

“Unclogging the Tubb(s)”

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Introduction

Feline urethral obstruction is a common and potentially fatal condition seen in cats with lower urinary tract disease. Cats can present with a partial or complete obstruction; however, both disorders should be treated as a medical emergency as death can occur in as little as 24 to 48 hours if left untreated.^{1,7} For cats that are refractory to medical therapy or experience recurrent obstructions, surgery is often recommended.^{1, 2, 7} A perineal urethrostomy (PU) is the most commonly recommended surgical procedure and involves removing the penis and suturing a portion of the urethra to the skin to create a new urinary opening.⁷ If a cat continues to re-obstruct following a PU or the urethra is obstructed cranially to the PU site, other salvage procedures may be pursued.² These procedures include prepubic, subpubic, and transpelvic urethrostomy. The following case details a complicated perineal urethrostomy converted intraoperatively into a transpelvic urethrostomy and will discuss the presentation, diagnostic approach, pathophysiology, treatment and outcome of the case.

History and Presentation

Tubbs is a 3-year-old male neutered domestic shorthair cat that presented to MSU-CVM Emergency Services on 7/7/20 for a urinary obstruction. Tubbs was referred to MSU-CVM by his primary care veterinarian for a perineal urethrostomy as this was his fifth obstructive episode within the past five months. Prior to referral, the primary veterinarian placed a urinary catheter and administered Unasyn (30 mg/kg Q8, unknown route). Tubbs' last three obstructions had been associated with urinary tract infections and resolved with antibiotics. The primary veterinarian also performed an abdominal ultrasound on 6/16/20, and no cystoliths were appreciated; however, struvite crystals were observed on urinalysis. Tubbs was prescribed and had been eating Hill's c/d since his first obstruction in March.

On presentation, Tubbs was quiet and alert. He weighed 6.5 kg with a body condition score of 7 out of 9. On cardiopulmonary auscultation, no crackles, wheezes, murmurs, or arrhythmias were appreciated. His vital parameters were mildly elevated with a temperature of 103°F, a heart rate of 180 bpm, and a respiratory rate of 80 bpm. His pulses were strong and synchronous. Tubbs' hydration status was normal with pink, moist mucus membranes and a capillary refill time of less than two seconds. On palpation, his abdomen was soft and non-painful, and his urinary bladder was small. The remainder of his physical exam parameters were within normal limits.

Diagnostic Approach

During Tubbs' initial exam, an electrocardiogram (ECG) was obtained and revealed normal sinus rhythm. Consecutive blood pressure readings showed 119/68 (85), 131/75 (93), and 122/74 (90) which were within normal limits. AFAST and TFAST (Abdominal and Thoracic Focused Assessment with Sonography for Trauma) were negative for free fluid with the only relevant finding consisting of a small urinary bladder with a diffusely thickened bladder wall. An iSTAT was performed and revealed no significant abnormalities despite his urethral obstruction. Tubbs was deemed stable and remained in the ICU until his transfer to MSU-CVM's Small Animal Surgery Service the following morning.

After Tubbs was transferred to the surgery service, abdominal radiographs were performed to rule out urolithiasis as a cause of his obstruction. The results showed no evidence of cystolithiasis or mineral opaque debris within the urinary bladder or urethra. Based on this information, the decision was made to move forward with Tubbs' perineal urethrostomy.

Pathophysiology

In cats, there are numerous etiologies that can result in urethral obstruction. Urinary outflow may not only be inhibited by a physical obstruction, such as urethral plugs, uroliths, and urethral strictures, but it may also be reduced due to local inflammation and pain.^{1,11} Regardless of the cause for obstruction, male cats tend to be more frequently affected due to their longer and more narrow urethras.^{1,11,12} The diameter of the penile urethra is only 0.7 mm, making it a prime area for obstructions to occur.^{2,10} However, at the level of the bulbourethral glands where PU stomas are created, the urethral diameter widens to approximately 1.3 mm, nearly double the width of the penile urethra.¹⁰ Other predisposing factors have been reported, but they are not specific to urethral obstruction and will be discussed later. As in other species, a urinary blockage leads to an increased intratubular pressure that reduces glomerular filtration and impairs renal tubule function.⁹ The result is life-threatening acid-base and electrolyte abnormalities, most notably metabolic acidosis and hyperkalemia.⁹ However, while this is a potentially fatal condition, it is important to acknowledge that urinary obstruction is merely the sequela of a much larger disease process referred to as feline lower urinary tract disease.^{6,12}

Feline lower urinary tract disease, or FLUTD, is a topic that has plagued the veterinary profession for decades as there are numerous etiologies, and diagnosis is not always straightforward. The term FLUTD is an umbrella term that encompasses the various conditions that affect the bladder or urethra of cats and cause lower urinary tract signs such as periuria, stranguria, dysuria, pollakiuria, and hematuria.^{6,8,12} These conditions include feline idiopathic cystitis (FIC), urolithiasis, urinary tract infections, urethral plugs, and neoplasia.^{6,12} Of these, the most common etiology is feline idiopathic cystitis, accounting for approximately two-thirds of all cases of FLUTD.^{8,12} While FIC occurs most frequently, the pathophysiology is still poorly understood and continues to be an area of controversy. As such, various terminology has been

used to describe this disease including idiopathic feline lower urinary tract disease, feline urologic syndrome, feline interstitial cystitis, and Pandora syndrome; however, feline idiopathic cystitis continues to be the most recognized term.^{6,12} With such uncertainty surrounding this disease, FIC continues to be a diagnosis of exclusion and is applied only after ruling out other disorders of the urinary tract.^{6,12}

Certain risk factors are associated with FIC and may aid in diagnosis. Often, FIC affects young to middle aged (1-10 years old), overweight cats that live primarily indoors or in multi-cat households.^{6,12} Males and females are equally represented; however, male cats more commonly present with urethral obstruction.¹² There is also a genetic component as Persian, Manx, and Himalayan cats are at a higher risk while Siamese cats are at a lower risk.^{6,12} A newer theory also suggests that exposure to adverse events in utero or very early in life may lead to the development of FIC later on.^{3,8,12} When pregnant females are exposed to significant stressors, the resultant stress hormones may cross the placenta and alter the development of the fetal stress response system and create a state of hypervigilance.^{3,12}

Although the precise pathogenesis is unknown, FIC is believed to be a complex condition involving the urinary bladder, neuroendocrine system, and environmental factors.^{6,8,12} The leading hypothesis is that cats susceptible to FIC have abnormalities of the hypothalamic-pituitary-adrenal axis.^{6,8,12} In these cats, chronic stress alters the normal stress response and feedback mechanisms resulting in inadequate adrenocortical inhibition and an increased sympathetic nervous system response.^{6,8,12} The enhanced catecholamine response results in increased bladder permeability which allows irritating urinary solutes to migrate across the uroepithelium and stimulate sensory neurons within the bladder.^{6,8,12} The subsequent neurogenic pain and inflammation results in the lower urinary tract signs associated with this disease.^{8,12}

Treatment

As feline idiopathic cystitis manifests as a response to stress, most cases resolve spontaneously within 2 to 7 days regardless of treatment.¹² Therefore, treatment of this disease is usually centered around supportive care and multimodal environmental modification (MEMO) to reduce stress. Some recommendations for MEMO include ensuring adequate availability of resources (food, water, litterboxes), providing a variety of toys to allow cats to demonstrate their natural predatory behaviors, and offering consistent and positive social interactions from humans and other animals.^{6,12} However, in Tubbs' case, he was suffering from frequent urinary obstructions secondary to FIC, and a perineal urethrostomy was elected to reduce the chance of future obstructions. Generally, PU surgeries offer a good prognosis but are not without complications including urethral stricture, urinary tract infection, and urinary or fecal incontinence.² In this case, the complication occurred intra-operatively as the distal urethral tissue was too compromised to complete a PU, and the procedure was converted into a transpelvic urethrostomy (TPU). A TPU was preferred over the other salvage procedures as it is associated with fewer complications.^{2,5} Historically, prepubic urethrostomies are associated with high incidences of chronic urine-scald dermatitis, urinary incontinence, and urinary tract infections.² Specifically, the incidence of urinary incontinence and urinary tract infections after the prepubic technique range from 12% to 58% and 22% to 75% respectively.² While the subpubic technique appears to reduce the incidence of these complications compared to prepubic, there are not enough studies to support this claim.^{2,5} However, several studies of TPU's reported these complications to be minimal to none.^{2,5}

Tubbs was anesthetized, an epidural was performed, and a purse string suture was placed in the anus. He was positioned in sternal recumbency, with hind limbs off the table, and the

perineal area was aseptically prepped with chlorhexadine solution. A tomcat catheter was placed to use as a guide during surgery to identify the location of the urethra. An elliptical incision was made around the penis/prepuce with a #10 blade. An Allis tissue forcep was placed on the end of the prepuce to aid in manipulation. Blunt and sharp dissection with Metzenbaum and tenotomy scissors were used to free the penis and distal urethra from the surrounding tissue. The penis was elevated dorsally, and the retractor penis muscle was cut with the Metzenbaum scissors. The retractor penis muscle was then removed using Metzenbaum scissors. The ischiocavernosus and ischiourethralis muscles were transected, and the bulbourethral glands were then identified. Tenotomy scissors were used to longitudinally incise the penile urethra distally to proximally. The urethra was extremely friable and continued to tear proximally as sutures were placed; therefore, the surgery was converted to a transpelvic urethroscopy.

The patient was repositioned in dorsal recumbency, with hindlimbs off the table, and the abdomen was aseptically prepped. The initial perineal incision was extended along ventral midline to the cranial pubic margin. Using Lempert and Love-Kerrison rongeurs, progressive ostectomy of the ischium in a caudal to cranial direction was performed, creating an ostectomy area of 10 mm wide and 12 mm long. Fat tissue around the stoma was excised to reduce skin tension. A closed Halsted Mosquito hemostat was passed (to the level of the box locks) up the urethra to ensure that the urethral width was adequate. The urethra was transected longitudinally, and the urethral mucosa was sutured to the skin margins in a simple interrupted pattern with 4-0 polypropylene. The portion of the penis distal to the bulbourethral glands was amputated. Additional simple interrupted sutures with 5-0 monocril were used cranially and caudally to close the remaining wound. A rent in the dorsal urethral mucosa was noted. It was apposed in a

simple continuous pattern of 5-0 monocryl. A Foley catheter was placed to monitor urine output. Immediate recovery from surgery and anesthesia were uneventful.

Case Outcome

After surgery, Tubbs remained in the ICU for the next 4 days. Immediately post-operation, he was maintained on a fentanyl constant rate infusion (CRI) at 3 mcg/kg/hr and intravenous fluids of lactated ringer's solution at 3.2 mL/kg/hr. The following morning (one day post-op), the fentanyl CRI was discontinued, and Tubbs' pain was managed with oral robenacoxib (1.8 mg/kg Q24) and buccal buprenorphine (0.015 mg/kg Q6). Tubbs also received intravenous Unasyn (30 mg/kg Q8) until five days post-op. During his stay in ICU, Tubbs' stoma and urinary catheter were kept clean, and his urinary output was quantified every four hours. His urinary catheter was removed five days post-op when his urine output was consistent and averaged 1 mL/kg/hr. At this point, Tubbs' intravenous catheter was also removed, and he was moved to cat wards. The following day (six days post-op), Tubbs urinated on his own and was discharged. At the time of discharge, his owner was provided with instructions to maintain his Elizabethan collar, limit activity, continue the Hill's c/d diet, increase water intake, monitor urination, and return in 7-10 days for suture removal. Proper stoma care was also stressed to Tubbs' owner. Not only would the site need to be kept clean and remain undisturbed while healing, but long-term maintenance would be required as well. The hair on Tubbs' abdomen should be clipped short to prevent urine collection around the stoma as this could irritate the skin and lead to urine scald. The area should also be cleaned with a damp cloth and petroleum jelly or barrier spray may be applied to help prevent skin irritation.

Conclusion

While feline idiopathic cystitis is not the most common cause of urethral obstruction in cats, it is the most common cause of lower urinary tract disease.^{1,9,12} Therefore, it should always be considered as a differential in cases of urinary blockage. Depending on the cause, the recurrence rate of urethral obstruction is 15-40%; thus, a fair number of cats may require surgical treatment.⁴ Although a PU is considered the standard approach, it may not be feasible in every case. As demonstrated in this case, TPUs can offer successful outcomes with low morbidity. Some studies even suggest TPUs may serve as an alternative to PUs in the future.^{2,5} While further studies are required to investigate this claim, TPUs do show promise for their use in feline medicine.

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