Prepubic urethrostomy and placement of a caudal superficial epigastric flap for treatment of a self-mutilation injury in a serval

Bonnie G. Campbell, DVM, PhD, DACVS

The differential diagnosis for self-mutilation injuries includes hypersensitivity reactions, foreign bodies, spider bites, and psychogenic, dermatologic, neurologic, urogenital, and infectious disorders. In animals with a self-inflicted wound, addressing the cause of the self-mutilation behavior is necessary to prevent recurrence. Aggressive débridement, provision of adequate drainage, elimination of tension on sutures, and insurance of ample blood supply to tissues covering the wound bed can decrease the risk of infection and dehiscence when a contaminated wound is closed.

A 10-year-old 10-kg (22 lb) male pet serval (Felis serval) was referred to the Washington State University Veterinary Teaching Hospital a few hours after the owner discovered a self-mutilation injury. Vaccinations for FeLV, feline rhinotracheitis, calicivirus, panleukopenia, and rabies were current. The serval had been healthy with the exception of 3 episodes of illness at 4 or 5 years of age. All 3 episodes had occurred after the serval was fed llama meat. The animal was housed alone in an outside pen with a dirt floor in southeastern Washington. A 9-year-old, unrelated female serval was housed in an adjacent pen, did not have any health problems. After the self-mutilation injury, the serval was initially examined by a local veterinarian who reported that the cat was able to ambulate and had function of its tail. The cat was sedated with xylazine and ketamine for transport to the teaching hospital.

On physical examination, the serval was laterally recumbent and slightly responsive. Mucous membranes were extremely pale, and capillary refill time was prolonged. The serval was estimated to be 10% dehydrated. The medial aspect of the right thigh and abdomen portions of the semimembranosus and semitendinosus muscles. Withdrawal and patellar reflexes were intact in both hind limbs.

A catheter was placed in a cephalic vein, and administration of a shock dose of lactated Ringer’s solution (90 mL/kg [41 mL/lb], IV) was begun. A CBC and serum biochemical analyses were performed; results were interpreted by comparison with established reference ranges for domestic cats. Hematologic abnormalities included macrocytic, hyperchromic anemia (PCV, 15% [reference range, 31 to 50%]; mean corpuscular volume, 59 fl [reference range, 43 to 53 fl]; mean corpuscular hemoglobin, 19 pg [reference range, 12 to 16 pg]) and high WBC count (59,400 cells/µL; reference range, 5,300 to 21,000 cells/µL) with 88% neutrophils (52,272 neutrophils/µL; reference range, 2,500 to 12,500 neutrophils/µL), 3% band neutrophils (1,782 band neutrophils/µL; reference range, < 300 band neutrophils/µL), and 2% eosinophils (1,188 eosinophils/µL; reference range, < 500 eosinophils/µL). Toxic changes were not seen. Blood cross-matching indicated incompatibility with 2 in-house blood donor cats. Serum biochemical abnormalities included high alanine aminotransferase activity (159 U/L; reference range, 30 to 80 U/L) and urea nitrogen (32 mg/dL; reference range, 19 to 27 mg/dL), glucose (181 mg/dL; reference range, 60 to 120 mg/dL), total protein (5.8 g/dL; reference range, 6.5 to 9.0 g/dL), albumin (2.9 g/dL; reference range, 2.5 to 3.5 g/dL), total bilirubin (0.3 mg/dL; reference range, < 0.7 mg/dL), and creatinine (1.7 mg/dL; reference range, 0.8 to 1.6 mg/dL).

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The rectum felt intact on rectal palpation. The penis, scrotum, and testicles were absent or unrecognizable. The wound also involved the caudal aspect of the left thigh with severe shredding or loss of the proximal portions of the semimembranosus and semitendinosus muscles. Withdrawal and patellar reflexes were intact in both hind limbs.

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On physical examination, the serval was laterally recumbent and slightly responsive. Mucous membranes were extremely pale, and capillary refill time was prolonged. The serval was estimated to be 10% dehydrated. The medial aspect of the right thigh and ventral aspect of the proximal third of the tail were alopecic with patches of irregular, brown skin discoloration. There was extensive trauma to the ventral and left portions of the perineal region, including loss of the ventral half of the anal mucocutaneous junction (Fig 1). The rectum felt intact on rectal palpation. The penis, scrotum, and testicles were absent or unrecognizable. The wound also involved the caudal aspect of the left thigh with severe shredding or loss of the proximal portions of the semimembranosus and semitendinosus muscles. Withdrawal and patellar reflexes were intact in both hind limbs.

A catheter was placed in a cephalic vein, and administration of a shock dose of lactated Ringer’s solution (90 mL/kg [41 mL/lb], IV) was begun. A CBC and serum biochemical analyses were performed; results were interpreted by comparison with established reference ranges for domestic cats. Hematologic abnormalities included macrocytic, hyperchromic anemia (PCV, 15% [reference range, 31 to 50%]; mean corpuscular volume, 59 fl [reference range, 43 to 53 fl]; mean corpuscular hemoglobin, 19 pg [reference range, 12 to 16 pg]) and high WBC count (59,400 cells/µL; reference range, 5,300 to 21,000 cells/µL) with 88% neutrophils (52,272 neutrophils/µL; reference range, 2,500 to 12,500 neutrophils/µL), 3% band neutrophils (1,782 band neutrophils/µL; reference range, < 300 band neutrophils/µL), and 2% eosinophils (1,188 eosinophils/µL; reference range, < 500 eosinophils/µL). Toxic changes were not seen. Blood cross-matching indicated incompatibility with 2 in-house blood donor cats. Serum biochemical abnormalities included high alanine aminotransferase activity (159 U/L; reference range, 30 to 80 U/L) and urea nitrogen (32 mg/dL; reference range, 19 to 27 mg/dL), glucose (181 mg/dL; reference range, 60 to 120 mg/dL), total protein (5.8 g/dL; reference range, 6.5 to 9.0 g/dL), albumin (2.9 g/dL; reference range, 2.5 to 3.5 g/dL), total bilirubin (0.3 mg/dL; reference range, < 0.7 mg/dL), and creatinine (1.7 mg/dL; reference range, 0.8 to 1.6 mg/dL).

Figure 1—Photograph of the perineal region of a male serval with a self-inflicted injury. The serval is positioned in dorsal recumbency with the caudomedial aspects of the right (RH) and left (LH) hind limbs visible. The wound extends from the ventral mucocutaneous junction of the anus (arrow) ventrally and laterally into the perineum and further laterally into the muscles of the caudal aspect of the left thigh (asterisk). The penis, scrotum, and testicles were obliterated by the injury. T = Tail (under towels).

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reference range, 67 to 126 mg/dL), and chloride (126 mEq/L; reference range, 104 to 116 mEq/L) concentrations. There were slight to mild decreases in total protein (5.8 g/dL; reference range, 6.4 to 7.8 g/dL), albumin (2.5 g/dL; reference range, 2.6 to 3.7 g/dL), globulin (3.3 g/dL; reference range, 3.4 to 4.4 g/dL), and cholesterol (78 mg/dL; reference range, 84 to 255 mg/dL) concentrations. Total CO2 was low (12 mmol/L; reference range, 16 to 27 mmol/L). On lateral and ventrodorsal radiographic projections of the pelvis, the soft tissue defect and accompanying emphysema were seen, but no uroliths or skeletal abnormalities of the pelvis or caudal spine were evident. No evidence of uroliths or other disease was detected with abdominal ultrasonography.

Anesthesia was induced with thiopental (10 mg/kg [4.5 mg/lb], IV) and maintained with isoflurane. Lactated Ringer's solution was administered IV at a rate of 20 mL/kg (9.1 mL/lb) for the first 30 minutes and at a rate of 6 mL/kg (2.7 mL/lb) for the remainder of the anesthetic period. Morphine (0.025 mg/kg [0.011 mg/lb]) was given epidurally preoperatively and fentanyl was administered by continuous IV infusion intraoperatively to effect. During the course of anesthesia, the serval received dobutamine and histamine (17 mL/kg [7.7 mL/lb], IV) to help maintain blood pressure and 2 doses of bicarbonate (1 mEq/kg [0.45 mEq/lb], IV) to counter acidosis. Cefazolin (20 mg/kg [9.1 mg/lb], IV) was administered every 2 hours during the procedure. Examination of the oral cavity while the serval was anesthetized revealed a brown, plaque-like lesion under the tongue and firm, pinpoint yellow lesions on the hard palate.

The serval was positioned in dorsal recumbency for surgery. No remnants of the penile urethra could be found. The left and right caudal superficial epigastric arteries and their branches were easily seen through the skin. A left caudal superficial epigastric skin flap was raised, using a ventral midline skin incision as the mediolateral border. The cranial border was located between the first 2 mammary glands, and the lateral border was lateral to the nipples at a distance equal to the distance between the ventral midline and nipples. The skin flap was wrapped in moistened laparotomy pads for later use.

A ventral midline laparotomy was performed. The urethra was isolated as far caudally as possible with care being taken to minimize dissection dorsally where the vascular and nerve supplies enter the urethra. The prostate gland was small and did not interfere with mobilization of the urethra. The urethra was transected at approximately two-thirds of its length and exited out a right paramedian stab incision in the ventral abdominal wall. The cut end of the urethra was spatulated, and prepubic urethrostomy was performed by suturing urethral mucosa to skin with simple interrupted sutures of 4-0 nylon. A 5-F Foley catheter was inserted into the bladder via the urethrostomy site, and the balloon was distended with 3 mL of sterile saline solution. The linea alba and cranial half of the overlying subcutaneous layer were closed routinely.

The wound in the perineum and caudal aspect of the thigh was vigorously flushed with warm sterile saline (0.9% NaCl) solution, and devitalized tissues were debrided with sharp dissection. The sciatic nerve was visible in the deep aspect of the caudal thigh defect, limiting the amount of debridement that could be safely carried out in this area. The caudal superficial epigastric flap was unwrapped and rotated 180° into place over the wound. A bridging incision was made from the caudomedial corner of the flap, extending caudally to connect to the perineal defect. The flap was sutured to the edges of the wound, including the ventral border of the anus (Fig 2). A half-inch diameter Penrose drain was placed in the deep aspect of the wound and exited ventral to the wound on the left hind limb. A sterile laparotomy pad was placed over the drain exit site and anchored with umbilical tape woven through loose, interrupted sutures placed through the skin on either side of the exit site. The remainder of the ventral abdominal subcutaneous tissue and the skin edges of the laparotomy and flap procedures were closed routinely. A skin biopsy specimen was taken from an alopecic area with brown discoloration on the right hind limb.

The PCV at the end of surgery was 10%. Hemoglobin concentration (5 mg/kg [2.3 mg/lb], IV) was administered for 2 hours in the immediate postoperative period. Buprenorphine (0.03 mg/kg [0.014 mg/lb], IM) was given for postoperative analgesia. An Elizabethan collar was placed on the serval, and anesthetic recovery and subsequent hospitalization were carried out in an isolation ward to minimize environ-
mental stress from other animals and people. Results of a urinalysis performed on urine collected from the urinary catheter were within reference limits. Approximately 3 hours after surgery, the serval removed the urinary catheter; it was not replaced.

The serval squatted and voluntarily urinated, producing a good urine stream from the urethrostomy site approximately 7 hours after surgery. Postoperative care included regular changes of the laparotomy pad overlying the drain and administration of amoxicillin-clavulanic acid (18.8 mg/kg [8.5 mg/lb], PO, q 12 h). The diet was changed from the commercial dry cat food to rabbit, mice, and chicken. Amoxicillin-clavulanic acid was given for a total of 2 weeks after surgery. The serval was discharged 3 days after surgery with instructions for cage rest and daily bandage changes. Amoxicillin-clavulanic acid (18.8 mg/kg [8.5 mg/lb], PO, q 12 h) was given for 1 week for the first episode but not for the second episode of self-mutilation or evidence of urinary tract disease.

Self-mutilation behavior in animals may be secondary to a hypersensitivity reaction, foreign body, insect bite, or psychogenic, dermatologic, neurologic, urogenital, or infectious disorder. The peripheral eosinophilia and skin lesions grossly resembling eosinophilic granuloma complex in the serval described in this report suggested a hypersensitivity reaction.1,2 Flea bite hypersensitivity is the most common cause of allergic dermatitis in cats and cannot be ruled out even if flea debris is not seen in the animal’s coat. Intraoral testing, which can be used to definitively diagnose flea bite hypersensitivity and atopy, was not performed in this case. Nevertheless, the lack of any history of flea or atopy problems and the absence of self-traumatic behavior when the serval returned to its home environment postoperatively suggest that these hypersensitivities were unlikely. Food hypersensitivity, on the other hand, was considered to be a plausible explanation for the serval’s self-mutilation behavior when it was discovered that the serval had experienced a previous episode of food intolerance and a recent diet change.

The serval’s diet consisted primarily of commercial dry cat food and whole animals (rabbits, mice, and chickens). At 4 or 5 years of age, the serval had 3 episodes of illness, described by the owner as lethargy, vomiting, pale mucous membranes, and gray to tarry stools. When these signs occurred the third time, it was realized that the serval had been fed llama meat, a new addition to its diet, before each episode. The time interval between the serval’s eating the llama meat and the onset of illness was 1 week for the first episode but only a few hours for the third episode. Eleven other servals (including cougar, jaguar, caracal, and other servals) on the property ate meat from the same llama at the same time with no adverse effects. The serval’s illness did not recur after llama meat was discontinued, and the cat remained healthy until the self-mutilation injury, which occurred 10 days after the serval was changed to a new brand of commercial dry cat food not previously used by the owner.

The most common manifestation of food hypersensitivity in animals is pruritus, which is seen in virtually all affected cats and may be focal or generalized.2 A definitive diagnosis of food hypersensitivity is made when clinical signs resolve after the animal is placed on an elimination diet and signs recur when the offending component from the original diet is reintroduced. Postoperatively, the serval was fed a whole animal diet for 6 months. A previously used brand of dry cat food was subsequently added without incident, but because of the severity of the self-mutilation injury, a provocative trial with the cat food fed prior to injury was not performed.

Other possible causes of a single episode of self-
mutilation were also considered in this case. A foreign body lodged in soft tissue can induce inflammation and even a local hypersensitivity reaction. Spider bites can cause focal pain, pruritus, and tissue necrosis and may induce an eosinophilic reaction. Both of these irritants can alter sensation and lead to self-trauma, which may subsequently obliterate evidence of the inciting cause. Although the presence of skin lesions beyond the traumatized area was not consistent with a soft tissue foreign body or spider bite as the cause of the self-mutilation injury in this serval, these potential causes could not be ruled out.

Other causes of self-mutilation injury were considered unlikely in this serval because of the 1-time nature of the aberrant behavior and the lack of other corroborating evidence. Repetitive self-mutilating behaviors are seen in animals with psychogenic dermatoses induced by stress, confinement, or obsessive-compulsive disorder, but the serval had been with the current owner since 10 days of age and appeared to be well-adjusted to its environment. Examination of skin scrapings and a skin biopsy specimen did not reveal any evidence of a parasitic or infectious disease that might induce pruritus, and there had been no recent environmental changes that would have suggested a contact dermatitis. Altered sensation induced by cauda equina compression or peripheral nerve injury has induced self-mutilation in dogs and cats, but the normal findings on orthopedic and neurologic examinations and the normal appearance of the pelvis and lumbosacral portion of the spine on radiographs made neurologic damage unlikely. Diseases of the urogenital tract, such as neoplasia, seminal vesiculitis, and blockage of the distal portion of the urethra, have led to penile licking or self-trauma in a variety of species. Although distal urethral obstruction could not be ruled out in this serval, the absence of uroliths on abdominal ultrasonograms and radiographs, the lack of abnormal findings on urinalysis, and the absence of any history of urogenital disease suggest that this was unlikely. Both Aujeszky's disease (pseudorabies) and rabies can induce intense pruritus that leads to self-trauma, but the serval had been with the current owner since 10 days of age and appeared to be free of these diseases. In this serval, perineal urethrostomy was not an option, and prepubic urethrostomy was performed instead.

Ideally, a contaminated wound with such severe tissue damage would have been treated by en bloc resection or serial lavage and debridement, leaving the wound open until granulation tissue was established and closing the wound secondarily after a healthy wound bed was obtained or allowing the wound to close on its own by second intention healing. Closure of a contaminated wound favors the development of supplicative infection and predisposes to dehiscence. Unfortunately, en bloc resection was not possible in this case because of the size and location of wound. In addition, the serval was essentially wild, and attempts at restraint were met with substantial struggling that raised concerns about the possibility of injury to the serval or handlers. Thus, serial lavage and debridement of the wound would have been risky. Beyond this, the location of the wound was such that there were concerns about repeated fecal contamination of the wound bed if the wound had been treated in an open fashion. Furthermore, the location of the wound would have made it difficult to maintain an effective bandage. For these reasons, therefore, the decision was made to close the wound primarily on the day of injury. Partial dehiscence 1 week later necessitated daily sedation for several days.

When circumstances require closure of a contaminated wound, the risks of infection and dehiscence can be decreased by debriding contaminated tissues aggressively, providing for adequate drainage, eliminating tension on sutures, and ensuring ample blood supply to tissues covering the wound bed. The serval's wound was debrided as extensively as possible while avoiding damage to the sciatic nerve and anal sphincter. A Penrose drain provided drainage of the region under the caudal superficial epigastric flap, but may not have adequately drained the distal extent of the wound on the caudal aspect of the thigh where dehiscence occurred. Placement of an additional drain in this area may have been beneficial. Furthermore, although not judged to be excessive at the time of closure, tension in the area that dehisced was greater than in the rest of the wound. More extensive undermining of the skin edges or use of releasing incisions may have decreased tension at this site. The use of a closed ingress-egress drain system to allow postoperative lavage of the wound bed may have decreased the risk of dehiscence and bacterial growth.

Axial pattern flaps have been advocated for use in wounds that have an uneven surface, lack a vascular bed, have areas of persistent contamination, or have areas of exposed bone, tendon, or cartilage. Preservation of the direct cutaneous vessel supplying the flap ensures the flap's survival and circumvents the need for a free graft. Caudal superficial epigastric flaps have been used successfully in a variety of species; a caudal superficial epigastric flap easily reached the perineal region in this serval. The ready visibility of the caudal superficial epigastric artery and its branches through the skin of this individual allowed a high degree of confidence that this flap would be viable.

In a cat with irreparable distal urethral trauma, disease, or obstruction, urinary outflow can be restored by means of perineal or prepubic urethropexy. Potential complications for either procedure include stomal stricture, subcutaneous leakage of urine, recurrent urinary tract infection, peristomal necrosis, and urinary incontinence. The incidence of postoperative problems is lower following perineal than prepubic urethropexy, and the long-term results are better. However, because of the extensive tissue damage in this serval, perineal urethropexy was not an option, and prepubic urethropexy was performed instead.

The urethra in this serval appeared longer, in relation to its body size, than the urethra in domestic cats, aiding in tension-free anastomosis of urethral mucosa to skin in the prepubic location. Because of the need for a left caudal superficial epigastric flap, the urethropexy was positioned to the right of the ventral
midline. However, it was anticipated that the right ventral abdominal skin and subcutaneous tissue would be pulled to the left of midline during closure of the flap defect. Therefore, this expected distortion was taken into account when selecting the urethrostomy site. The location was chosen to avoid kinking of the distal portion of the urethra, which may have predisposed to obstruction or stenosis, and to avoid distorting the stoma’s position and increasing the risk of urine scalding.

In summary, wounds that are caused by self-mutilation are likely to be contaminated and may contain considerable tissue damage. Such wounds are preferably left open and treated with serial debridement and lavage until a healthy wound bed is obtained. However, circumstances related to the location of the wound, affected tissues, and patient compliance may lead to a decision for early wound closure. Attention to debridement, drainage, tension, and blood supply can decrease the risk of infection and dehiscence in these cases. Furthermore, when confronted with a self-mutilation injury, it is important to address the cause of this aberrant behavior in addition to the wound itself to prevent recurrence of self-trauma.

References