Reconstruction of the urethra by use of an inverse tubed bipedicle flap in a dog with hypospadias

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Case Description—A 1-year-old castrated male German Shepherd Dog was evaluated because of a history of hematuria and stranguria secondary to recurrent urinary tract infections.

Clinical Findings—Physical examination revealed hypospadias with penile and preputial aplasia. The urethral orifice was just ventral to the ventral aspect of the anocutaneous junction. Ascending urinary tract infections, secondary to fecal contamination of the urethral orifice, were the presumed source of recurrent bouts of cystitis that developed despite periodic antimicrobial treatment.

Treatment and Outcome—A 1-cm-diameter urethral extension was constructed from the urethral mucosal remnant located along the midline of the perineum (urethral trough). Two parallel 4-cm incisions (3 cm apart) were made lateral to that urethral trough. The borders were sutured to form an inverted, epithelium-lined tube (bipedicled flap) attached to the dorsal urethral orifice. The lateral skin margins were sutured over the reconstructed urethral extension, completing the procedure. Postoperative swelling necessitated temporary catheterization of the urinary bladder. After closure of a small fistula from the reconstructed urethral segment, the dog subsequently had only 2 episodes of cystitis during a 3-year period. To minimize skin irritation secondary to urine exposure, the dog’s owner regularly trimmed the hair around the new urethral orifice.

Clinical Relevance—In dogs, correction of perineal (subanal) hypospadias via urethral reconstruction should be considered among treatment options. By use of an inverse tubed urethral extension, direct fecal contamination to the lower urinary tract may be effectively eliminated, dramatically reducing the incidence of ascending urinary tract infections in dogs with hypospadias. (J Am Vet Med Assoc 2007;231:71–73)

A 1-year-old castrated male German Shepherd Dog weighing 60 kg (132 lb) was referred to the Angell Animal Medical Center for evaluation of a urinary tract anomaly. The dog reportedly had incomplete development of the penis and prepuce, with a urethral opening contiguous with the ventral aspect of the anocutaneous junction. During the preceding few months, the dog had several episodes of cystitis with hematuria and stranguria but had responded to empirical treatment with broad-spectrum antimicrobials. At the time of the initial evaluation, the dog had been treated with amoxicillin trihydrate-clavulanate potassium (10 mg/kg [4.5 mg/lb], PO, q 12 h) for >1 week.

Physical examination of the dog revealed hypospadias with aplasia of the penis and prepuce. The anal mucosa was joined with the urethral mucosa. A narrow, hairless mucosal trough (a vestigial remnant of the incomplete urethral tube) extended from the border of the urethra ventrally (Figure 1). Vestiges of the prepuce and penis were detected on the lower ventral portion of the abdomen. Other findings from the examination were considered normal. The proximity of the urethral orifice and anus was considered a major contributory factor in the development of frequent episodes of cystitis.

Results of a CBC and serum biochemical analyses were within reference limits. Prior to induction of anesthesia (day 2), the dog was administered hydromorphone (0.05 mg/kg [0.023 mg/lb], IM), glycopyrrolate (0.005 mg/kg [0.002 mg/lb], IM), and acepromazine (0.025 mg/kg [0.01 mg/lb], IM). Anesthesia was induced with thiopental (10 mg/kg, IV). The dog was intubated, and anesthesia was maintained with isoflurane and oxygen. Lactated Ringer’s solution was administered IV at a rate of 5 mL/kg/h (2.3 mL/lb/h) until completion of the surgical procedure. An epidural analgesic block consisting of morphine (0.05 mg/kg) and bupivacaine (1 mL of 0.5% solution/15 kg [1 mL of 0.5% solution/33 lb]) was administered. The dog was placed in sternal recumbency and positioned to gain access to the perineum. The hair over the entire perineum and caudal abdomen was clipped, and the sites were prepared for surgery with chlorhexidine surgical scrub solution1 alternated with sterile swabs soaked in saline (0.9% NaCl) solution.

After draping the surgical area, a 16-F Foley catheter was inserted through the urethral orifice into the urinary bladder. Two parallel incisions (each 4 cm long and separated by a distance of 3 cm) were made in the skin lateral to the hairless urethral trough. The inner incisional borders of this bipedicled flap were grasped with skin hooks and carefully undermined; the apposing borders were then folded over the Foley catheter, inverting the epithelial surfaces. The inverted folds were apposed by use of 4-0 absorbable suture in a simple interrupted pattern. The incisions were connected with an

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inverted U-shaped incision placed dorsal to the original urethral orifice. The edges were gently undermined and sutured in a Y-shaped configuration to complete the 1-cm-diameter inverse urethral tube (Figure 2). A 0.25-inch Penrose drain was used to control dead space through a separate stab incision distal and lateral to the surgical site. The remaining lateral borders of the 4-cm incisions were undermined and advanced over the urethral tube to complete the surgical procedure (Figure 3). Lastly, a small strip of inflamed, hairless epithelium (a urethral remnant involving the lower portion of the abdomen) was resected and sutured. The dog was then allowed to recover from anesthesia.

The inflated Foley catheter was connected to a closed urinary collection system postoperatively; the catheter and Penrose drain were subsequently removed 24 hours later (day 3). The dog was able to urinate through the extended urethral orifice with a steady stream. The owners elected to take the dog home later that day. The dog was administered amoxicillin-clavulanic acid for 10 days.

Forty-eight hours later (day 5), the owner contacted hospital personnel, indicating that the dog was now straining to urinate and was able to pass only a few drops of urine. The owner was instructed to return the dog to the hospital for immediate evaluation. On physical examination, the dog had a large urinary bladder. A lubricated 14-F Foley catheter was inserted into the bladder and >500 mL of urine was evacuated. The catheter was maintained in position to offset postoperative inflammation that had developed at the surgical site. At the owner’s request, a closed collection system was established, and the dog was discharged; the owner was instructed on its use. The referring veterinarian was contacted to assist the owner in maintaining the catheter and facilitate its removal after 1 week. After catheter removal, the owner reported that the dog was able to urinate without difficulty.

Three months later (day 89), the owner reported that a thin stream of urine occasionally was evident ventral to the anus. Closer examination revealed that a small fistula had developed at the proximal (Y-intersect) of the original surgical closure. The dog was anesthetized the following day, and the border of the 4- to 5-mm fistula was resected with a No. 11 scalpel blade. Absorbable suture (4-0) was used to close the inner epithelial fistula and the outer cutaneous defect. The skin sutures were subsequently removed 2 weeks later (day 104).
Over a 3-year period, the owner provided periodic updates on the dog's progress. The dog had 2 episodes of cystitis: the first 6 months after the last surgery and a second 2 years later. In both instances, cystitis resolved after treatment with antimicrobials for 3 weeks. To prevent local areas of dermatitis from occasional urine contamination, the owner had been advised to keep the hair trimmed around the urethral orifice to facilitate rinsing the skin with water. Topical application of neomycin–polymyxin–bacitracin ointment was suggested to manage any skin irritation. The owner reported that the hair around the orifice was clipped every 2 or 3 weeks. Cleaning was limited to gently spraying the area with water (usually once every 2 weeks) to remove occasional urine residue. The owner was pleased with the results of surgical treatment, and the dog had gained 15 kg (33 lb) over the past 2 years.

Discussion

Hypospadias is a congenital anomaly that affects a variety of canine breeds and several species. It is typically characterized by the abnormal presence of a urethral meatus located on the ventral penile surface. Embryologically, there is a failure in fusion of the urogenital folds resulting in the premature involution of the interstitial cells of the developing testes.1 With the cessation of androgen production, there is incomplete masculinization of the external genitalia. In humans, hypospadias has a low familial incidence and is a random occurrence in most instances.1 Because descended testicles and renal anomalies are more common in humans with hypospadias, a detailed examination is performed to assess the entire urogenital tract.1

In the veterinary medical literature, there is a report2 of renal aplasia and cryptorchidism in an 8-month-old Beagle. Detection of cryptorchidism would especially warrant close examination of the urogenital system. Because of cost constraints and results of the initial evaluation of the dog of this report, ultrasonographic and radiographic (with contrast agent) assessments of the lower urinary tract were not performed.

In dogs, hypospadias has been classified according to the location of the urethral meatus. In dogs, the abnormal urethral orifice may involve the glans penis, penile shaft, scrotal area, perineum, or anal area.3,4,5 In the author's experience, urinary incontinence is not commonly associated with hypospadias in dogs, although it has been reported in the veterinary medical literature.6 Variable degrees of malformation of the penis and prepuce are typically present. Similarly, a urethral meatus involving the perineum and adjacent anal areas also is comparatively uncommon. The most common finding is a urethral meatus located in the midscrotal or ventral ischial area; the scrotal septum is nonexistent, with each scrotal half portion containing an individual testicle. Castration of affected dogs is recommended because they are not considered suitable candidates for breeding.

Dogs with a scrotal or ischial urethral meatus typically urinate in a fashion similar to dogs that have undergone scrotal urethrostomy. Skin irritation and odor secondary to urine contamination of the adjacent skin and hair is occasionally present. These problems can be managed with basic grooming care as described for the dog of this report. Removal of the penile and scrotal remnants has been recommended in the veterinary medical literature.4,5,6 However, unless these tissues are a source of irritation or inflammation, removal may not be necessary. In the dog of this report, the partially developed prepuce was retained for potential use if additional reconstructive surgery was required.

In dogs with hypospadias, location of the urethral meatus near the anus is most problematic because of the high incidence of recurrent ascending urinary tract infections. The author is not aware of any reports in the veterinary medical literature regarding surgical correction of hypospadias in this location. In several human reconstructive surgical textbooks,7 there are a variety of techniques described for reconstruction of the penile urethra secondary to hypospadias; many of these procedures are not directly applicable to dogs. For the dog of this report, the author elected to use a bipedicled flap technique because of the availability of a hairless mucosal strip of tissue along the perineal midline and the relative simplicity of the procedure. A more ambitious alternative would be use of an inverse tubed mucosal graft to create a urethral tube extension.1 Reconstruction of the terminal urethra in the dog of this report was both simple and effective, dramatically reducing the incidence of cystitis to 2 episodes during a 3-year postoperative period.

References