GASTROINTESTINAL FOREIGN BODY OBSTRUCTION IN DOGS

Todd Tams, DVM, Dipl. ACVIM
VCA Antech
Los Angeles, CA, USA

Howard Seim III, DVM, Dipl. ACS
Colorado State University
Fort Collins, CO, USA

Overview
GI obstructions are a common cause of vomiting in patients seen in clinical practice. Causes of anatomic obstruction include foreign bodies (linear or nonlinear), pyloroantral hypertrophic disease, polyps, intussusception, intramural masses (neoplasia, granulomatous enteritis, phycomycosis, strictures, hematoma), and extramural compression (adhesions, strangulation, volvulus). Functional obstruction is caused by such disorders as adynamic ileus (e.g., surgical operations, peritonitis, sepsis, metabolic abnormalities). Intestinal obstruction can be classified as acute or chronic, partial or complete, and simple or strangulated.

Ingested foreign bodies are the most common cause of GI obstruction in dogs. Foreign bodies become impacted in the gastrointestinal tract at both normal anatomic and pathologic points of narrowing. The major factors that determine whether a foreign body will pass uneventfully or be retained are its size and configuration (e.g., rough versus smooth edges, presence or absence of projections, and width).

Many foreign bodies that enter the stomach pass through the remainder of the gastrointestinal tract without difficulty. However, large smooth objects (e.g., rocks, balls, lead sinkers), nonpliable materials (e.g., leather, plastic), and objects with sharp or irregular edges may be retained in the stomach because they are either too large to pass through the pylorus or their sharp edges become impacted in the antrum, pylorus, or cardia. Other points of normal anatomic narrowing in the gastrointestinal tract that occasionally become impacted with foreign material include the angles of the duodenum, ileocecal valve, and anus. Additionally, pathologic abnormalities in the intestine, such as strictures, tumors, and areas of prior surgical intervention, predispose to lodgment of foreign bodies.

Clinical Signs
Presenting signs of GI obstruction are variable, ranging from acute onset of frequent vomiting, to intermittent vomiting, and even chronic intermittent vomiting, depending on the location, type, and size of the obstructing lesion (e.g., foreign body, mucosal hypertrophy, mass, sliding intussusception). Other signs can include decreased appetite or complete anorexia, lethargy, abdominal pain, and weight loss. While there are myriad potential causes of vomiting, the possibility of a foreign body should always be included on the differential diagnosis list of dogs of any age with a history of vomiting.
Gastric foreign bodies are commonly associated with partial or complete outlet obstruction with accompanying characteristic symptoms. If the foreign object is freely movable, vomiting may occur only intermittently and, especially if the object is small, there may be many days when the animal displays no clinical signs whatsoever. Large foreign bodies are usually associated with frequent vomiting, and signs are usually most pronounced when the foreign body lodges in the antrum. The presence of a gastric foreign body may also cause inapetence or complete anorexia, malaise, and nonspecific mild abdominal tenderness. The combination of pain and fever suggests perforation, which may be associated with signs of peritonitis or which may be walled off with minimal or no abdominal signs evident. Toxic foreign objects may cause other clinical signs such as seizures (e.g., seizure activity related to lead toxicity) or hemolysis (e.g., zinc from pennies minted after 1982, nails, zippers or jewelry containing zinc). Small disk batteries used as an energy source for watches, hearing aids, and cameras contain alkali, such as potassium hydroxide, and the heavy metals mercury and cadmium. Toxicity depends on the leakage of these substances from their casings, the duration of contact with the mucosa, and the inherent toxicity of the chemicals themselves. Endoscopic or surgical removal of a toxic foreign body is mandatory if the object remains in the stomach for longer than 24 hours or if it lodges in the intestinal tract.

Sometimes the clinical signs that are exhibited seem incongruous with the type or size of foreign body present. For example, some small breed dogs become completely anorectic as a result of a small gastric foreign body such as a peach pit. The appetite predictably returns to normal as soon as the foreign body is removed. In other cases some foreign bodies that have been present for weeks to months cause minimal or no clinical signs.

Initial Patient Assessment
Because of the varied causes of vomiting in dogs, some serious and some not, clinicians are challenged anytime a dog is presented due to vomiting to determine what treatments should be administered at the outset and how in depth the diagnostic work-up should be and how quickly it should be done. That is, is conservative management acceptable for an individual patient, or not? Dogs with acute vomiting may have a non-life threatening or a potentially life threatening condition. Gastrointestinal signs can be secondary to disease of other organs or a consequence of systemic diseases. A complicating factor is that the clinician’s ability to do a thorough assessment in cases considered potentially life threatening may be limited by financial constraints of the client. A detailed history and physical exam are of paramount importance in the assessment of dogs presented for vomiting.

Examples of non-life threatening causes of acute vomiting include the so-called “acute gastritis” group of disorders (e.g., dietary indiscretion, abrupt diet change, ingested foreign material including foreign objects and plants, drugs such as antibiotics, NSAIDs, etc.), GI parasites (including Giardia), and motion sickness. Potentially life-threatening causes include intestinal foreign body obstruction, GI ulceration, intussusception, parvovirus enteritis, leptospirosis (and consider the zoonotic potential of this infectious disease), hepatic encephalopathy, acute pancreatitis, acute renal failure, hypoadrenocorticism, pyometra, peritonitis, etc. All of these possibilities should be considered and a diagnostic work-up is done to rule-in and rule-out various causes.
It must also be remembered that animals with acute frequent vomiting are at increased risk for developing esophagitis. This is related to frequent contact of the esophageal mucosa with gastric acid, activated enzymes (e.g., pepsin), and toxins from the GI tract. Patients that are dehydrated, weak, anorectic, and recumbent are likely at increased risk. Esophagitis can be quite painful and of course our animal patients are not able to “voice” the clinical signs of heartburn that many humans are very familiar with. The possibility of esophagitis should always be considered in dogs with acute pancreatitis, linear intestinal foreign body, parvoviral enteritis, toxic enteritis, etc.

Diagnostic Assessment
Baseline tests for dogs with acute vomiting of unknown cause include complete blood count, complete biochemical profile (“mini” panels can and will miss key diagnostic findings in some cases), urinalysis, fecal exam (required for diagnosis of GI parasites), and survey abdominal radiographs. At some institutions it is routine to perform left and right as well as ventrodorsal radiographic projections of the abdomen (3 view baseline study). This may enhance identification of obstructive disease. Baseline tests might establish a diagnosis (e.g., hypoadrenocorticism with electrolyte abnormalities, GI foreign body, liver or renal disease, the gastric parasite Physaloptera if eggs are found on a fecal centrifugation test, etc.), and if not, important direction is still gained and further tests are performed based on the baseline findings.

In animals with severe signs, emergency treatment is instituted immediately and then key diagnostic tests are evaluated as soon as possible. Key immediate tests include packed cell volume, total protein, blood glucose, electrolyte panel, blood urea nitrogen, acid-base panel, lactate, and platelet assessment.

The adverse effects of intestinal obstruction are a consequence of fluid loss into the GI tract, proliferation of intestinal bacteria, and inflammation of the intestine. Common findings in dogs with intestinal obstruction include dehydration and pre-renal azotemia. In complicated cases there may be hypoglycemia (could indicate sepsis secondary to perforation), hypochloremic metabolic alkalosis (high small bowel obstruction).

Treatment of GI Foreign Bodies
Initial medical management
Initial treatment depends on the condition of the patient. If there is minimal or no apparent patient compromise, as may be the case with a gastric foreign body, treatment might be limited to nothing offered per os (NPO), antiemetic therapy to control vomiting (e.g., maropitant [Cerenia, Pfizer]), fluid support, acid reduction (e.g. famotidine [Pepcid]), and observation to see if the foreign object will pass uneventfully or endoscopic retrieval. Antiemetic drugs with prokinetic properties (e.g., metoclopramide [Reglan]) should be avoided. Excellent antiemetic drugs that do not increase or decrease GI motility include maropitant, ondansetron [Zofran], and dolasetron [Anzemet].
Patients with a foreign body lodged in the small intestine often have more significant signs. Partial or incomplete obstruction allows for passage of fluid or gas, while complete obstruction does not. Clinical course and signs are more severe in animals with complete intestinal obstruction, and particularly with a higher small bowel obstruction. Aggressive intravenous fluid and electrolyte support are very important. Pay special attention to potassium levels to ensure that hypokalemia is prevented or corrected. Animals with a high small bowel obstruction may have hypochloremic, hypokalemic metabolic alkalosis. Distal obstructions more commonly result in hypokalemia and metabolic acidosis. In addition to antiemetic therapy and acid reduction, analgesia may also be indicated for patients with intestinal obstruction. Maropitant also provides some visceral analgesia, and is an excellent adjunct to primary analgesic drugs such as buprenorphine, hydromorphone, and fentanyl. The combination of antiemetic and acid reduction drugs helps reduce the likelihood of esophagitis secondary to frequent vomiting and may also help protect the stomach if there is erosive injury.

Parenteral antibiotics are indicated in patients with intestinal foreign body obstruction. Adverse effects of intestinal obstruction can include mucosal ischemia from impaired circulation in the mucosa and submucosa and full-thickness wall necrosis may ultimately occur at the obstruction site. This can lead to luminal bacterial overgrowth, and combined with an impaired mucosal barrier, gut permeability may increase, with bacterial migration and absorption of bacteria and toxins into the systemic circulation. Perforation leads to peritonitis.

Methods of Foreign Body Removal
Once a foreign body has been localized, the clinician must decide whether to observe for its passage or remove the object endoscopically or surgically.

Surgical Management of GI Foreign Bodies
Gastrointestinal obstruction represents one of the most common reasons to open the stomach or small bowel. Intestinal obstructions are commonly classified as high or low, partial or complete, and strangulating or non-strangulating. As a general rule, the closer an intestinal obstruction occurs to the pyloric region and the more complete the obstruction, the greater the severity of signs. High obstructions generally imply duodenum or mid-jejunum and low obstructions imply distal jejunum and ileum.

Gastric foreign bodies are removed via gastrotomy. The procedure is begun by placing full thickness stay sutures at each end of the proposed incision. These sutures are used to elevate the stomach thus preventing spillage of gastric contents and for traction and counter traction to facilitate suturing. A longitudinal incision midway between the lesser and greater curvature of the ventral aspect of the body of the stomach is made. The incision should be long enough to easily accommodate removal of the gastric foreign body and to adequately explore the entire gastric lumen and pylorus to ensure a second foreign body is not present. Closure of the incision is performed using a single layer, continuous appositional pattern with 3-0 (dogs) or 4-0 (cats) monofilament synthetic absorbable suture (Biosyn). Sutures should penetrate the
lumen (full thickness bites) in order to ensure the collagen laden submucosal layer is adequately engaged. Sutures should be placed at least 3-4 mm from the cut edge of the serosa and no further apart that 2-3 mm. A double inverting pattern is not necessary for secure stomach closure. 

Intestinal foreign bodies may be removed via enterotomy or in cases of severely devitalized bowel may require intestinal resection and anastomosis. The surgeon should be prepared to perform either an enterotomy or resection an anastomosis in each GIFB case.

When performing an enterotomy the segment of bowel to be incised should be exteriorized from the abdominal cavity, moved away from the abdominal incision, placed on a waterproof barrier (waterproof crib pad) and packed off with moistened laparotomy pads. An incision parallel to the long axis of the bowel (i.e., longitudinal) or perpendicular to the long axis of the bowel (i.e., transverse) may be made on the antimesenteric border, preferably in healthy bowel (i.e., the aboral side of the foreign body). Care should be taken to make the incision long enough to easily accommodate removal of the FB without tearing the commissures of the enterotomy incision.

Anatomic apposition of individual layers of the bowel wall (i.e., mucosa, submucosa, muscularis, and serosa) results in primary intestinal healing. Primary intestinal healing results in direct bridging of the collagen laden submucosal layer (holding layer) with rapid restoration of the villous epithelium and an undisturbed vascular pattern in the anastomotic area. Appositional techniques are superior to the older inverting or everting techniques because apposition of intestinal margins eliminates lumen compromise. Two suture patterns result in an appositional closure: simple continuous apposing and simple interrupted apposing.

Swaged-on "atraumatic" reversed cutting, fine taper point, or taper cut needles are recommended for gastrointestinal surgery. The use of any one of these needles will result in minimal tissue trauma as they are easily passed through the tough collagen laden submucosal layer. The authors’ needle of choice for gastrointestinal surgery is a half curved fine taper needle. When suturing intestine each suture should be placed 3 - 4 mm from the cut edge of the serosa and no further apart than 2 - 3 mm apart.

Simple continuous appositional pattern involves suturing all layers of the intestinal wall and careful placement of sutures as described above. The sutures should be pulled snug enough to affect a watertight seal, yet not so tight as to blanch the tissue and cause ischemia of intestinal margins. This technique is simple, fast, reliable, and does not result in lumen compromise. Simple interrupted appositional pattern is similar to the simple continuous technique, however, an interrupted suture pattern is used rather than a continuous pattern.

Recently suture companies (Covidien, Ethicon) have been manufacturing suture with extremely strong tensile strength relative to their small size diameter (i.e., smaller sizes of suture are now stronger!). In addition, the tensile strength of the smaller suture sizes is greater than the tensile strength of the tissues that are being sutured (i.e., intestinal wall). This fact has
resulted in the ability to safely use smaller size suture for GI surgery. The result is less trauma to the intestine, smaller holes in the intestine, and fewer foreign bodies (i.e., suture) left behind by the surgeon. Thus, for the majority of small intestinal surgical procedures in dogs 3-0 or 4-0 size suture material is adequate and in cats size 4-0 or 5-0 is recommended.

Intestinal anastomosis may be indicated for patients with GIFB’s that cause bowel wall ischemia. Once the affected length of bowel is identified and exteriorized from the peritoneal cavity it is isolated on a waterproof pad (waterproof crib pad) and packed with moistened laparotomy pads. The level of resection is determined, appropriate mesenteric vessels ligated, and the portion of intestine to be resected is isolated by clamping the bowel at a slight angle away from the mesenteric border. This angle ensures adequate blood supply to the antimesenteric border.

If the bowel lumens oral and aboral to the GIFB are dissimilar several options exist to create intestinal lumens of equal diameter:
1. Increase the angle of resection on the smaller diameter segment of bowel (i.e., aboral segment). This generally increases the orifice size by only 3-5 mm depending upon bowel width (e.g., dog vs cat).
2. In larger lumen size discrepancies the antimesenteric border of the smaller diameter stoma can be incised longitudinally to enlarge the lumen diameter.
3. If the smaller diameter segment of bowel cannot be enlarged, the larger diameter segment can be made smaller by closing the lumen with several simple interrupted apposing sutures.
4. An end to side anastomosis can be performed. First the larger diameter stoma is closed using a simple continuous or interrupted suture pattern. Second an appropriate size enterotomy is made in the antimesenteric border of the larger diameter segment of bowel and the smaller diameter is anastomosed to the new defect.

When suturing an anastomosis atraumatic handling of bowel wall and anatomic apposition of incised margins is important. It is recommended to begin suturing at the mesenteric border as this allows adequate visualization of mesenteric vessels and helps prevent encircling these vessels when placing each suture.

The following tips may prove helpful when performing an intestinal anastomosis.
1. First, place a stay suture to hold the mesenteric border of each segment of bowel in apposition. Tie this suture, leave the ends long, and place a hemostat on the suture end without the needle.
2. Place a second stay suture to hold the antimesenteric border of each segment of bowel and bring the ends of the intestinal segments into apposition. Place a hemostat on the ends of this suture.
3. Place gentle traction on the mesenteric and antimesenteric stay sutures to bring the two intestinal segments into apposition.
4. Using the needled segment of suture from the mesenteric stay suture, begin a simple continuous or interrupted appositional anastomosis. Make certain each suture meets the criteria stated above (bites are at least 3-4 mm from the cut edge of the serosa and no further apart than 2-3 mm). When the anastomosis is complete, tie the suture to the mesenteric stay suture.
The author's preference for evaluating the integrity of anastomotic closure is to visually examine each suture to be sure placement is no more than 2 - 3 mm apart and that each suture engages at least a 3-4 mm bite from the cut edge of the serosa. Alternatively the anastomosis can be tested by gently milking enteric material or gas to the area of the anastomosis and observe for leakage. Pressure should be mild as the small bowel is a low pressure conduit of fluid ingesta; even the best intestinal anastomosis can be "forced" to leak with enough pressure.

The prognosis for uncomplicated gastric and intestinal surgery for routine foreign body removal should be favorable. Paying attention to detail is the key to a predictably successful outcome.

The most common postoperative complication of small intestinal surgery is leak. This complication is generally caused by improper surgical technique (i.e., improper suture placement, inappropriate suture material, knot failure, sutures to far apart, inappropriate bite in the collagen laden submucosal layer, suturing nonviable bowel). A presumptive diagnosis may be accomplished by identifying a combination the following:

1. Body temperature (may be up if acute or down if moribund).
2. Abdominal palpation: periodic, gentle abdominal palpation for pain (gas or fluid?).
3. General attitude (depression anorexia).
4) Incision: examination of the patient’s incision for drainage (look at cytology if drainage is present)
5. CBC: leukocytosis followed by leukopenia (sepsis), or a degenerative left shift may imply breakdown.
6. Glucose: low glucose generally implies sepsis (this occurs early in sepsis and may be used as a screening test).
7. Abdominal radiographs: generally not helpful, they are difficult to critically assess due to the presence of postoperative air and lavage fluid. It can take 1 - 3 weeks for peritoneal air to diffuse from the abdominal cavity after routine abdominal surgery. Time variation is dependent upon the amount of air remaining in the abdominal cavity postoperatively (i.e., large deep chested animal vs. a small obese animal).
8. Abdominal tap (paracentesis): a four quadrant abdominal tap is accomplished by aspirating fluid using a 5 cc syringe and 20 gauge needle or placing a plastic IV catheter into the peritoneal cavity and allowing fluid to drip onto a slide.
9. Peritoneal lavage (if paracentesis is not productive): infuse 10-20cc/kg of sterile physiologic saline solution into the abdominal cavity, then gently palpate the abdomen and repeat the four quadrant paracentesis. This technique increases the sensitivity of paracentesis to 90%.

In a recent morbidity/mortality study of patients undergoing intestinal surgery it was found that animals requiring a second abdominal surgery to treat intestinal disorders were less likely to survive than patients requiring only one laparotomy. Also, the longer it took to determine whether or not intestinal leakage had occurred the less likely the patient would survive reoperation. The take home message is: pay attention to detail during the first surgery or if a leak occurs, diagnose it as soon as possible.