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CASE REPORT

Transpelvic urethrostomy in a female dog with congenital vestibulovaginal and urethral stenosis: A case report

Alessandra Chiaramonte VMD | Elizabeth Anglin DVM | Joel D. Takacs VMD, DACVS-SA | Morgan Spinelli VMD | Dana L. Clarke VMD, DACVECC | Lillian R. Aronson VMD, DACVS

Ryan Veterinary Hospital University of Pennsylvania (MJR-VHUP), University of Pennsylvania School of Veterinary Medicine, Philadelphia, Pennsylvania, USA

Correspondence
Alessandra Chiaramonte, University of Pennsylvania School of Veterinary Medicine, Philadelphia, PA, USA.
Email: achiaramonte.vmd@gmail.com

Abstract

Objective: To describe transpelvic urethrostomy (TPU) as a surgical technique for the successful treatment of vestibulovaginal and urethral stenosis in a 7 month old female spayed mixed-breed dog.

Study design: Case report.

Sample population: Female spayed mixed-breed dog with obstructive vaginal tissue present on vaginal examination.

Methods: The dog presented with a history of persistent urine dribbling, stranguria, and dysuria since birth. Vaginoscopy and fluoroscopy revealed severe vestibulovaginal and urethral stenosis. An episiotomy and partial vaginectomy were performed to remove stenotic tissue. A perineal urethrostomy was attempted from a blind-ended pouch associated with the stenotic urethral tissue but was unsuccessful. The dog was repositioned in dorsal recumbency and a postpubic urethrostomy was performed.

Results: Six days postoperatively, incisional dehiscence occurred at the cranial aspect of the urethrostomy. The site was revised at this location using a TPU to decrease tension at the urethrostomy site. The dog recovered uneventfully with no further complications identified after surgery. Forty-two months after surgical intervention, the dog continued to show no clinical signs.

Conclusion: Transpelvic urethrostomy may be a viable surgical alternative for dogs diagnosed with urethral stenosis.

1 | INTRODUCTION

Vestibulovaginal stenosis is a developmental defect caused by incomplete perforation of the hymen or hypoplasia of the genital canal. The developmental abnormality may result in the formation of a vertical septum or annular fibrotic stenosis cranial to the urethral papilla at the vestibulovaginal junction.[1–3] Clinical signs associated with vestibulovaginal stenosis include recurrent urinary tract infections (UTIs), chronic vaginitis, urine pooling with subsequent leakage, and pollakiuria.[1,2] Urinary tract infections are common sequelae due to urine accumulation. Although recurrent UTIs may be subclinical, one study found that 7 out of 11 dogs with recurrent UTIs had bacterial growth on serial urine cultures.[1,2,4] Several different treatments exist for vestibulovaginal stenosis including digital dilation, vestibule vaginoplasty, hymenectomy, vaginectomy, and vaginal resection and anastomosis.[1,5]

Urethral stricture or stenosis is a disease process observed infrequently in dogs. Potential causes include congenital defects, neoplasia, surgical injury, urethral

trauma secondary to urolithiasis, catheterization, or pelvic fractures.[6,7] Dysuria, stranguria, and pollakiuria are clinical signs associated with urethral stenosis.[8,9] Nonsurgical treatments include placement of urethral stents or balloon dilatation using minimally invasive, image-guided techniques.[10–12]

Urethrostomy is the most common surgical treatment performed in male dogs diagnosed with a urethral stricture.[13,14] The urethrostomy technique performed is dependent on the location of stenosis.[13] Urethrostomies are less commonly considered in female dogs due to the available length of the urethra. Urethral resection and anastomoses may be an option but are often limited by the availability of urethral tissue at the site of pathology.[13,14] Additionally, resection and anastomoses may be more challenging to perform if the location of the stricture is within the pelvic canal. Less common techniques, such as axial pattern flaps or lingual and buccal grafts, have been described experimentally in dogs.[15–17]

This case report describes the presentation, diagnostic evaluation, and successful treatment of a dog with concurrent vestibulovaginal stenosis and urethral stenosis. The combination of these conditions and surgical intervention has not been described previously in the veterinary literature.

2 | MATERIAL AND METHODS

A 7 month old female spayed mixed-breed dog was referred to Matthew J. Ryan Veterinary Hospital at the University of Pennsylvania (MJR-VHUP) for a history of urine dribbling, stranguria, and dysuria since birth. Historically, the dog would posture for 5-10 min during micturition but was never reported to produce a large amount of urine. Initial physical examination findings were unremarkable. Vaginal examination performed by the referring veterinarian revealed obstructive vaginal tissue, which prevented palpation cranial to the pelvic brim. Caudal abdominal ultrasound revealed urine accumulation and a dilated urethra distal to the urinary bladder. Urinalysis showed evidence of struvite crystalluria, and a urine culture was negative. Bloodwork was unremarkable aside from a mildly increased creatine kinase (232 U/L) and mild hyperphosphatemia (6.8 mg/dl).

A congenital urogenital malformation was suspected. Differentials included urogenital stenosis/stricture, ectopic ureters (EU), urethral sphincter mechanism incompetence (USMI), or the presence of a paramesonephric remnant. A diagnostic vaginoscopy with possible laser ablation for ureteral ectopia was recommended.

The dog was premedicated with oxymorphone (0.05 mg/kg IM, 1 mg/ml, Endo Pharmaceuticals Inc., Dublin, Ireland) and dexmedetomidine (2 mcg/kg IM, 0.5 mg/ml, Zoetis). Anesthesia was induced with propofol (4.2 mg/kg IV, 10 mg/ml, Fresenius Kabai, Bad Homburg, Germany) and maintained on isoflurane (99.9%, Covetrus) and 100% oxygen. The dog received 22 mg/kg cefazolin IV (100 mg/ml, Novaplus) at induction and antibiotics were administered every 90 min thereafter. Vaginoscopy revealed severe vestibulovaginal stenosis. The urethral papilla was visualized (Figure 1); however, attempts to pass a guidewire through the papilla were unsuccessful. Intraoperative digital dilation of the vestibulovaginal stenosis was attempted and was also unsuccessful. A paramesonephric remnant was not appreciated. Fluoroscopy performed during the vaginoscopy showed severe vestibulovaginal stenosis and a hypoplastic distal urethra with a possible stricture. Contrast filled the vagina, the urethra cranial to the stenosis, and the bladder (Figure 2). An exploratory episiotomy was scheduled 48 h later.

Prior to the exploratory episiotomy surgery, the dog was premedicated with oxymorphone (0.02 mg/kg IV) and was induced with propofol (9 mg/kg IV) and ketamine (1 mg/kg IV, 100 mg/ml, Zoetis). Anesthesia was maintained with isoflurane and 100% oxygen. The dog received cefazolin (22 mg/kg IV) at induction then every 90 min for the duration of the surgery. An episiotomy

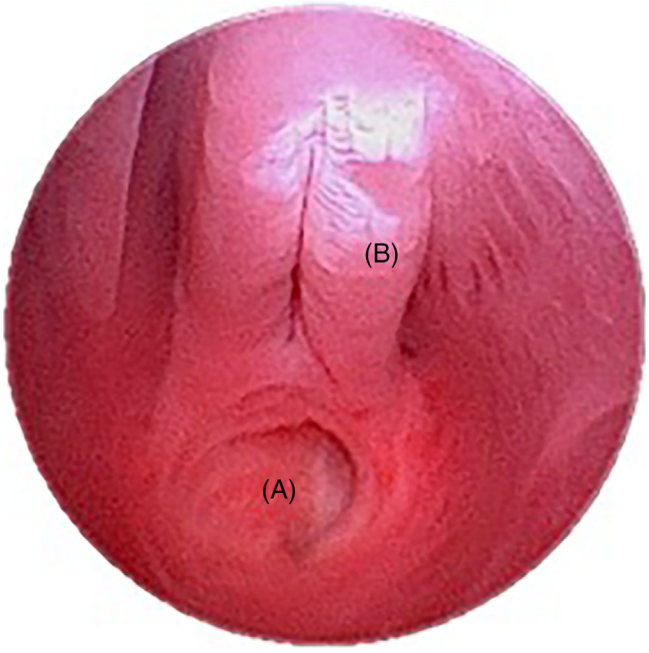

FIGURE 1 Visualization of the urethral papilla during vaginoscopy. The vagina (A) and urethral papilla (B) were identified; however, passage of a guidewire through the urethral papilla was unsuccessful. *Source*: University of Pennsylvania Matthew J Ryan Veterinary Hospital

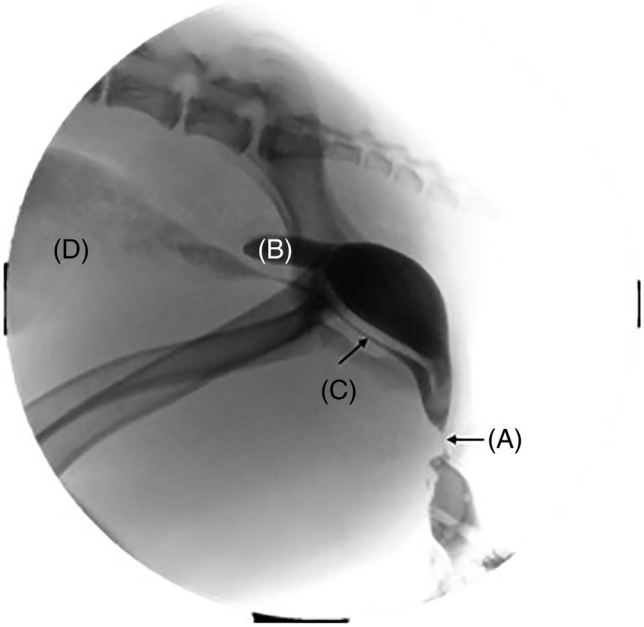

FIGURE 2 Fluoroscopy with positive contrast injected into the urogenital tract performed during the vaginoscopy. Contrast revealed vestibulovaginal stenosis with narrowed urethra (A), uterine stump (B), proximal urethra (C), and urinary bladder (D). *Source*: University of Pennsylvania Matthew J Ryan Veterinary Hospital

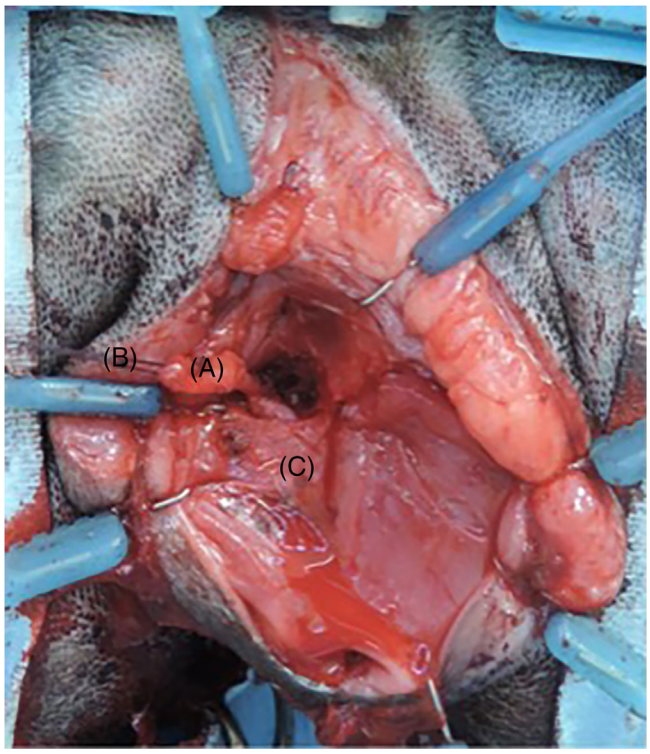

FIGURE 3 Exploratory episiotomy identified grossly visible vestibulovaginal and urethral stenosis (A). Stay suture was placed within the vestibule (B) that ended in a blind pouch. Location of pelvic brim (C). *Source*: University of Pennsylvania Matthew J Ryan Veterinary Hospital

was performed in sternal recumbency. The urethral tubercle was identified. Attempts to catheterize the urethra using a 3.5 Fr red rubber catheter (Covidien), tomcat catheter (Mila), and a 0.035″ angled hydrophilic wire (Merit) were unsuccessful. Large amounts of scar tissue encircled the urethral papilla and vaginal opening approximately 1 cm cranial to the urethral tubercle. The vagina tapered to a narrow stenosis and ended blindly 3 cm cranially (Figure 3).

A partial vaginectomy of the caudal 1/3 of the vagina was performed, and the stenotic tissue was removed. An incision was made circumferentially around the urethral tubercle and the urethra was dissected approximately 3 cm cranial to the stenosis. The proximal urethra could not be readily identified due to marked urethral stenosis. The episiotomy incision was closed, and the dog was repositioned in dorsal recumbency.

A ventral midline skin incision was made caudal to the umbilicus to cranial to the vulva. A celiotomy was performed, the urinary bladder was exteriorized, and a 2 cm ventral cystotomy was performed. A 14 Fr red rubber catheter (Covidien) was passed normograde down the urethra. Using monopolar electrocautery and a periosteal elevator, the adductor and gracilis muscles were partially elevated from the pubic symphysis at their site of origin. The subcutaneous tissue caudal to the ischium was bluntly dissected, and the urethra was identified by palpating the tip of the 14 Fr red rubber catheter. The dilated portion of the urethra cranial to the stenosis was identified and exteriorized. A sharp incision was made into the urethral lumen over the red rubber catheter with a #11 blade, extending 3 cm cranially (Figure 4). Sutures (4-0 Prolene; Ethicon) were preplaced from urethral mucosa to the skin margins (Figure 5). The cystotomy was closed with 3-0 polydioxanone (PDS; Ethicon) in a simple interrupted pattern. The celiotomy, subcutaneous tissue, and skin were closed in a routine way.

The dog recovered from anesthesia uneventfully. Mild hemorrhage at the urethrostomy site was observed postoperatively. Normal micturition was observed the morning after surgery. The dog was discharged from the hospital 2 days later. Meloxicam (0.1 mg/kg orally once daily for 10 days, 1.5 mg/ml, Ceva) and tramadol (3.5 mg/kg orally every 8 h, 50 mg, Sub Pharmaceuticals) were prescribed for analgesia postoperatively.

3 | RESULTS

Six days after the initial surgery, the dog presented again to MJR-VHUP for a several-day history of a foul odor

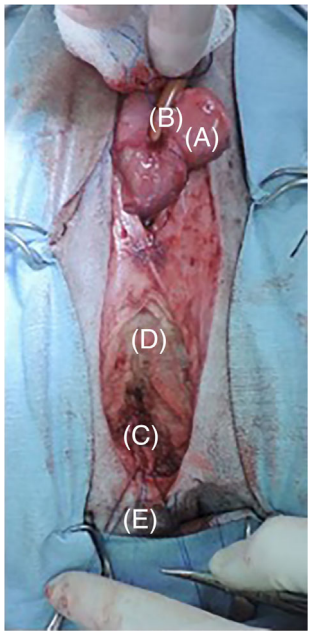

FIGURE 4 Cystotomy site (A) with 14F red rubber catheter (B) passed through the urethra (C) caudal to the pelvic brim (D). Stay sutures (E) were placed in the urethral mucosa for the prepubic urethrostomy. *Source*: University of Pennsylvania Matthew J Ryan Veterinary Hospital

FIGURE 5 Postpubic urethrostomy site (A) with stay sutures (B) in the urethral mucosa prior to suturing urethral mucosa to skin margins. *Source*: University of Pennsylvania Matthew J Ryan Veterinary Hospital

associated with the urethrostomy site. Examination revealed serosanguinous discharge originating from a 0.5 cm open wound at the left cranial aspect of the urethrostomy, just caudal to the ischium. The dog was readmitted for surgical revision of the urethrostomy site.

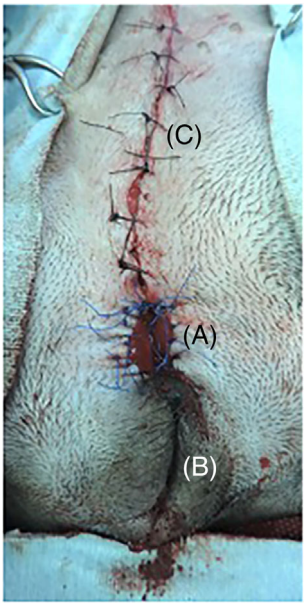

FIGURE 6 Postoperative transpubic urethrostomy. Urethral mucosa sutured to the skin margins (A) cranial to the vulva (B). Caudal laparotomy site (C). *Source*: University of Pennsylvania Matthew J Ryan Veterinary Hospital

The dog was premedicated with methadone (0.5 mg/kg IM, 10 mg/ml, Akron) and dexmedetomidine (3 mcg/kg IM) and induced with propofol (2 mg/kg IV). Anesthesia was maintained with isoflurane and 100% oxygen. The dog received cefazolin (22 mg/kg) intravenously at induction, then every 90 min. The dog was placed in dorsal recumbency and the previous urethrostomy sutures were removed. The urethra was identified using a 14 Fr red rubber catheter and the urethral tissue from the previous urethrostomy site and surrounding tissue were debrided. To help relieve tension, the adductor and gracilis muscles were elevated laterally from the pelvis. A 2.5 cm × 3 cm ischial ostectomy was performed using double-action bone rongeurs to expose healthy urethral tissue beginning at the ischiatic arch and extending cranially along the pubic symphysis.

A transpelvic urethrostomy (TPU) was performed using 4-0 Prolene simple interrupted pattern to suture the healthy urethral tissue to the skin margins (Figure 6). An aerobic urine culture was collected via intraoperative urinary catheterization, which showed no growth. The dog was discharged from the hospital 2 days following surgery with meloxicam (0.1 mg/kg orally once daily for 14 days, 1.5 mg/ml, Ceva), clavamox (17 mg/kg orally twice daily for 14 days, 125 mg, Zoetis), trazodone (1.7 mg/kg orally twice daily, 50 mg, Teva), and codeine (4 mg/kg orally twice daily for 5 days, 30 mg, Hikma).

Short-term follow up 12 days postoperatively revealed that the incision was fully healed with no evidence

of dehiscence, stricture, erythema, or discharge at the surgical site. The owner reported no concerns or complications. Urinary continence was retained. Routine urinalysis performed 6 months postoperatively and then annually postoperatively have remained normal with an inactive sediment. Long-term follow up, 42 months later, revealed absence of stranguria, polyuria, hematuria, urinary incontinence, urine scald, urinary tract infections, or stricture formation.

4 | DISCUSSION

The dog described in this case report was diagnosed with a vestibulovaginal stenosis in conjunction with a urethral stricture. The combination of these 2 defects has not been described previously in the veterinary literature. Although vestibulovaginal stenosis is a developmental defect of the genital tract, many causes of urethral stenosis exist.[6] A congenital defect was considered the most likely cause of urethral stenosis due to the dog's age, no previous history of trauma, and the findings at the time of surgery.

Vaginoscopy, in conjunction with a retrograde urethrocystogram, performed under fluoroscopy, allowed for the definitive identification of both urogenital defects. Based on the dog's clinical presentation, ectopic ureters or USMI seemed less likely as dogs with these abnormalities commonly present with a complaint of continuous dribbling or production of a large volume of urine.[6,8,18] Although the urethral papilla appeared normal on vaginoscopy, fluoroscopy identified a hypoplastic distal urethra with a possible stricture. Retrograde balloon dilation alone, or in conjunction with urethral stenting, was not possible for this case due to the inability to advance a guidewire and urinary catheter past the stenotic area. Antegrade access from the bladder could have been considered to facilitate urethral stricture dilation and stent placement, but given the young age of the dog, a definitive option without permanent implants was desired. Surgical correction was thus pursued. Potential surgical options to relieve the partial urethral obstruction included a urethrostomy directly into the vestibule or a perineal urethrostomy (PU).[8]

Perineal urethrostomy has been performed in female dogs as a salvage procedure for vaginal or vulvar neoplasia.[8] Urethrostomies shorten the length of the functional urethra, which can increase the risk of ascending UTIs due to the proximity to the anus and increased potential for fecal contamination.[7,8,17,18] Unfortunately, normal urethral tissue could not be identified in the dog described. The dog was repositioned in dorsal recumbency to perform a urethrostomy just caudal to the pubis, similar to a scrotal urethrostomy commonly performed in male dogs.[9,19] Prepubic urethrostomy (PPU) can be used as a salvage procedure following failed perineal urethrostomy in both male dogs and male cats and was also considered, however, reported complications include recurrent UTIs and urinary incontinence.[13,17,20,21] The decision to perform a more caudal approach was made to preserve more urethral tissue.

Six days following surgery, the cranial aspect of the urethrostomy dehisced with evidence of urine leakage into the subcutaneous tissue. The owner reported that the dog was licking at the incision site; however, it is unclear whether tension along the suture line, self-trauma, or a combination of these factors contributed to the incisional dehiscence. The dog was readmitted for surgery and a transpelvic urethrostomy (TPU) was performed. The use of a transpelvic approach via ischial ostectomy was described in 11 male cats as a first-line treatment for cats with a urethral obstruction as well as a salvage procedure for failed perineal urethrostomies and is considered an alternative to prepubic urethrostomy.[16,20,22] No operative complications were reported in this case series. One cat developed urinary incontinence which resolved 4 weeks postoperatively. Two cats experienced 1 episode each of lower urinary tract disease that responded to medical therapy.

A recent retrospective study comparing surgical indications and complications of various urethrostomies evaluated 8 out of 56 cats that had a TPU.[21] Short-term complications included UTI (3 cats), sterile cystitis (2 cats), incontinence (2 cats) and urethrostomy stricture (1 cat).[21] Long-term complications included sterile cystitis (2 cats) and UTI (1 cat). Owner satisfaction and long-term quality of life were reported. Many owners (7 out of 8) whose cats underwent TPU surgery stated that the surgery improved their cats' quality of life.[21] Another recent study reported pubic fractures in a cat occurring secondary to an extended TPU.[23] In the only canine report, TPU was performed successfully in a male Staffordshire bull terrier diagnosed with squamous cell carcinoma of the penile urethra. The dog was clinically normal 7 months after surgery and did not experience incontinence, UTIs, or dysuria.[24] Transpelvic urethrostomy has not been described previously in a female dog.

Urethrostomies are not commonly described in the human literature. In humans, urethral strictures are managed by a variety of treatments including urethral balloon dilatation, buccal mucosal graft (BMG), and vaginal flap urethroplasty.[25–29] The most successful of these procedures include BMG and the vaginal flap urethroplasty with a ~95% success rate.[25,28] Grafts and flaps used in both human and veterinary medicine require healthy urethral tissue for graft/flap integration.

In the dog described in this report, the urethra ended in a blind pouch and although the tissue appeared normal on fluoroscopy cranial to the stricture, access and visualization were limited. Reconstruction using a graft or flap did was therefore not a viable surgical option.[15,30]

This case report describes the successful use of a TPU in the female dog for the treatment of vestibulovaginal and urethral stenosis, which has not been previously described in veterinary literature. The technique may also be effective for female dogs suffering from urethral stenosis alone. Additional cases are necessary to understand fully potential complications associated with this procedure in the female dog. Results from this case suggest that a TPU could serve as a viable surgical option for female dogs with congenital urogenital malformations, urethral trauma, or obstructive neoplasms resulting in urethral strictures.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this report.

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