Modified perineal urethrostomy using preputial mucosa in cats

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Perineal urethrostomy in cats is a standard salvage procedure performed to alleviate stenosis or obstruction of the penile urethra that develops secondary to diseases of the distal portions of the urinary tract, obstruction by calculi, or extensive mucosal damage. The procedure mobilizes the pelvic segment of the urethra and creates a new stoma by suturing the urethral mucosa to the perineal skin. To the authors' knowledge, perineal urethrostomy was first reported in cats in 1963; the penis was transected, and the urethra was sutured to the perineal skin. Since that report, a number of modified methods have been proposed.

The technique reported by Wilson and Harrison in 1971 is presently the most commonly accepted method for urethrostomy in male cats. The technique has a high success rate and limited complications if return of normal urination is the sole consideration.

In this method, the dorsal aspect of the pelvic and penile urethra is incised, the distal portion of the penis is transected, and the urethral mucosa is sutured directly to the perineal skin to create a stoma leading to the pelvic urethra. Possible complications include stricture of the stoma, wound dehiscence, postoperative cystitis, and perineal hernia. With long-term postoperative monitoring, however, we have observed that the stoma may be small and hidden in perineal hair, although urination may not be compromised. The appearance of the external stoma after this type of urethrostomy is obviously different from the appearance of the normal anatomic structures. The purpose of the study reported here was to develop a modified perineal urethrostomy technique that used preputial mucosa and resulted in a more acceptable cosmetic appearance.

**Procedures**

Cats were sedated by administration of atropine and ketamine and anesthetized by administration of isoflurane and oxygen. Appropriate IV administration of fluids was determined on the basis of each cat's degree of hydration and serum electrolyte concentrations. Ketoprofen (1 mg/kg [0.45 mg/lb] of body weight, IM) was administered before surgery to provide analgesia. After the perineal region was shaved and aseptically prepared, cats were positioned in sternal recumbency with hind limbs tied on the end of a tilted table.

A purse string suture was placed in the anus, and sexually intact cats were castrated. Instead of removing a vertically oriented elliptical piece of skin that included the scrotum and prepuce, as described in the Wilson method, only a triangular piece of scrotal skin between the anus and the prepuce (Fig 1A) was removed. Through this wound, the penis was dissected free from the loose connective tissues. The preputial mucosal membrane was carefully incised around the entire penis at the fornix of the prepuce (Fig 1B). The penis was then pulled out from the prepuce, thus releasing the intact, tube-like preputial tissue from its attachment to the penis (Fig 1C).

The penis was further dissected and freed from the surrounding connective tissues in a manner similar to that of the Wilson method. Briefly, the penis was retracted dorsally to permit transection of the ventral ligament of the penis. The bilateral ischio cavernous muscles were transected at their ischial attachments. The penis was freed further by careful blunt finger dissection ventrally and laterally, to completely free the penis from its pelvic attachments. The penis was then reflected ventrally, and the retractor penis muscle was excised from the dorsal surface of the penis to the level of the bulbourethral glands. The lumen of the distal portion of the urethra was identified by insertion of a 24-gauge catheter, and an incision was made on the superficial aspect of the penile urethra with iris scissors to a point that was not >1 cm cranial to the bulbourethral glands to expose the penile urethral mucosa. A pair of Kelly hemostat forceps was inserted into the opening to confirm that diameter of pelvic urethra was adequate. The distal portion of the penis (1 cm) was amputated with scissors. A full-thickness 4-0 nylon mattress suture was placed through the transected end of the corpus cavernosum penis to control hemorrhage.

A midline incision was made on the inner wall of the preputial mucosa. The mucosa was then trimmed to form a blunt-angled single pedicle flap that faced downward. Nylon 4-0 suture on a reverse cutting needle (9 cats) or polyglyconate suture material on a tapered needle (5 cats) was used to anastomose the spatulated penile urethra and preputial mucosa. Ophthalmic conjunctiva forceps were used to grasp the urethral and preputial mucosa to avoid excessive trauma. The first suture was placed in the most dorsal point of the preputial mucosal flap and then passed through the dorsal roof of the urethra just cranial to the incised apex of the pelvic urethra in a through-and-through mattress pattern (Fig 1D). This stay suture kept the most cranial parts of the structures in an exterior position and facilitated direct observation of the mucosal edges that were to be anastomosed. Simple continuous full-thickness sutures were carefully placed to appose the remaining urethral and preputial mucosa in an apex-ventral-apex order to finish the anastomosis (Fig 1E). The corpus spongiosum was included in these suture bites to minimize excessive bleeding into the dead space. Sutures were left in situ and were not removed.

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removed unless complications developed. After the anastomosis, a lubricated 2.6-mm urinary catheter (typically used for male dogs) was inserted through the external preputial stoma to verify adequate diameter. The skin was closed with simple interrupted 4-0 nylon sutures (Fig 1F). The purse string suture in the anus was removed. A urinary catheter was not placed after surgery.

Ice packs were used after surgery to control excessive local bleeding, swelling, and pain, and a broad-spectrum antibiotic was administered for 6 days. If urinary tract infection was diagnosed, specific antibiotics chosen on the basis of results of bacteriologic culture of urine obtained during surgery and antimicrobial susceptibility testing were administered for another 3 to 4 weeks, until negative bacteriologic culture results of further urine specimens were obtained. An Elizabethan collar was placed on the neck to prevent cats from licking the surgical wound and was removed 1 week later. Cats were given appropriate prescription diets after surgery that were determined according to results of urinalysis and bacteriologic culture.

Long-term follow-ups were accomplished by telephone interview on a bimonthly basis. Information was requested concerning pattern of urination behavior, urine volume, and overall health of the cats, as well as owners’ satisfaction with outcome. If owners had concerns, cats were reexamined clinically by the authors.

Results
Fourteen male cats (6 neutered, 8 sexually intact) ranging in age from 1 to 4.5 years (median age, 3 years) with partial or complete penile urethral obstruction were used in this study. Median body weight was 3.83 kg (8.44 lb; range, 2.7 to 5.15 kg [5.95 to 11.35 lb]). Breeds included Persian (n = 11), domestic shorthair (2), and mixed breed (1). Most cats were referred by private practice veterinarians. Causes of urethral obstruction or stricture included recurrent, uncontrollable lower urinary tract disease (n = 3), urolithiasis (1), and repeated or traumatic urinary catheterization (10). Bacteriologic culture of urine specimens obtained at surgery (n = 9) revealed growth of Staphylococcus...
However, external appearance of the region position of the preputial opening of healthy male cats. The preputial stoma was pulled closer to the anus than the antibiotic were administered for 14 days. Nisolone (0.25 mg/kg [0.11 mg/lb], PO, q 12 h) and an mucosa. Dysuria was resolved after surgery; prednisolone (0.25 mg/kg [0.11 mg/lb], PO, q 12 h) and an antibiotic were administered for 14 days. Exploratory surgery revealed that a misplaced suture caused by prolonged obstruction by calculi developed dysuria 40 days after the modified urethrostomy. Exploratory surgery revealed that a misplaced suture was caught in the lumen of the newly reconstructed urethra. The suture was removed, and the lumen reformed by resection of fibrotic tissue in the urethral mucosa. Dysuria was resolved after surgery; prednisolone (0.25 mg/kg [0.11 mg/lb], PO, q 12 h) and an antibiotic were administered for 14 days.

With the modified urethrostomy technique, the preputial stoma was pulled closer to the anus than the position of the preputial opening of healthy male cats. However, external appearance of the region (Fig 2) was still similar to that of a castrated male cat. Urinary catheterization was accomplished easily by simply inserting a lubricated, flexible plastic tomat catheter or a 2.6-mm male dog catheter into the preputial orifice. Signs of urine scalding and hair ingrowth around the urethral orifice were not observed after surgery. All cat owners were satisfied with outcome regarding cats' physical appearance and urinary function.

Discussion

One of the most important complications of conventional skin-to-mucosa perineal urethrostomy is stricture of the newly constructed urethral orifice. Although this is an uncommon problem when urethrostomy is performed by an experienced surgeon, urethral stricture may require mechanical (eg, bougie) or surgical correction to relieve signs of obstruction and dysuria. In addition, in the authors' experience, although urine flow usually remains adequate, the newly sutured orifice still becomes smaller, and the surrounding hair inverts into the opening within a few months.

In the new technique described here, the dorsally incised penile urethra was anastomosed to the preputial mucosa to lengthen the reconstructed urethra. Thus, the small, tapered, distal portion of the penile urethra was reformed to become increasingly larger toward the preputial orifice, which was retained as the natural opening. Although measurements of the newly formed urethra were not made, increased lumen diameter was indicated by ease of catheterization with a plastic 2.6-mm male dog catheter.

Ascending bacterial urinary tract infection is another complication that may develop after conventional perineal urethrostomy. Prevalence of such infections ranges from 19 to 23%, whereas the incidence of urinary tract infection in cats with diseases of the lower portions of the urinary tract of all causes is only 1 to 3%. A variety of natural defense mechanisms make the lower portions of the urinary tract resistant to bacterial infection, including frequent and complete urination that mechanically eliminates organisms, intrinsic antibacterial activity of the urethral mucosa, and urine osmolarity sufficient to kill or inhibit some bacteria.

With conventional urethrostomy, lower urinary tract function is partially altered by surgically induced damage to the nerve fibers located dorsal to the urethra and sacrifice of a considerable length of the urethral mucosal barrier. With the modified urethrostomy reported here, the natural mucosal barrier is preserved; effects on incidence of postoperative urinary tract infections are not yet known.

Urine scalding and hair ingrowth around the urethral orifice were prevented by using the prepuce to maintain extension of the urethra to its natural orifice. Cosmesis was acceptable to the cat owners, and subsequent urinary catheterization was easy to perform. However, veterinarians who are not aware that this technique had been performed may cause severe injury during manipulation of the preputial and urethral mucosa in efforts to locate the penis, which was amputated.

In the first 9 cats, anastomosis of the urethral and preputial mucosa was performed with nylon sutures on a cutting needle, chosen on the basis of our experience with nylon sutures in vascular surgery and because of the ease of its handling and knot security. In the last 5 cats, polyglyconate suture material on a tapered needle was used; major differences in outcome were not detected between these 2 groups. These findings suggest that 4-0 nylon suture material may be used to anastomose the urethral and preputial mucosa without major complications. Accurate identification of structures and careful surgical manipulations are necessary to perform a successful modified preputial urethrostomy.

References