HOW I TREAT GASTROINTESTINAL OBSTRUCTION

Catriona MacPhail, DVM, PhD
Diplomate, American College of Veterinary Surgeons (ACVS)
ACVS Founding Fellow, Surgical Oncology
Associate Professor, Soft Tissue Surgery
Colorado State University, Fort Collins, Colorado, USA

Gastrointestinal obstruction is a common condition encountered in small animal medicine. Obstruction is classically categorized as either mechanical or functional. Mechanical obstruction in the gastrointestinal tract is most often due to entrapped intraluminal foreign material, but can also be caused by intussusception, intestinal entrapment, torsion, mucosal or muscular hypertrophy, or neoplasia. For dogs and cats that present with acute signs of gastrointestinal disease, obstruction is a primary differential. Clinical signs are associated with the location of the obstruction within the gastrointestinal tract, the duration of obstruction, and whether the obstruction is partial or complete.

Focal Obstruction

Focal mechanical gastrointestinal obstruction occurs following indiscriminate ingestion of unusual items. There is no specific signalment associated with gastrointestinal foreign body obstruction, although there is a tendency for affected dogs and cats to be relatively young (< 4 years). Frequently ingested items include, but are not limited to, rocks, bones, corncobs, peach pits, balls, toys, plant material, and clothing items. Common locations for focal foreign bodies to become lodged include the pylorus, duodenal flexure, and ileocolic junction, although items may become lodged at any point along the gastrointestinal tract.

Animals typically present with acute and protracted vomiting, and can be clinically dehydrated with severe electrolyte imbalances. Abdominal palpation is usually painful and the foreign object can occasionally be felt. Complete mechanical obstruction can lead to breakdown of the gastrointestinal mucosal barrier, wall necrosis, or perforation, and have a high likelihood of causing hypovolemic and septic shock.

Foreign bodies lodged in the pylorus or proximal duodenum may show classic bloodwork abnormalities of gastric outflow obstruction. In these cases protracted vomiting causes significant loss of gastric secretions. This results in hypochloremic, metabolic alkalosis. Distal gastrointestinal obstruction more commonly results in metabolic acidosis

Diagnosis of gastrointestinal obstruction can be made from two-view abdominal radiographs, which may show the foreign material if it is radiodense. Otherwise, obstruction is suspected based on the dilation of obstructed intestinal loops with air or fluid. With no history of recent abdominal surgery, the presence of free abdominal gas is an immediate indication for surgery. If the diagnosis is not apparent from the initial radiographic study, repeat abdominal radiographs, contrast studies, or ultrasonography may be necessary. Contrast studies should be performed with caution, as barium contrast agents are contraindicated if perforation is suspected, and iodinated contrast agents may exacerbate dehydration. A recent study found that when using abdominal ultrasound to diagnose small intestinal mechanical obstruction there is greater accuracy, fewer equivocal results, and greater diagnostic confidence when compared to abdominal radiography.

Focal gastrointestinal obstruction is a surgical emergency. A full abdominal exploratory should be performed first. Although there are several significant differences in the healing properties of the

stomach, small intestine, and large intestine, the same suturing principles apply regardless of the location of the foreign body within the gastrointestinal tract. Gentle tissue handling, adequate tissue purchase, use of appropriate suture material, and proper suture placement will ensure a secure closure. Contamination of the peritoneal cavity should be kept to a minimum by packing off the abdomen and using one of several methods to hold back ingesta and fluid within the intestinal tract. These include: an assistant's fingers, Doyen intestinal forceps, buffered Alice tissue forceps, wide umbilical tape, penrose drains, etc.

Gastric foreign bodies are removed through routine gastrotomy. The procedure is facilitated with the placement of stay sutures at each end of the proposed incision. The body of the stomach is opened with a stab incision into the lumen in a relatively avascular area between the greater and lesser curvatures. The incision is continued with Metzenbaum scissors to create an opening large enough to remove the foreign material.

For closure of a gastrotomy incision, synthetic absorbable monofilament suture (e.g., 3-0 or 4-0 Monocryl, Biosyn, or PDS) with a swaged-on taper needle is the material of choice. There are numerous techniques to choose from when deciding how to close the stomach. Regardless of the suture pattern, the common theme for all gastrointestinal surgery is inclusion of the submucosal layer in the closure. Full-thickness purchase of the tissue ensures that this holding layer is incorporated in the suture line. Specific options for gastrotomy closure include:

- Single-layer full-thickness simple continuous pattern
- Single-layer full-thickness simple interrupted pattern
- Two-layer continuous inverting pattern
    - Full-thickness simple continuous pattern followed by,
    - Partial-thickness (seromuscular) Lembert or Cushing pattern
- Two-layer continuous inverting pattern
    - Simple continuous to close the mucosa and submucosa followed by,
    - Partial-thickness (seromuscular) Lembert or Cushing pattern

For simple gastrotomy, a single-layer full-thickness simple continuous pattern is preferred due to increased efficiency and decreased amount of suture material used. A two-layer pattern may be more appropriate if performing a partial gastrectomy or if there is a concern about tissue viability.

Foreign bodies located in the small intestine are approached through a longitudinal incision aboral to the obstruction. Following removal of the foreign material, the intestine is evaluated for viability. If there are any concerns about the health of the small intestine, a resection and anastomosis should be performed. Otherwise, the enterotomy incision is closed with a single-layer appositional pattern using 4-0 monofilament absorbable suture (e.g., Monocryl, Biosyn, PDS).

Luminal compromise is not typically an issue with simple enterotomies, however some prefer to routinely close small longitudinal incisions transversely to avoid this problem altogether. Inverting patterns have been proposed to minimize mucosal eversion and the formation of adhesions. However, since adhesions are an infrequent problem in small animals and since luminal diameter is significantly decreased by inverting the tissue, this technique is not recommended. Options for simple enterotomy closure include:

- Single-layer simple interrupted approximating pattern
- Single-layer simple continuous approximating pattern

Sutures are placed 2 mm from the incised edge and 2 to 3 mm apart. Continuous patterns are begun and ended beyond the edges of the enterotomy to ensure closure of the entire incision.

If a perforation exists or if there are concerns about intestinal viability, resection and anastomosis should be performed. Assessing the tissue viability of the gastrointestinal tract can be challenging. Most often subjective parameters of viability are relied on to make the decision between enterotomy and resection. These parameters include: color, peristalsis, arterial pulsation, capillary (cut surface) bleeding, and tissue thickness. Objective parameters (e.g., fluorescein dye, Doppler flowmetry) offer little information to improve the subjective assessment.

As with enterotomy closure, single-layer approximating patterns are preferred for intestinal anastomosis. Simple continuous patterns are faster and use less suture material, which is not only economical, but also decreases the amount of foreign material in the abdominal cavity. Tissue apposition is also thought to be better. The concern about creating a purse-string effect with a continuous pattern can be avoided if a modified simple continuous pattern is performed. In this technique, two suture lines are used, one originating at the mesenteric border and the other originating at the antimesenteric border. Good visualization of the mesenteric knot is imperative as this is the most common site for leakage. A single-layer full thickness continuous suture line is placed from the mesenteric knot to the stay suture at the antimesenteric knot with tissue purchases 2 mm from the wound edge and 2 mm apart. This is repeated on the other side from the antimesenteric knot to the mesenteric knot. There is no difference in reported rates of dehiscence between animals with simple continuous anastomotic closures and animals with simple interrupted closures.

An alternative to traditional hand-suturing for intestinal anastomosis, is to use surgical staplers. The gastrointestinal anastomotic stapler (GIA) creates a side-to-side anastomosis with a lumen of approximately 4-5 cm in length. Surgical staples are strong, inert, and efficient.

If there is luminal disparity between the two ends being anastomosed, this can be addressed in a variety of ways depending on the degree of discrepancy. Methods to address this issue include:

- Adjust suture spacing (closer on smaller end, farther apart on larger end)
- Cut small end at more oblique angle
- Make an incision or excise wedge from antimesenteric border of smaller end
- Suture down the larger end to match the smaller end
- Perform an end-to-side anastomosis
- Perform a side-to-side anastomosis (GIA stapler)

Postoperatively, animals are recovered ideally with continuous –rate infusions of multimodal analgesia (e.g., opiates [fentanyl], lidocaine). Food and water can be offered once the animal is awake and sternal. For surgeries classified as clean-contaminated, antibiotics are typically discontinued at the end of surgery. If antibiotics are continued following surgery, the clinical signs associated with visceral dehiscence may be masked. Animals should be monitored closely for evidence of leakage: tachycardia, abdominal pain, abdominal effusion, etc.

Linear obstruction

Gastrointestinal obstruction with linear material is a unique situation most commonly associated with cats. Foreign bodies such as string, thread, or cloth are ingested and become anchored typically at the base of the tongue or at the pylorus. Peristalsis advances the foreign body into the intestine. However, as a result of the anchor, the intestine will gather around the foreign material. This plication of the

intestines may cause a complete or, more often, partial obstruction. Intestinal peristalsis continues against the fixed material and may lacerate the mucosa and cause perforations along the mesenteric border.

Diagnosis of linear obstruction can be challenging. A thorough physical examination may provide the most information. Careful oral examination may reveal foreign material anchored around the base of the tongue. Abdominal palpation is frequently painful and may reveal a large mass of bundled intestines. Abdominal radiographs may show bunching of the small intestine (enteroplication) in the right cranial quadrant on the ventrodosal projection and along the ventral abdomen on the lateral projection. The appearance of 3 or more small, eccentrically located, luminal gas bubbles tapered at one or both ends was diagnostic for linear foreign body in one study. If the diagnosis is still uncertain, other imaging techniques, such as upper gastrointestinal contrast studies or abdominal ultrasonography, may be required. Ultrasonographic appearance of a linear foreign body is described as a central hyperechoic line with intestine plicated on either side. Contrast agents should be administered with caution as it has been reported that 16% of cats had intestinal perforation found at surgery.

Linear foreign bodies are considered surgical emergencies. Conservative management of linear foreign bodies has been reported. However, in that study 42% of cats that were initially managed medically ultimately went to surgery. Given that perforated intestine from the linear foreign body carries a ~ 50% mortality rate, emergency surgical intervention is the treatment of choice. Multiple enterotomies are typically required for removal for linear foreign bodies. This allows for segmental removal of the material and minimizes the risk of iatrogenic perforation from too much traction. Simple enterotomies are closed with an appositional simple interrupted or simple continuous pattern using monofilament absorbable suture material as described above.

Depending on the extent of damage, intestinal resection and anastomosis may be indicated. Due to the mesenteric fat, perforations along the mesenteric border can be difficult to identify and to suture appropriately. This is the most common site for dehiscence following intestinal resection and anastomosis. In this scenario, resection and anastomosis may be preferable to primary closure of the site in the mesenteric border of the intestine. Alternatively, serosal patching of repaired mesenteric perforations may be performed.

Intussusception

Gastrointestinal obstruction due to intussusception occurs when a segment of intestine (intussusceptum) moves into the lumen of an adjoining segment (intussuscipiens). Intussusception has been reported at all levels of the gastrointestinal tract with ileocolic intussusceptions being most common. Causes have been attributed to intestinal parasitism, linear foreign bodies, previous abdominal surgery, inflammatory bowel disease, and neoplasia, although often the cause is unknown. Diagnostic imaging is mostly used to confirm what is already suspected from abdominal palpation. A typical finding on abdominal radiographs is a large tubular soft-tissue density structure along the ventral abdomen. The characteristic ultrasonographic appearance of an intussusception is a multilayered target-like image in the transverse plane and alternating hyperechoic and hypoechoic parallel lines in the longitudinal plane.

Emergency surgical intervention is the treatment of choice for intussusception. At surgery, manual reduction of the intussusception should be gently attempted, but it is often not successful. If reduced, the involved intestine (or intussusceptum) is evaluated for perforations and viability. Intestinal resection and anastomosis is indicated when manual reduction fails or if the reduced tissue is

devitalized. The resected segment should be submitted for histopathological evaluation to potentially identify the cause of the intussusception. Enteroplication (or enteroenteropexy) is described to prevent recurrence; however complications may result from this procedure. Both intussusception recurrence and severe postoperative complications associated with enteroplication have been reported in the dog and cat.

SUGGESTED READING:

Anderson S, Lippincott CL, Gill PJ: Single enterotomy removal of gastrointestinal linear foreign bodies. *J Am Anim Hosp Assoc* 1992;28:487-490

Applewhite AA, Hawthorne JC, Cornell KK. Complications of enteroplication for the prevention of intussusception recurrence in dogs: 35 cases (1989-1999). *J Am Vet Med Assoc* 2001;219:1415-1418.

Burkitt JM, Drobatz KJ, Saunders HM, et al. Signalment, history, and outcome of cats with gastrointestinal tract intussusception: 20 cases (1986-2000). *J Am Vet Med Assoc* 2009;234:771-776

Hayes G. Gastrointestinal foreign bodies in dogs and cats: a retrospective study of 208 cases. *J Small Anim Pract* 2009;50:576-83.

Hobday MM, Pachtinger GE, Drobatz KJ, et al. Linear versus non-linear gastrointestinal foreign bodies in 499 dogs: clinical presentation, management and short-term outcome. J Small Anim Pract 2014;55(11):560-5.

Patsikas MN, Papazoglou LG, Papaioannou NG, et al. Normal and abnormal ultrasonographic findings that mimic small intestinal intussusception in the dog. *J Am Anim Hosp Assoc* 2004;40:147-151

Pratt CL, Reineke EL, Drobatz KJ. Sewing needle foreign body ingestion in dogs and cats: 65 cases (2000-2012). J Am Vet Med Assoc 2014;245(3):302-8

Sharma A, Thompson MS, Scrivani PV, et al. Comparison of radiography and ultrasonography for diagnosing small-intestinal mechanical obstruction in vomiting dogs. *Vet Radiol Ultrasound* 2011;52:248-55

Weisman FL, Smeak DD, Birchard SJ, et al. Comparison of a continuous suture pattern with a simple interrupted pattern for enteric closure in dogs and cats: 83 cases (1991-1997). *J Am Vet Med Assoc* 1999;214:1507-1510

Wylie KB, Hosgood G: Mortality and morbidity of small and large intestinal surgery in dogs and cats: 74 cases (1980-1992). *J Am Anim Hosp Assoc* 1994;30:469-474