Intestinal Surgery in Cats; How is it different?

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OVERVIEW

Cats are monogastric carnivores and have similar anatomy to other monogastric animals but the physiology of their digestive tract is not nearly as well studied as it is in the dog. Although the anatomic makeup and relative length of the various portions feline intestinal tract is similar to that of dogs certain clinical conditions such as cecal inversion and intestinal volvulus are not of clinical significance. It does appear that the cat’s microvascular anatomy is similar to that of dogs with the vasa recta perforating the outer longitudinal and inner circular muscularis layers and supplying a rich submucosal vascular plexus. In fact the collateral circulation of the intestine in cats is superior that seen in the intestine of dogs. It also seems that the cat can tolerate intestinal perforation more effectively and is less likely to develop peritonitis than is the dog.

INTESTINAL OBSTRUCTION

In the dog intestinal obstruction is commonly associated with vomiting whereas in the cat it’s far more common to see anorexia and weight loss. It is essential to do a thorough physical examination on a cat including abdominal palpation and oral examination. Cats are prone to ingestion of linear foreign bodies and looking under the tongue will often lead to a quick diagnosis of yarn or fishing line entrapped at the frenulum. Abdominal palpation has actually been shown to be more reliable than abdominal radiography with respect to diagnosing intestinal obstruction with one study reporting a diagnosis rate of 70-75% on palpation and less than 60% with plain radiographs. Linear foreign bodies will often cause pleating of the jejunum which can be noted on palpation. Abdominal plain film radiographs may reveal a radiopaque foreign body, loss of visceral detail or an obstructive gas pattern. Like wise bunching up of the small intestine can sometimes be seen on plain films. Ultrasonography is a sensitive way of detecting foreign bodies and is especially useful in detecting the “bull’s-eye” sign typical of intussusception. Ultra-sonographic changes commonly seen with feline intestinal neoplasia include symmetrical hypoechoic changes seen with lymphosarcoma and symmetric or asymmetric echogenicity seen with intestinal adenocarcinoma.

Distinguishing between simple mechanical and strangulated (ischemic) bowel obstruction is critical because the latter condition requires early and rapid surgical intervention. Mechanical obstructions can be luminal (foreign bodies), intramural (neoplasia), or extramural (adhesions). With simple mechanical luminal obstruction, blood flow to the distended bowel is not completely obliterated, but increased bowel wall tension may cause both histological and physiologic changes. Venous and lymphatic hydrostatic pressures are exceeded but arterial pressures are not which results in vascular congestion. Reduced capillary flow,
diminished tissue perfusion, and ultimate increase in vascular permeability result in extravasation of fluid into the interstitium. Mural edema further compromises blood flow causing hypoxia, tissue ischemia, and mucosal necrosis.

Strangulated obstruction may occur from intraluminal obstruction with local pressure necrosis and or perforation of the bowel. More commonly, strangulation obstruction occurs secondarily to mesenteric vascular disruption caused by intussusception or a strangulated hernia. Primary vascular disease leading to thromboembolism and secondary ischemia as seen in human beings and horses is an uncommon finding in small animals. With strangulation obstruction, the mucosa is sensitive to insufficient perfusion and anoxia and undergoes necrosis. After the mucosal barrier is destroyed, bacteria and endotoxins pass transmurally into the lymphatics and peritoneal cavity where they enter the systemic circulation. Vasoactive properties of bacteria, endotoxins, and free peritoneal hemoglobin create systemic hypotension and septic shock. Eventually full thickness infarction and perforation may occur.

ADENOMATOUS POLYPS OF THE DUODENUM IN CATS

Adenomatous polyps of the duodenum in cats have been reported in 18 cats. These are older cats with a median age of about 12 years and tend to occur primarily in the Siamese and Himalayan breeds. These polypoid mucosal masses are located in the upper duodenum and tend to cause vomiting and weight loss. When the lesions ulcerate hematemesis may occur. About half the cats become anemic secondary to chronic blood loss. Diagnosis is made on contrast radiography or by endoscopy. A skilled ultrasonographer can also sometimes see the polypoid lesions within the lumen of the duodenum. This is a surgical disease and requires excision of the lesions through an enterotomy incision or via resection and anastomosis. The lesions are benign but regrowth is possible if inadequate resection occurs. In the one case study 13 of 18 cats were cured, four had recurring signs and one cat died following surgery.

SMALL INTESTINAL ADENOCARCINOMA

These occur in older animals with a mean age of about 12 years. The so called napkin ring lesion is typically located in the jejunum although duodenal or ileal lesions are also reported. Inappetence and weight loss is typically seen and a radiographic obstructive pattern is rare. In one study of 32 cases 50% of the diagnosis were made on palpation and only 35% made radiographically. Although intestinal AC is a terminal disease and there are not really good chemotherapeutic agents to treat with it is worthwhile to tru resection and anastomosis if lymph node involvement is not present since in about 40% of the cats the mean survival time was greater than 15 months.

FOREIGN BODIES

Surgical management of gastrointestinal foreign bodies varies depending on the type and location of the foreign body. Sharp foreign bodies such as straight pins, safety pins, bones, nails, or glass will usually pass through the gastrointestinal tract without creating intestinal perforation. Rubber balls, cellophane, or corn cobs tend to pass slower or not at all and are more likely to cause complete mechanical obstruction requiring emergency laparotomy.

Linear foreign bodies caused by such items as fishing line, meat wrappers, or sewing yarn present a difficult surgical problem. The trailing end of string foreign bodies often catches over the base of the tongue or in the stomach and act as an anchor. Intestinal peristalsis moves the foreign body aborally resulting in bowel plication. The string often cuts through the wall on the mesenteric surface resulting in peritonitis. Linear foreign bodies should be managed by initially identifying and releasing the anchor point. If wrapped around the
tongue, the foreign body should be released prior to laparotomy. More commonly, a
gastrotomy is necessary to free the wadding string or fish line from its gastropyloric anchor.
Multiple enterotomies are then usually required to facilitate complete removal of the foreign
body. If too few enterotomies are made with too much traction placed on the string, the
mesenteric border may be perforated in an area which is difficult to explore and suture.
Occasionally the string has cut through at several locations and peritonitis is evident.
Sometimes, in long-standing cases, fibrosis has occurred around the foreign body so that
even after its removal, the bowel retains its pleated conformation. In these cases, intestinal
resection and anastomosis may be necessary. In some cases the number of enterotomies
can be reduced by passing the end of the vinyl feeding catheter to the string through the
pleated bowel, attaching the linear foreign body to its end and pulling the catheter distally to
disengage the string.

ASSESSING TISSUE VIABILITY

With a complete obstruction, intestinal distention is often severe and the distended loops of
bowel take on a cyanotic appearance. Intestinal viability is best evaluated after: 1) 
decompression of dilated loops of intestine, and 2) removal of the foreign body.
Decompression of fluid and gas from the proximal segment of the distended bowel is
performed with a 20 gauge needle and suction apparatus or a 60 cc syringe with a three-way
stop cock. If intestinal wall ischemia and necrosis is present, then resection and anastomosis
is performed immediately. However, in most cases of simple non-strangulated obstruction,
bowel viability is maintained and the visual appearance of dark distended loops of bowel
improves rapidly after removal of the obstruction. Standard clinical criteria for establishing
intestinal viability are color, arterial pulsations, and the presence of peristalsis. Of these
three parameters, experimental data has shown peristalsis to be the best and most
dependable determinant of viability. The "pinch test" should be performed on questionable
bowel to determine if smooth muscle contraction and peristalsis can be initiated. Intravenous
fluorescein dye can also be used to determine viability.

INTUSSUSCEPTION

Intussusceptions are most often seen in immature cats. The exact biomechanical cause of
the condition is unknown and has not been reproduced experimentally. Probably a local
incongruency of the intestine caused by induration or spasticity (intestinal parasitism) or
sudden diameter change (ileocecocal area) occurs in which a proximal bowel segment
invaginates (intussusceptum) into a distal section of bowel (intussuscipiens). Three layers of
bowel wall are thus created if one were to make a cross section through the intussusception.
Heavy intestinal parasitism with ascarids or coccidia as well as severe enteritis is reported
as predisposing causes. Intussusceptions are also seen with increasing frequency after
laparotomy on elective or non-elective intra-abdominal procedures.

Clinical signs depend on the completeness and level of obstruction. The majority of
intussusceptions occur at the ileoceccolic junction in cats but jejunojejunal or even higher
pylorogastric and gastroesophageal intussusceptions are reported in dogs. Patients with
high intussusceptions usually undergo profuse vomiting, rapid dehydration and early death.
Ileocolic intussusceptions often present with a history of sporadic vomiting, inappetence, or
bloody stools. Increased mortality of these cases may be due to 1) predisposing fluid and
electrolyte imbalances, 2) agranulocytosis and secondary bacterial septicemia, 3) increased
tendency for the intussusceptions to recur.

Although the invaginated bowel may become devitalized, perforation is rare because the
outer ensheathing layer retains its viability and fibrinous adhesions seal the proximal border
of the intussusception. Occasionally spontaneous recovery occurs when the nonviable
intussusceptum is sloughed and patency of the intestinal lumen is reestablished.
DIAGNOSIS

Diagnosis of intussusception can usually be accomplished by simple abdominal palpation and ultrasonography. A cylindrical sausage shaped mass located in the mid to caudal sublumbar abdomen is pathognomonic for the disease. An obstructive pattern is seen on plain radiographs. With an upper GI series or Barium enema, and "coiled spring" appearance of the intussusceptum may be seen.

SURGICAL TREATMENT

Surgical management of intussusceptions involves: 1) reduction and or 2) resection and anastomosis coupled with 3) prophylactic enteropexy. Upon identifying the intussusception, it is isolated and packed off from the peritoneal cavity. Reduction is facilitated by gentle milking of the intussusceptum from the intussuscipiens. The ensheathing layer is gently compressed over the apex of the intussusceptum while gentle traction is placed on the ileum. In relatively acute cases, reduction is usually accomplished and bowel viability is closely scrutinized. When mature adhesions have formed between the invaginated and ensheathing layers, reduction is usually not possible, and resection and anastomosis are performed.

Following reduction and/or resection and anastomosis of the intussusception, a bowel plication or enteropexy technique may be performed. Bowel plication involves laying the bowel side by side in a series of gentle loops. At least three loops of plicated bowel are used proximally and three distally to the origin of the intussusception. The loops are sutured together on their antimesenteric border using simple interrupted sutures of 3-0 to 4-0 chromic surgical gut which penetrate the seromuscular layers of bowel but does not enter the lumen. An alternative to this is an enteropexy technique where the intestinal serosa is sutured to the adjacent areas of the bowel and to the peritoneal surface using surgical gut sutures which are placed every eight to twelve cm. A recent report indicated that intestinal plication may not be necessary since the risk of complications is higher and there was only a slight reduction of recurrence rate.

MANAGEMENT OF MEGACOLON IN CATS

CLINICAL SIGNS

Idiopathic megacolon is a disease of middle-aged cats. It has been reported in cats as young as one year and as old as 15 years. The mean age however is about 5 years. Commonly, cats with megacolon won't pass stools for days or weeks. The large dilated colonic segment can be easily palpated through the abdomen. Plain film radiographs will disclose colonic dilatation and impaction. A barium enema may be performed after complete evacuation of the feces to try to locate a stricture. Proctoscopy if available is also very useful in the diagnosis of colorectal strictures.

MEDICAL MANAGEMENT

Complete evacuation of the colon usually requires general anesthesia, multiple soapy water or mineral oil enemas and fecal evacuation with sponge or clamshell forceps. Bran or cereal-based diets, stool softeners such as Metamucil or dioctyl sodium sulfosuccinate are then used in an attempt to manage the problem. Hypertonic sodium phosphate (Fleet) enemas should be avoided in cats because they may cause dehydration, hypernatremia, hyperphosphatemia, and tetany due to hypocalcemia.
The prokinetic agent cisapride (Propulsid - Jansen Pharmaceuticals) has been used in conjunction with oral lactulose to successfully treat some cats with idiopathic megacolon. Cisapride works by causing the release of acetylcholine from the enteric nervous system which stimulates colonic smooth muscle to contract. The treatment is effective in some cats but not in all yet it is worth trying prior to the recommendation for surgery. The dosage used at the University of Florida is 5 cc of lactulose and 5 mg of cisapride given BID to TID. Dosages of up to 7.5 mg of cisapride can be given safely. Once constipation is relieved some animals can be maintained on alternate drug treatment. Although the treatment is successful in some cats many owners have to have subtotal colectomy performed because the cats develop an aversion to the lactulose therapy.

**SURGICAL TECHNIQUE FOR SUBTOTAL COLECTOMY**

When performing subtotal colectomy in cats the right colic and part of the left colic artery can be ligated but the cranial rectal branch off the left colic artery should be preserved. Impacted feces are milked into the enlarged colonic segment proximally and distally and intestinal forceps are applied. The proposed resection sites are at the ileocecal junction and in 1-2 cm cranial to the brim of the pubis. The ileum is anastomosed to the colon in end-to-end fashion using a simple interrupted pattern of 4-0 prolene. Luminal disparity is corrected by cutting the mesenteric surface of the colonic stump back at a 60° angle and opposing the cut edges with simple interrupted sutures until the stoma diameter approximates that of the ileal lumen. An alternative approach is to do an end-to-side anastomosis. The final anastomosis is wrapped with omentum. Preoperative bowel preparation is usually not possible and perioperative IV administration of Cefoxitin (40 mg/kg) 2 hours prior to and BID after surgery is recommended.

**POSTOPERATIVE COURSE**

Cats are often somewhat depressed and anorectic for 48 hrs following surgery. They will sometimes have a moderate fever of 103-103.5°F in the absence of leukocytosis. Dark tarry liquid feces are usually noted for about 3-4 days. Feces remain liquid and poorly formed for 2-6 weeks. At which time they usually become soft and poorly formed (cow pie consistency) for the remainder of the cats life. Some excellent studies have recently been done looking at the physiologic after effects of this surgery. Most cats seem to maintain their normal bad, weight or even gain a little after the surgery. The cats generally use the litter box 2-3 times a day but the total amount of water loss in the feces equals that of normal cats. The ileum increases its absorptive capacity by increasing villus height. Bacterial overgrowth is not a problem as evidenced by normal serum coalbumin levels in operated cats. Folic acid deficiency or anemia does not seem to be a problem either. The major complaint by some owners is chronic perineal soiling caused by the loose feces. If this becomes a problem, it can often be managed by clipping hair in the perineal area. Antibiotic therapy is dependent on presence or absence of peritoneal contamination. Onset of fever, abdominal tenderness, vomiting and positive peritoneal tap warrants early reexploration of the abdomen.

**RECTAL PROLAPSE**

Rectal or anorectal prolapse is a double layer evagination of the rectum (sometimes including the anorectal junction) through the anal canal. It is seen most commonly in kittens with severe endoparasitism, enteritis, and associated tenesmus. In older cats rectal prolapse most commonly occurs secondarily to dystocia, in queens. It has also been reported secondary to urethral obstruction in male cats.

**DIAGNOSIS**
Diagnosis is made by visual examination of a tube-like mass of varying length which protrudes from the anal orifice. It is important to distinguish a true rectal prolapse from a prolapsed ileocolic intussusception. A well lubricated thermometer is gently passed between the anus and the prolapsed mass. With a rectal prolapse the fornix is located within a cm or less of the anus whereas with a prolapsed intussusception, the probe can be easily passed for a distance of 5-6 cm past the mass. Occasionally only the mucosal portion of the rectal wall will be exposed. Rectal mucosal eversion may occur secondarily to some of the previously mentioned conditions but usually reduces spontaneously following treatment of the primary disease.

TREATMENT

Management of rectal prolapse depends on 1) degree of tissue viability and 2) number of recurrences. If the rectal mucosa is viable (red oxygenated blood oozes from its surface) and it is the cat's first occurrence, reduction and an anal pursestring suture is initially attempted.

If the rectal prolapse is viable but not digitally reducible or if there is a history of multiple recurrence, then a colopexy procedure is performed. Colopexy has been especially effective in cats where pursestring management is ineffective and the risks of suture line dehiscence or rectal stricture after amputation are high. After performing a midline laparotomy, gentle traction is placed on the descending colon and reduction of the prolapse is confirmed by an assistant under the drape. The colopexy is performed to the left abdominal wall with the colon in slight traction. A 5 mm x 1 cm elliptical section of peritoneum is removed from the abdominal wall 2 cm lateral to the midline. A similarly shaped area of colonic serosa is removed with a #15 blade. The raw bleeding surfaces are then apposed with 5 or 6 simple interrupted sutures of 3-0 nylon or polypropylene taking care not to penetrate into the lumen of the colon. Usually three or four colopexy sites are created along the length of the colon.

When the prolapsed segment is devitalized an amputation and rectal anastomosis is performed. A devitalized prolapse is usually dark purple or black in appearance and exudes cyanotic blood from its often ulcerated surface. The prolapse is then sharply resected 1.0 cm from the anus. The outer and inner walls of the rectum are then apposed with full thickness simple interrupted sutures of 3-0 synthetic absorbable suture. Stay sutures are removed and the anastomosis retracts back through the anus.

REFERENCES