



EPITHELIOTROPIC GASTROINTESTINAL T-CELL LYMPHOMA WITH CONCURRENT INSULINOMA AND ADRENOCORTICAL CARCINOMA IN A DOMESTIC FERRET (*MUSTELA PUTORIUS FURO*)

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Abstract

A 5-year-old male castrated ferret was presented for evaluation of chronic diarrhea, unresponsive to medical therapy. Initial examination and minimum database findings failed to determine an underlying etiology for the ferret's gastrointestinal disorder. Biopsies obtained by exploratory surgery confirmed a diagnosis of epitheliotropic gastrointestinal T-cell lymphoma. Several treatment strategies were discussed, and ultimately palliative care with prednisolone was elected. Over the course of treatment, the ferret developed concurrent pancreatic beta-cell adenomas (insulinoma) and a left adrenocortical carcinoma. At the time of necropsy, nearly 15 months after the exploratory surgery, the lymphoma appeared to be in regression despite the use of only palliative therapy. Copyright 2015 Published by Elsevier Inc.

Key words: T-cell lymphoma; insulinoma; adrenocortical carcinoma; ferret; lomustine

A 1.1 kg, 5-year-old, male castrated domestic ferret was referred to the William R. Pritchard Veterinary Medical Teaching Hospital (VMTH), School of Veterinary Medicine, University of California, Davis, for evaluation of diarrhea of 6-weeks' duration. The diarrheic feces were described as soft, yellow, and mucoid. The ferret had been examined by the referring veterinarian 1 month before the referral presentation for the same problem, and was treated empirically with amoxicillin, metronidazole, and bismuth subsalicylate (doses and products were not provided). The diarrhea resolved while the animal was being treated, but recurred 2 days after cessation of therapy. Treatment with a commercially available animal probiotic (Forti-Flora; Nestlé Purina PetCare Company, St. Louis, MO USA) was initiated, but quickly discontinued due to the development of liquid to mucoid hemorrhagic diarrhea. Approximately 10 days before the presentation to the VMTH, the referring veterinarian performed an abdominal ultrasound on the ferret and noted enlargement of multiple mesenteric lymph nodes. Historically, exploratory surgery was performed at approximately 18 months of age for an intestinal obstruction, which was found to be a trichobezoar, and at 34 months of age the ferret was diagnosed at the VMTH with a Type I, 2nd degree atrioventricular (AV) block; no treatment was initiated at that time for the heart condition. The ferret was reported to have had numerous occurrences of diarrhea after the first visit to the VMTH, all of which had responded to the same medical therapies (amoxicillin, metronidazole, and bismuth subsalicylate) until this current episode. The ferret was housed with one other ferret that was also having diarrhea, but the conspecific's gastrointestinal

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problem resolved after treatment (amoxicillin, metronidazole, and bismuth subsalicylate) for 14 days. Both ferrets were offered a commercial ferret kibble containing 38% crude protein (Marshall Premium Ferret Diet; Marshall Pet Products, Wolcott, NY USA), and tap water, ad libitum. Treats offered to the animals included dog biscuits and occasional bread. The ferret that was presented to the VMTH was also given a commercially available laxative hairball remedy for ferrets PRN (Ferret Lax; Marshall Pet Products, Wolcott, NY USA); the amount and frequency were not specified. No changes were noted in the ferret's appetite, water intake, or urine production.

On physical examination, the ferret was mildly obese with a body condition score of 6 of 9. The intestinal loops were thickened on abdominal palpation, and mesenteric lymph nodes and the spleen were noted to be enlarged. The ferret appeared uncomfortable on palpation of the caudal abdomen. A cardiac arrhythmia was auscultated, consistent with physical examination findings recorded when the 2nd degree AV block was diagnosed. The ferret produced diarrheic brown feces with yellow mucus during the examination procedure. All other physical examination findings were unremarkable.

A minimum database, consisting of a complete blood count (CBC), serum biochemical profile with electrolytes, abdominal ultrasound, and fecal centrifugal flotation was performed. Overall, the CBC and biochemical profile findings were within reference intervals (Table), including albumin and total protein. The ferret was mildly leukopenic with a normal differential count.¹⁻³ No parasites were identified on fecal flotation. On abdominal ultrasound, multiple enlarged lymph nodes were observed, including the mesenteric and gastrohepatic nodes. The abnormal lymph nodes were rounded and hypoechoic in appearance. The lymph node anomalies were interpreted as suspicious of an infiltrative disease (e.g., neoplasia), or as reactive lymphadenopathy. Diffuse splenomegaly with a focal nodular splenic mass was also noted. Fine needle aspirate cytology of the enlarged abdominal lymph nodes was consistent with mild lymphoid reactivity with no evidence of neoplasia, and that of the spleen was typical of moderate lymphoid hyperplasia and extramedullary hematopoiesis. An exploratory laparotomy was recommended to obtain full-thickness biopsy samples of the gastrointestinal tract as well as other organs, if indicated. The owners declined surgery as the ferret's diarrhea improved several days after the initial examination at the VMTH, without any treatment changes. A diet that contained a higher

crude protein content was recommended, and the owners were advised to stop offering all additional treats.

The ferret was presented for recurrent diarrhea 20 days after the initial presentation to the VMTH. The diarrhea had continued intermittently since the previous visit, but no changes were noted in the ferret's activity level, appetite, or water intake. The ferret was still consuming its original diet, being reluctant to eat the prescribed food, but was no longer provided treats. On examination, the ferret's weight remained 1.1 kg. Neither the enlarged abdominal lymph nodes nor the previously noted caudal abdominal discomfort was appreciable on abdominal palpation. The stomach and intestinal loops did not feel thickened when palpated. The remaining physical examination findings were unchanged from the previous visit. A fecal flotation, direct fecal smear, and direct immunofluorescent antibody testing of the feces for *Cryptosporidium* spp. and *Giardia* spp. were performed, and all results were negative. A fecal Gram stain did not reveal any abnormal populations of fecal bacteria.⁴ The owner had been considering proceeding with the recommended surgery, therefore a cardiac examination was performed to re-evaluate the patient's heart condition. Echocardiographic examination showed myxomatous degeneration of the aortic valve, with mild aortic insufficiency. The previously diagnosed Type I 2nd degree AV block was unchanged. An atropine response test was recommended before surgery.

The ferret was re-presented for exploratory laparotomy 23 days later. The owner had again attempted to convert the patient to the recommended higher protein diet, but there was a sustained resistance to the change. The ferret continued to have intermittent diarrhea, with the feces ranging from formed to liquid and mucoid. Physical examination findings were unchanged from the previous visit. An atropine response test was performed, and the ferret responded with an elevated heart rate and resolution of the

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