

Urethral Reconstruction Combined with Modified Urethrostomy in a Cat after Prepubic Urethrostomy

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ABSTRACT

Background: In cats, urethral obstruction is generally caused by various reasons, including feline idiopathic cystitis, urethral crystals, urethral trauma, mucous plug, congenital or acquired anatomical deformity, and urolithiasis, especially in male cats. Depending on the severity and duration of clinical signs, immediate management including conservative or surgical therapy for restoration of urethral patency is required. Repetitive urethral obstruction due to intraluminal plugs, obstruction that cannot be resolved by medical management, and urethral strictures, trauma, or neoplasia should be managed by surgery. When the penile or pelvic urethra is ruptured or not long enough to mobilize the pelvic urethra to the perineal skin by repetitive perineal urethrostomy, prepubic urethrostomy is indicated. Potential complications of prepubic urethrostomy include urinary incontinence, peristomal dermatitis. In such cases, management of the peristomal site or placement of an artificial urethral sphincter have been reported previously. However, to date, urethral reconstruction using pre-existing penis has not been reported after prepubic urethral stricture following prepubic urethrostomy. The objective of this report is to describe surgical procedure of the urethral reconstruction combined with modified perineal urethrostomy in a cat with prepubic urethral stricture after prepubic urethrostomy.

Case: A 3-year-old castrated Scottish straight cat presented with dysuria after prepubic urethrostomy. The owner reported that the patient was diagnosed with urethral rupture, had undergone prepubic urethrostomy 2 months prior to presentation, and had persistent dysuria despite repetitive surgical revision of the prepubic urethral stoma at a local hospital. On physical examination, the preputial orifice and the penis appeared grossly normal. On ultrasonography, pericystic and periurethral fat had an edematous, striated appearance with alternating hyperechoic and anechoic regions. A small amount of free fluid was visible around the urethra. Abdominal radiography revealed a mildly distended bladder and loss of serosal detail around the area of the urinary bladder neck, consistent with inflammation and free fluid observed on ultrasonography. The retrograde urethrogram showed no leakage in either sites of the prepubic urethral orifice or the penis. Hence, complete urethral reconstruction with modified perineal urethrostomy was performed. The patient had normal urination at the 15-month follow-up.

Discussion: Prepubic urethrostomy is beneficial for the patients whose penile or pelvic urethra is ruptured or not long enough to mobilize the pelvic urethra to the perineum. Complications of prepubic urethrostomy include skin necrosis around the stoma; urinary incontinence; stricture of the urethral stoma due to several reasons such as surgical-site irritation; poor mucosa-skin apposition; failure to provide tension-free stoma; and failure to expose wider pelvic urethra. In these cases, surgical management of the level of prepubic urethral stoma has been recommended by previous studies. However, no studies have been reported urethral reconstruction using pre-existing penile urethra in a patient with prepubic urethral stricture so far. To the author's knowledge, this case is the first report describing urethral reconstruction in a cat with urethral stricture after prepubic urethrostomy.

Keywords: cat, modified urethrostomy, prepubic urethrostomy, urethral reconstruction.

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INTRODUCTION

In cats, urethral obstruction is generally caused by several reasons, including feline idiopathic cystitis, urethral crystals, urethral trauma, mucous plug, congenital or acquired anatomical deformity, and urolithiasis, especially in male [2,9,11]. Depending on the severity and duration of obstruction, systemic signs such as vomiting, decreased appetite, or azotemia are expected; they require immediate management including conservative or surgical therapy for restoration of urethral patency [7]. As medical management, placement of indwelling urinary catheter is needed with appropriate correction of fluid, electrolytes, and acid-base imbalance. Repetitive urethral obstruction due to intraluminal plugs, obstruction that cannot be resolved by catheterization, and urethral strictures, trauma, or neoplasia can be successfully managed by surgery [2]. The purpose of this report is to describe surgical procedure of the urethral reconstruction combined with modified perineal urethrostomy (MPU) in a cat with prepubic urethral stricture after prepubic urethrostomy.

CASE

A 3-year-old castrated Scottish straight cat presented with dysuria after prepubic urethrostomy. The owner reported that patient was diagnosed with urethral rupture, underwent prepubic urethrostomy 2 months prior to presentation, and had persistent dysuria despite undergoing revision of the prepubic urethral stoma twice at a local hospital. On physical examination, the urethral stoma was cranial to the pubic brim and peristomal dermatitis was evident (Figure 1A). The preputial

orifice and the penis appeared grossly normal (Figure 1B). Complete blood count test, serum biochemistry analysis, dipstick urine analysis, urine cytology, and urine specific gravity analysis revealed unremarkable findings. To evaluate the patency of the urethral stoma and the penile urethra, a 3.5-Fr indwelling tomcat catheter was used. However, the catheter could be inserted only up to 1 cm from the end of the prepubic urethral stoma and 3 cm from the end of the preputial orifice. On ultrasonography, pericycstic and periurethral fat had an edematous, striated appearance with alternating hyperechoic and anechoic regions. A small amount of free fluid was visible around the urethra. Abdominal radiography revealed a mildly distended bladder and loss of serosal detail around the area of the urinary bladder neck, consistent with inflammation and free fluid observed on ultrasonography. The retrograde urethrogram showed no leakage in either sites of the prepubic urethral orifice or the penis.

Reconstruction of the entire urethra was considered rather than widening the prepubic urethral orifice surgically due to following reasons: 1) although the cause and the location of the previous urethral rupture was unknown, it was assumed the surrounding tissues around the ruptured urethra would have sufficiently recovered as >8 weeks had passed after the initial trauma and 2) the penis and the preputial orifice appeared grossly normal, indicating that the penis has not undergone any other type of urethrostomy.

With informed consent of the owner, the patient was injected with ampicillin/sulbactam¹ [Ubacillin inj.[®] - 30 mg/kg] and butorphanol² [Butopahn[®] - 0.3 mg/kg] intravenously as a preoperative antibiotic

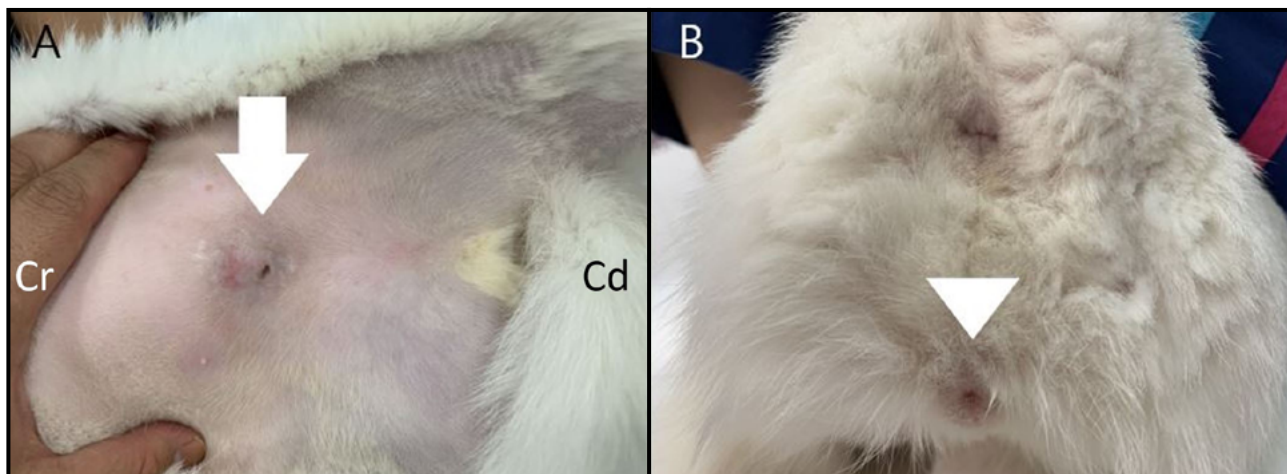


Figure 1. Physical examination: The prepubic urethral stoma (white arrow) was located just cranial to the pubic brim and the penis (white arrowhead) was identified in gross appearance at the time of presentation. [Cr: Cranial; Cd: Caudal].

and preanesthetic agent, respectively. Subsequently, intubation was performed after intravenous injection of alfaxalone³ [Alfaxan[®] - 4 mg/kg]. General anesthesia was maintained with isoflurane⁴ [Isoflurane[®]] with oxygen. The patient was constantly injected with 0.9% normal saline⁵ at a rate of 5 mL/kg/h throughout the surgery.

The stricture of the distal portion of the penile urethra was corrected by MPU [15]. Briefly, in sternal recumbency, after a triangular incision was made between the anus and the penis, the penis was further separated from the surrounding tissues. After excising the retractor muscle from the dorsal surface of the penis, the penis was exposed cranial to the bulbourethral glands. As a stricture was identified on the initial physical examination, an incision was made cranial to the stricture region to expose the urethral lumen. Subsequently, the distal end of the penile urethra and the prepuce were sutured with a continuous suture.

The skin was closed with Nylon 3-0. Subsequently, in ventral recumbency, after an incision was made from the xiphoid to the pubis, the prepubic urethral stoma was dissected carefully from surrounding connective tissues and the abdominal wall was incised enough to expose the urinary bladder and the end of the pubis (Figure 2A). For a better exposure of the caudal end of the proximal urethra connected to the urinary bladder, a Kelly forceps was inserted in the urinary bladder by pushing it caudally in a retrograde manner (Figure 2B). Special care was taken to separate the urethra from the surrounding tissues. Subsequently, the cranial end of the distal urethra was identified by pushing an 8-Fr Foley urethral catheter, placed through the perineal urethra cranially, and a stay suture was placed, preventing the distal urethra from entering into the intrapelvic space (Figure 2C). A direct mucosa-to-mucosa, end-to-end anastomosis over the 8-Fr Foley urethral catheter was achieved (Figure 2D). The abdominal

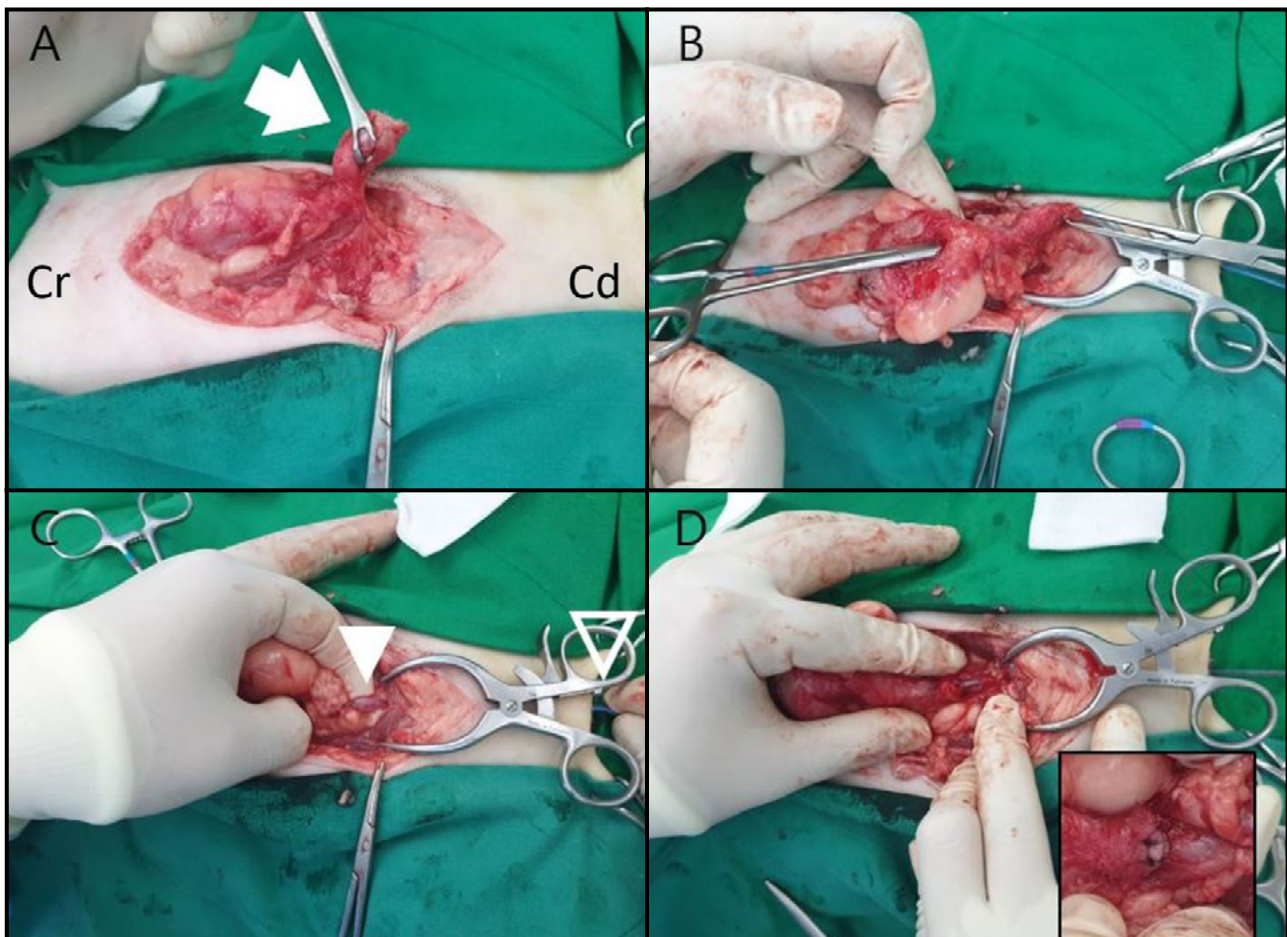


Figure 2. Surgical procedure: A- The proximal portion of the urethra was dissected carefully from surrounding connective tissues (white arrow). B- Kelly forcep was inserted to the urinary bladder in a retrograde manner to identify the caudal end of the proximal urethra. C- The cranial end of the distal urethra was identified (white arrowhead) by pushing indwelling catheter cranially (white open arrowhead). D- Apposition of the caudal end of the proximal urethra and the cranial end of the distal urethra. [Cr: Cranial; Cd: Caudal].

wall and the skin were closed in a routine manner. Recovery from anesthesia was uneventful. The 8-FR Foley catheter was removed 10 days after the surgery. On a positive-contrast retrograde urethrocytogram⁶ [Omnipaque 300®], there was no leakage or stricture formation in the entire urethra (Figure 3). After normal urination for 2 days, the patient was discharged after suture removal. The patient had normal urination at the 15-month follow-up.

DISCUSSION

According to the location of urethral opening, prepubic, transpelvic, or perineal urethrostomy is performed. The most frequently performed surgery is perineal urethrostomy, which was initially introduced by Wilson and Harrison [14]. MPU using preputial mucosa has also been described [15]. When the penile or pelvic urethra is ruptured or not long enough to mobilize the pelvic urethra to the perineal skin by repetitive perineal urethrostomy, prepubic urethrostomy is indicated [1,6]. Prepubic urethrostomy is beneficial for the patients when it is appropriately performed [1]. Complications of prepubic urethrostomy include skin necrosis around the stoma; urinary incontinence; stricture of the urethral stoma due to several reasons such as surgical-site irritation; poor mucosa-skin apposition; failure to provide tension-free stoma; and failure to expose wider pelvic urethra. In these cases, surgical management of the level of prepubic urethral stoma has been recommended by previous studies [8,9]. However, no studies have been reported urethral reconstruction using pre-existing penile urethra in a patient with prepubic urethral stricture so far. To the author's knowledge, this case is the first report describing urethral reconstruction in a cat with urethral stricture after prepubic urethrostomy.

It is obvious that prepubic urethrostomy is beneficial rather than perineal urethrostomy when the urethra is ruptured or damaged by trauma or urine extravasation. Because it is challenging to identify the urethra from surrounding tissues due to massive fibrotic response to urine extravasation or hemorrhage in early phase of urethral injury [13]. However, when the patient has recovered from major associated injuries after prepubic urethrostomy without undergoing perineal urethrostomy, but has complications such as dysuria, urinary incontinence, or peristomal necrosis due to urine extravasation after prepubic urethrostomy, urethral reconstruction combined with perineal

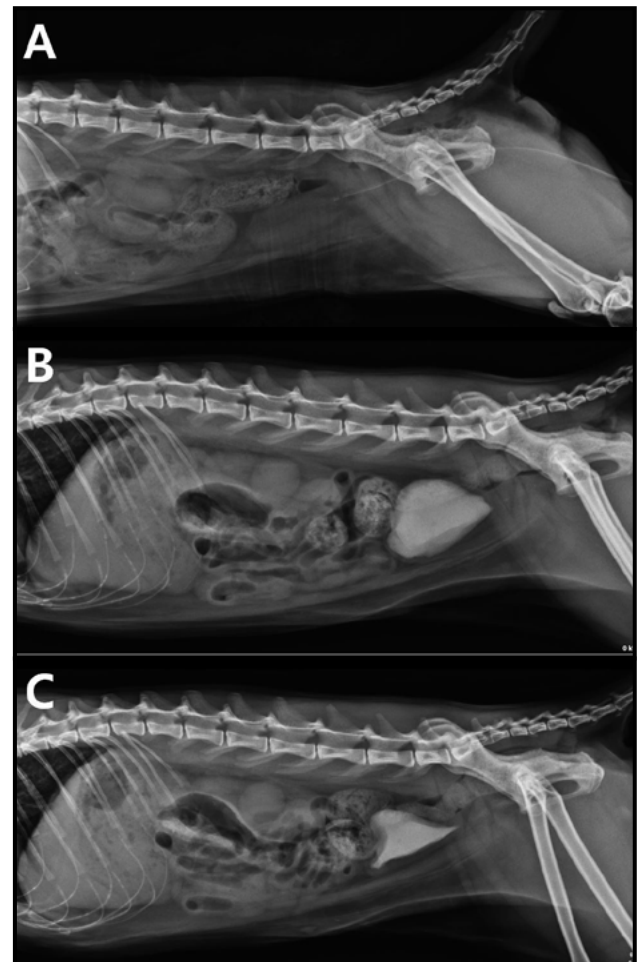


Figure 3. Retrograde urethrocytogram: A- The 8-Fr Foley catheter was placed without resistance. B- The urinary bladder was filled with contrast medium. C- No leakage was identified while the contrast medium in the urinary bladder is expelled out through the urethra.

urethrostomy is recommended rather than surgical revision of prepubic urethral stoma or management of peristomal skin. Because inflammation associated with the urethral rupture might have fully recovered, and perineal urethrostomy or MPU have a lower rate of complications [12,15]. In the case reported here, the entire urethra was easily identified and isolated from surrounding tissues at the time of the surgery. However, there is no consensus on exactly how long after the initial rupture the urethral reconstruction should be performed. In humans, urethral reconstruction is generally performed 3 months after initial urethral injury. However, according to a recent study, there is no significant difference in the outcome between patients undergoing repair within 3-6 weeks of injury and those undergoing repair after 12 weeks of injury [10]. In this case reported here, successful urethral reconstruction

combined with MPU in a cat with urethral stricture after prepubic urethrostomy could be achieved.

Since perineal urethrostomy was introduced by Carbone [4] in 1963, various techniques have been reported [3,5]. Perineal urethrostomy, the most commonly performed technique, is a procedure that removes the narrowest part of the urethra and creates permanent urethral opening by suturing the relatively wide urethra to the perineal skin [14]. However, in the case reported here, the MPU proposed by Yeh & Chin [15] was performed, rather than a traditional perineal urethrostomy, because of the following reason: intraoperatively, presence of scar tissue around the prepubic urethral stoma was expected based on physical examination and ultrasonography findings; these scar tissues warranted removal for accurate end-to-end anastomosis of the urethra. The removal of this excess fibrotic tissue would shorten the distal end of the proximal urethra.

Compared with a traditional perineal urethrostomy, the MPU preserves the preputial mucosa, which could be used for urine passage. This modification of the technique compensates for the urethral shortening during its isolation from the surrounding fibrotic tissue [15].

In conclusion, urethral reconstruction combined with MPU might be an option for patients with urethral stricture after prepubic urethrostomy if the penis appears grossly normal.

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Declaration of interest. The authors report no conflicts of interest. The authors alone are responsible for the content and writing of paper.

REFERENCES

- 1 Baines S.J., Rennie S. & White R.S. 2007.** Prepubic urethrostomy: A long-term study in 16 cats. *Veterinary Surgery*. 30(2): 107-113.
- 2 Bass M., Howard J., Gerber B. & Messmer M. 2005.** Retrospective study of indications for and outcome of perineal urethrostomy in cats. *Journal of Small Animal Practice* 46(5): 227-231.
- 3 Blake J. 1968.** Perineal urethrostomy in cats. *Journal of the American Veterinary Medical Association*. 152(10): 1499-1506.
- 4 Carbone M.G. 1963.** Perineal urethrostomy to relieve urethral obstruction in the male cat. *Journal of the American Veterinary Medical Association*. 143: 34-39.
- 5 Christensen N. 1964.** Preputial urethrostomy in the male cat. *Journal of the American Veterinary Medical Association* 145: 903-908.
- 6 Eayrs M.K. & Moore A.L. 2020.** Management of incontinence following pre-pubic urethrostomy in a cat using an artificial urethral sphincter. *Journal of Small Animal Practice*. 62(7): 604-607
- 7 Gerber B., Eichenberger S. & Reusch C.E. 2008.** Guarded long-term prognosis in male cats with urethral obstruction. *Journal of Feline Medical and Surgery*. 10(1): 16-23.
- 8 Jordan C.J., Kulendra E., Perry K.L. & Halfacree Z.J. 2012.** Management of peristomal tissue necrosis following prepubic urethrostomy in a cat. *Veterinary Comparative Orthopedics and Traumatology*. 25(5): 433-437.
- 9 Phillips H. & Holt D.E. 2006.** Surgical revision of the urethral stoma following perineal urethrostomy in 11 cats: (1998-2004). *Journal of the American Animal Hospital Association*. 42(3): 218-222.
- 10 Scarberry K., Bonomo J. & Gómez R.G. 2018.** Delayed Posterior Urethroplasty Following Pelvic Fracture Urethral Injury: Do We Have to Wait 3 Months? *Urology*. 116: 193-197.
- 11 Segev G., Livne H., Ranen E. & Lavy E. 2011.** Urethral obstruction in cats: Predisposing factors, clinical, clinicopathological characteristics and prognosis. *Journal of Feline Medicine and Surgery*. 13(2): 101-108.
- 12 Smith C. & Schiller A. 1978.** Perineal urethrostomy in the cats: a retrospective study of complications. *Journal of the American Animal Hospital Association*. 14: 225-228.
- 13 Tuñ H.M., Tefekli A.H., Kaplancan T. & Esen T. 2000.** Delayed repair of post-traumatic posterior urethral distraction injuries: Long-term results. *Urology*. 55(6): 837-841.

- 14 Wilson G. & Harrison J. 1971.** Perineal urethrostomy in cats. *Journal of the American Veterinary Medical Association* 159(12): 1789-1793.
- 15 Yeh L.S. & Chin S.C. 2000.** Modified perineal urethrostomy using preputial mucosa in cats. *Journal of the American Veterinary Medical Association*. 216(7): 1092-1095.