Surgical Management of Megacolon
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Additional information on this topic can be found in the textbook ‘Small Animal Surgery’ edited by Teresa Fossum, published by Elsevier. If you would like an instructive DVD of this topic, go to www.ivseminars.net and click on Video Vet.

Key Points
• Pay attention to the unique blood supply to the colon
• Increase collagenase activity occurs 5 - 7 days after colotomy/anastomosis
• Colon is a high pressure conduit system
• Subtotal colectomy is curative for megacolon in cats

Introduction: The need for colonic surgery is relatively uncommon in veterinary medicine. Colonic disorders requiring surgery are rare and such intervention is frequently avoided due to the possibility of catastrophic operative and postoperative complications (i.e., leak and fecal peritonitis).

Physiology: The colon performs three major physiologic functions: it acts as a reservoir for the storage of intestinal contents, it secretes mucus to lubricate the formed ingesta, and it absorbs water and electrolytes (primarily sodium and chloride).

Surgical anatomy: Several factors associated with anatomy and function of the colon may predispose it to operative and postoperative complications.

1) Surgical stimulation of a high collagenase activity at 5 7 days postoperatively. The layer of strength of the colon is the collagen laden submucosa as in the small bowel. This layer is strong due to its relatively high collagen content. The effects of collagenase can result in a weakened suture line and subsequent dehiscence.

2) Bacterial content of the colon is high (i.e., 10% of its dry weight) and included in the flora are pathogenic aerobes and anaerobes. Leakage can result in acute fulminating generalized peritonitis.

3) The colon is a relatively high pressure conduit system compared to the small intestine. Storage of solid stool requires dilatation of the colonic wall, a factor that could cause additional stress on the suture line. As solid stool passes through the colon, further aggravation of an anastomotic or colotomy incision may result.

4) Blood supply to the colon does not come from a richly vascular mesenteric pedicle with numerous branches supplying each segment. The colon is generally supplied by a single major artery coursing parallel to its mesenteric border (i.e., hemorrhoidal vessels). Small vasa recti are segmentally given off perpendicularly from the major vessels. When performing a colonic anastomosis, preservation of the major hemorrhoidal vessels is essential, while ligation of the small vasa recti of the involved colon is meticulously carried out.

From the above discussion, it can be seen that colonic surgery should be avoided whenever possible; but if an operative procedure is necessary, the surgeon must pay attention to detail in order to decrease the possibility of postoperative complications.

Indications for Colonic Surgery: The major indications for colonic surgery are biopsy, intussusception, neoplasia, megacolon, and traumatic wounds (especially abdominal bite wounds).

Preoperative Preparation: Because of negative factors which predispose the colon to leakage or breakdown (see above), it is to the advantage of the surgeon and patient to try and control these factors prior to surgical intervention. Two factors that may be controllable are stool production and consistency and bacterial content. Generally, only elective colonic procedures allow for such a “planned approach”.
Bowel Preparation
1. NPO 24 hours prior to surgery.
2. Clear fluids only (48 hours prior to surgery).
3. Warm soapy water or betadine enemas (BID 48 hours prior to surgery; SID 24 hours prior to surgery)
4. Neomycin (20 mg/kg BID 48 hours prior to surgery)
5. Kanamycin (11 mg/kg BID 48 hours prior to surgery)
6. Metronidazole (Flagyl 60 mg/kg SID 48 hours prior to surgery)

Unfortunately, the majority of patients presented with colonic disturbances require immediate surgical intervention. This precludes adequate preoperative colonic preparation. In such cases, preoperative intravenous antibiotics (i.e., first generation cephalosporins) are indicated. A cleansing enema immediately prior to surgery is contraindicated as liquid feces are more difficult to contain during surgery and may predispose the patient to leakage and subsequent peritonitis.

Surgical Techniques
Colotomy: The segment of colon to be incised is exteriorized from the abdominal cavity and packed off with moistened laparotomy pads. The smallest incision necessary to accomplish the task (i.e., biopsy, foreign body removal, tumor resection) is made in the antimesenteric portion of the affected colon. If possible, perform the colotomy incision in the most viable portion of bowel. Closure is accomplished by adhering to the following principles:

1) The submucosa is the layer of strength and should be incorporated in each suture.

2a) A single layer, simple continuous or simple interrupted suture pattern provides water tight apposition. Sutures are placed 2 - 3 mm apart and each bite should include at least 3 mm of submucosa. Sutures are pulled snug enough to create a water tight seal but not so tight as to cause ischemia. The author’s suture pattern of choice is a single layer simple continuous appositional using 3 0 or 4 0 synthetic absorbable (e.g., PDS, Maxon) or monofilament nonabsorbable (e.g., nylon, polypropylene, novafil) suture with a swaged on atraumatic taper-cut, penetrating point, fine taper, or reverse cutting needle. Sutures are pulled snug enough to create a water tight seal but not so tight as to cause ischemia. Braided nonabsorbable sutures (e.g., silk, braided or twisted nylon, dacron) are absolutely contraindicated because of their tendency to harbor bacteria and result in abscessation.

2b) Due to the relatively large lumen diameter and distensibility of the colon, single or double layer, interrupted or continuous inverting suture patterns may be used. Serosa to serosa contact results in an early water tight fibrin seal. Cushing, Connell, or Lembert suture patterns using 3 0 or 4 0 synthetic absorbable (Vicryl, Dexcel, PDS, Maxon) or 3 0 or 4 0 monofilament nonabsorbable (nylon, polypropylene, novafil) with a swaged on atraumatic taper-cut, penetrating point, fine taper, or reverse cutting needle are recommended. Sutures are placed 2 - 3 mm apart and each bite should include at least 3 mm of submucosa. Sutures are pulled snug enough to create a water tight seal but not so tight as to cause ischemia. Braided nonabsorbable sutures (e.g., silk, braided or twisted nylon, dacron) are absolutely contraindicated because of their tendency to harbor bacteria and result in abscessation.

3) Atraumatic tissue handling will help preserve colonic blood supply and result in a more predictably favorable outcome.

Surgical Technique: Anastomosis
The affected colon is exteriorized and packed off with moistened laparotomy pads. The area of resection is assessed for proper margins (i.e., bowel viability, neoplasia).

Care is taken to preserve the major arterial blood supply that runs parallel to the affected colon. If possible, only the vasa recti are ligated in the area to be resected. The colon is then incised at a 60° angle to the mesenteric border to assure adequate blood supply and viability to the antimesenteric portion of the colon.
Fecal spillage and contamination are kept to a minimum with the use of Doyen intestinal forceps and frequent local irrigation of the exteriorized colon with body temperature 0.1% povidone iodine solution.

When considering suturing a colonic anastomosis, the following principles should be followed:
1) Submucosa is the layer of strength.
2) Avoid undue tension on the anastomosis.
3) Maintain an adequate blood supply.
4) Use meticulous suturing technique.
5) Avoid peritoneal contamination.

The preferred technique for colonic anastomosis is an end to end anastomosis. End-to-side anastomosis is an option; however, it is rarely an advantage over end-to-end. Side to side anastomosis of the colon is not recommended as the formation of a fecal filled "blind pouch" may occur.

Suture patterns advocated for use in colonic anastomosis are similar to those described for colotomy and include simple continuous appositional, simple interrupted appositional, and continuous or interrupted Cushing, Lembert, or Connell. The author's suture pattern of choice is a single layer simple continuous appositional using 3 0 or 4 0 synthetic absorbable (e.g., PDS, Maxon) or monofilament nonabsorbable (e.g., nylon, polypropylene, novafil) suture with a swaged on atraumatic taper-cut, penetrating point, fine taper, or reverse cutting needle. Braided nonabsorbable sutures (e.g., silk, braided or twisted nylon, dacron) are absolutely contraindicated because of their tendency to harbor bacteria and result in abscessation. Sutures are placed 2 - 3 mm apart and each bite should include at least 3 mm of submucosa. Sutures are pulled snug enough to create a water tight seal but not so tight as to cause ischemia.

Inverting patterns may also be used due to the relatively large lumen diameter and distensibility of the colon. A possible advantage of an inverting pattern is it provides serosal contact at the anastomosis and therefore a more immediate fibrin seal. Suture materials of choice include 3 0 or 4 0 synthetic absorbable (e.g., Maxon, PDS) or monofilament nonabsorbable (e.g., nylon, polypropylene, novafil) with a swaged on taper-cut, penetrating point, fine taper, or reverse cutting needle.

Whenever a colotomy or colonic anastomosis is performed in the face of peritonitis, hypoproteinemia, severe debilitation and anemia, or bowel of questionable viability, a serosal patch, using a loop of healthy jejunum, should be considered to help support and protect the colonic incision. An enterostomy feeding tube should also be considered.

Prior to closure, peritoneal lavage is performed using body temperature sterile physiologic saline solution at a volume of 200 - 300 ml/kg body weight. In the case of heavy contamination or severe generalized peritonitis, open peritoneal drainage and intermittent lavage should be considered.

Postoperative Management
Nutritional support of the postoperative colonic surgical patient is important. Two factors must be considered in proper nutritional management:
1) maintain fluid and caloric needs
2) provide a residue free diet

Feeding tubes: In the anorexic patient, an artificial means of feeding may be necessary (i.e., naso-esophageal, esophagostomy, gastrostomy, or enter-ostomy tube). An appropriate low residue, high caloric diet can be provided by blenderizing the list of foods provided below or using a commercially available polymeric diet (e.g., Isocal, Osmolite HN, Ensure, Jevity).

Residue free diet: If the patient will eat postoperatively, the following foods should be considered in preparation of a residue free diet: strained fruit juices, broth, jello made from strained fruit juices, white bread and butter, cooked egg white, lean meat, well boiled rice, gelatin, sucrose, karo corn syrup, liver, farina, and cottage cheese.
Feeding a normal diet can commence approximately 2-3 weeks after surgery. Stool softeners may be used for 1-2 weeks.

Antibiotics: Systemic antibiotics are continued for 7-10 days postoperatively. At 4-7 days post-operatively, the patient should be watched very carefully for evidence of breakdown. Patient attitude, abdominal palpation, rectal temperature, and complete blood count. Paracentesis and fluid cytology evaluation may help diagnose a potential problem before it gets out of control.

SURGICAL MANAGEMENT OF MEGACOLON

Clinical presentation: Megacolon is a condition in which the ascending, transverse, and descending colon are chronically large in diameter and filled with inspisated stool. Patients generally present with a history of chronic constipation (i.e., weeks to years), tenesmus, and weight loss. Males are more commonly affected than females and the age ranges from one year to 12 years.

Etiology: The etiology of megacolon is either congenital, acquired, or idiopathic. The idiopathic form is the most common type seen in the cat.

Diagnosis: Diagnosis of idiopathic megacolon in cats is usually made on the basis of history, abdominal palpation, and radiography. Confirmation is based on exploratory laparotomy.

Treatment: The decision to operate is generally made on the basis of the constipation becoming progressively worse and responding only to multiple enemas and manual deobstipation. Exhaustive medical therapy is generally performed prior to surgical intervention.

Preoperative management: Preoperative bowel preparation, using antibiotics administered orally or multiple cleansing enemas is probably useless in cases of severe constipation or obstipation. A parenterally administered antimicrobial agent, with a spectrum of activity directed toward coliforms and anaerobes, is probably the most efficacious preoperative management.

Subtotal colectomy: Subtotal colectomy is the procedure of choice in cats with megacolon. This technique is performed regardless of how much of the colon appears diseased. The surgical objective is to remove all of the colon except what is necessary to reestablish bowel continuity. When the ileoceccolic valve is removed (i.e., which is done if the cecum appears grossly abnormal), a 1 to 2 cm segment of descending colon just proximal to the pubis (i.e., colorectal junction) is saved to accommodate the ileo-colonic anastomosis. When the ileoceccolic valve is retained, a 1 cm segment of ascending colon is preserved to accommodate the colonic anastomosis.

Several techniques have been described for performing the colonic anastomosis. The author’s technique of choice is an end-to-end anastomosis. The procedure is performed using a single layer simple continuous or simple interrupted appositional pattern with 3-0 or 4-0 synthetic absorbable or monofilament nonabsorbable suture. Because of lumen diameter differences between the ileum and colon, it is necessary to place several sutures in the larger diameter bowel in order to produce an even, watertight anastomosis.

After the anastomosis is completed, the peritoneal cavity is thoroughly lavaged with 200 - 300 ml/kg of warm, sterile physiologic saline solution prior to closure. In situations where the anastomosis is under any question, particularly with respect to color and blood supply (i.e., tissue viability), it is advisable to place a serosal or omental patch over the anastomotic area to help prevent leak, provide a source of blood supply, and help support the anastomosis.

Postoperative care: Immediately postoperatively patients should be supported with a balanced electrolyte solution intravenously until they are able to maintain their hydration status. Antimicrobial agents are continued for five to seven days in all cases. Patients are returned to their normal diet within 24 hours and are allowed water ad libitum.
Results: Long term results have been somewhat variable from case to case, but generally:
1) all patients maintain fecal continence post-operatively
2) after a 10-15% weight loss 2 - 3 weeks postoperatively, body weight is regained within 3 - 7 weeks
3) watery to mucoid stools occur during the first 3 - 7 weeks followed by mucoid to semi-solid to formed stools by 3-6 months
4) frequency of stools is approximately six per day initially followed in 1-2 months by four per day, then at six months to 2-3 stools per day (range 1-4 stools per day)
5) owner satisfaction has been excellent in the majority of cases.

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