Temporary Rectal Stenting for Management of Severe Perineal Wounds in Two Dogs

Owen T. Skinner, BVSc, DECVS, Laura C. Cuddy, MVB, MS, DACVS-SA, DECVS, DACVSMR, James G. Coisman, DVM, MS, DACVS-SA, Jennifer L. Covey, DVM, DACVS-SA, Gary W. Ellison, DVM, MS, DACVS

ABSTRACT

Perineal wounds in dogs present a challenge due to limited local availability of skin for closure and constant exposure to fecal contaminants. This report describes temporary rectal stenting in two dogs following severe perineal wounds. Dog 1 presented with a 4 × 4 cm full-thickness perineal slough secondary to multiple rectal perforations. A 12 mm internal diameter endotracheal tube was placed per-rectum as a temporary stent to minimize fecal contamination. The stent was removed 18 days after placement, and the perineal wound had healed at 32 days post-stent placement, when a minor rectal stricture associated with mild, intermittent tenesmus was detected. Long-term outcome was deemed good. Dog 2 presented with multiple necrotic wounds with myiasis, circumferentially surrounding the anus and extending along the tail. A 14 mm internal diameter endotracheal tube was placed per-rectum. The perineal and tail wounds were managed with surgical debridement and wet-to-dry and honey dressings prior to caudectomy and negative pressure wound therapy (NPWT). Delayed secondary wound closure and stent removal were performed on day six without complication. Long-term outcome was deemed excellent. Temporary rectal stenting may be a useful technique for fecal diversion to facilitate resolution of complex perineal injuries, including rectal perforation. (J Am Anim Hosp Assoc 2016; 52:385–391. DOI 10.5326/JAAHA-MS-6350)

Introduction

Perineal and peri-anal wounds in dogs present a challenge due to limited local availability of skin for closure and the constant exposure to fecal contaminants and the associated risk of wound contamination. Early fecal diversion, traditionally by colostomy, is frequently advocated in humans with perineal and rectal wounds to minimize complications associated with contamination and subsequent sepsis; however, controversy exists regarding optimal management. Colostomy has been infrequently described in dogs. The additional cost and care incurred by temporary colostomy may not be acceptable to some owners and the attendant morbidity of colostomy may be substantial. While Hardie et al. reported diverting or incontinent colostomy in five dogs for palliation of obstruction or leakage of the distal colon or rectum, peritoneal leakage of fecal contents and subsequent septic peritonitis occurred in one patient. In addition, skin excoriations associated with the stoma site appear almost inevitable. Furthermore, these colostomies require intensive management, including regular bag and flange changes.

Rectal catheter systems have been used successfully in humans with perineal excoriations or burns to manage fecal contamination. Although fecal soiling was not completely eliminated in all

From the Department of Small Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, Florida (O.T.S., G.W.E.); Joint Base Lewis-McChord Veterinary Center, Tacoma, Washington (J.G.C.); Department of Surgery, Section of Veterinary Clinical Studies, School of Veterinary Medicine, University College Dublin, Dublin, Ireland (L.C.C.); and Oakland Veterinary Referral Services, Bloomfield Hills, Michigan (J.L.C.).

Correspondence: skinnero@ufl.edu (O.T.S.)
cases, peri-anal disease activity index, including scoring of discharge and fecal soiling, significantly decreased after tube insertion in a series of 20 patients.7,14 The only major complications in 28 patients were 1 case of bowel occlusion and 1 case of anal ulceration.7,13

To the authors’ knowledge, no dedicated veterinary rectal catheter systems are currently available. This, coupled with the significant drawbacks associated with colostomy in dogs, has limited widespread use of either technique in veterinary medicine. This report describes the clinical presentation and outcome of 2 dogs with severe perineal wounds, managed with the aid of temporary rectal stenting.

Case Report

Dog 1
A 6 yr old 3.9 kg intact male miniature dachshund was referred to the University of Florida Small Animal Hospital for evaluation of a large (4 cm x 4 cm) full-thickness perineal wound and multiple non-healing rectal perforations of 19 days duration. The patient had previously presented to a primary care veterinarian with hemorrhagic gastroenteritis and subsequently developed gastric dilatation and volvulus. Gastric de-rotation and incisional gastropexy was performed and intravenous antibiotic therapy was administered (ampicillin [unknown dose], enrofloxacin [unknown dose], and metronidazole [unknown dose]). The dog improved clinically over the next 3 days; however, progressive inguinal and scrotal swelling were subsequently noted (day 1). The dog was discharged but returned 4 days later (day 5) with purulent discharge and fecal soiling, significantly decreased after tube insertion in a series of 20 patients.7,14 The only major complications in 28 patients were 1 case of bowel occlusion and 1 case of anal ulceration.7,13

The rectal perforation progressed into more substantial open wounds and the patient was referred to a board-certified surgeon (day 16), at which point a rectal stricture was identified 1.5 cm orad from the anus and immediately aborad to the wounds. A 2 mm anal sac perforation was also identified, in addition to the multiple rectal wounds ranging from 2 mm to 2 cm in diameter. A full-thickness colonic biopsy was obtained and histopathologic evaluation revealed evidence of mild erosive colitis. Aerobic culture and susceptibility of the perineal wound revealed growth of multiple bacterial species, including *E. coli* resistant to trimethoprim/sulphonamide but susceptible to amikacin and imipenem. Healthy granulation tissue was identified over the surface of the perineal wound. The rectal perforations were closed with simple interrupted sutures of 3-0 polydioxanone; however, full-thickness rectal wall dehiscence was noted the following day. The wounds were repaired two further times with 4-0 polydioxanone, with dehiscence noted the following day on each occasion. The dog was subsequently referred to the University of Florida Small Animal Hospital for further evaluation.

On presentation (day 19), a 4 x 4 cm perineal wound was present, with a healthy granulation bed that was grossly contaminated with fecal contents. A single 1 cm long full-thickness rectal perforation was identified on the right ventrolateral wall communicating with the perineal wound. The wound was lavaged with 0.9% saline solution. The cuff was removed from a 12 mm internal diameter silicone endotracheal tube that was cut to a length of 10 cm. Approximately 8 cm of the tube was placed percutaneously as a rectal stent to divert feces to prevent fecal contamination of the perineal wound, to minimize rectal stricture, and facilitate rectal healing by second intention; 2 cm of the tube was left protruding from the anus. Four simple interrupted sutures of 0 polypropylene were placed from the wall of the tube to the external anal sphincter dorsally, ventrally, and at the 3 and 9 o’clock positions. Replaceable sections of nitrile butadiene rubber glove were affixed to the caudal end of the stent to collect feces and were replaced as necessary (typically 2–3 times a day, while hospitalized). Oral lactulose solution (170–510 mg/kg q 8 hours) was administered as a stool softener to aid fecal passage through the stent; the dose was adjusted to maintain soft but not excessively liquid feces. An Elizabethan collar was applied to prevent patient interference.

Wet-to-dry dressings were applied to the perineal wound for two additional days, prior to placement of amikacin compounded in a depot slow-released gel (15 mg/kg), applied topically, with a primary contact layer of non-adherent petroleum gauze. The secondary contact layer consisted of dry gauze swabs and the bandage was covered with an adherent iodoine impregnated drape. The dog was then discharged to the owner’s care with instructions to monitor the tube; to clear obstructions, where feasible, with a cotton-tipped applicator; and to change the nitrile butadiene fecal reservoirs as required. The dressing was replaced every 5–7 days by the dog’s primary care veterinarian. Moderate to severe rectal straining was noted for the duration of stent placement, with continuous passage of loose stool through the stent.

The stent was replaced after inadvertent removal on day 26. At that time, the rectal perforation was still present but granulation...
tissue was noted surrounding the stoma. A recheck on day 30 found the stent in place and the perforation to have reduced in size, albeit with the presence of a mucoid discharge from the perineal wound; however, no evidence of gross fecal contamination was seen at any point. The dog re-presented on day 36 due to tenesmus and further mucoid discharge from the perineal wound. On rectal examination on day 37, the rectal perforation was healed and the stent was removed and no further wound dressings were applied. The dog’s anal tone was subjectively reduced immediately following stent removal but subsequently improved; no episodes of incontinence were reported.

Rectal examination at re-evaluation at day 51 revealed a minor annular rectal stricture, with a subsequent rectal diameter of 7 mm, 2 cm oral to the anus. “Ribbon-like” stools had been reported with occasional straining. The wound was completely healed and there was no further difficulty reported during defecation; the owner reported the outcome as very good. Endoscopy and balloon dilation were offered but declined. Communication with the owner 19 mo after injury revealed persistent mild fecal tenesmus managed with dietary pumpkin supplementation.

**Dog 2**

An 11 yr old 11.6 kg male Lhasa apso presented to the University of Florida Small Animal Hospital with multiple perineal wounds circumferentially surrounding the anus and radiating outwards approximately 4 cm, at the tail base, and extending half the length of the tail. The dog resided in a multi-dog household and the owners attributed the wounds to an attack by its housemates prior to presentation.

On presentation (day 1), the dog was laterally recumbent and dull but responsive, with pale pink mucous membranes. The heart rate was 200 beats per minute with a systolic blood pressure of 80 mmHg; axillary temperature was 39.3°C. Necrotic wounds with sub-dermal myiasis extended approximately 4 cm circumferentially, radiating from the anus (Figure 1). Full-thickness skin wounds were present at the tail base, while multiple puncture wounds were noted along half the length of the tail. Complete blood count revealed a leukopenia (3.02 K/µL [5.0–13.0 K/µL]) characterized by neutropenia with a degenerate left shift (segmented neutrophils: 0.81 K/µL [2.7–8.9 K/µL]; band neutrophils: 0.9 K/µL; metamyelocytes: 0.12 K/µL), while serum biochemical analysis showed a panhypoproteinemia (albumin: 1.3 g/dL [2.9–3.8 g/dL], globulin: 1.6 g/dL [2.2–4.2 g/dL]). Sepsis and hypovolemic shock were suspected and two intravenous boluses of 300 mL 0.9% NaCl were administered, which restored normotension.

No evidence of intra-abdominal pathology was identified on abdominal radiographs or focused assessment with sonography for trauma. Extensive perineal and tail wound lavage was performed with tap water to remove gross contamination, followed by lavage with 0.9% NaCl. Samples were obtained from the peri-anal wounds for aerobic and anaerobic culture, prior to administration of

**FIGURE 1** (A) Anal wounds prior to initial debridement. Numerous necrotic tracts can be seen, which radiated 4 cm circumferentially from the anus. (B) Wound following tail amputation and apposition of the caudal musculature. The sutures used to hold the rectal stent in place can be seen.
intravenous ampicillin with sulbactam (30 mg/kg q 8 hr) and enrofloxacin (10 mg/kg q 24 hr). The wounds were then sharply surgically debrided. The severity of the circum-anal wounds necessitated complete excision of the superficial anal tissues from the external anal sphincter radiating 4 cm outwards circumferentially. The cuff was removed from a 14 cm long, 14 mm internal diameter, endotracheal tube. Ten centimeters of the tube was placed per-rectum to minimize fecal contamination of the wound and secured to the rectal mucosa using simple interrupted stay sutures of 0 polypropylene, placed into the wall of the endotracheal tube and through the external anal sphincter. Wet-to-dry dressings using 7% hypertonic saline soaked gauze, retained by a tie-over dressing, were applied to the wound bed around the stent. An Elizabethan collar was applied to prevent patient interference. Postoperative analgesia was maintained with intravenous infusion of fentanyl (2–5 μg/kg/hr).

On day 2, the wounds displayed small foci of necrosis distributed throughout each wound bed, but the external anal sphincter appeared to be largely intact. The wounds were debrided and dressed with mānuka honey and gauze swabs, maintained with tie-over dressings; this was repeated on day 3, with reduction in visible necrotic tissue associated with the wound beds. Diffuse skin necrosis was, however, noted extending circumferentially approximately 10 cm caudad from the base of the tail, despite the presence of good tail pulses caudally. Results of initial wound culture revealed heavy mixed growth on both aerobic and anaerobic culture, with confirmed susceptibility of the predominant organisms to current antimicrobials. Repeat complete blood count revealed a mild leukocytosis (13.10 K/μL [5.0–13.0 K/μL]) with left shift (segmented neutrophils: 7.5 K/μL [2.7–8.9 K/μL]; band neutrophils: 4.3 K/μL; metamyelocytes: 0.26 K/μL).

On the morning of day 4, the stent and skin surrounding the dog’s wounds were aseptically prepared and the wound beds were treated with 0.05% chlorhexidine solution before debridement. Sparse early granulation tissue development was noted. The tail was amputated via disarticulation between the second and third caudal vertebrae and the muscular tissues apposed. Skin at the tail base was excised to form a single wound, the margins of which were then undermined (Figure 1). A 12 mm hole was made in open cell foam, which was passed over the stent, applied to the entire wound surface, and stapled in place (Figure 2). A 1 cm wide continuous bead of stoma paste was applied around the rectal stent and foam junction. A 14 mm hole was made in the center of flap resolved by re-examination on day 13. (C) Appearance of surgical site prior to suture removal, 13 days following wound closure.
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an impermeable adhesive drape, which was passed over the stent and adhered to the skin surrounding the wound. An adhesive pad with associated tubing was applied and the vacuum pump connected. Continuous negative pressure of 125 mmHg was chosen for therapy. During negative pressure wound therapy (NPWT), the reservoir fluid was serosanguineous and typical of normal effluent, with no evidence of fecal contamination.

On the afternoon of day 6, the wound dressing was removed and asepsis was achieved as on day 4. Healthy granulation tissue covered the entirety of the wound bed. The skin margins were minimally sharply debrided and the ventral and lateral aspects of the wound were closed in two layers, using 2-0 polydioxanone and 3-0 nylon, with the superficial layer apposing anal mucosa and skin. A 4 cm defect remained dorsal to the anus and extended 8 cm cranio-dorsad; this was closed with minimal tension with the aid of a 90° transposition flap from the caudal dorsum. Walking sutures were placed to minimize tension at the caudal margin and the flap margins were apposed in 2 layers, using 3-0 poliglecaprone 25 and 3-0 nylon. Once the wound was closed, the rectal stent was removed.

Dog 2 did not defecate while the stent was in place; upon removal, the stent was found to be obstructed with feces. Despite this, minimal tenesmus was noted for the duration of rectal stent placement and the tube was not replaced at any point. The dog passed normal feces on the evening of day 8 and was discharged on day 9 with oral enrofloxacin (11.6 mg/kg q 24 hr) and amoxicillin with clavulanic acid (21.5 mg/kg q 12 hr) for continued antibiotic therapy, in addition to oral tramadol (2.2 mg/kg q 8–12 hr) and carprofen (1.1 mg/kg q 12 hr) for analgesia.

Recheck examinations were performed on days 11, 13, 19, and 24. The transposition flap healed by primary intention and the ventral and lateral closures achieved delayed primary closure with no dehiscence. Sutures and the Elizabethan collar were removed at day 19 (13 days after wound closure). Telephone follow-up at 6 mo postoperatively confirmed normal fecal continence, with no wound complications or tenesmus noted. The final cosmetic result was considered excellent.

Discussion

Temporary rectal stenting simplified the management of perineal wounds in the 2 dogs described in this report by minimizing fecal contamination in both dogs while allowing continued fecal diversion in Dog 1. While permanent colorectal stenting has been reported for the management of colorectal neoplasia in a dog, this is the first report of the use of a temporary rectal stent for endorectal fecal diversion to aid in rectal and perineal wound healing in dogs.

Dog 1 consistently defecated through the stent. This dog had diarrhea prior to presentation, which would have aided fecal passage; in addition, fecal consistency was controlled with lactulose. Although Dog 2 did not defecate while the stent was present, due to stent obstruction with feces, stool softeners were not administered in an effort to reduce fecal contamination of the wound bed. No evidence of contamination was seen at any point, whether at the wound bed or within the negative pressure reservoir. Dog 2 presented acutely and the presence of normal feces in the colon may have predisposed this dog to early obstruction. In addition, it is possible that the NPWT may have desiccated feces within the colon; however, no abnormalities were noted that raised concern for an incomplete seal at any region of the vacuum-assisted closure (VAC) dressing. Nevertheless, the blocked stent did not precipitate clinical signs of obstruction due to its short-term use. Should only short-term rectal stent management be anticipated, treatment with enemas and lactulose to soften stool may be unnecessary and may increase the risk of contamination associated with excessively liquid feces. Management of fecal consistency by intraluminal stent irrigation is typically employed in humans with endorectal fecal diversion. Irrigation, in conjunction with dietary management of stool consistency with lactulose, may have prevented obstruction in Dog 2 and should be considered for patients with wounds that are likely to present an ongoing challenge. Therefore, future management of these cases may be dependent on the estimated time of stent usage.

Endorectal fecal diversion systems employed in humans use an inflatable bulb to maintain positioning, with a narrowed neck to minimize discomfort and stretching of the external anal sphincter. Only one patient in two case series complained of discomfort. The stents placed in this study were modified endotracheal tubes that were not specifically designed to allow irrigation and fecal clearance. The tubes used in this series had a uniform diameter, which would likely exert greater forces on the anal sphincter and seem more likely to produce discomfort. In addition, the sutures used to retain the tubes may have provided an additional source of discomfort. Despite these potential issues, Dog 2 tolerated stent placement without any overt signs of discomfort, although Dog 1 exhibited persistent tenesmus. While further cases may benefit from the use of specifically designed endorectal catheters, the human systems would not have been appropriate for Dog 1, due to small body size and insufficient endorectal length and the force produced by the system to secure it within the rectum.

Endoscopy was not performed in either dog after stent removal to assess for the presence of iatrogenic pathology so the effects of stent placement on the ano-rectal mucosa are unknown;
however, no major clinical complications were associated with stent placement. Ideally, any such stent would be formed of adjustable and pliable material that would elicit minimal reaction from the ano-rectal mucosa. The stent should also have a patent lumen with multiple ports for fecal management. Lateral displacement and low compliance of endorectal devices may raise the risk of associated rectal perforation, which may be of particular importance in dogs, as restraint may be challenging.\(^7\) Both stents were largely well tolerated; however, patient-induced trauma must always be a consideration when using such a device in a dog.

Application of dressings to the perineum presents challenges and healing by secondary intention holds a risk of subsequent stricture if circumferential wounds are present, while premature closure risks dehiscence.\(^1\) Any techniques that separate the wound bed from fecal contamination and simplify wound management improve the potential for reconstruction and early resolution. VAC has been successfully used to treat perineal and peri-anal lesions in humans and may have a role to play in management of extensive or chronic perineal and peri-anal wounds by simplifying complex wounds.\(^5,18–21\) VAC has furthermore been identified to accelerate granulation tissue formation in animals, including dogs.\(^22,23\) Due to the intrinsic risk and discomfort associated with rectal stenting in dogs, rapid resolution should be attempted to minimize risk of complications and patient discomfort. In the case of Dog 2, the stent provided a seal both cranially and caudally when negative pressure was applied. The stent also provided an attachment point around which the adhesive layer could be affixed, without adversely affecting the anal mucosa. A healthy granulation bed had formed after approximately 54 hr of NPWT, which accepted a transposition flap without complication. Dog 1, on the other hand, presented a different challenge due to the communicating rectocutaneous fistula. We could not ensure in confidence that we could maintain negative pressure without drawing more fecal matter into the wound bed.

Conclusion

Although temporary rectal stenting may not be necessary in all cases of peri-anal or perineal wounds, it may provide a useful tool to minimize fecal contamination and wound sepsis without recourse to more aggressive surgical intervention. Rectal stenting may also accelerate wound healing by facilitating additional wound management techniques, such as VAC. The risks and morbidity involved with temporary rectal stenting in dogs are still unknown and warrant further investigation through larger-scale studies. Despite these limitations, stent (or catheter) fecal diversion and VAC are considered by the authors to be helpful adjunctive therapies in the management of severe perineal wounds.

**FOOTNOTES**

1. PDS II; Ethicon, Somerville, New Jersey
2. Prolene; Ethicon, Somerville, New Jersey
3. Amikacin gel; Taylor’s Pharmacy, Winter Garden, Florida
4. Adaptic; Systagenix, Gargrave, United Kingdom
5. Ioban 2; 3M, St. Paul, Minnesota
6. Active Manuka Honey UMF 16+; Manuka Honey USA, Aurora, Colorado
7. V.A.C. GranuFoam Dressing; Kinetic Concepts Inc, San Antonio, Texas
8. Stomahesive; Convatec Inc., Skillman, New Jersey
10. V.A.C. Freedom Therapy Unit; Kinetic Concepts Inc, San Antonio, Texas
11. Monocryl; Ethicon, Somerville, New Jersey
12. Active Manuka Honey UMF 16+; Manuka Honey USA, Aurora, Colorado
13. V.A.C. GranuFoam Dressing; Kinetic Concepts Inc, San Antonio, Texas
14. Stomahesive; Convatec Inc., Skillman, New Jersey
16. V.A.C. Freedom Therapy Unit; Kinetic Concepts Inc, San Antonio, Texas
17. Ethilon; Ethicon, Somerville, New Jersey
18. Ioban 2; 3M, St. Paul, Minnesota
20. V.A.C. Freedom Therapy Unit; Kinetic Concepts Inc, San Antonio, Texas
21. Monocryl; Ethicon, Somerville, New Jersey

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