/dL); all other parameters were within reference intervals.¹ To evaluate his urinary tract, the ferret was sedated with midazolam (0.25 mg/kg intramuscularly; Versed, West-ward, Eatontown, NJ, USA) and butorphanol (0.25 mg/kg intramuscularly; Torbugesic, Zoetis, Parsippany, NJ, USA) to perform an abdominal ultrasound (Fig. 1).

At this time, please evaluate the history, physical examination, clinical pathology results, and ultrasonographic findings (Fig. 1). Use this information to develop a list of differential diagnoses and plan for additional diagnostics and therapeutics.

DIAGNOSIS

Differential diagnoses for urinary obstruction in a ferret include urolithiasis, prostatomegaly, urinary

tract neoplasia, and cystic urogenital anomalies.² Abnormalities in the complete blood count and plasma biochemistry results were consistent with chronic inflammation, dehydration, and urinary obstruction. The abdominal ultrasound revealed a large, thick-walled cystic mass dorsal to the bladder neck and attached to the bladder at the serosal surface level (Fig. 2). Both the urinary bladder and cystic structure were severely distended with fluid and contained hyperechoic sediment, as well as moderately echoic sediment. The prostate gland was enlarged and heterogeneously hyperechoic with some cystic areas. The left adrenal gland was enlarged and irregularly shaped with heterogeneous medullary architecture, including focal calcification.

Cystocentesis was performed on both the urinary bladder and urogenital cyst, which revealed straw colored, cloudy urine from both

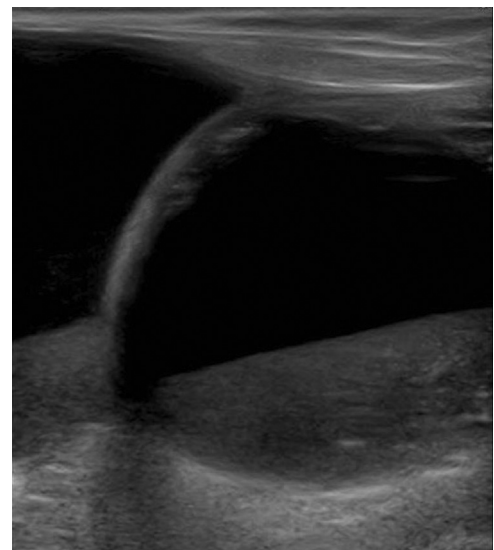


FIGURE 1. Ultrasonographic longitudinal view of the urinary bladder of the male ferret that presented for urinary obstruction.

aspirates. A urinary catheter was passed following the cystocentesis, while the ferret was still sedated; however, based on the severity of clinical signs, humane euthanasia was elected.

On postmortem examination, cranial and ventral to the caudal aspect of the urinary bladder

and dorsal to the trigone, there was an approximately 3.5 cm × 3.3 cm × 2.5 cm cystic structure with a moderately thick wall that was dark red in color externally and greenish brown with yellow plaques internally and contained roughly 5 mL of purulent, thick, yellow fluid (Fig. 3). The cyst did not appear to communicate with the urinary bladder. The bladder measured 3.5 cm × 4 cm × 2.8 cm, had a moderately thick dark red wall, but contained approximately 3 mL of urine of normal appearance. The prostate, measuring approximately 1 cm in diameter, was located 1 cm caudal to the cyst and was palpable through the surrounding adipose and connective tissue.

The left adrenal gland measured 2 cm × 1 cm × 0.5 cm, and the right adrenal gland measured 0.4 cm × 0.2 cm × 0.2 cm. The left adrenal gland appeared to have a solid, compressible mass associated with its cranial pole. The remainder of necropsy was unremarkable.

Histopathologic examination revealed that the urinary bladder wall was normal in architecture with transitional epithelium (Fig. 4). The cyst wall was characterized by stratified squamous epithelium with infiltration of neutrophils that expanded the epithelium. The submucosal blood vessels of the cyst were moderately congested. In close proximity to the prostate were a few small cysts or dilated prostatic ducts which were lined by stratified squamous keratinizing epithelium. The lumen of these cysts contained variable amounts of keratin admixed with necrotic debris and

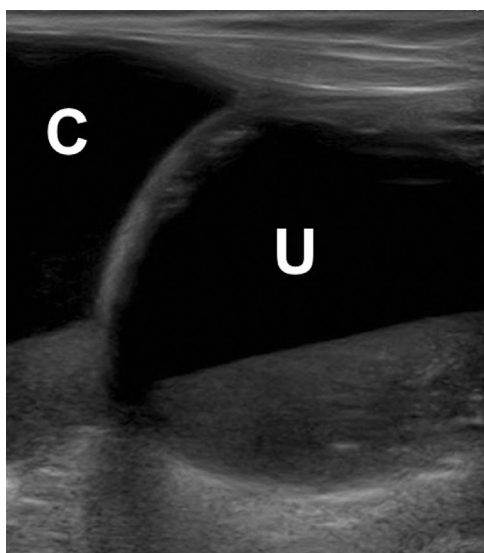


FIGURE 2. Ultrasonographic longitudinal view of the urinary bladder of the male ferret that presented for urinary obstruction. A urogenital cyst (C) was adjacent to the urinary bladder (U).



FIGURE 3. Gross appearance of the urogenital cyst on postmortem examination of this ferret. The cyst (C) is cranial and ventral to the caudal aspect of the urinary bladder (U).

neutrophils. The left adrenal gland mass was consistent with an adrenocortical adenoma.

DISCUSSION

This 4-year-old neutered male ferret was diagnosed with a cystic urogenital anomaly, as well as ferret adrenal gland disease due to adrenocortical adenoma. The urogenital cyst compressed the urinary bladder trigone and resulted in urinary obstruction. Differential diagnoses for the cystic urogenital anomaly included a urethral gland cyst, prostatic cyst, paramesonephric duct cyst, urinary bladder diverticula, bladder duplication, urachal cyst, or abscess.

Cystic urogenital anomalies have been previously described in ferrets.³ In 1 report, 4 male and 2 female ferrets presenting for dysuria were diagnosed with single, multiple, or multiloculated cysts located on the dorsal aspect of the urinary bladder near the trigone or bladder neck.³ It was speculated that these cystic anomalies likely originated from paramesonephric or mesonephric duct remnants based on their location and histologic appearance; urinary bladder diverticula, urachal cysts, and bladder duplication were unlikely. Similar to the ferret in this case, 5 of the 6 ferrets in that report also had adrenal gland pathology, suggesting the possible role of an altered androgen axis in the development of these cystic anomalies.

Prostatomegaly due to prostatitis and prostatic cysts has been reported in male ferrets with adrenal gland disease.⁴ Prostatomegaly can cause urethral compression and subsequent urethral obstruction in these male ferrets with adrenal disease. Increased androgen production by hyperplastic or neoplastic adrenal glands is thought to stimulate proliferation of prostatic glandular tissue, which can become cystic and inflamed.^{2,4} In the present

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