

# Volvulus of the colon in four dogs

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- ▶ Volvulus of the colon should be considered as a cause of vomiting of short duration in dogs, especially when intestinal dilatation has been detected radiographically.
- ▶ Exploratory celiotomy is necessary to confirm the diagnosis and perform surgical correction of colonic volvulus.
- ▶ Surgical treatments of volvulus of the colon include derotation of the colon followed by gastrocolopexy if the tissues of the colon are viable or resection and anastomosis of the devitalized intestinal segment if tissue necrosis has developed.

Four dogs were examined at 2 referral animal hospitals because of vomiting of 7 to 48 hours' duration. These dogs included a 5-year-old sexually intact male German Shepherd Dog (dog 1), a 6.5-year-old neutered male Bullmastiff (dog 2), a 3.5-year-old neutered male Labrador Retriever (dog 3), and a 6-year-old spayed female Great Dane (dog 4). Dog 1 had tenesmus and hematochezia, in addition to vomiting, for 7 hours prior to admission. Except for abdominal palpation, physical examination findings were unremarkable. In dog 1, dilated segments of intestine were palpable but no signs of pain were elicited on palpation of the abdomen. Dog 2 had a palpable mass in the cranial portion of the abdomen, which may have represented dilated portions of intestine; dog 4 had slight abdominal distension. Dogs 3 and 4 had signs of discomfort on abdominal palpation, but the degree of discomfort was difficult to assess in dog 2 because sedatives were administered before referral.

Available laboratory data indicated few clinicopathologic abnormalities in the dogs. At the initial evaluations at the referral hospitals, dogs 1 and 2 had a stress leukogram, and lactate concentration (measured in samples of whole blood) was within reference limits for both dogs; during the first 60 hours after admission, 4 repeat measurements of blood lactate concentration were within reference limits for dog 1. Serum electrolyte concentrations were available for dogs 1 and 4 and were initially within reference ranges. Additional

clinicopathologic findings for dog 1 included prothrombin and partial thromboplastin times, serum trypsinlike immunoreactivity concentration, and serum folate concentration that were within reference limits; negative results of a fecal ELISA<sup>a</sup> for parvovirus; and low serum vitamin B<sub>12</sub> concentration (222 ng/L; reference range, 249 to 733 ng/L). Diagnostic abdominocentesis in dog 1 yielded a modified transudate with blood contamination.

At the initial evaluation, distension of portions of the intestinal tract with gas was identified via abdominal radiography in all 4 dogs. The affected segment of the intestinal tract was identified as the colon in dogs 2 and 4. An irregular soft tissue opacity was identified within the lumen of a gas-distended portion of the colon in dog 2; comparison with abdominal radiographs obtained by the referring veterinarian 7 hours earlier revealed progressive gaseous distension of portions of the intestinal tract. In dog 3, foreign material was detected within a gas-distended segment of intestine. Abdominal effusion was suspected but not definitively identified radiographically in dogs 2 and 3.

In dog 1, the tenesmus, hematochezia, and vomiting did not resolve with medical treatment during the first 2 days of hospitalization. Abdominal radiography was performed on 3 occasions during this period, and persistent gas distension of the intestinal tract was identified; although the jejunum was suspected as the affected segment, exploratory celiotomy confirmed the colon as the affected segment. Because of the lack of resolution of clinical signs and the radiographic evidence of the persistence of intestinal dilatation, exploratory celiotomy was performed. The entire colon was purple to black; it was rotated 180° to 270° around the mesenteric root, involving both the cranial and caudal mesenteric arteries. With the dog in dorsal recumbency and viewed from the ventrum, the rotation was counterclockwise. The duodenum, jejunum, and ileum appeared unaffected. To gain access to the rectum, pubic osteotomies were performed at the craniolateral aspect of each obturator foramen and at the caudal aspect of the pubis between the obturator foramina. The colon was resected, and an end-to-end ileorectal anastomosis was performed. The pubis was secured with 3 cerclage wires, and 2 closed suction drains were placed in the abdomen before routine closure. Findings of histologic examination of sections of the distal portion of the ileum and colon were consistent with vascular strangulation. Bacterial culture of a sample of abdominal fluid obtained before surgery yielded growth of *Escherichia coli*. The dog was discharged from the hospital 11 days after surgery.

Exploratory celiotomy was performed within 4 hours of admission in the other 3 dogs. In these dogs,

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the cecum and ascending and transverse segments of the colon were distended with gas and rotated around the mesenteric root. In dogs 2 and 3, the degree of intestinal rotation was 180°; as viewed from the ventrum of the dog, the rotation was counterclockwise (Figure 1). The degree and direction of the volvulus could not be assessed in the fourth dog, and a splenectomy was performed in an attempt to visualize and correct the volvulus. In all 3 of these dogs, derotation of the colon followed by gastrocolopexy of the transverse colon to the greater curvature of the stomach was performed. Additional surgical procedures included a colopexy of the descending colon to the left lateral abdominal wall in dog 4 and a prophylactic incisional gastropexy in dog 3. Prophylactic incisional gastropexy had been performed in dog 4 at 6 months of age. Colonic resection was not necessary in any of these 3 dogs. Foreign material was palpated within the transverse colon of dog 3 and was manually manipulated into the rectum, from which it was later removed. The foreign material was a plastic bag, which the dog had been observed eating the day before the initial evaluation.

One month after discharge, dog 1 was admitted to the hospital because of gastric dilatation-volvulus (GDV). At the time of surgery, the duodenum, jejunum, and ileum were diffusely dilated but other-

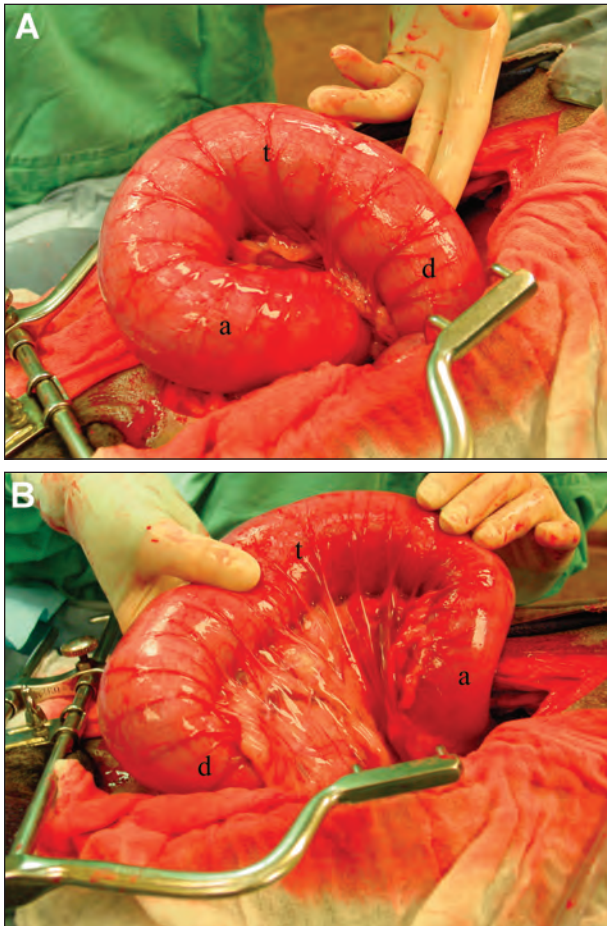


Figure 1—Photographs obtained during surgery prior to (A) and after (B) correction of volvulus of the colon in a dog (dog 3). Notice the ascending (a), transverse (t), and descending (d) portions of the exteriorized colon. The dog's head is to the right.

wise appeared normal. An incisional gastropexy was performed, and the dog was discharged after 4 days of hospitalization. One year after the original surgery, the dog had not had recurrence of intestinal obstruction.

Unlike dog 1, the other 3 dogs recovered with minimal complications or associated illness. Dog 3 was reevaluated 1 week after surgery because of a 6-day history of progressively worsening diarrhea; the dog responded to medical management for colitis and was discharged after 2 days of hospitalization. During the first 2 weeks after surgery, dog 4 had mild gastrointestinal signs, including 1 episode of vomiting and diarrhea, that resolved following treatment with metronidazole (13 mg/kg [5.9 mg/lb], PO, q 12 h). None of these 3 dogs had recurrence of intestinal obstruction 7 to 10 months after surgery.

The previous medical history of dogs 1 and 4 included signs of gastrointestinal tract disease. Prior to development of colonic volvulus, the medical history of dog 1 included failure to gain weight, poor body condition, and intermittent episodes of diarrhea that improved with empiric antimicrobial treatment. Dog 4 had a 4-year history of chronic, intermittent vomiting and diarrhea; previous diagnostic investigation of the vomiting and diarrhea revealed no hematologic or serum biochemical abnormalities and no abnormal findings on endoscopic examination of the esophagus and stomach. Histologic examination of jejunal biopsy specimens obtained during abdominal exploratory surgery 3 years before diagnosis of colonic volvulus in dog 4 revealed mild to moderate lymphoplasmacytic inflammation. Results of additional clinicopathologic analyses included high serum folate concentration (13 µg/L; reference range, 6.5 to 11.5 µg/L); serum trypsin-like immunoreactivity concentration (12.5 µg/L; reference range, 5 to 35 µg/L) and serum vitamin B<sub>12</sub> concentration (347 ng/L; reference range, 249 to 733 ng/L) were within reference limits. An ACTH stimulation test revealed no abnormalities (basal plasma cortisol concentration, 3.7 µg/dL [reference range, 1.0 to 5.0 µg/dL]; plasma cortisol concentration 1 hour after ACTH administration, 8 µg/dL [reference range, 6.0 to 17.0 µg/dL]). Findings of a fecal ELISA for *Giardia* organisms and microbial culture of feces were negative. In dog 4, vomiting and diarrhea improved but did not resolve with dietary modification and intermittent metronidazole administration (13 mg/kg, PO, q 12 h). Forty-five days before admission to the hospital because of colonic volvulus, dog 2 had undergone thoracotomy to treat presumptive idiopathic chylothorax at the Tufts Cummings School of Veterinary Medicine; at that time, thoracic duct ligation, pericardectomy, and omentalization were performed.

Volvulus involving the colon is uncommon in dogs and cats. Cecal-colonic volvulus was reported in 2 Great Danes,<sup>1</sup> and colonic volvulus with partial colonic torsion has been reported<sup>2</sup> in a cat. Other reports<sup>3,4</sup> may describe cases of colonic volvulus, but it is not possible to determine whether those lesions represented volvulus or torsion (in which a segment of intestine twists around its mesenteric axis or on its long axis, respectively).<sup>5</sup>

Vomiting of short duration was the most common clinical sign among the 4 dogs with colonic volvulus.

During abdominal palpation, signs of discomfort were elicited in 2 dogs and dilated segments of intestine were detected in the other 2 dogs. Abdominal radiography revealed gas-distended portions of the intestines in all 4 dogs, but the affected intestinal segment was correctly identified as the colon in only 2 dogs. Abdominal effusion was suspected in 2 dogs. Persistent, progressive, and severe distension of the intestines with gas (and the presence of intraluminal intestinal foreign material in dog 3) contributed to the decision to pursue exploratory surgery in the 4 dogs.

On the basis of a radiographic finding of gas-distended intestinal segments, volvulus of the small intestine (duodenum, jejunum, and ileum) and causes of adynamic ileus<sup>6</sup> should be considered among the differential diagnoses in addition to colonic volvulus. Ideally, the decision to proceed to surgery would follow differentiation of mechanical obstruction and adynamic ileus, but this distinction can be difficult to make (as it was in dog 1 of this report). Clinical response to fluid therapy is not helpful in differentiating causes of radiographically detectable intestinal distension,<sup>7</sup> but results of abdominocentesis may indicate disease requiring surgical treatment. In dogs with a strangulating obstruction of the intestines, findings of abdominal fluid analysis typically include orange to red color, cloudy opacity, total protein concentration of 5 to 7 g/dL, nucleated cell count  $> 100 \times 10^3$  cells/ $\mu$ L, predominance of degenerative neutrophils, and bacteria (located intra- or extracellularly). In most dogs, adynamic ileus resolves spontaneously without surgical intervention.<sup>6</sup> However, the decision to delay surgery may have resulted in severe colonic necrosis and illness in dog 1 and may have fatal consequences in dogs with other diseases requiring surgical treatment such as small intestinal volvulus.<sup>7,8</sup>

As has been reported<sup>7-9</sup> for dogs with small intestinal volvulus, preexisting or concurrent gastrointestinal tract disease may be present in dogs with colonic volvulus. In a previous report,<sup>1</sup> a dog had an incisional gastropexy performed for treatment of GDV 1 year before development of colonic volvulus; a cat with colonic volvulus and partial colonic torsion<sup>2</sup> had previously been evaluated for chronic diarrhea and weight loss, for which a cause remained undetermined despite thorough diagnostic investigation. Dog 1 of this report had poor body condition and diarrhea before development of colonic volvulus and developed GDV approximately 1 month after treatment of the colonic volvulus. Although a specific gastrointestinal tract disorder was not identified in dog 1, its breed<sup>5,7-12</sup> and clinical history may indicate gastrointestinal dysfunction. Dog 2 did not have apparent gastrointestinal tract disease, although the role that omental transposition played in development of colonic volvulus in this dog is unclear. Dog 3 may have had altered intestinal motility caused by a foreign body.<sup>13</sup> Dog 4 had a history of chronic vomiting and diarrhea, the cause of which remained uncertain despite thorough diagnostic investigation. Histologic examination of full-thickness jejunal biopsy specimens revealed mild to moderate lymphoplasmacytic inflammation; although the clinical importance of this finding was unclear, it is possible that dog 4 had

inflammatory bowel disease with resultant abnormal intestinal motility<sup>14,15</sup> and propagation of abnormal contractions across the ileocolic junction.<sup>b</sup>

Several factors may contribute to the severity of illness in dogs with colonic volvulus. As in dogs with small intestinal volvulus,<sup>16</sup> the degree and the duration of colonic volvulus both likely impact the extent of vascular occlusion in the intestinal tissues. In the previous report<sup>1</sup> of a dog with colonic volvulus in which the intestinal rotation was 360°, shock developed preoperatively and fatal cardiopulmonary arrest developed postoperatively; this is in contrast to the survival with mild associated illness of 2 of 3 dogs (dogs 2 and 3) of this report and 1 dog of a previous report<sup>1</sup> in which the degree of colonic rotation was 180°. The degree of intestinal segment rotation could not be determined for dog 4, which survived with mild associated illness. Duration of volvulus can be difficult to determine because it may or may not coincide with time elapsed from the onset of clinical signs to treatment. In 3 of the 4 dogs in this report, the colonic tissue was viable at the time of surgery, but each of these dogs had clinical signs for longer than 24 hours. Compared with dogs 2, 3, and 4, the necrotic condition of the colon and bacterial growth obtained on culture of an abdominal fluid sample collected before surgery in dog 1 may suggest a longer duration of volvulus.<sup>17</sup>

In dogs with volvulus of the colon in which resection is unnecessary, both right-sided gastropexy and gastrocolopexy of the transverse colon to the greater curvature of the stomach should be considered. Although a causal relationship between GDV and other forms of intestinal volvulus has not been described, GDV has occurred prior to small intestinal volvulus<sup>7</sup> and colonic volvulus,<sup>1</sup> as well as after colonic volvulus in dog 1 of this report.

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