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SPONTANEOUSLY ARISING DISEASE

Changes in the Small Intestine of a Cat Associated with Barium Sulphate Following Contrast Radiography

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Summary

A 7-year-old neutered male domestic short-haired cat that had undergone contrast radiography of the bowel with barium sulphate after acute episodes of vomiting 2 months previously, was presented with chronic vomiting, anorexia and weight loss. Abdominal radiography and ultrasonography revealed residual contrast enhancement and an obstruction of the small intestine. A contracted and stenosed ileum and distal jejunum were identified by exploratory laparotomy and surgically resected; subsequently, the clinical signs resolved. Histopathological examination of the ileum revealed mucosal ulceration with severe submucosal granulation tissue formation associated with scattered foreign crystalline material. Energy-dispersive X-ray spectroscopy revealed that the crystals contained barium sulphate. This is the first report in animals of the rare complication of barium sulphate incorporation into the gastrointestinal mucosa after contrast radiography.

Keywords: barium sulphate; cat; contrast radiography; granulation tissue

Barium sulphate is insoluble and is not absorbed by the gastrointestinal mucosa. Therefore, it is considered relatively safe for examination of the gastrointestinal tract and is used commonly for contrast radiography in human and veterinary medicine (Vukmer and Trummer, 1965; Nolan, 1981; Mahaffey and Barber, 2002; Bischoff, 2003). However, gastrointestinal perforation associated with leakage of barium sulphate into the abdominal cavity resulting in peritonitis with granulomatous inflammation has been reported in dogs and cats (Ko and Mann, 2014). Barium granuloma of the rectum has been described as an uncommon complication of a barium enema in people (Lewis *et al.*, 1975).

This report describes a case of granulation tissue formation with incorporation of barium sulphate crystals within the ileal submucosa of a cat that had undergone gastrointestinal contrast radiography with barium sulphate.

A 7-year-old neutered male domestic short-haired cat was presented initially with acute episodes of gastrointestinal signs, including vomiting and anorexia. Routine haematological and serum biochemical investigations indicated only elevated liver enzymes (alanine transaminase 337 U/l [normal range 22–84 U/l], aspartate transaminase 132 U/l [normal range 18–51 U/l]) and radiography revealed no abnormalities. Contrast radiography with barium sulphate revealed delayed gastric emptying, but other abnormalities were not detected. Subsequently, exploratory laparotomy was performed; ileal hyperaemia and impaction with large hair balls were observed and the coeliotomy was closed without

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surgical intervention in the gastrointestinal tract. The cat subsequently received symptomatic therapy for 2 months. However, clinical signs, including anorexia, weight loss and vomiting, persisted and the cat was referred to the Veterinary Medical Center of the University of Tokyo.

Abdominal ultrasound revealed obstruction in the ileum with thickening of the muscularis and dilation of the intestine cranial to this level. On abdominal radiography, dilation of the gastrointestinal tract was evident and residual contrast enhancement was identified in the small intestine (Supplementary Fig. 1). Routine haematological and biochemical investigations did not reveal any abnormality. Exploratory laparotomy revealed dilation of the small intestine cranial to an area of contraction and stenosis of the ileum and distal jejunum (Fig. 1), corresponding with the radiological findings. The contracted lesion of the distal small intestine, approximately 20 cm in length, was resected and end-to-end anastomosis was performed. The resected section of intestine was fixed in 10% neutral buffered formalin and submitted for histopathological examination. Following surgery, the cat received supportive therapy and the clinical signs resolved within a week.

On histopathological examination, ulceration with prominent submucosal thickening was seen in the section of resected ileum. The ulcerated mucosa had abundant neutrophilic infiltration and the thickened submucosa had severe reactive fibrosis with mild infiltration of neutrophils (Fig. 2). Foreign crystalline material was mostly detected in the superficial layer of the thickened submucosa (Fig. 3 and Supplementary Fig. 2) and some material was also detected in the lamina propria away from the ulcerated region (Fig. 3), while rarely observed at the ulcerated region (Fig. 2). The crystals were clear, 5–12 μm in diameter and shaped as irregular polygons (Fig. 3). They were refractile under polarized light. The same foreign material was detected in the submucosa where submucosal thickening was not observed and even in intact areas of the lamina propria.

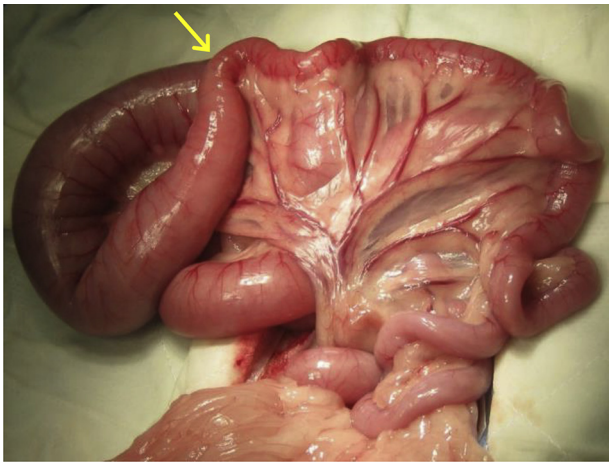

Fig. 1. Gross findings of the small intestine. Note the contracted ileum and distal jejunum, (arrow), and dilation of rostral intestinal tract (left side of the arrow).

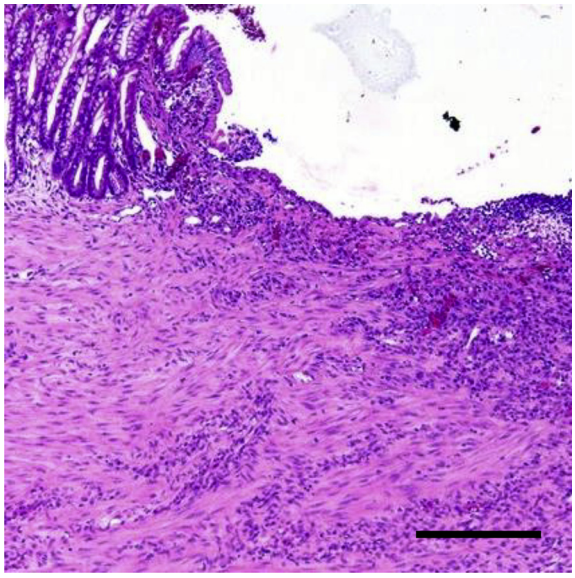

Fig. 2. Histopathological findings in the ileum. Mucosal ulceration is observed in the stenosed ileum, with severe collagen hyperplasia and vascularization of the submucosal region. HE. Bar, 250 μm.

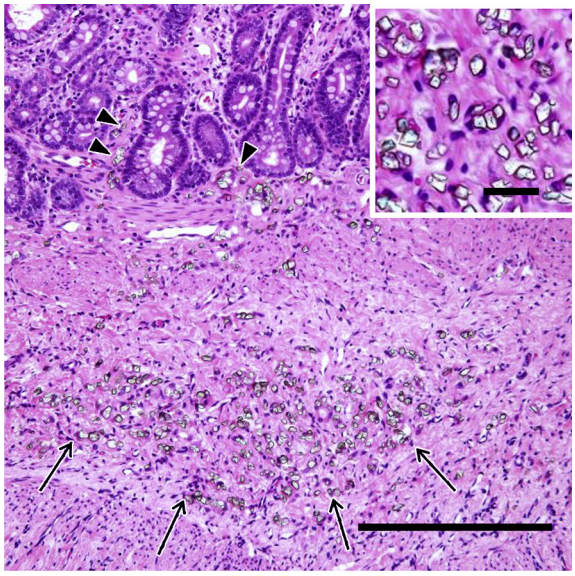

Fig. 3. Histopathological findings in the ileum. Foreign crystalline material is scattered in the thickened submucosa (arrows) and the lamina propria (arrowheads). HE. Bar, 250 μm. Inset: Foreign crystalline material within the submucosa. HE. Bar, 25 μm.