

Mesenteric Volvulus in a Dog

Introduction:

Mesenteric volvulus is a rare, often fatal, disorder that involves twisting of the intestine on its mesenteric axis.¹ The mesenteric root contains the cranial mesenteric artery and vein, and the intestinal lymphatic vessels. In most cases of mesenteric volvulus the cranial mesenteric vessels become obstructed leading to ischemic necrosis of the bowel from the distal duodenum to the proximal descending colon.¹ Death is typically caused by a cascade of vascular obstruction, intestinal anoxia, circulatory shock, endotoxemia, and cardiovascular failure.¹

Mesenteric volvulus occurs most commonly in adult, male, large-breed dogs.¹ Clinical signs include acute onset of shock, lethargy, and abdominal pain and distention, with or without vomiting, diarrhea, hematemesis, or hematochezia.¹

Most cases of mesenteric volvulus have no identifiable cause, however many predisposing factors have been proposed.¹ Breed (German Shepherd Dog), recent abdominal surgery, dietary indiscretion, exocrine pancreatic insufficiency, inflammatory bowel disease, concurrent gastric dilatation and volvulus, gastrointestinal foreign bodies, treatment of ascariasis, or parvovirus infection have been suggested as possible predisposing causes.¹

Prophylactic gastropexy has also been associated with increased risk of mesenteric volvulus, however the benefit of gastropexy in preventing gastric dilatation and volvulus likely outweighs the potential risk of mesenteric volvulus.¹

Diagnosis of mesenteric volvulus is based on imaging. Abdominal radiographic findings include dilation of most of the small bowel with gas and fluid.² Peritoneal effusion is variable

and concurrent torsion of other organs (stomach and/or spleen) is possible.² Clinicopathological results are variable and may be within normal limits initially.

Differential diagnoses for mesenteric volvulus include small intestinal mechanical obstruction and functional ileus.² Patients with mesenteric volvulus generally present more painful and hemodynamically unstable than patients with ileus or obstruction, and rapidly deteriorate clinically.²

Treatment/Management/Prognosis:

Treatment for mesenteric volvulus involves aggressive initial stabilization and immediate surgery to reduce the obstructed mesenteric root.¹ Resection of affected bowel may be necessary. Short bowel syndrome is possible if large sections of bowel must be removed.

Prognosis is grave even with early detection and intensive management. Mortality rates reported in the literature vary from 58% to 100%.¹ Many patients are euthanized due to the severity of intestinal necrosis present. Death secondary to reperfusion injury is also possible after derotation of the bowel.

Case History and Presentation:

A six-year-old intact male Belgian Malinois/German Shepherd Dog mix weighing 29.7 kg with a body condition score of 4/9 presented for emergency evaluation of acute onset lethargy. The dog was a police K9 and was on shift when the handler noted that he had one episode of diarrhea and became severely lethargic. The patient had had some previous occasional diarrhea and had recently lost approximately two kg of body weight despite a good appetite. The patient had been otherwise healthy and was performing his job well until the day of presentation. The patient had no previous surgical history.

At the time of presentation the patient was quiet but responsive. The patient was tachycardic (200 beats per minute) and tachypneic (60 breaths per minute) with pale, tacky mucus membranes. The patient did not tolerate abdominal palpation. An intravenous catheter was placed and the patient was administered methadone (0.2 mg/kg, IV, once) and started on a 20 ml/kg bolus of Lactated Ringers Solution while diagnostic testing was performed.

Blood testing identified mild hyperglycemia and lymphopenia consistent with a physiologic stress response, hemoconcentration and elevated creatinine consistent with dehydration, and mildly elevated alanine aminotransferase thought to be secondary to intestinal inflammation.

Abdominal radiographs showed numerous mild-moderately dilated segments of small intestine, mild-moderate peritoneal effusion, and heterogenous soft tissue opaque material within the small intestine in the mid-ventral abdomen. The appearance of the intestine was most consistent with mechanical obstruction, however severe functional ileus or intestinal torsion/volvulus was not excluded.

Abdominal ultrasound confirmed a small amount of free fluid within the abdomen, however an area large enough to sample was not visualized. Multiple segments of dilated, non-motile bowel were identified throughout the abdomen.

Due to the acute onset and severity of the patient's clinical signs, concern for intestinal torsion/volvulus was high and emergency laparotomy was recommended.

Case Management and Outcome:

The patient was pre-medicated with dexmedetomidine (0.005 mg/kg, IV). Ampicillin sulbactam (22 mg/kg, IV over 5 minutes) was administered during patient preparation. Mepivacaine (2 mg/kg, SC) was used for incisional anesthesia. General anesthesia was induced with alfaxalone (1 mg/kg to effect, IV), an endotracheal tube was placed, and

anesthesia was maintained with inhalant isoflurane and oxygen. During surgery the patient was placed on thermal support, and blood pressure (systolic, diastolic, and mean arterial pressure), oxygen saturation, respiratory rate, end-tidal carbon dioxide level, heart rate, electrocardiogram, and temperature were measured and recorded every 5 minutes. A crystalloid replacement solution was administered intravenously at a rate of 10 mL/kg/hour.

A ventral midline surgical approach was used, extending from the xyphoid to the prepuce. A large amount of moderately distended, purple, edematous bowel was visible within the abdomen. The bowel was carefully exteriorized and the mesenteric root evaluated. A 180 degree anticlockwise mesenteric volvulus was identified and immediately corrected.

A sample of abdominal fluid was collected for evaluation which revealed a modified transudate with no evidence of infectious agents or neoplasia. The patient was administered enrofloxacin (5 mg/kg, IV over 5 minutes, once) due to concern for bacterial translocation.

The bowel was evaluated from the stomach to the colon. The intestine, associated mesentery, and mesenteric lymph nodes from the distal duodenum to the cecum were moderately edematous and purple. The small intestine was distended with fluid and gas, and had no evidence of peristalsis. A large volume of fluid and gas was also present within the colon. This material was gently milked to the rectum, resulting in the evacuation of a large volume of foul-smelling, bloody diarrhea.

The bowel was placed back in to the abdominal cavity and reevaluated after five minutes. At this time, the bowel color was improved and there was a decrease in the amount of edema present. Return of peristalsis was visualized throughout the intestine.

The abdomen was lavaged with warm sterile saline and suctioned two times, and the abdomen was closed. The linea alba was closed with 2-0 polydioxanone in a simple continuous pattern. The subcutaneous tissue was closed with 3-0 polydioxanone in a simple continuous pattern. The skin was closed with 3-0 polydioxanone in a continuous subcuticular pattern.

During the approximately 60-minute surgery the patient became hypotensive on three occasions. The first episode was the most severe (60/42, with mean 48 mmHg) and occurred immediately after derotation of the mesenteric volvulus. This episode was treated with a 20 mL/kg bolus of crystalloid fluid as well as 4 mL/kg of hypertonic saline (7.2% NaCl) given intravenously. Subsequent events were less severe and improved with administration of a crystalloid fluid bolus (20 mL/kg). The patient's inhalant anesthetic dose was also adjusted based on patient parameters.

The patient recovered from surgery uneventfully. He was hospitalized on IV crystalloid fluids, and received methadone (0.2 mg/kg, IV, q 4 h), ampicillin/sulbactam (22 mg/kg, IV slow, q 8 h), and enrofloxacin (5 mg/kg, IV, q 24 h). During this time, refeeding was instituted using small, frequent meals of a commercially available critical care diet. The patient was discharged on post-operative day two with directions for exercise restriction, feeding, and close monitoring for any decrease in appetite or change in demeanor. The patient was prescribed codeine (2 mg/kg PO q 8 h) for pain relief, as well as trazodone (7 mg/kg, PO, q 8-12 h) and gabapentin (10 mg/kg, PO, q 8-12 h) for anxiety during the post-operative recovery period.

Per communication with the police department one week after surgery, the patient was recovering well with no identified complications.

The patient's folate, cobalamin, trypsin-like immunoreactivity, and pancreatic lipase were evaluated three weeks after surgery to assess for underlying gastrointestinal disease that may have predisposed the development of mesenteric volvulus. The results of these tests were within normal limits.

The patient was evaluated six weeks after the day of surgery. He had made a full recovery and was deemed fit to return to work.

References and Endnotes:

1. Andrews SJ, Thomas TM, Hauptman JG, et al. Investigation of potential risk factors for mesenteric volvulus in military working dogs. *J Am Vet Med Assoc.* 2018 Oct 1; 253(7):877-885.
2. Seitz M. Twisted in Every Way: Diagnosing Abdominal Torsions, in *Proceedings. ABVP Symposium 2022*; 80-81.

Lab data/Imaging:

Table 1: Complete Blood Cell Count

Test	Result	Reference Range
WBC	8.49 x 10 ⁹ /L	6.0-17.0 x 10 ⁹ /L
LYM	0.90 x 10⁹/L L	1.0-4.8 x 10⁹/L
MON	0.49 x 10 ⁹ /L	0.2-1.5 x 10 ⁹ /L
NEU	6.96 x 10 ⁹ /L	3.0-12.0 x 10 ⁹ /L
EOS	0.10 x 10 ⁹ /L	0.0-0.8 x 10 ⁹ /L
BAS	0.04 x 10 ⁹ /L	0.0-0.4 x 10 ⁹ /L
RBC	8.67 x 10¹²/L H	5.5-8.5 x 10¹²/L
HGB	21.0 g/dL H	12.0-18.0 g/dL
HCT	56.62% H	37.0-55.0%
MCV	65 fl	60.0-77.0 fl
MCH	24.2 pg	19.5-24.5 pg
MCHC	37.1 g/dL	31.0-39.0 g/dL
RDW	17.9%	14.0-20.0%
PLT	305 x 10 ⁹ /L	165.0-500.0 x 10 ⁹ /L
MPV	9.7 fl	3.9-11.1 fl

Table 2: Serum Biochemistry

Test	Result	Reference Range
ALB	3.3 g/dL	2.2-4.4 g/dL
ALP	38 U/L	20.0-150.0 U/L
ALT	162 U/L H	10.0-118.0 U/L
AMY	491 U/L	200.0-1200.0 U/L
TBIL	0.4 mg/dL	0.1-0.6 mg/dL
BUN	22 mg/dL	7.0-25.0 mg/dL
CA	9.3 mg/dL	8.6-11.8 mg/dL
PHOS	6.3 mg/dL	2.9-6.6 mg/dL
CRE	1.5 mg/dL H	0.3-1.4 mg/dL
GLU	135 mg/dL H	60.0-110.0 mg/dL
NA+	146 mmol/L	138.0-160.0 mmol/L
K+	3.8 mmol/L	3.7-5.8 mmol/L
TP	5.8 g/dL	5.4-8.2 g/dL
GLOB	2.5 g/dL	2.3-5.2 g/dL

Figure 1: Abdominal Radiographs

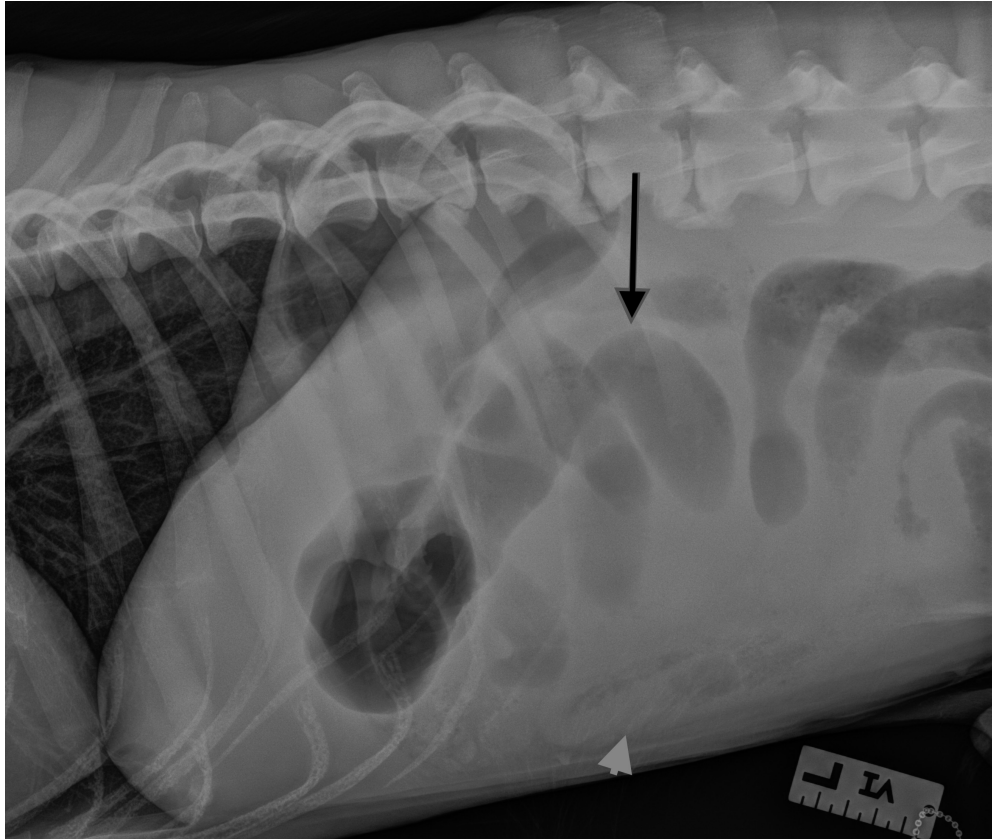


Figure 1a: Left lateral cranial abdomen. Dark arrow indicates gas distention in the small intestine. Light arrow head indicates soft-tissue opaque material in the small intestine.

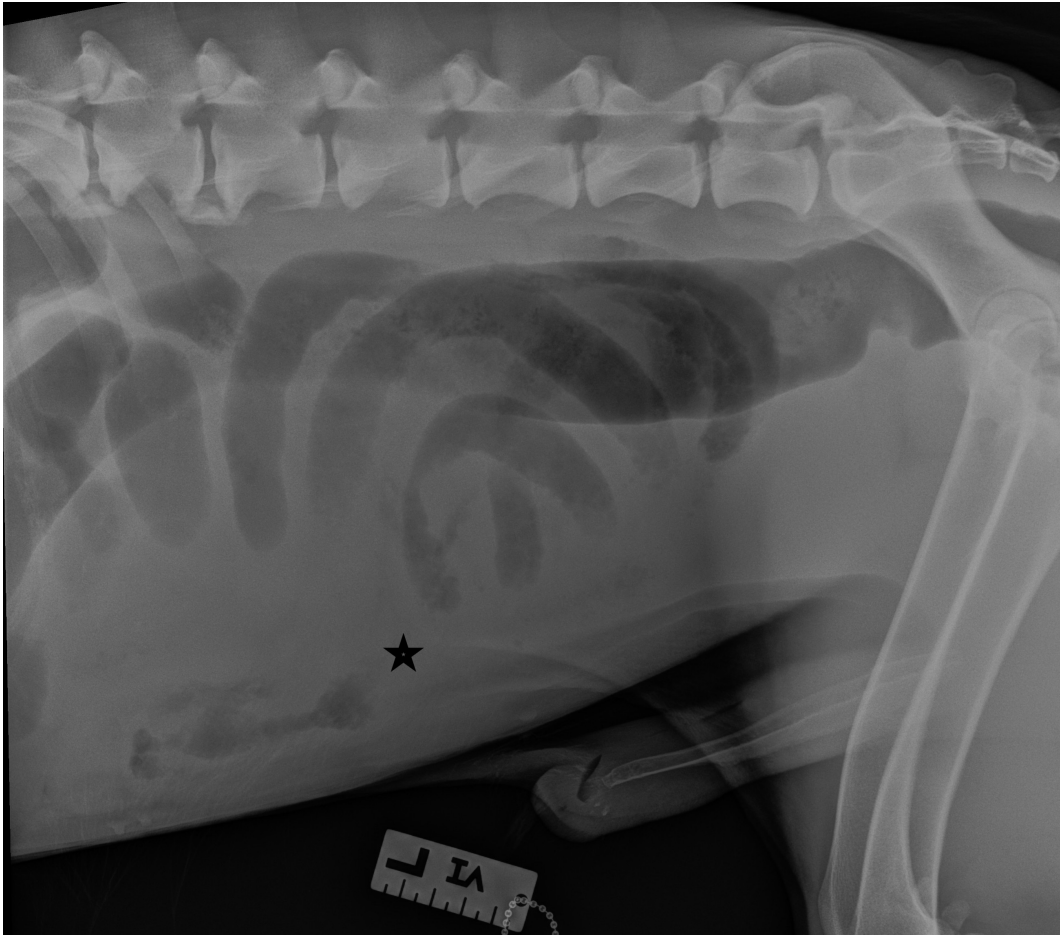


Figure 1b: Left lateral caudal abdomen. Star indicates loss of serosal detail consistent with peritoneal effusion

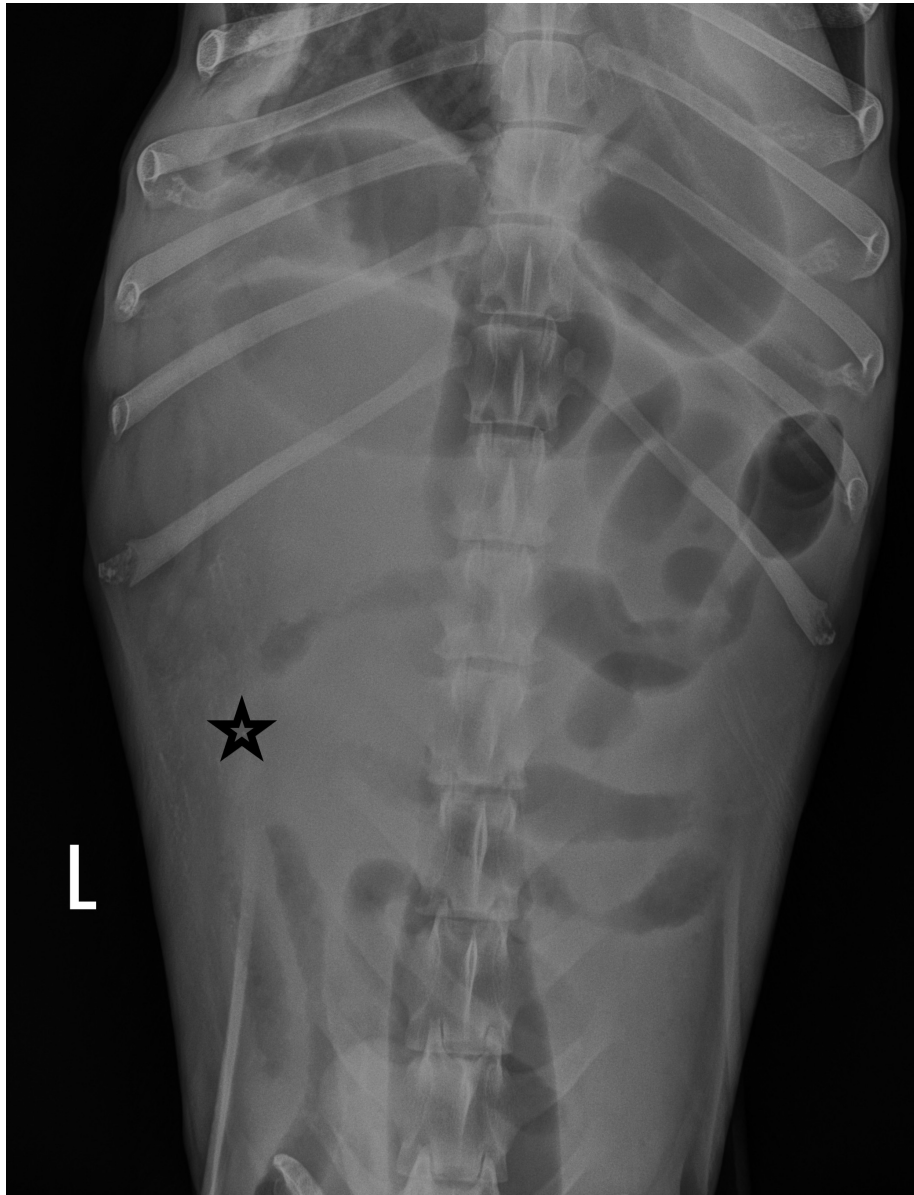


Figure 1c: Ventrodorsal abdomen. Star indicates loss of serosal detail consistent with peritoneal effusion

Table 3: Abdominal Fluid Analysis

Test	Result	Interpretation
Appearance	Serosanguinous	
Specific gravity	1.019	Modified transudate
Total protein	2.1 g/dL	Modified transudate
Cytology	Low total nucleated cellularity composed of predominantly erythrocytes on a pale basophilic, fluid background. Rare platelet aggregates and low numbers of blood-associated leukocytes. No atypical cells or infectious agents identified.	Modified transudate with no evidence of infectious agents or malignancy

Table 4: Serum Testing for Gastrointestinal Disease

Test	Result	Reference Range
Trypsin-like immunoreactivity	29.9 mcg/L	5.7-45.2 mcg/dL
Pancreatic lipase	48 mcg/L	<200 mcg/L
Folate	12.2 mcg/L	7.7-24.4 mcg/L
Cobalamin	668 ng/L	251-908 ng/L