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Preputial urethrostomy in a cat with suspected glandular hypospadias: case report and literature review

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Abstract

Case summary An 11-year-old neutered male Turkish Angora cat was referred for obstructive feline lower urinary tract disease (FLUTD). On physical examination, the penis was curved at the tip and had a smaller than normal urethral opening proximal to the end, consistent with singular glandular hypospadias with a dorsal penile curvature. Because of its recurrent obstructive FLUTD history and inability to catheterise the urethra, a preputial urethrostomy (PRU) was performed. The PRU resolved the clinical signs with no clinical recurrence and no short- or long-term complications.

Relevance and novel information To the authors' knowledge, this is the first description of singular glandular hypospadias in a cat. In addition, this is the first time feline hypospadias has been reported to occur with obstructive FLUTD and to be treated by preputial urethrostomy.

Keywords: Glandular hypospadias; dorsal penile curvature; preputial urethrostomy; obstructive feline lower urinary tract disease

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Introduction

Hypospadias is a congenital defect characterised by an abnormal location of the male urethral opening due to incomplete fusion of the median raphe of the penis, prepuce or scrotum. The urethral opening can be located ventrally to the tip of the penis (glandular), ventrally on the penile body (penile), at the level of the scrotum (scrotal) or in the perineal area (perineal).¹

Hypospadias is the second most common congenital anomaly in men. Depending on the position of the meatus, it is commonly classified as distal (anterior), mid-shaft or penile (middle), and proximal (posterior) hypospadias.² Nearly 70% of hypospadias cases in men are distal (glandular or coronal) and are considered mild.³ In dogs, the perineal and penile forms predominate, usually accompanied by other anomalies.⁴ Glandular hypospadias has been described only sporadically in canine patients.⁵

In cats, this congenital anomaly is rarely documented in the literature and its prevalence is not well-known.⁶

Despite variations in the classification of hypospadias among the authors, several types have been described (Table 1), including perineal, scrotal, penile and glandular hypospadias.^{7–16} More severe anatomic defects, such as division or absence of the scrotum, a rudimentary penis and other genitourinary tract abnormalities, were present in all cases.

Hypospadias often presents asymptotically, particularly when only the glandular type is present. In severe cases, animals frequently exhibit clinical signs

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Table 1 Reported feline hypospadias

Report	Cases	Type of hypospadias and concomitant anomalies	Breed	Age	Clinical signs	Karyotype	Treatment
1 Foley and Collins ¹⁶	2	(1,2) Penile hypospadias, bifid scrotum and urorectal septum	(1) Abyssinian (2) DSH	NA	NA	NA	Orchidectomy
2 Sassnau ¹⁵	1	Penile hypospadias, ectopic testicles, divided scrotum, atresia of the urethral opening, lack of perineum epithelialisation. Inferior brachygnathia, left forelimb hypomelia	DSH	7 months	None	NA	Orchidectomy
3 King and Johnson ⁷	1	Glandular hypospadias, divided scrotum. Mucous membrane extending from the penis to the anus. Urethral opening 0.5cm ventral to the tip of the penis	Himalayan	1 year	Chronic cystitis	Male karyotype (38, XY)	Perineal urethrostomy
4 Nowacka-Wozuk et al ⁸	3	(1) Perineal hypospadias, rudimentary penis, residual scrotum (2) Penile hypospadias, rudimentary penis, frenulum persists, lack of scrotal septum (3) Perineal hypospadias, rudimentary penis, glans penis not covered by the prepuce, lack of scrotal septum	NA	(1) 6 months (2) 10 months (3) 11 months	NA	Male karyotype (38, XY)	NA
5 Reynolds et al ⁹	1	Imperforate anus, dorsal hypospadias, rectourethral fistula and genital dysgenesis (penis restricted to the glans, absence of prepuce and bifid scrotum)	NA	2 months	Related to imperforated anus	Male karyotype (38, XY)	Reconstructive surgery
6 Kim et al ¹³	1	Scrotal/perineal hypospadias, divided scrotum with a rudimentary penis	Persian	9 months	Chronic constipation	NA	Orchidectomy
7 Lentini et al ¹⁰	1	Perineal hypospadias: cloacal structure with two outlets, the rectum dorsally and the urethra ventrally. Peniform structure without relationships with the urethral meatus. Divided scrotum	DSH	2 years	None	Male karyotype (38, XY)	Orchidectomy
8 Knight et al ¹¹	1	Scrotal hypospadias: divided scrotum with a urogenital opening between two halves of the bifurcated scrotum	DSH	2 years	None	Male karyotype (38, XY)	Orchidectomy
9 Sousa ¹⁴	1	Perineal hypospadias, rudimentary penis and testicles	DSH	6 months	Perineal dermatitis	NA	Perineal urethrostomy
10 Paim et al ¹²	2	(1) Glandular hypospadias, incomplete anal sphincter, rudimentary penis, divided scrotum (2) Glandular hypospadias, testicles in the lateral region of the penis and absence of scrotum	(1) DSH (2) Persian	(1) 9 months (2) 3 months	(1) Bacterial cystitis (2) Dysuria	NA	Perineal urethrostomy
11 *	1	Glandular hypospadias with dorsal penile curvature	Turkish Angora	11 years	Obstructive FLUTD	NA	Preputial urethrostomy

*Unpublished

DSH = domestic shorthair; FLUTD = feline lower urinary tract disease, NA = not available

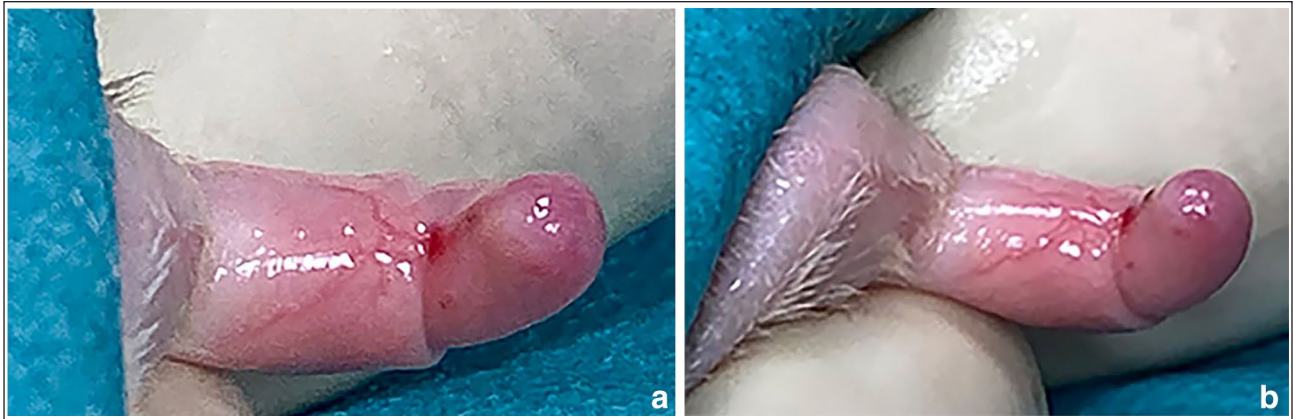


Figure 1 Isolated glandular hypospadias: smaller than average urethral opening 5mm proximal to the penis end compatible with (a) glandular hypospadias and (b) a dorsal penile curvature

associated with urinary incontinence and perineal dermatitis.^{1,11} Known surgical treatments for hypospadias in cats include bilateral orchidectomy,^{8,11,13} perineal urethrostomy^{7,12,14} and reconstructive surgery in a case with concomitant imperforate anus and rectourethral fistula.⁹

Preputial urethrostomy (PRU), introduced by Yeh and Chin¹⁷ in 2000, is a modification of perineal urethrostomy in which the urethral mucosa is anastomosed to a remnant of the preputial mucosa. Two publications have addressed this technique with 20 and 52 cats, respectively.^{18,19} Despite the authors' suggestion that this procedure enhances cosmesis and diminishes the incidence of postoperative complications,^{17–19} it has not been widely adopted.

To the authors' knowledge, this is the first case to report an isolated glandular hypospadias in a cat and the first case of feline hypospadias treated by preputial urethrostomy. The aim of the present case report was to detail the clinical findings, surgical treatment and outcome of a cat with suspected glandular hypospadias.

Case description

An 11-year-old neutered Turkish Angora cat was referred for obstructive FLUTD. The cat had a 2-week history of dysuria and pollakiuria, which progressed to severe stranguria. The cat's first episode of obstructive FLUTD was at the age of 6 years and had shown multiple recurrent episodes of lower urinary signs, all managed with difficult urethral catheterisation and medical treatment.

Abnormalities identified on physical examination included mild dehydration and abdominal discomfort with a distended and painful bladder on palpation. Haematology and serum biochemistry revealed a mild lymphopenia of 1060/ μ l (reference interval 2000–7200). Urinalysis showed an active urine sediment with

erythrocytes, epithelial cells and abundant neutrophils without bacteriuria. Abdominal ultrasound revealed chronic renal changes with loss of corticomedullary differentiation and multiple renal cysts. There was no evidence of urolithiasis on either abdominal ultrasound or radiographs.

Owing to an abnormally shaped penis, the emergency team could not perform urinary catheterisation on arrival. Consequently, a 40 cm cystostomy tube (Cystofix; Braun) was surgically placed. The cat was hospitalised for urinary output monitoring and medical therapy, including intravenous fluid therapy (Lactated Ringer's supplemented with potassium chloride [40 mEq/l]), maropitant (1 mg/kg IV q24h, Cerenia; Zoetis), methadone (0.1 mg/kg IV q4h, Semfortan; Eurovet Animal Health) and amoxicillin–clavulanic acid (22 mg/kg IV q8h, Amoxicillin-Clavulanic Acid; Normon). Surgery was performed the next day.

After premedication with methadone (0.2 mg/kg IV) and dexmedetomidine (0.0025 mg/kg IV, Dexdomitor; Orion), general anaesthesia was induced with alfaxalone (1 mg/kg IV, Alfaxan; Zoetis) and midazolam (0.2 mg/kg IV, Midazolam; Normon) and maintained with isoflurane (Isovet; Braun) in oxygen. Locoregional analgesia was provided by sacrococcygeal epidural with bupivacaine (1 mg/kg IV, Bupivacaine 0.5%; Braun) and amoxicillin–clavulanic acid (22 mg/kg IV) was administered before the procedure.

The abdominal and perineal regions were clipped and aseptically prepared and the cat was placed in dorsal recumbency. A ventral midline exploratory laparotomy was performed. The cystostomy tube was removed by a small cystectomy and a 0.018-inch (0.046 cm) guidewire (Glidewire Advantage Angled Radiofocus; Terumo Europe) was introduced normograde into the urethra. However, the guidewire could not be

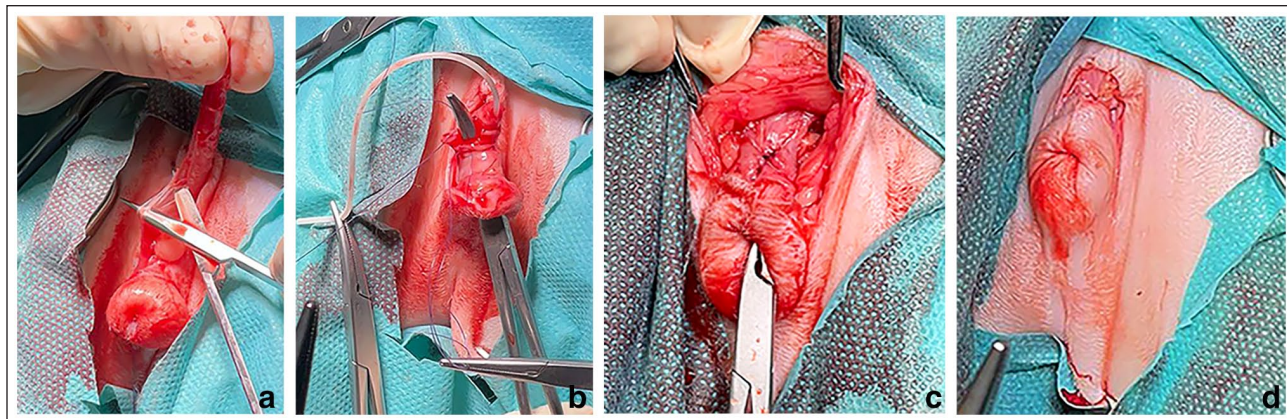


Figure 2 Preputial urethrostomy. (a) After the release of the penis from the preputial mucosa at the fornix level and its dorsal exteriorisation through the semilunar scrotal incision, a conventional penile dissection and amputation were performed. (b,c) The remaining penile urethra was spatulated and anastomosed to the preputial mucosa using two continuous suture patterns. (d) The semilunar skin incision was closed in two layers

exteriorised through the urethral opening. The penis was curved at the tip, presenting a dorsal penile curvature, along with a smaller than normal urethral opening 5 mm proximal to the end, indicative of glandular hypospadias (Figure 1). A urethral plug was manually expressed from the tip of the penis, allowing retrograde catheterisation with a 0.018-inch guidewire. A rigid urinary catheter (Tom Cat Catheter 3.0 Fr 11 cm; Braun) was passed over the wire. The presence of the catheter in the bladder was visually confirmed, and the bladder and abdominal wall were routinely closed.

The cat was repositioned to sternal recumbency and aseptically prepared for a preputial urethrostomy. A semilunar portion of the scrotum dorsal to the prepuce was excised while preserving its integrity. The preputial mucosa was then incised around the penis at the fornix and the penis was dorsally exteriorised through the incision. To maintain tissue alignment throughout the procedure, stay sutures with 4-0 polydioxanone (Monoplus; Braun) were placed at the ventral and dorsal midlines of the preputial mucosa. The penis was dissected and amputated at the level of the bulbourethral glands as described in conventional perineal urethrostomy (Figure 2a).²⁰ Once the distal portion of the penis was amputated, the remaining penile urethra was spatulated and anastomosed to the preputial mucosa with two simple continuous patterns using 4-0 polyglycolide sutures (Monosyn; Braun) (Figure 2b,c).

An adequate urethral diameter was verified by introducing a mosquito forceps. Finally, the semilunar skin incision was closed in two layers with 4-0 polyglyconate (Monosyn; Braun) simple continuous sutures (Figure 2d).

Recovery was uneventful and the patient was discharged 72h after surgery with a prescription for meloxicam (0.05 mg/kg PO q24h, Metacam; Boehringer



Figure 3 Catheterisation of the preputial urethrostomy at the 2-month recheck.

Ingelheim), amitriptyline (0.5 mg/kg PO q24h, Amitriptyline hydrochloride; Neuraxpharm) and prazosin (0.5 mg PO q12h, Minipres; Pfizer). The owner received optimal husbandry recommendations to mitigate the risk of feline idiopathic cystitis (FIC) episodes.

Bladder histopathology findings indicated mild lymphoplasmacytic and neutrophilic cystitis, accompanied by moderate diffuse oedema and urothelial hyperplasia. Bacterial culture yielded no growth. The wound healed well with an excellent functional and aesthetic result at the 2-week follow-up appointment. At the 2-month recheck, urinary catheterisation was easily accomplished by inserting a catheter into the preputial orifice (Figure 3). The owner reported no urinary clinical signs.

Preputial urethrostomy resolved the clinical signs in this patient, with no recurrence or complications observed during the 15-month follow-up period.

Discussion

Hypospadias in cats is a rare occurrence with an uncertain prevalence,⁶ with perineal and penile forms being the most common. This case report documents a cat with isolated glandular hypospadias accompanied by a dorsal penile curvature and concomitant obstructive FLUTD. This is the first reported case of feline hypospadias without other associated malformations.

Ventral penile curvature is a common component of men's hypospadias, always present in proximal hypospadias (scrotal and perineal) and in 86% of patients with distal hypospadias.²¹ The penile curvature observed in our cat was described as dorsal, reflecting the distinctive anatomy of the feline penis. Unlike in humans, where hypospadias usually results in a ventral penile curvature, the feline urethral surface is oriented caudodorsally.²² This orientation results in dorsal hypospadias with a dorsal penile curvature.

While hypospadias in cats is commonly seen in young or developing patients (aged 2 months to 2 years),⁷⁻¹⁴ this case involves an 11-year-old cat with clinical signs emerging at the age of 6 years. Mild cases of hypospadias might be a diagnostic challenge, as evidenced by the failure to diagnose the condition despite repeated urinary catheterisations.

Some authors suggest that cats with hypospadias may have a developmental sexual disorder (DSD) associated with sex chromosome abnormalities.²³ While we did not perform a cytogenetic analysis, previous cases of hypospadias that underwent karyotyping had a normal 38-XY male karyotype.⁷⁻¹¹ It is reasonable to speculate that hypospadias in cats may be a form of XY DSD without chromosomal abnormalities, like humans^{2,24} and dogs,⁴ as suggested by other authors.⁶

Hypospadias has never been suggested as a contributing factor in obstructive FLUTD. However, other anatomical abnormalities linked to FLUTD include urethral strictures, ectopic uterine horn invading the urinary bladder, patent urachus, urachal diverticula, ectopic urethra and urethrorectal fistula.²⁵ We hypothesise that the smaller and abnormally located urethral opening predisposed the cat to experience more frequent obstructions during FLUTD episodes.

Considering the cat's history of obstructive FLUTD, with FIC and hypospadias diagnosis, which might predispose it to further episodes, we opted to perform a preputial urethrostomy. Unlike previously reported cases, the cat had isolated glandular hypospadias that could be surgically treated by preputial urethrostomy due to the lack of involvement of adnexal structures and the proposed benefits of this technique.

Preputial urethrostomy has been previously described for treating obstructive FLUTD but has never been used in a cat with hypospadias. Nevertheless, the technique has been described for correcting a urethrorectal fistula in a young male cat with an excellent result.²⁶ This technique improves cosmetics and potentially reduces complications such as urine scalding, bacterial cystitis and narrowing of the urethral opening due to regrowing hairs.¹⁷⁻¹⁹ This is achieved by using the preputial foreskin to obtain a more natural urethral opening, avoiding constant exposure of the urethra. In addition, a perineal urethrostomy can be performed in the event of a stricture in the preputial urethrostomy.¹⁹

Preputial urethrostomy resolved the clinical signs in this patient, with no recurrence or complications observed during the 15-month follow-up period. Nonetheless, reported postoperative complications associated with this technique include recurrent hematuria (2/14 cases), urethral mucosal damage and scar formation due to a misplaced suture (1/14 case),¹⁷ subcutaneous urine accumulation resulting from leakage between the anastomosed urethra and preputial mucosa (3/20 cases)¹⁸ and stenosis (3/55 cases).¹⁹ It is important to note that the recurrence of sterile cystitis is a common complication of perineal urethrostomy,²⁷ suggesting the possibility of lower urinary tract signs recurrence in this case.

Conclusions

This is the first report that links glandular hypospadias to obstructive FLUTD in a cat. This paper aims to show that feline patients with hypospadias may present with subtle clinical signs. It may be an aggravating cause of FLUTD, so performing an excellent anatomical examination on feline patients with recurrent urinary problems is vital. Furthermore, a preputial urethrostomy resulted in an excellent outcome in this case.

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Conflict of interest The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognised high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS Open Reports*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

Informed consent Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers, tissues and samples) for all procedure(s) undertaken (prospective or retrospective studies). No animals or people are identifiable within this publication, and therefore additional informed consent for publication was not required.

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