

GASTROTOMY AND GASTRECTOMY IN SMALL ANIMALS

Introduction

Gastrotomy and gastrectomy are major surgical interventions involving the opening or removal of the stomach in domestic carnivores (dogs and cats). Excellent technical mastery is essential to minimize the risk of complications, particularly peritonitis.

THE STOMACH

• Topography

In the dog, the stomach is a left post-diaphragmatic organ, located in the center of the cranial abdomen, caudal to the liver. Its long axis is perpendicular to the vertebral column, and its topography varies greatly depending on its state of fullness.

The cardia, slightly to the left of the median plane, is located a few centimeters vertically from the 11th thoracic vertebra. The pylorus is slightly to the right of the median plane.

When empty, the stomach is entirely hidden under the hypochondrium. Dorsally, it reaches the 12th left rib, and its ventral border does not reach the abdominal wall.

When very distended, the stomach can occupy most of the left half of the abdominal cavity. Cranially, it can push back the diaphragm to reach the sixth rib, and caudally, it can reach the fourth lumbar vertebra. It contacts the abdominal wall, pushing the spleen and left kidney caudally, and the jejunal loops caudally and to the right.

• Anatomy

Carnivores are monogastric animals; they possess a simple, unilocular stomach. It is a dilated part of the digestive tract that follows the esophagus at the cardia and continues with the small intestine through the pylorus. This reservoir is located caudally to the liver, in the center of the diaphragm.

The stomach temporarily retains food before sending it to the intestines. In dogs, the stomach volume varies greatly depending on breed, diet, and the state of organ fullness. Its capacity can range from 0.5 L for small breeds to 7 liters for large breeds.

• Structure

Four tunics constitute the stomach wall. From outside to inside, these are: the serosa, the muscularis, the submucosa, and the mucosa.

• **Fixation Means**

The stomach is maintained firstly by its continuity with the esophagus and the intestine, as well as by the pressure of other viscera. It is also suspended in the center of a true peritoneal framework that attaches to its entire periphery, the topographic subdivisions of which constitute: the lesser omentum, the gastro-phrenic ligament, and the greater omentum.

• **Vessels and Nerves**

The arteries originate from the three branches of the celiac artery. The left gastric artery supplies the lesser curvature and both surfaces of the body, as well as the cardia and the corresponding part of the fundus. The splenic artery irrigates the rest of the fundus and, via the left gastroepiploic artery, the left half of the greater curvature and the adjacent part of the surfaces. The hepatic artery supplies the pyloric part, with the right gastric artery (formerly "pyloric") for the regions near the lesser curvature and the right gastroepiploic artery for those bordering the right half of the greater curvature. All divisions of these arteries are very tortuous to accommodate the organ's volume variations and travel for some time under the serosa before supplying the various arterial networks of the wall.

The veins form from a network of anastomosed large capillaries around the crypts, beneath the mucosal surface, where they receive the periglandular capillaries. From this network, anastomosed venules descend deep from lobule to lobule towards the mid-height of the glandular layer, reaching a subglandular mucosal network. In the proventricular mucosa, the venous capillaries first descend within the papillae and are similarly collected into a network near the muscularis mucosae. The mucosal network is in turn drained through the latter by a rich submucosal network. Collectors originating from this network traverse the muscularis, receiving numerous tributaries, and reach a subserosal network, from which the roots of the actual gastric veins arise. These veins exactly accompany the distribution branches of the arteries. They are often present in pairs for each artery, framing them. However, near the point where they leave the viscus, they unify, and there is never more than one vein accompanying any significant artery. The major gastric veins initially mirror the arterial arrangement. However, they then separate, and the gastric, splenic, and gastroduodenal veins drain into the portal vein, which carries their blood to the liver.

Lymphatics originate as blind sacs beneath the superficial epithelium of the mucosa. They soon anastomose into a mucosal network, simple in the proventricular regions, divisible in the peptic regions into an interglandular and a subglandular network. This system supplies a submucosal network whose efferents traverse the muscularis, draining the muscular network en route, and terminate in a subserosal network. The latter is particularly dense on the stomach surfaces. Its efferents often travel a long path to reach the groups of collector lymph nodes. These nodes all belong to the celiac lymphocenter; they are multiple, and their arrangement varies with species. They are mainly the gastric, splenic, pancreatoduodenal, and celiac lymph nodes.

As for nerves, they originate from the parasympathetic system (which increases tone, motility, and secretion of the organ) via the vagus nerves and from the sympathetic system (which acts as a moderator) via the celiac plexus. The course of the former is generally distinct from that of the vessels. The ventral vagal trunk distributes its branches to the anterior surface of the body, the lesser curvature, and the pyloric part, while the dorsal vagal trunk supplies the fundus and the posterior surface. Sympathetic nerves, on the contrary, accompany the various vessels and form plexiform networks around them.

The terminals of these two systems first mix in a subserosal network, from which fibers arise that plunge into the wall and reach two important mixed plexuses containing nerve cells. The first of these is the myenteric plexus (Plexus myentericus), formerly "Auerbach's plexus": analogous to that of the intestine, it distributes its fibers to the muscularis itself, which it seems to control tonicity and motility.

The other is the submucosal plexus (Plexus submucosus), formerly "Meissner's plexus," also analogous to that of the intestine; its ultimate fibers ascend to contact the glandular cells, seemingly controlling their secretion and mucosal sensitivity. In each of these plexuses, the nerve cells represent disseminated ganglionic formations belonging to the parasympathetic system. These cells appear particularly numerous in the muscular plexus of the cardia and pylorus.

I-GASTROTOMY

Definition

Gastrotomy is an incision made in the stomach wall to access its internal cavity.

• Indications

- Extraction of gastric foreign bodies.
- Biopsies for diagnosis (gastritis, ulcers, neoplasia).
- Repair of gastric lesions.
- Interventions in cases of gastric dilatation-volvulus (GDV).

• Contraindications

- Severe hemostasis disorder.
- Portal hypertension.
- Ongoing infection.
- Respiratory insufficiency.
- History of abdominal surgery should warrant caution.
- Renal insufficiency.
- Presence of ascites.
- Severe malnutrition.

Preoperative Preparation

- Food fasting: 12 to 24 hours.
- Stabilization: fluid therapy, electrolyte correction.
- Antibiotic prophylaxis.

Surgical Steps

1. Preparation and Abdominal Incision:

- Patient positioning in dorsal recumbency.
- Wide shaving and disinfection.
- Ventral midline laparotomy (xipho-pubic incision as needed).

2. Isolation of the Stomach:

- Place two stay sutures in the stomach, one at each end of the intended incision site.
- Gently remove the stomach from the abdomen.
 - Place moistened laparotomy sponges or compresses between the stomach and the remaining abdominal viscera to prevent contamination of the viscera by gastric contents.

3. Gastric Opening:

- Make an incision midway between the greater and lesser curvatures of the stomach. This area is relatively avascular.
- Make an initial incision, then use scissors to enlarge the incision, following the curvature of the stomach.
- Make the incision long enough to adequately visualize and remove the foreign body.
- Remove the foreign body.
- Rinse the stomach lumen with a small amount of warm saline solution.
- Inspect the gastric lumen.

4. Stomach Closure:

- Close the mucosa and submucosa with a simple continuous suture using a monofilament, synthetic absorbable suture material (3-0 to 4-0).
- Close the seromuscular layer with an inverting continuous Lembert or Cushing suture, also using a monofilament, synthetic absorbable suture material.

5. Rinsing and Abdominal Cavity Closure:

- Abundant peritoneal lavage with warm physiological saline.
- Closure of the abdominal wall in three layers (peritoneum/muscle, subcutaneous, skin).

Postoperative Care

- Monitoring for signs of peritonitis or infection.
- Administration of analgesics and antacids (omeprazole).
- Gradual introduction of liquid food.

GASTRECTOMY

Definition

Gastrectomy is the partial or total removal of the stomach, often used to treat tumors, perforated ulcers, or necrosis due to GDV.

Indications

- Gastric neoplasia (adenocarcinoma, lymphoma).
- Perforating gastric ulcers.

- Necrosis secondary to gastric dilatation-volvulus.

Types of Gastrectomy

1. **Partial:** Removal of a portion of the stomach.
2. **Total:** Rare, requires esophagojejunal anastomosis.

Surgical Steps

1. Preparation and Abdominal Incision: Positioning and preparation similar to gastrotomy.
2. Identification of the Area to be Resected: Visualization and palpation of the lesion. Clamping of vessels in the affected area to control bleeding.
3. Gastric Resection: Removal of the affected part (neoplasia or necrotic tissue). Preservation of a healthy safety margin.
4. Gastrointestinal Anastomosis: Creation of an anastomosis (gastroduodenostomy or gastrojejunostomy). Two-layer suture (mucosa and serosa/muscularis).
5. Leak Test: Injection of physiological saline into the stomach to check for leaks.
6. Rinsing and Abdominal Closure: Abundant lavage of the abdominal cavity. Standard three-layer closure.

Postoperative Care

- Close monitoring during the first 48 hours (temperature, signs of pain, vomiting).
- Drug treatment: gastric protectants, antibiotics.
- Parenteral or liquid nutrition.

Potential Complications

1. Anastomotic leakage leading to peritonitis.
2. Delayed gastric emptying post-surgery.
3. Wound or intra-abdominal infections.
4. Peritoneal adhesions that may complicate future interventions.

Conclusion

The success of gastrotomy and gastrectomy relies on rigorous planning, precise surgical technique, and attentive postoperative management. Technical expertise is essential to minimize complications and ensure good patient recovery.

GASTRODUODENAL ULCER

The ulcer is a chronic inflammation of the digestive tract that can be linked to several factors. This problem can be very painful depending on the case and lead to serious complications.

Gastroduodenal ulcer is a deep wound that forms in the inner wall of the digestive tract. It can have two localizations: gastric ulcer when located in the stomach and duodenal ulcer when located in the duodenum, the first part of the small intestine.

However, duodenal ulcers are 10 times more common than gastric ulcers. Several factors can increase the risk of an ulcer's appearance, but it is always linked to an imbalance in the gastric region.

Indeed, stomach cells produce a very acidic juice used for food digestion. To prevent this substance from attacking the digestive tract mucous membranes, other cells produce mucus and bicarbonate to protect the walls. In the case of an ulcer, this process is disrupted, and the mucous membranes are attacked by the acidity of the juice.

The ulcer is a disease that progresses in flare-ups and can lead to serious complications such as perforation or digestive hemorrhage. Although this disease has been known for a very long time, a discovery revolutionized its understanding in 1983 when researchers identified a major cause of the ulcer: the bacterium *Helicobacter pylori*.

In Dogs

Symptoms of canine ulcers are vomiting (often with "coffee ground" blood), abdominal pain, lack of appetite, weakness, and black, tarry stools. Pain appears and disappears in flare-ups that can last a few weeks, interspersed with symptom-free periods. The appearance of nausea, vomiting, blood in the stool, fatigue, or weight loss signals a worsening of the ulcer.

Medical Treatment:

Treatment relies on two types of medication. First, antisecretory drugs that reduce gastric acid secretions and thus help ulcer healing.

- Cimetidine (Tagamet): Reduces gastric acid, promoting ulcer healing.

- Sucralfate: Forms a protective gel within the ulcer lesion.
- Special diet: Low-fat diet to combat stomach ulcers.

In case of *H. pylori* infection, antibiotics are combined with antisecretory drugs.

Surgical Treatment:

This type of treatment is generally indicated when there are complications like hemorrhage or perforation. It may also be decided in case of failure to heal. Interventions vary depending on the case and may, for example, consist of removing part of the stomach.

2. GASTROPEXY**Introduction**

Gastric dilatation-volvulus often has a fatal outcome in large breed dogs. The pathophysiology of this syndrome is only partially understood. Surgery is essential in cases of gastric torsion and is recommended for simple dilatation. Prophylactic gastropexy involves fixing the stomach to the abdominal wall to prevent this syndrome.

GASTRIC DILATATION-VOLVULUS SYNDROME (GDV) IN DOGS

GDV is a hyperacute abdominal disease characterized by the accumulation of gas and liquids in the stomach, causing its dilatation followed by torsion. A state of shock rapidly sets in, leading to death within a few hours.

Risk Factors

- Stressful event.
- Age (5 to 8 years average).
- History of GDV.
- Family history.
- Dietary factors (elevated bowl, one large meal per day, rapid eating, large water intake, exercise after a meal) are considered less significant than breed and stress.

Symptoms

- Whining, restlessness.

- Unsuccessful attempts to vomit.
- Copious, foamy salivation.
- Abdominal distension.

Diagnosis

Radiography distinguishes simple dilatation from dilatation-volvulus. Surgery is necessary regardless of the result.

Prognosis

Without intervention, death occurs within 6 to 12 hours. Mortality has decreased significantly with advances in resuscitation.

Medical Treatment

1. **Fluid Therapy:** Major element to restore blood volume, tissue oxygenation, and limit reperfusion injury.
2. **Decompression:** Gastric decompression is the second major element, rapidly restoring venous return, ventilation, and gastric wall perfusion.

Surgery

Gastropexy can be performed via laparotomy or laparoscopy.

Objectives: Decompression, derotation of the stomach, assessment of splenic and gastric viability (with gastrectomy or splenectomy if necessary), and fixation of the stomach to the abdominal wall to prevent recurrence.

Incisional Gastropexy

After returning the stomach to its normal position, a 5 cm seromuscular incision is made on the pyloric antrum between the greater and lesser curvatures. Opposite this incision, a similar incision is made 2-3 cm caudal to the last rib on the right side, through the peritoneum and transverse abdominal muscle, parallel to the muscle fibers. Two continuous sutures are placed: the first connecting the deep parietal margin to the corresponding gastric margin, the second between the two more superficial margins.

Belt-Loop Gastropexy

A seromuscular flap is created on the pyloric antrum along the greater curvature, centered on two or three branches of the gastroepiploic artery. Two parallel incisions (approx. 5 cm, 3 cm apart) are made caudal to the last rib on the right side. The flap is tunneled through these incisions and sutured back to its original gastric position.

Circumcostal Gastropexy

Similar to belt-loop gastropexy, but the seromuscular flap is tunneled under the 11th or 12th right rib, taking care not to damage the diaphragm.

Linea Alba Gastropexy

Incorporates the gastric seromuscular layer into the laparotomy closure. This technique is simple but carries a risk of gastric incision during future surgeries and is therefore not recommended.

Gastrostomy Tube Gastropexy

Involves placing a gastrostomy tube from the pyloric antrum to the right abdominal wall. Adhesions form, and the tube allows for postoperative decompression and feeding. The tube must remain in place for at least 7 days.

Gastrocolopexy

Fixation of the stomach body to the transverse colon. Due to a high recurrence rate (40%), its use is not advised.

Laparoscopic Gastropexy

Allows for stomach derotation under celioscopy and creation of a gastropexy between the gastric seromuscularis and the transverse abdominal muscle. A minimally invasive or laparoscopically guided procedure.