SMALL INTESTINAL OBSTRUCTION – PART TWO:SURGICAL MANAGEMENT

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Samantha Woods discusses treating this problem using different surgical techniques, including enterectomy and enterotomy, in the second part of this article

PART one of this article (*VT*42.23) looked at the pathophysiology of small intestinal obstruction, its diagnosis and medical management.

Surgical treatment of partial obstructions is indicated if abdominal pain, fever, lethargy and/or vomiting are present in cases where serial radiographic monitoring has not shown any progression of an obstruction within an eight-hour period or where there is failure to pass an obstructing object within 36 hours. Surgical intervention is recommended in all cases of complete obstruction.

Exploratory coeliotomy

A full exploratory coeliotomy should be performed in every case to ensure only one site of obstruction exists and to identify any evidence of intestinal damage. If intestinal viability is questionable, the choice is whether enterotomy and removal of a luminal obstruction can be performed or whether intestinal resection and anastomosis is required.

Intestinal viability is assessed subjectively by evaluation of the intestine’s colour, the presence of arterial pulsations, peristalsis and bleeding from any cut surgical edge. Perfusion may be assessed in a clinical situation by using intravenous fluorescein dye injection, pulse oximetry or Doppler flow measurements.

Enterotomy

For discrete foreign bodies or luminal obstructions requiring investigation where the intestines appear viable, enterotomy is performed. A biopsy of the intestine can be taken at the same time. The affected area of intestine is exteriorised from the abdominal cavity and isolated using moistened laparotomy sponges. Intestinal contents are milked proximal and distal to the intended incision site and either an assistant's fingers or atraumatic bowel clamps (such as Doyenne's) are used to minimise spillage of the intestinal content following incision **(**Figure 1**)**. If a foreign body is identified, the enterotomy incision is made in healthy tissue distal to the obstruction site – the proximal intestine must be evaluated for areas of necrosis where the object may have been stuck previously.

A full-thickness stab incision is made into the anti-mesenteric border of the intestine using a number 11 scalpel blade. The incision is extended using Metzenbaum scissors or the blade to allow removal of the foreign object without tearing the intestinal tissue **(**Figure 2**)**. A full-thickness biopsy of the intestine can be taken at this stage by removing a small sliver of intestine at the margin of the first incision. The lumen is suctioned and a longitudinal, appositional closure is performed. Sutures should penetrate all the layers of the intestinal wall – the submucosa is the holding layer and it is imperative to include a healthy bite of this layer in each suture. A simple continuous or simple interrupted suture pattern can be used for closure with an absorbable, monofilament suture material. Care should be taken to ensure the closure is firm, but that tissue crush causing vascular trauma is minimal **(**Figure 3**)**.

A leak test is performed by injecting a small volume of sterile saline (approximately 2ml to 3ml) through a 23-gauge needle into the lumen of the repaired segment while maintaining the intestinal occlusion. Gentle digital pressure is then applied to the occluded segment and the suture line is observed for leakage **(**Figure 4**)**. Repeated irrigation of the abdominal cavity until fluid runs almost clear should be performed prior to omentalisation of the surgery site **(**Figure 5**)**. Any contaminated instruments should be discarded and a swab count performed prior to abdominal closure. Gloves should be changed to reduce contamination during closure.

Enterectomy

Intestinal resection and anastomosis are recommended to remove ischaemic, necrotic and neoplastic segments of intestine and irreducible intussusceptions. Again, a full exploratory coeliotomy should be performed prior to performing an enterectomy. The affected intestine is isolated from the abdominal cavity using moistened laparotomy pads and the intestinal viability is assessed. It is important to evaluate the vascular supply to an affected area to ensure the intestine that remains has a healthy blood supply. The mesenteric vessels supplying the area of intestine for removal are double ligated and intestinal contents are milked from the lumen. The lumen at both ends is again occluded to minimise contamination and forceps are placed at each end of the segment to be removed to prevent spillage from this portion. Crushing forceps can be used since

this portion will be excised (Figure 6). A perpendicular incision through the intestine is made using a number 11 scalpel blade. If there is luminal disparity, an oblique incision may be required in the smaller diameter intestine to allow anastomosis to the larger portion. The ends of the intestine are suctioned and any debris removed before closure.

Closure of the anastomosis may be by sutures or staples. A simple continuous or simple interrupted suture pattern in 3-0 or 4-0 monofilament, absorbable suture material is usually recommended. All layers of the intestinal wall must be incorporated in each suture bite. The mesenteric and antimesenteric border sutures are placed first to appose the ends and check luminal size. The mesenteric suture must be placed carefully since this border is hidden in fat and this region commonly leaks following anastomosis (Figure 7). Following suturing, the anastomotic site should be checked for leakage, as with the enterotomy, and omentalisation should be performed.

For stapled anastomosis, a gastrointestinal anastomosis (GIA) and thoracoabdominal (TA) stapler are used to create a functional end-to-end anastomosis (Figures 8a to 8c). It is important to check the vasculature at each end of the transverse anastomosis because these small vessels often leak extensively following stapling. Some authors recommend a crutch suture to reduce the amount of tension at the intestinal join (Figure 8d). Endto-end anastomosis using an end-to-end anastomosis stapler can also be performed.

Following a leak test and lavage of the abdominal cavity, omentalisation of the anastomosis site should be performed. A swab count and change of gloves and instruments is advised to minimise contamination during closure.

Surgical conditions

• Intestinal foreign body

As mentioned previously, intestinal obstruction by foreign bodies is common in small animals. Young animals or those with indiscriminate eating habits are most at risk. Objects that pass easily through the mouth, oesophagus and stomach often get lodged in the intestines due to their much narrower diameter. The narrowest areas of the small intestine are the distal duodenum and proximal jejunum. Foreign objects may not become completely lodged, but can pass down the intestines with peristalsis causing trauma to the mucosal surface along the way. If these objects reach the colon they are usually passed out in faeces. Most foreign bodies can be removed via enterotomy. However, if necrosis or possible perforation of the intestinal wall is evident, enterectomy is performed.

Linear foreign bodies occur more commonly in cats, due to their fascination with string or thread. Often the length of material becomes fixed proximally (usually around the base of the tongue or at the pylorus) while the rest extends down the intestinal tract. Peristalsis occurs to try to move the foreign body through the intestines, but the fixed proximal portion prevents this, causing the

intestines to move proximally up the foreign material. This causes the intestines to bunch or plicate, and leads to signs of partial obstruction.

If untreated, the linear material will eventually erode through the intestinal wall causing perforation and peritonitis. It is important to be aware these perforations most commonly occur on the mesenteric border of the intestine.

Multiple enterotomies may be required to remove a linear foreign body, as the linear material should never be pulled out of a single enterotomy site under tension. It is very important to cut the most proximal attachment to allow the linear material to move. Other approaches used to remove string materials include making a single proximal enterotomy incision and suturing a soft catheter to the string. The catheter can then be milked through the intestines and removed through the anus.

• Mesenteric torsion

Although relatively uncommon in small animals, intestinal volvulus (twisting of the intestine causing obstruction) and torsion (twisting around the root of the mesentery) are medical and surgical emergencies. Young adult, male, large-breed dogs are most often affected, with German shepherd dogs and English pointers being the most commonly affected breeds. In patients with torsion, the cranial mesenteric artery that supplies blood to the intestinal segment between the distal duodenum and the proximal descending colon becomes obstructed (Figure 9). This leads to intestinal anoxia, mucosal breakdown, bacterial translocation, circulatory shock, endotoxaemia and, eventually, cardiovascular collapse leading to death. Surgical correction is required immediately to save these patients, although reperfusion injury following de-rotation also contributes to mortality. A mortality rate of up to 100 per cent has previously been reported in German shepherd dogs (Junius et al, 2004). Medical treatment aims to correct hypovolaemic shock and any acid-base abnormalities, although surgery should not be delayed in these patients.

• Intussusception

Intussusception is the invagination of a segment of the gastrointestinal tract into the lumen of an adjacent segment, often due to hypermotility of the intestine (Figure 10). The most common sites of intussusception are the small intestine (jejunojejunal) and the ileocolic junction. The cause of most intussusceptions is unknown, although occurrence may correlate with cases of enteritis and systemic illness. Occasionally, they will occur following environmental changes and postoperatively, especially if ileus, adhesions or anastomotic malfunction occurs.

The invagination initially causes a partial obstruction that may progress to complete luminal obstruction. Vessels attached to the inner portion (intussusceptum) can kink and collapse and may avulse, causing ischaemia of the intestinal wall. Blood can extravasate into the lumen and, with chronicity, fibrin seals form. These adhesions between the intussusceptum and intussuscipiens can make the intussusception difficult to reduce manually and often necessitate resection and

anastomosis.

German shepherd dogs and Siamese cats are reported to be more at risk of intussusception. In younger dogs, enteritis and parasitism are often causatory, whereas in older dogs intestinal thickening or neoplasia should be suspected. Partial or complete signs of obstruction can be present. Haemorrhagic diarrhoea, vomiting, abdominal pain and palpable abdominal masses may occur. Chronic cases are more likely to show signs of weight loss and hypoalbuminaemia. Investigations include radiography or ultrasonography.

Percutaneous manual reduction has been reported, but the majority of cases require surgical intervention. Again, full exploratory coeliotomy is performed to ensure whether multiple sites are involved. The affected intestine is isolated from the abdominal cavity and manual reduction is attempted by applying gentle traction to the neck of the intussusceptum and milking the apex from the intussuscipiens. If fibrin has caused a seal between the layers, manual reduction will fail and intestinal resection and anastomosis is indicated. A biopsy of the affected intestine should be submitted for evaluation of the cause.

Eenteroplication can be performed to prevent recurrence of intussusception and may be advantageous where continuing intestinal hypermotility is evident. Serosa-to-serosa adhesions are formed by suturing adjacent loops of intestine **(**Figure 11**)**. The entire small intestine, from the duodenocolic ligament to the ileocolic junction, should be included to prevent intestinal strangulation. It is important to note this procedure is not benign and has the potential for further intestinal dehiscence or the creation of angled intestinal loops that may be subject to further obstruction. It is also time-consuming, increasing anaesthetic time for an often compromised patient.

• Intestinal neoplasia

Intestinal tumours are frequently identified in the gastrointestinal tract of dogs and cats. Most are malignant and can cause either intramural or intraluminal intestinal obstruction. The most common small intestinal neoplasms are adenocarcinoma, lymphoma, leiomyosarcoma and leiomyoma. Polyps occasionally occur in the duodenum of older male cats. Patients are usually older with a mean age at presentation of nine to 10 years old and often have a vague history of chronic obstruction, although some will have signs of complete obstruction. Mid-abdominal masses are often palpable during physical examination, but radiographic and ultrasonographic evaluation is usually performed to confirm diagnosis and assess any degree of metastasis.

Lymphosarcoma may respond well to chemotherapy, although diagnosis often involves surgical biopsy. Surgical resection is the treatment of choice for solid mass lesions. Unfortunately, cases are often too advanced for complete resection by the time of diagnosis and palliation is all that can be achieved.

• **Congenital malformations**

Failure of embryonic development leading to intestinal diverticula and diversion are rare. They are seen in younger animals and can be found at any point along the gastrointestinal tract. Clinical signs range from partial to complete obstruction and intestinal haemorrhage is often associated. If the biliary outflow tract is affected, jaundice can occur. Treatment is usually resection and anastomosis and surgical excision is likely to be curative.

• **Physiologic ileus**

Ileus is caused by ineffective aboral propulsion of the intestines, leading to clinical and radiographic signs of obstruction, without the presence of an obstructive lesion. Ileus can be seen following surgery or with certain electrolyte imbalances. It is usually managed medically with correction of the underlying cause or administration of prokinetic treatments such as metoclopramide. Early postoperative oral feeding may help prevent the development of ileus.

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References and further reading

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