Rectal perforations carry the inherent risk of introducing fecal material into the peritoneal cavity or the retroperitoneal space in the pelvic canal. In most species, septic peritonitis and generalized septicemia develop rapidly if the peritoneum is directly contaminated by feces. Retroperitoneal fecal contamination may also lead to generalized sepsis in dogs and cats if clinical signs are not recognized and appropriately managed early.1,2 Another sequela of rectal perforation is rectocutaneous fistula, which has been described as secondary to traumatic rectal injury1,3,4 and to iatrogenic rectal perforation from anal gland or perineal hernia surgery.4,5 Rectal perforations and rectocutaneous fistulas may be challenging to treat because they are prone to complications such as dehiscence, infection, and delayed healing, sometimes despite early identification and repair.1,2,6

ETIOLOGY
Rectal perforation in dogs and cats has been most frequently described in association with pelvic fractures.1,2,7 Overall, rectal tears are very rare (<1%) in pelvic trauma cases,2 and urethral or bladder perforation is more common in dogs with pelvic fractures.2,8 Other causes of rectal perforation include penetrating animal bites,3,4 perineal herniorrhaphy or anal saccullectomy,4,6 trauma from ingested foreign bodies or intraluminal foreign bodies entering via the anus, iatrogenic tears during rectal examination, improper use of enema tubes, gunshot wounds, and stab wounds.9

Most rectal perforations described in dogs and cats occur within the most caudal 4 cm of the rectum.1,2,7 The rectum extends from the pelvic inlet cranially to the anal canal caudally. Cranial to approximately the second caudal (coccygeal) vertebra, the rectum is suspended from the ventral aspect of the sacrum by the mesorectum, which forms the parietal peritoneum lining the pararectal fossa, a direct extension of the abdominal peritoneal cavity.10 This more cranial part of the rectum is relatively mobile and distensible and appears to be less prone to traumatic penetration. However, at the level of the second caudal vertebra, the visceral peritoneum from the rectum reflects cranially to blend into the parietal peritoneum. Caudal to this point, the rectum is extraperitoneal and is more fixed to the encircling muscle cuff forming the pelvic diaphragm. This less mobile area appears to be more susceptible to trauma.

Rectocutaneous fistula is a potential complication of any rectal perforation, including peri-
anal surgery. However, to my knowledge, this disorder has been previously reported in only six small animal cases. The cause of the initial rectal perforation in these animals was pelvic trauma, an animal bite, or perineal/anal surgery. In all cases, the initial rectal perforations were surgically closed by experienced surgeons one or several times before dehiscence and subsequent development of a fistulous tract. Reinforcement of the primary repair with a biceps muscle flap or fascia lata graft did not lead to a successful outcome.

**DIAGNOSIS**

**Clinical Signs**

Rectal perforation is easily overlooked in a dog or cat with severe pelvic and polysystemic trauma. However, early detection and treatment are imperative to avoid complications, such as sepsis and repair failure, that predispose the patient to fistula formation. The first step is for the veterinary practitioner to be alert to the fact that rectal tears are occasionally associated with pelvic fractures.

In pelvic trauma cases, the acute clinical signs of rectal perforation (i.e., pelvic canal pain and swelling) may be obscured by hypovolemic shock or severe pain or swelling from the pelvic fractures. Rectal perforation in these cases can be identified by a meticulous physical examination and evaluation of diagnostic images. If diagnosis is delayed beyond the first few hours after trauma, the initial clinical signs will include diarrhea and perineal swelling, often preceding clinical signs of septic shock.

In cases of iatrogenic rectal penetration or perforation, the initial clinical signs include hematochezia, dyschezia, and pain or discomfort associated with defecation or rectal palpation. Perineal herniorrhaphy with inadvertent suture placement into the rectal mucosa may cause tenesmus as an early clinical sign. If the offending suture is not removed, subsequent suture tract infection may lead to formation of a rectocutaneous fistula.

The clinical signs of a rectocutaneous fistula include drainage of fecal material through the perianal defect and pain and swelling associated with a perifistular inflammatory reaction.

**Physical Examination and Diagnostic Imaging**

The physical examination of a dog with rectal perforation may reveal omentum herniated through a full-thickness lesion into the rectum and protruding from the anus, in which case the defect is readily apparent. In other cases, the defect is more obscure. A rectal examination should be performed in any cat or dog with trauma to the pelvis or perineal region. The tear in the rectal mucosa may not be directly palpable, but the presence of blood in the rectal lumen may be an indication of full-thickness rectal wall trauma and should lead to further investigation.

In three of six cases of rectal perforation associated with pelvic fracture, the perforation was initially not readily apparent on physical examination, and diagnosis was delayed. Subsequent retrospective examination of pelvic radiographs revealed free gas in the perirectal soft tissue. The finding of small volumes of perirectal gas in a dog or cat with pelvic trauma must be considered suggestive of rectal perforation. The analysis of pelvic radiographs should include a meticulous evaluation of the perirectal soft tissue in addition to more readily apparent bony lesions.

No reports in the veterinary literature describe the value of advanced imaging or endoscopic examination in cases of rectal perforation. It is reasonable to believe that three-dimensional imaging using computed tomography or magnetic resonance imaging would allow easier examination of the perirectal tissue compared with conventional radiography.

The diagnosis of an established rectocutaneous fistula in a dog or cat is usually more straightforward than that of a recent rectal perforation because the drainage from the fistulous tract shows fecal contamination.

**TREATMENT**

It is often stated that minor retroperitoneal rectal perforations can heal by second intention if adequate drainage is provided. However, healing by second intention was reported in only two of eight patients with rectal perforation/rectocutaneous fistula that sur-
Management of a Rectocutaneous Fistula in a Dog by Temporary Colostomy

History and Presentation
A 59.4-lb (27-kg), 4-year-old, male castrated Karelian bear dog was referred to the Washington State University Veterinary Teaching Hospital (WSUVTH) for a rapidly growing soft tissue sarcoma located in the right perineal region. The mass was surgically resected, leading to a small rectal perforation that was surgically repaired during the same procedure. Five days after the first surgery, the perineal area was surgically reexplored because of fecal drainage from the incision, and a 1-cm rectal defect was sutured and reinforced with porcine intestinal submucosa (Vet BioSiSt, Cook Biotech Inc., West Lafayette, IN). An 18-fraction course of radiation therapy was started 14 days after the second surgery and was completed after 23 days. Two weeks after the last radiation treatment, the local veterinarian diagnosed a rectocutaneous fistula located in the previous surgical field. The dog returned to WSUVTH for surgical repair through an anal approach.

Treatment and Outcome
One week after the third surgery, the dog returned to WSUVTH because of severe pain during defecation and drainage of fecal material from the perineal area. A rectocutaneous fistula was again located in the center of the previous perineal incision. Results of a complete blood count, biochemistry profile, and urinalysis were within normal limits. Subcutaneous administration of amikacin (20 mg/kg once daily) was instituted, and the dog was subsequently monitored by daily urinalysis. Proctoscopy and rectal examination revealed two defects in the right ventrolateral rectal wall, 1 cm and 3 cm cranial to the anus, respectively. Two days later, a left flank diverting colostomy was performed, as described by Hardie and Gilson.7 The site of the colostomy—a flat area without skin folds in the dorsal flank region (Figure A)—was planned with the dog awake in normal standing position. A circular skin incision 4 cm in diameter was made and the underlying abdominal wall musculature separated rather than incised to gain entrance into the abdominal cavity. The descending colon was exteriorized, and a rod created from three 90-mm LuBrap plates wired together was passed through the mesocolon and sutured in a vertical position in the subcutis and to the underlying muscle fascia. The seromuscular layer of the exteriorized colon was sutured to the subcutaneous tissue. A 4-cm antimesenteric longitudinal enterotomy was performed and the mucosa sutured to the skin with simple interrupted sutures. Care was taken to allow the mucosa to evert over the skin edges to create a “nipple-like” protrusion in an attempt to minimize fecal contact with the skin (Figure B).

Four days after the colostomy procedure, the perineal inflammation had decreased significantly and the rectocutaneous fistulous tracts were surgically resected. The previously identified rectal wall defects were sutured from the perineal approach, and an internal obturator muscle flap was used to reinforce the repair and support the rectal wall. On the 32nd day after colostomy creation, the colon was sharply dissected from the skin and abdominal wall, and the longitudinal enterotomy was closed in a transverse direction. The lumen of the colon aborad to the stoma was mildly atrophied. One centimeter of the skin and subcutis surrounding the stoma was resected, the area was lavaged, and the muscle layers, subcutis, and skin were closed in separate layers. The dog recovered without complications and was discharged the following day with the recommendation to feed a liquid diet for 2 days and then

Figure A. The planned colostomy site. A flat area without folds in the left dorsal flank region was chosen.

Figure B. The colonic mucosa is allowed to evert over the skin edge in an attempt to minimize fecal contact with the skin.
a low-residue diet in gradually larger portions over the next 10 to 14 days.

Four doses of doxorubicin were administered 3 weeks apart, starting 4 weeks after the colostomy reversal. After the first treatment, the dose was decreased from 29 mg/m² to 25 mg/m² because of a decrease in the white blood cell count. At the time of each chemotherapy administration, the rectum was palpated and no masses or defects were noted.

Approximately 4 months after the last chemotherapy dose, the dog returned to WSUVTH with pain on defecation. A mass 3 cm in diameter was palpated in the area of the previous rectal wall defects. Abdominal ultrasonography showed no evidence of metastasis and a colonic wall within normal limits. Fine-needle aspiration of the mass showed spindle-shaped cells consistent with local recurrence of the sarcoma. The owners elected euthanasia.

**Stoma Care**

The stoma was kept patent for 32 days, during which a low-residue diet was fed. During this time, a two-piece flange-and-bag system was used (Figures C and D), with the opening in the flange cut to a diameter of 45 mm. The adhesive backing on the flange did not provide a secure attachment, so additional adhesive was applied to the peristomal area and adhesive tape was used to secure the edge of the flange (Figure E).

The stoma care and the products used for the colostomy

(Box continues on page 230)
Management of a Rectocutaneous Fistula in a Dog by Temporary Colostomy (continued)

Figure G. After modification of the stoma care, including skin protection with diaper rash ointment, the excoriation improved and resolved (day 32 after colostomy).

(period continued from page 227)

Both of these cases required fecal diversion by colostomy or jejunostomy before a successful outcome was achieved. The size of the defect appears to have little impact on the outcome of the case. In six cases in which rectal defect sizes were reported, the defects ranged from 2 mm in diameter to 20 x 40 mm, with a median length of 17.5 mm. In one of the two cases that ultimately required fecal diversion to heal, the rectal perforation was only 2 mm in diameter.

Time to primary repair appears to be of greater importance than defect size. In two of three cases successfully managed by primary repair without fecal diversion, the rectal defects were closed within 24 hours of occurrence. In the third case, primary repair was carried out on the sixth day after trauma. However, lavage of the pelvic canal and treatment with intravenous broad-spectrum antibiotics had been instituted 3 days earlier. In both cases requiring fecal diversion, the time from perforation to primary repair exceeded 1 week, and rectocutaneous fistulas had developed.

In three cases reported by Schiller and colleagues, primary repair was attempted several times. After multiple repair failures with formation of rectocutaneous fistulas, the cranial aspect of the defect was anastomosed to the anus, which led to a successful outcome. However, clinical signs, defect size and location, and time to repair in these dogs were not well described. This technique has also been suggested by Matthiesen and Marretta for the management of rectocutaneous fistulas secondary to perineal hernia repair. If the patient presents with clinical signs of generalized sepsis from retroperitoneal rectal perforation, stabilization before anesthesia and surgery is imperative. Fluid therapy to correct hydration status and colloid osmotic pressure is necessary, as are intravenous broad-
Table 1. Care of the Temporary Colostomy in the Reported Case

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Frequency</th>
<th>Equipment[^a]</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Bag changes               | Twice daily or after bowel movement | Disposable or reusable (Figure C) colostomy bag  
Used here:  
- Sur-fit Natura drainable pouch[^b]  
- Sur-fit Natura closed-end pouch[^b] | • Use gloves to protect hands from intestinal bacteria.  
- Reusable bag requires cleaning and drying before reuse; fecal material characteristics (“stickiness”) may make reusing bags difficult. I recommend having both types available. Do not lose the bag clip if using a reusable bag. |
| Stoma cleaning            | Twice daily or after bowel movement | • Long-handled cotton-tipped applicators  
- Cotton makeup pads  
- Saline  
- Triple antibiotic ointment  
- Diaper rash ointment  
Used here:  
- Desitin original[^c]  
- Neosporin original[^c] | • Use gloves to protect hands from intestinal bacteria.  
- Oil- or petroleum-based skin protection products tend to mix with the fecal content and may be difficult to dissolve with water-based products. Cleaning may be more effective using the skin protection product rather than water or saline. |
| Skin protection           | After each cleaning         | • Triple antibiotic ointment  
- Diaper rash ointment  
Used here:  
- Desitin original[^c]  
- Neosporin original[^c] | Apply with cotton-tipped applicators to the skin (not colonic mucosa) exposed to fecal material. |
| Flange change             | Every 2–4 days              | • Flange (Figure C)  
- Adhesive  
- Wide elastic adhesive tape  
Used here:  
- Sur-fit Natura Stomahesive wafer  
  6 × 6-in, 4-in flange[^b]  
- Sur-fit Natura Stomahesive flexible wafer, 5 × 5-in, 2¼-in flange[^b]  
- Stomahesive paste[^b]  
- Skin-Bond[^d]  
- Elastikon[^c] | • Flange removal may require sedation, especially if the adhesive irritates the skin.  
- In the case presented here, Skin-Bond was irritating the skin and difficult to remove; the owners chose to use Stomahesive around the inner perimeter of the flange and adhesive tape (Figure E) to secure the remainder of the flange.  
- Adhesive remover is available but was not used in this case. |
| Protection of appliances   | Daily                       | • Stockinette  
- T-shirt | A 6-inch stockinette conforms well to the trunk and minimizes downward displacement of the flange/bag. For added protection during walks and travel, a tight T-shirt can be worn over the stockinette. |

[^a]The product information is strictly for products used in this case report and is not an exhaustive list of available products.  
[^b]ConvaTec, Princeton, NJ  
[^c]Johnson & Johnson Consumer Companies, New Brunswick, NJ  
[^d]Smith & Nephew, Largo, FL; this product has since been discontinued by the manufacturer.  

Spectrum antibiotics. In addition, adequate drainage of the perineal area with or without wound lavage is important to successfully stabilize these cases for anesthesia and subsequent primary repair or fecal diversion. Septic peritonitis must be ruled out in these animals by abdominocentesis, diagnostic peritoneal
lavage, or surgical abdominal exploration. Adequate drainage can be achieved by open wound management of the perirectal tissues, using wet-to-dry bandages.\textsuperscript{1,3} A management approach to cases of suspected rectal perforation is depicted in Figure 1.

**TEMPORARY FECAL DIVERSION BY ENTEROSTOMY**

**Comparative Medicine**

In human medicine, temporary fecal diversion by colostomy has been used for more than 200 years and remains a common and important treatment option for many colorectal diseases.\textsuperscript{14} Indications include colorectal or other obstructing cancer; severe inflammatory disease; pelvic, perineal, or perianal sepsis, including rectal perforation; and major large intestinal resection and anastomosis (coloanal or ileoanal).\textsuperscript{15} An anastomosis between the skin and intestinal mucosa can be achieved after exteriorization of the intestinal segment and either transverse transection of the intestinal segment, creating an end enterostomy, or enterotomy, creating a loop enterostomy.\textsuperscript{15}

In humans, minimizing the bulk and odor of the fecal effluent is of great concern, and ileostomy is often preferred over colostomy for this reason.\textsuperscript{16} The overall complication rate appears to be fairly similar between ileostomy and colostomy.\textsuperscript{17,18} Complications after any enterostomy are very frequent; the most common include skin excoriation, appliance leakage, stoma retraction, and small bowel obstruction.\textsuperscript{15} Small bowel obstruction is common after both creation and closure of a loop ileostomy. The obstruction is most commonly a result of intraabdominal adhesions following the laparotomy, but in some instances, disuse atrophy of the distal intestinal limb, leading to a narrowing diameter, is believed to play a role.\textsuperscript{15} A complication more commonly associated with ileostomy
than with colostomy is the high output of liquid or semi-liquid efflux, leading to dehydration and electrolyte disturbances. Colostomy is associated with a higher frequency of intestinal prolapse than ileostomy.

High body mass index, inflammatory bowel disease, and old age have repeatedly been shown to be risk factors for enterostomy complications; immunosuppressive treatment, diabetes, and surgeon inexperience are less consistently cited. A significantly decreased risk for complications has been noted if an enterostomal therapist is involved in the treatment of stoma patients. The role of the enterostomal therapist in counseling the patient preoperatively, determining the stoma location, and educating the patient in the care of the stoma and appliances is extremely important.

Colostomy has also been reported as being of benefit in horses with rectal tears. In horses, rectal tears tend to occur in the peritoneal segment of the rectum or descending colon and are often incurred iatrogenically during rectal palpation. Patients with incomplete tears have excellent survival rates after conservative management with antibiotics, antiinflammatories, and stool softeners. Tears extending to the serosa or mesocolon or through all layers are considered high grade and are potentially fatal because the risk for septic peritonitis is high unless immediate treatment is instituted. Colostomy has been previously recommended as the preferred treatment of high-grade tears in which more than 25% of the rectal circumference is torn. However, the complication rates associated with colostomy or its reversal have been high, reaching 84% in two available studies. In these studies, only one of the 12 horses that survived the initial 3 postoperative days recovered without complications. The most common complications included partial dehiscence of the stoma during anesthesia recovery (eight of 12 horses), partial dehiscence of the paralumbar incision after reversal (six of 11), peristomal hernia (two of 12), and stomal prolapse (two of 12). In addition, severe atrophy of the distal colonic limb, leading to impaction and obstruction of the colon adjacent to the reversed stoma site, was observed in one study. Daily lavage of the distal limb with 20 L of warm water was believed to reduce the distal limb atrophy in the other study. One case of small bowel obstruction caused by adhesion formation between jejunum and abdominal wall was noted.

**Enterostomy in Small Animals**

Only eight clinical cases of enterostomy in dogs have been reported. The indication for enterostomy was rectal obstruction associated with cancer or cancer treatment in four cases; rectal perforation in three cases; of which rectocutaneous fistula developed in two cases; and temporary colostomy to protect the surgery site after rectal resection and anastomosis in one case. Most of the dogs (five of eight) were treated by left flank colostomy through either a loop colostomy (four dogs) or end colostomy (one dog); ventral loop colostomy; left ventrolateral end colostomy; and rightsided end jejunostomy were used in one dog each.

In a case series of five dogs reported by Hardie and Gilson, the first dog underwent a ventral colostomy. This dog experienced fecal leakage into the peritoneal cavity, generalized sepsis, and multiple organ failure. The authors speculated that the ventral location caused tension on the suture line, leading to the failure, and the subsequent cases were managed by a left flank colostomy using a colostomy rod to minimize tension on the stoma site. The complications in the four surviving dogs mainly consisted of skin excoriation and appliance-related problems. In two of the four dogs, the primary disease process allowed reversal of the colostomy, and despite mild atrophy of the distal colonic limb, no further complications occurred at the incision site or in gastrointestinal function. In a case of end colostomy reported by Tobias, no complication related to the stoma occurred. In this case, a “cuff” of colonic mucosa was created before anastomosis of the mucosa to the skin to prevent fecal contamination of the skin, and the stoma was left open and unbandaged. In the most recent case reports of enterostomy, a temporary end jejunostomy and a permanent left flank end colostomy were created, and the only complications noted included skin excoriation.

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**If identified late, a rectal perforation may lead to generalized sepsis or rectocutaneous fistula formation.**
and a disparity between the proximal and distal intestinal limb diameter, prohibiting an end-to-end anastomosis at reversal.1

CONCLUSION

Early detection and treatment of rectal perforation is the preferred method to avoid formation of rectocutaneous fistulas. If a fistula is established and its size or location precludes the use of local repair techniques, an enterostomy for fecal diversion may be indicated in combination with primary repair or healing by secondary intention. Enterostomies in small animals appear to be associated primarily with mild complications such as skin excoriation and mild atrophy of the aborad bowel segment. Stoma care is intensive, and owner education and commitment are imperative for a successful outcome.

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ARTICLE #2 CE TEST

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1. Rectal perforation or tear is seen in fewer than ___ of small animal cases with pelvic trauma.
   a. 1%  c. 10%
   b. 5%  d. 20%

2. Other than vehicular trauma, etiologies for rectal perforation that have been reported in small animals include
   a. animal bites.
   b. iatrogenic injury in association with perineal herniorrhaphy.
   c. iatrogenic injury in association with anal sacculctomy.
   d. all of the above
3. Most rectal perforations in dogs and cats occur within ____ cm of the anus.
   a. 1   c. 3
   b. 2   d. 4

4. Rectal perforation should be suspected in a dog or cat with pelvic trauma that
   a. develops melena.
   b. demonstrates pain on rectal palpation.
   c. is showing free perirectal gas on radiographs.
   d. presents in shock.

5. Which statement regarding rectal perforations in dogs is true?
   a. Only defects larger than 1 cm are clinically significant.
   b. Early repair appears to be important for successful outcome.
   c. Healing by second intention has proven to be highly successful.
   d. Primary repair should not be attempted.

6. In humans, ileostomy is often preferred over colostomy for fecal diversion because
   a. ileostomy is associated with fewer complications.
   b. the bulk and odor of the effluent are less offensive.
   c. small bowel obstruction has not been associated with ileostomy.
   d. dehydration and electrolyte abnormalities due to high-volume efflux are more common with colostomy.

7. Risk factors for complications with enterostomy in humans include
   a. high body mass index.
   b. inflammatory bowel disease.
   c. old age.
   d. all of the above

8. Which statement regarding colostomy in horses is false?
   a. Low complication rates have been seen in clinical studies.
   b. Colostomy has been recommended for high-grade rectal tears involving >25% of the rectal circumference.
   c. Stoma dehiscence often occurs during recovery from anesthesia.
   d. Small bowel obstruction has been reported as a complication.

9. _____ is the most commonly reported enterostomy technique in dogs.
   a. Left flank loop colostomy
   b. Right flank end jejunostomy
   c. Left flank end colostomy
   d. Ventral loop colostomy

10. The most commonly reported complication of enterostomy in dogs is
    a. atrophy of the oral bowel segment.
    b. intestinal prolapse through the stoma.
    c. skin excoriation.
    d. dehydration and electrolyte imbalance due to high efflux from the stoma.