CHAPTER 21

Surgery of the Sheep and Goat Digestive System

Amanda Hartnack and Meredyth Jones

Gastrointestinal surgeries in sheep and goats are not commonly performed for animals in production settings; however, they should always be considered for individual patients of economic worth or for pet animals. Procedures that are performed most commonly include surgeries of the forestomach (reticulorumen) compartments and abomasum, rumen and esophageal fistula placement in research settings, and correction of intestinal obstruction or trauma and rectal prolapse.

SURGERY OF THE FORESTOMACH

Disease of the forestomach compartments (reticulorumen) can be fairly common in sheep and goat practice. Ruminal distention, rumen acidosis, rumen impaction, bezoar formation, foreign body consumption with subsequent impaction, and rumenitis/reticulitis are conditions that may require surgical intervention. Although ingestion of metallic objects is less common than in cattle, ingestion of other foreign materials may lead to obstruction. Ingested ruminal foreign bodies have been extensively reported in underdeveloped countries where forage material may be scarce. Cases of rumenolith formation as well as traumatic reticulopericarditis have also been reported in small ruminants. Rumenotomy may be necessary to remove obstructions or to lavage the rumen following rumen acidosis/grain overload.

Although surgery of the rumen is often performed under emergency conditions, the patient should be held off feed for 12 to 24 hours before surgery if possible. General anesthesia helps control animal movement and maintains a clean surgical field. Tracheal intubation may also help reduce the risk of aspiration pneumonia. However, if economics preclude general anesthesia use, a rumenotomy can be done with a local anesthetic and manual restraint. Sedation may be necessary. It is important to remember that sheep and goats are highly susceptible to lidocaine toxicity and use of diluted (1%) lidocaine may be necessary to achieve appropriate analgesic levels while remaining below the toxicity threshold of 10 mg/kg.

Surgery may be performed in the standing or recumbent patient, depending on surgeon preference and the status of the patient. If the surgery is to be performed on the recumbent patient, the patient is placed in either right-lateral recumbency or in sternal recumbency and the left flank prepared for aseptic surgery. For a rumenotomy, a 15-cm vertical skin incision is made 5 cm caudal to the last rib and 5 cm distal to the transverse processes of the lumbar vertebrae. If a foreign body is suspected, it is important to make the incision large enough to both locate and remove the offending object. The surgeon should remember that the rumen incision will be smaller than the skin incision once it has been properly sutured to the skin layer, and enlarging the incision at this point will be difficult. The underlying muscle layers (internal and external abdominal obliques and transversus abdominis) should be sharply incised. Blunt dissection of the muscles along their fascia planes (grid technique) is recommended if a small incision is desired, as in the case of rumenostomy. It should be noted that small ruminants have a more pronounced cutaneous trunci muscle than do cattle, and sheep and goat muscle layers are much thinner than those in cattle. Pronounced abdominal distention will further stretch these muscles, and care should be taken to avoid prematurely incising the rumen. The peritoneum should be elevated with Brown-Adson forceps and incised using scissors. Once the rumen has been visualized, at least 10 cm of rumen should be exteriorized and sutured to the skin of the wound margin with a simple continuous pattern around the entire incision margin using monofilament, nonabsorbable suture on a tapercut needle. To avoid a purse-string effect, a broken continuous pattern should be used. For the rumen-to-skin fixation, a bite is taken through the skin, and then a bite is taken through the rumen. Ideally the bites taken through the rumen are not full thickness. This suture pattern forms a seal that prevents rumen fluid from entering the abdomen and is important to minimize abdominal contamination. Once the suture placement is inspected and found intact, the rumen wall is incised within this margin. The surgeon should avoid traumatizing the rumen wall as much as possible. Other rumenotomy techniques have been described in both cattle and small ruminants, including rumen skin clamp fixation, rumen stay suture fixation, and ring fixation (Weingarth's ring).

Use of a wound ring drape may help to minimize contamination.[1] Once the rumen has been incised, it is possible to explore the reticuloruminal cavity. At this point, any foreign material is removed, and the cardia and reticuloomasal orifice are inspected and checked for patency. The abomasum can be palpated through the rumen wall for distention and normal location. The ventral floor of the rumen can be swept and grasped, checking for any adhesions.

Closure of the rumen occurs in two steps. First, the initial incision is closed using absorbable suture in a simple continuous pattern. At this point, gloves, surgical instruments, and gowns should be changed to avoid abdominal contamination. The wound should be flushed with copious warm saline to remove any remaining debris. Once wound cleansing has been accomplished, the rumen to skin suture should be removed and the rumen lavaged again before it is replaced into the abdomen. The second layer of rumen closure occurs now with absorbable suture in a Cushing pattern, incorporating the portions of rumen that had been sutured to the skin.

Closure of the abdomen is routine, although much smaller suture material (No. 0 or 1) can be used than in an adult cow. Each layer is closed in a simple continuous pattern with an absorbable suture, and lavage is performed between each layer. The peritoneum and transversus abdominis may be closed together, as can the internal and external abdominal

[1]Steri-Drape wound edge protector, 3M Health Care, St. Paul, MN, USA.

oblique muscles. The skin is closed with a nonabsorbable suture in a continuous pattern. The most ventral sutures should be placed in an interrupted fashion in case drainage of the wound is necessary. Appropriate antibiotics should be used for at least 5 days after surgery. Antiinflammatory drugs are commonly used, especially in goats (flunixin meglumine 1.1 to 2.2 mg/kg IV; meloxicam 0.5 to 1.0 mg/kg orally every 24 to 48 h). Clients should receive written notification of drug withdrawal times.

Rumenotomies to remove a foreign body have the most favorable prognosis. The most common items found in the rumen of small ruminants are plastic bags, rope, and large foreign bodies. A rumenotomy can also be performed for grain overload; however, the prognosis is guarded for this condition if longer than 12 hours' duration. Medical management of these cases through intravenous fluids, electrolyte monitoring and replacement therapy, probiotics, and oral alkalizers can be as—or more—successful. In addition to stabilization of the systemic and rumen pH, transfaunation can be an important tool for successful case management. Transfaunation per os generally requires 250 to 500 mL of collection fluid two to three times daily for 3 to 5 days. This fluid should be kept anaerobic, at rumen temperature, and out of light until inoculation occurs. Ideally, the time from collection to transfaunation should be less than 30 minutes.

Abomasal Surgery

Disease of the abomasum in small ruminants is much less common than in cattle and decidedly more difficult to manage surgically. Abomasal impaction, abomasitis, perforating abomasal ulcers, abomasal foreign bodies, and abomasal emptying defect in Suffolk sheep can potentially be managed with surgical intervention. However, in most instances medical management should be attempted initially. Unlike in cattle, displaced abomasum is extremely rare in small ruminants, though it has been reported.

On physical examination, heart and respiratory rates are often elevated. Feces are generally scant and melena may be noted. Depending on an individual animal's value and owner preference, a number of ancillary diagnostic tools may be helpful in the diagnosis of abomasal disorders in small ruminants. Ultrasound of the abomasum in the standing patient is simple and noninvasive. Fecal occult blood tests may be positive in cases of bleeding abomasal ulcers. A chemistry panel including plasma electrolyte concentrations may be valuable in assisting with diagnosis and determining medical therapy, as abomasal outflow obstruction typically results in hypochloremic hypokalemic metabolic alkalosis and eventual dehydration and azotemia. Medical management may include the following: large volume fluid replacement, correction of electrolyte imbalance, cholinergic drugs, and intravenous calcium and vitamin E/selenium—all of which have been used with limited success. Abomasal impaction is much more common in goats than in sheep. Pregnancy, poor-quality hay, and feeding a total pelleted diet can predispose goats to impaction. Abomasal impaction can also occur in goats confined to semidesert grazing of grassland/brush forage that contains a high percentage of awns, which form phytobezoars ranging in size from 2 to 10 cm. Patients present with inappetence, malaise, weakness, scant feces, and cranial right abdominal swelling/distention. An abomasotomy is generally corrective.

Abomasal emptying disease in Suffolk sheep commonly presents as impaction, but the etiology is different and has not been elucidated. It also does not consistently produce the hypochloremic, hypokalemic metabolic alkalosis typical of abomasal obstruction. Pregnant sheep on a diet high in concentrates are commonly affected with abomasal emptying defect. Medical management seems to be the most common treatment course, but an abomasotomy is occasionally attempted in valuable individuals with limited success.

ABOMASOTOMY

Once the decision has been made to perform an abomasotomy, the surgeon must decide which surgical approach to take. In small ruminants, surgery of the abomasum is performed in a recumbent position. Both the right-paracostal and ventral midline approaches will give the surgeon access to the abomasum; however, exteriorization is more easily achieved using the right-paracostal approach. General anesthesia is recommended, particularly in animals with distention and an increased risk of aspiration. It is possible, however, to perform these procedures under local anesthesia and sedation if general anesthesia is not possible for financial or other reasons. For the right-paracostal approach, the patient is positioned in left-lateral recumbency, and the right-paracostal region is prepared for aseptic surgery. A sharp 15-cm incision parallel to and 3 cm caudal to the last rib is made and extended along the costochondral junction. Subcutaneous tissues and muscle layers are sharply incised. The peritoneum is tented and entered sharply using scissors. After the peritoneum is entered, the incision site should be checked digitally for adhesions before proceeding. The greater curvature of the abomasum should be evident upon entry into the abdomen as the greater curvature normally lies in the paracostal position. At this point in time, the abdomen should be explored. If a distended abomasum is the only abnormal finding, or if an impaction or abomasal foreign body can be palpated, an abomasotomy is performed. Before incising the abomasum, the greater curvature is exteriorized as much as possible and isolated from the rest of the abdomen using laparotomy sponges. The size and position of the abomasal incision is dependent of the lesion being addressed. For abomasal impactions, a generous curved incision is made in the abomasal wall, and the impacted contents are emptied. Once the abomasum is empty, the site is rinsed with sterile fluids. The abomasum is closed in two layers, usually simple continuous in the first layer and Cushing in the second layer. Time is spent rinsing with copious fluids to free the area of debris as much as possible. Gloves are changed and the abdomen closed routinely.

Surgical Management of Intestinal Obstruction or Trauma

Economics frequently dictate management of intestinal obstruction or trauma in small ruminants. Animals with abdominal trauma often have a history of either dog attack or having been gored by a member of their herd (Figure 21-1). With the exception of traumatic injuries, symptoms of digestive system disease are often very vague. Inappetence, abdominal distention, diarrhea, melena, and a history of foreign body consumption are typical. Abdominal radiographs, ultrasound, abdominocentesis, and basic bloodwork may be useful ancillary diagnostics if available. If needed, exploratory surgery could be indicated for diagnostic purposes. General anesthesia with intubation is appropriate for an exploratory laparotomy in small ruminants, although much can be done with sedation and regional anesthesia if necessary. Suspected trauma, foreign body obstruction, intussusception, ileus, cecal volvulus, and torsion of the mesenteric root can all be indications for surgical intervention. Cecal volvulus and concomitant mesenteric torsion are a medical/surgical emergency. The patient is usually in extreme pain and rapid hypovolemic shock occurs. It is imperative that emergency surgery be implemented. Medical management may be attempted in animals with other

Figure 21-1 Goat presenting for traumatic injury secondary to being gored by a herdmate. (Courtesy of Dr. Andy Niehaus, The Ohio State University.)

conditions, including ileus. In some cases, supportive care for pain and fluid therapy can be corrective without the need for surgery.

EXPLORATORY LAPAROTOMY

The patient is placed in left-lateral recumbency, and the right-paralumbar fossa is prepared for aseptic surgery. A 10- to 12-cm vertical skin incision is made in the midparalumbar fossa. The muscle layers, which are much thinner than in the cow, are incised sharply in a vertical direction. The peritoneum is tented and incised.

Upon entering the abdominal cavity, the organs should be inspected in a thorough and organized manner. Great care should be taken manipulating the intestinal tract, as it can be quite fragile and much less forgiving in small ruminants than in adult cattle. Bowel resection for foreign body removal, intussusception, and ileus are performed as described in calves (see Chapter 17). In the case of foreign body obstruction, the affected piece of bowel is exteriorized, and moist laparotomy sponges are used to isolate the bowel from the abdomen before enterotomy. A linear incision is made over the foreign body, and the foreign body is removed. The enterotomy site is lavaged using sterile saline and closed in a Cushing pattern using small (3-0) absorbable monofilament sutures. Small ruminants are highly susceptible to peritonitis so care should be taken to be as clean and atraumatic as possible. Instillation of sodium carboxymethylcellulose may decrease adhesion formation. In cases of trauma, the abdominal cavity should be lavaged copiously with warm, sterile saline. Closure of the laparotomy site is in three or four layers. Both sheep and goats usually require postsurgical antibiotic therapy as well as pain control. Transfaunation or the use of probiotics may be indicated when long-term antibiotic use has been implemented.

Rumen, Abomasal, and Esophageal Fistulization (Cannulization)

Fistula placement may occasionally be requested for nutritional studies as well as the development of animals for herd/flock transfaunation (rumen cannulas only). Occasionally, cannulas are placed for enteral feeding in animals that cannot prehend food properly, as in cases of listeriosis. Due to the thin abdominal wall present in small ruminants, inert plastics are most commonly used for cannulas; however, rubber, polyvinyl chloride, and stainless steel are also occasionally used. Currently, there is one company[2] manufacturing cannulas for both small ruminants and cattle in the United States. Syringe cases can also be used to make rumen cannulas, and abomasal cannulization for research purposes in sheep and goats is generally performed with a Pezzer[3] (mushroom head) urinary catheter.

SURGICAL PROCEDURE

For rumen cannulization, the left-paralumbar fossa region is prepared for surgery and a local anesthetic administered as described for rumenotomy. The surgical approach when placing a rumen cannula is significantly different from the approach taken when a rumenotomy is to be performed. For cannula placement, a circular skin incision site approximately 1 to 1.5 cm smaller than the diameter of the cannula is made sharply. The muscle is dissected using the grid technique so that the holding capacity of the muscle layers is retained. Following skin incision, the external abdominal oblique muscle is sharply divided vertically, followed by blunt division of the internal abdominal oblique and transversus abdominis muscles parallel to their fiber directions. The peritoneum may be entered digitally or with a stab incision. At this point, the rumen is exteriorized and sutured first to the dermis and subcutaneous tissues using an absorbable suture material. A broken continuous pattern is appropriate. Once a good seal of rumen to skin is obtained, the rumen is incised and the mucosa sutured to the skin using a simple interrupted pattern of nonabsorbable sutures. It is helpful to use a cutting or a taper-cut needle for the suture lines in this procedure. Most often, the cannula is warmed in hot water before insertion to make the plastic more pliable. Postsurgical antibiotics are indicated as with the rumenotomy procedure described earlier.

Esophageal and abomasal cannula placements are less common requests, as they are used entirely for research purposes. Esophageal cannulas tend to be problematic in sheep because of wool growth. Myiasis and wool irritation are both common sequelae that need to be addressed.

The surgical technique is similar to rumen cannulization. General anesthesia is indicated, with tracheal intubation mandatory to help prevent aspiration pneumonia. The animal is placed in right-lateral recumbency, and a surgical site prepared in the midcervical region just ventral to the jugular furrow and to the left of midline. A stomach tube is placed in the esophagus and maintained as a landmark for the incision site. The skin is incised directly over the tube. Blunt dissection of the sternomastoideus and cleidomastoideus muscles allows visualization of the esophagus. It is important to remember the jugular vein, carotid artery, and vagosympathetic nerves all run close to the surgical site. Careful dissection is imperative. The esophagus should be incised to a length of approximately 10 mm larger than the size of the cannula stopper. The stomach tube will be visible within the esophagus. At this point, the esophageal mucosa should be sutured to the overlying muscle and skin in a broken continuous mattress pattern using a small-diameter absorbable suture. In this region, it is important that the sutures not be too tight because tissue necrosis can be a common sequela. At this point the cannula sleeve and stopper are placed. The skin incision cranial and caudal to the cannula should be

[2]Bar Diamond Parma, Parma, ID, USA. http://www.bardiamond.com.
[3]Pezzar, Davol, Arista Surgical Supply Co., New York, NY, USA.

closed with a nonabsorbable suture using a cruciate or simple interrupted pattern. As with other fistulization procedures, antibiotics are indicated. Regular application of wound-safe fly spray will help prevent myiasis. When this procedure is performed in sheep, the wool around the cannula site should be sheared regularly.

Abomasal cannulization of sheep and goats is described using the Pezzer[4] (mushroom head) urinary catheter. Other materials, such as silicone tubing, may be used as well. The site selection and approach are as previously described in the abomasotomy. The catheter is a 36 to 40 French Pezzer catheter that is inserted into the ventral aspect of the abomasum along the greater curvature.

The midventral aspect of the abomasum can be exteriorized from a paramedian or paracostal approach. Once the desired site is located, a circular purse-string suture pattern is placed with a 3-cm diameter using 2-0 to 3-0 absorbable material. A small stab incision, just large enough to insert the mushroom head of the Pezzer catheter (approximately 1 cm), is made into the lumen of the abomasum. The purse-string suture can then be tightened around the catheter. The catheter is exteriorized through the abdominal wall (right of midline) separate from the primary incision. Enough slack should be allowed so the abomasum can be replaced in normal position. As previously described, the incision sites are closed in three layers. Before repelling the abomasum back into normal position in the abdomen, the surgeon should flush the wound field with warm sterile saline. Gloves and instruments should be changed before closure. The catheter is sutured to the skin with nonabsorbable suture material. The catheter should be supported with a body bandage for the first 10 to 14 days. Antibiotics and nonsteroidal anti-inflammatory drugs are also indicated.

Rectal Prolapse

Rectal prolapse occurs in sheep more commonly than in goats, primarily because of the practice of short tail docking in exhibition lambs. Other conditions associated with rectal prolapse in small ruminants include enteritis (coccidia, *Salmonella*), dysuria, estrogenic feeds, obesity, lush forages, and coughing. It is important for the benefit of the herd or flock to identify the inciting cause of rectal prolapse in individual animals, as most of these inciting causes affect the whole herd. When tail docking length is believed to be the primary cause of rectal prolapse, owners should be educated about appropriate docking lengths and welfare considerations. An increased incidence has long been believed to be caused by damage to nerves of the perineum by short tail docking. A study published in 2003 evaluated three docking lengths in lambs managed in feedlots or on pasture. Short tail docks were located as close to the body as possible, long docks were performed at the distal insertion of the caudal tail fold, and medium docks were performed at the point halfway between. The short tail dock was associated with a 7.8% incidence of rectal prolapse, significantly higher than that of medium dock (4.0%) or long dock (1.8%).

Rectal prolapses are classified based upon either the tissue layers involved or by severity. A Class I prolapse is mild, with only a small amount of rectal mucosa protruding, which is often intermittent. Class II prolapses include all layers of the rectum in the prolapsed portion and may also be intermittent. Class III prolapses include all layers of the rectum and also include large colon, resulting in a large prolapse and significant discomfort and straining. Class IV prolapses include rectum and large colon and are constricted by the action of the anal sphincter. Class II prolapses are the most common prolapses presented to the veterinarian for correction.

Classification by Severity

By this system, Class I prolapses include tearing of the mucosa and submucosa. Class II include tearing of the muscular layers, whereas Class III prolapses have tearing of the mucosa, submucosa, and muscular layers, further subdivided by location of the tear. Class IV prolapses are full thickness, mucosa through serosa.

Once a rectal prolapse occurs, venous and lymphatic return begins to be compromised and swelling and edema rapidly occur. This accentuates the straining response, exacerbating the prolapse. Although rectal prolapses are generally not considered emergencies, they should be corrected quickly to minimize damage from outside trauma and continued tenesmus. Those that are actively bleeding or have significant tearing should be evaluated urgently.

Class I and II prolapses may generally be managed by nonsurgical means (Figure 21-2). Most of these prolapses may be manually reduced after gentle massage and a purse-string suture placed, which allows feces to pass. Umbilical tape is often used for the purse string. This can be placed following an epidural or local block, remembering the small ruminant sensitivity to lidocaine. Most of the purse-string suture should be buried under the skin, and it should be tied in a bow so that the size can be adjusted. In lambs with short tail docks, a purse-string suture is frequently accompanied by injection sclerotherapy, where an irritating substance (usually iodine based) is injected in a line within the pelvis along the serosal surface of the rectum to incite the formation of scar tissue, adhering the rectum into the pelvis to prevent future prolapse.

Recurrent and refractory Class II and all Classes III and IV prolapses require resection (Figure 21-3). Nonsurgical amputation is often selected in market animals and can be performed through the placement of a rigid plastic tube into the lumen and an elastrator band placed proximal to the prolapse in healthy tissue. This results in ischemic necrosis of the distal portion of the prolapse with scarring at the level of the band, which results in anastomosis. The rigid tube maintains a lumen for defecation pending the tissue slough.

Figure 21-2 Anatomic Class II rectal prolapse in a lamb with a very short tail dock. The mucosa is intact and there is minimal edema. This prolapse was manually reduced and maintained in place with a purse-string suture and injection sclerotherapy.

[4]Pezzar, Davol, Arista Surgical Supply Co., New York, NY, USA.

Figure 21-3 Anatomic Class III rectal prolapse. This prolapse was surgically resected to remove the damaged tissue and replace the prolapse.

Figure 21-4 Lamb placed in sternal recumbency with hind limbs pulled forward. This opens the lumbosacral space to facilitate placement of a needle for lumbosacral epidural anesthesia.

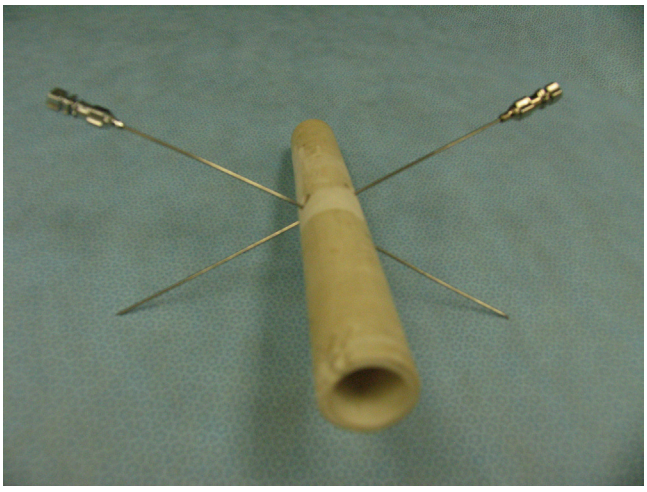

Figure 21-5 Polyvinyl chloride tube with offset paired holes drilled, which allow for cross pinning of the prolapse and facilitating the identification of the lumen.

Once the tissue has sloughed, the tube and band will fall off, and the rectum is reduced.

Surgical amputation is commonly performed and results in immediate reduction of the prolapse. The animal should be well restrained or sedated and a caudal epidural used to provide total temporary anesthesia to the tail. The sacrococcygeal intervertebral space is identified and the site clipped and prepared. The tail is pushed ventrally (if present) and a 22- to 20-gauge, 1- to 1½-inch (2.54 to 3.81 cm) needle is inserted, nearly horizontally, through the skin and a drop of lidocaine or other local anesthetic placed in the needle hub. The needle is advanced to the epidural space, where negative pressure draws in the local anesthetic. The injection is then administered. If the drop is not pulled into the epidural space, the needle is advanced until administration requires little pressure on the syringe plunger. A dose of 20 to 40 mg of lidocaine is sufficient for most large lambs and adult sheep or goats. Alternatively, a lumbosacral epidural may be performed using aseptic technique. The animal is sedated and placed in sternal recumbency with the hind limbs pulled forward (Figure 21-4). Standing behind the animal, the thumb and middle fingers are placed on the tips of the ileal wings and the index finger dropped down and the lumbosacral space identified. An 18- to 20-gauge, 1½-inch (3.81 cm) needle is inserted perpendicular to the skin and a hanging drop of lidocaine placed. The needle is advanced until the drop is pulled in to the epidural space. If using lidocaine 2%, 1 mL per 7 kg is administered at this site. If cerebrospinal fluid is obtained during the procedure, the needle should be withdrawn several millimeters into the epidural space. This will provide total anesthesia and loss of motor function to the pelvic organs and hind limbs.

After anesthesia is attained, a small-diameter rubber or plastic tube is drilled with an offset pair of holes to allow for needles or Steinmann pins to pass through it, forming an X (Figure 21-5). This tube is not required for this procedure but is extremely helpful in identifying the anatomy of the rectal layers during the procedure. This tube is placed into the prolapse, and long (6-inch, 15-cm) needles or Steinmann pins are inserted through the rectum, through the holes, and out the other side (Figure 21-6). The pins should be placed into healthy tissue, proximal to the planned site of amputation. This stabilizes all layers of the prolapse for amputation and maintains the lumen for anatomic orientation.

An incision is initiated where the mucosa is still healthy, usually about 1 to 2 cm away from the sphincter (Figure 21-7). This incision is continued circumferentially around the tube and continued until it is full thickness and the prolapse is removed (Figure 21-8). At this point, an anastomosis is performed between the two ends of the rectum that are now exposed. If the initial prolapse was too long initially for luminal tube placement, the inner portion of the prolapse may be grasped, the crosspins removed, and a tube placed at this point (Figures 21-9 and 21-10). The cut ends of the rectum are then sutured together using size 0 or 2-0 absorbable suture, preferably a monofilament on a taper needle. Maintenance of orientation to the anatomy is facilitated by the initial placement of three interrupted sutures at 12, 5, and 8 o'clock (Figure 21-11). The intervening spaces are then

Figure 21-6 Initial cross pinning of the prolapse. The length of this prolapse initially limited placement of a luminal tube, so cross pinning was performed to facilitate amputation of the distal portion with later placement of the tube. See later figures.

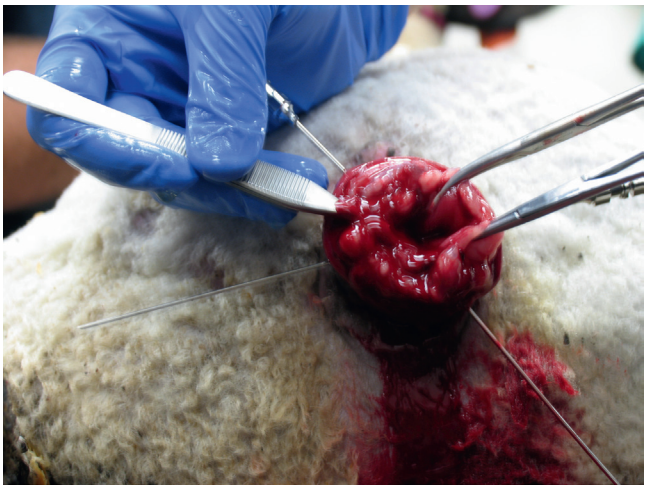

Figure 21-9 The inner large colon is grasped by hemostats and thumb forceps to maintain its exterior placement, and the cross pins are pulled to allow placement of the luminal tube.

Figure 21-7 Incision distal to the crosspins for amputation.

Figure 21-10 The luminal tube is placed and cross pins replaced.

Figure 21-8 Circumferential incision is complete, and the proximal large colon is kept from retracting into the abdomen by the crosspins.

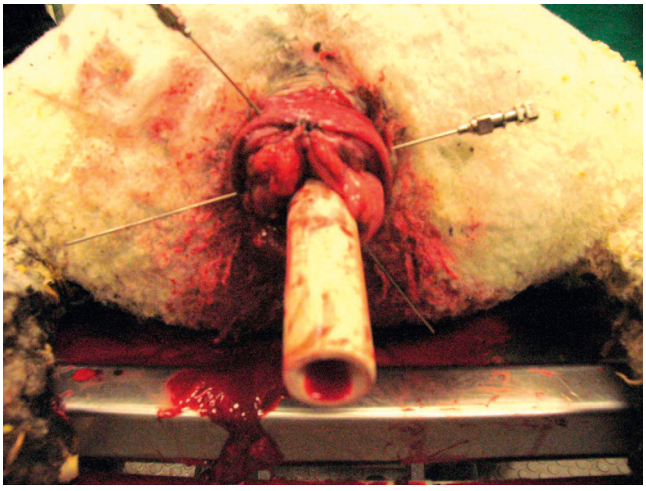

Figure 21-11 Initial 12 o'clock suture placed.

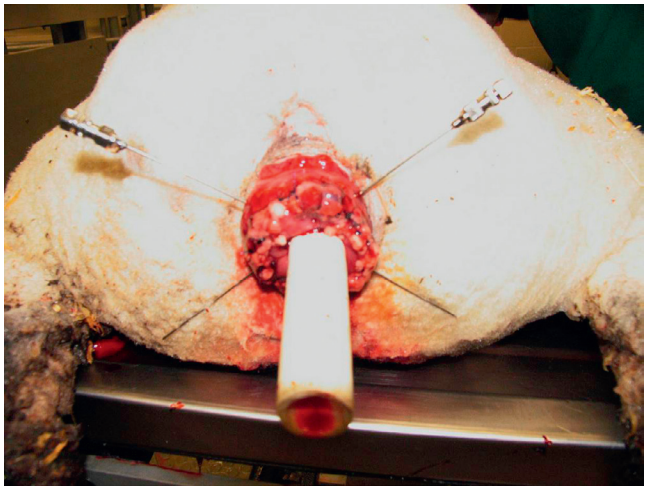

Figure 21-12 The anastomosis is complete and the pins and tube will be removed, allowing for replacement of the prolapse.

filled. A simple interrupted or cruciate pattern is most appropriate (Figure 21-12). Interrupted continuous lines, where a portion is sutured in a continuous pattern and the pattern is stopped and then restarted, may also be used but may be associated with an increased risk of stricture. Once the anastomosis is complete, the needles are pulled and the tube (if used) removed. The rectum is then replaced.

Analgesics and antimicrobials should be used before and after surgery, and measures should be taken to soften the feces to facilitate passage past the anastomosis. This may include administration of mineral oil or magnesium hydroxide or slightly increasing the legume or grain portion of the diet. Owners should monitor animals for general demeanor, appetite, abdominal contour, and fecal passage. Animals with increases in abdominal size, reductions in appetite, or evidence of constipation should be evaluated. Strictures, abscesses, peritonitis, dehiscence, and death are all potential postoperative complications.

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