The approach to urethral obstruction in the cat: Part 2

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Catheterising and post obstruction management

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Background:
Urethral obstruction is one of the most commonly encountered emergencies in feline medicine, with a wide range of clinical signs from dysuria to peri-arrest. Such patients are some of the most challenging cases in feline medicine, with several factors to consider; however, they can be equally rewarding.

Aim:
This is the second of three articles in this series. The aim of this article is to summarise urethral catheterisation, and immediate post-catheterisation management. The first article discusses presentation and stabilisation. The third is to discuss the behavioural and long-term management needed once the cat has gone home.

Catheterising

Sedation or general anaesthesia

The stability of the cat will dictate whether sedation or general anaesthesia is most

appropriate. Before undertaking either, the cat should be as haemodynamically stable as possible.

General anaesthesia is required in all but the most compromised patients as this ensures the urethra is as relaxed as possible and the cat cannot feel the stress and pain of urethral catheterisation. However, in collapsed cases, a combination of opioids and midazolam may be sufficient to deeply sedate the cat, while causing minimal cardiovascular depressant effects. Whilst sedating these critical patients can be concerning, attempting to catheterise a conscious cat is unlikely to be successful, and risks additional stress, pain and trauma.

Preparation

Examine the penis first, as there may be a distal plug or small urolith that can be easily dislodged, restoring urine flow without invasive intervention.

Before aseptic preparation of the perineum, a ***rectal examination should be performed in all cases*** to evaluate the intrapelvic urethra and try to determine the cause of the obstruction. In most cases, the obstruction will be secondary to chronic muscular spasm of the urethra and or plugs associated with FIC. Focal uroliths may also be identified, as can bruising, trauma, and neoplasia (either urothelial carcinoma or, rarely, prostatic carcinoma). Per-rectal massage of the urethral spasm may be all that is needed to release the spasm and allow the urine to pass.

A wide clip to encompass the entire perineum should be performed, to minimise the risk of iatrogenic bacterial introduction on catheterisation. The area should then be aseptically prepared, and the prepuce flushed with dilute povidone iodine solution.

In cases where only sedation is used, topical local anaesthetics can be applied at this point, such as EMLA cream, allowing the patient to better tolerate suture placement when securing the catheter.

Caudal epidural blocks should be considered and may facilitate catheterisation, whilst also providing analgesia to a traumatised urinary tract in the day that follows. They have been

shown to be safe, reducing the volume of anaesthetic drugs needed, and can provide prolonged post procedural analgesia (Pratt *et al*. 2018). An excellent review and detailed step by step guide on how to perform this technique has been published by O'Hearn and Wright (2011; see below).

How to determine the most appropriate way to unblock a particular cat's urethra?

There are five major methods of urethral un-blocking and catheterisation:

- Retrograde urethral catheterisation
- Retrograde hydro-pulsion
- Antegrade or Voiding Urohydropropulsion
- Percutaneous Antegrade Urethral Catheterisation
- Surgical Antegrade Urethral Catheterisation

Since the majority of urethral obstructions are due to either urethral spasm or proteinaceous plugs, catheter placement via ***retrograde urethral catheterisation*** should be the first approach in these cases (Figure 5; see below).

When urethroliths or clots are present ***retrograde urethral hydropulsion*** will be needed to expel the stone or clot back into the bladder (Figure 6; see below).

Where urethroliths are small, in female cats or male cats that have had a perineal urethrostomy, ***antegrade or voiding urohydropropulsion*** may be considered (Figure 7; see below).

If a urethral catheter cannot be placed or stones can neither be expelled nor repelled into the bladder, referral is recommended. ***Percutaneous antegrade urethral catheterisation*** (Figure 8) or ***surgical antegrade urethral catheterisation*** may then be performed if repeated retrograde urethral catheterisation, retrograde urethral hydropulsion, or antegrade or voiding urohydropropulsion are unsuccessful.

Catheterising

Retrograde urethral catheterisation

Select a non-traumatic urethral catheter, which is ideally open ended. In all but the smallest cats a 10-11 cm long catheter is not long enough to reach into the bladder, hence catheters that are 14 cm long are preferred, although adjustable ones can be useful in very large cats. If the catheter comes with a stylet, this should be removed given the risk of perforating the urethra if it is left in. Using 3.5F rather than 5F diameter catheters reduces the risk of re-obstruction following catheter removal. It is occasionally necessary to use a catheter with a very small aperture, e.g. the sheath of a 22 gauge intravenous (IV) catheter, or even a lachrymal catheter.

While different clinicians will have favoured different catheters at different times, our preference is currently for the KatKath™ Catheter (Vygon Vet).

- The KatKath™ Catheter comes as an 11 and 14cm long catheter. There is also an adjustable length version for larger cats. It is sufficiently stiff to be useful for unblocking the urethra and comfortable for leaving *in situ.* The swivel connection between the catheter and the hub means that the extension set to the closed collection system is less likely to become tangled
- The Slippery Sam™ catheter also comes as an 11 and 14cm long catheter. It is good for unblocking the urethra but should not be left *in situ* as there is a tendency for the catheter to become separated from the hub. The hub is rather soft which makes it difficult to use without a Little Herbert connector.
- *The Mila EASYGO* is an adjustable length catheter; however, it is too soft to be used for unblocking the urethra. There is a version with a stylet; however, as with all catheters with stylets, we do not recommend them as the risk of urethral trauma is significant. This catheter can be difficult to leave *in situ* as it tends to twist and kink.
- *The standard (Jackson-type) Tomcat* catheters are often used as they are easy to handle, stiff and inexpensive. Most of these catheters have side holes rather than being open-ended, so if the obstruction is near the tip of the penis it may not be possible to get the catheter sufficiently far into the urethra to allow flushing with saline. Since these catheters are only 10 – 13 cm long they are too short to reach the

bladder in all but small cats, so they risk damage to the proximal urethra, which is exacerbated by the rough edges of the side holes which can be very traumatic. They should not be left *in situ.*

- Olive tipped catheters, which are rigid with a rounded end, can be useful in cases where the obstruction is in the distal penis.

Figure 5 explains retrograde urethral catheterisation in step-by-step images. Sterile lubricant should be used, and lidocaine can be mixed with this to provide analgesia within the urethra. Some authors also suggest instilling a neuromuscular blocker into the urethra, such as atracurium (Galluzzi *et al.* 2012); however, the authors have no experience of this. An assistant should extrude the penis from the prepuce. The catheter is then inserted into the urethral orifice until it reaches the base of the penis or the point of obstruction. The primary veterinarian should then pull the prepuce caudally and dorsally upwards towards the tail. This is essential as it straightens out the natural 'S' shape of the urethra facilitating catheter placement.

With the majority of urethral obstructions being due to either urethral spasm and/or proteinaceous plugs, catheter placement should be relatively unopposed, although per-rectal urethral massage may be needed, as may gentle flushing with saline. If the saline is cool this can theoretically encourage vasoconstriction and decrease urethral swelling. But care should be taken not to cool the patient. Saline is the best fluid to use for flushing; acidic solutions (such as Walpole's) give no benefit to unblocking the urethra, and are irritating and painful on the inflamed mucosa.

Retrograde urethral hydropulsion

If there is a focal obstruction, such as a urolith or firm blood clot (aka 'blood stone'), then retrograde urethral hydropulsion may become necessary. The most commonly encountered uroliths in cats are calcium oxalate and struvite stones. Plain radiographs of the entire urinary tract should be obtained to confirm urolith number and position, aiding decision making on whether urethral catheterisation is likely to be possible.

To perform hydropulsion (Figure 6), the primary veterinarian advances the catheter into the distal urethra as far as it will pass. They then gently compress the penis around the catheter to create a seal. An assistant then places their finger *per rectum*. Digital pressure is applied to the urethra until it is compressed onto the pelvic bone. The primary veterinarian then flushes saline into the catheter until it generates pressure within the urethra. This is appreciated as palpable urethral distension by the assistant, and resistance to flushing pulses of saline by the primary veterinarian. The aim of this step is to distend the urethra so that it lifts off from the urolith. When this distension is palpated, the primary veterinarian will give a pulse of saline and the assistant will relieve rectal urethral compression at the same time. The aim is for the stone to be flushed back into the bladder. This can take several attempts and the bladder should be frequently palpated to ensure it does not become excessively distended requiring cystocentesis.

Additional strategies can include altering the patient's position, i.e. whether they are in lateral, dorsal or sternal recumbency. If there is a large amount of pressure proximal to the obstruction due to bladder distension (recognised on palpation or when using ultrasound at the pelvic inlet), then decompressive cystocentesis should be performed.

Once the catheter has been placed in the urethra, bladder lavage can be performed, flushing with sterile saline to remove any residual debris. This could be repeated until the returning fluid is clear. In the absence of a randomised controlled study, there is currently no strong evidence that this makes a difference in terms of prognosis or hospitalisation time (Dorsey *et al.* 2019). However, first principles suggests that removing plasma proteins, inflammatory cytokines, cellular debris, blood clots and crystals should be beneficial; the current publication grouped all cases together, so lacked the granularity to see if severe cases benefited from lavage, while mild ones did not.

If the catheter is to be left *in situ* it should be secured to the perineum – it is best to place sutures in the perineum close to the prepuce, but not in the prepuce itself (Figure 9). One option to facilitate catheter replacement if necessary, is to secure looped stay sutures to the perineum. Additional sutures can then be placed through the holes of the catheter hub and attached to the stay sutures in the perineum.

A sterile extension line and closed-collection system should then be attached to the hub of the catheter, and the extension tubing taped to the cat's tail so tension is removed from the sutures in the perineum (Figure 5I). Some slack should be left in the tubing to allow the cat's tail to move and for the cat to ambulate with minimal interference, as this improves tolerance. However, the tubing should not be so loose that the cat can get a leg caught in it. The urinary bag should be placed in a zip lock bag and kept at a level lower than the cat to facilitate bladder emptying. An Elizabethan collar should then be fitted to the cat to prevent it from interfering with the urinary catheter.

Antegrade or Voiding Urohydropropulsion

This technique (Figure 7) can be considered when a female cat (or a male cat that has had a perineal urethrostomy) has small urethral stones (< 2 - 3 mm diameter). The cat should be anaesthetised, and radiographed to try to determine the exact number of stones within the urethra and bladder. The perineum should then be clipped and aseptically prepared. A urinary catheter is then placed so the bladder can be gently distended with saline. The bladder should be gently agitated so the stones move away from its wall. The catheter is then removed, the cat held up by its axilla, and the bladder squeezed to create a rush of urine, saline and stones.

If these attempts are not successful, then referral may need to be considered.

Medical management without catheterisation

Where a cat is known to block because of recurrent urethral spasm, and there is limited systemic biochemical change, there is a protocol that avoids urethral catheterisation.

In one study (Cooper *et al.* 2010), the cats were sedated with ACP (0.25mg/cat IM or 2.5mg/cat PO q8h), buprenorphine (0.075mg/cat PO q8h) and medetomidine (0.1mg/cat IM q24h). Decompressive cystocentesis was then performed and subcutaneous fluids given as necessary. The cats were left in a quiet dark environment to minimise stress. They were intermittently monitored, and spontaneous urination occurred in under 72 hours in over 70% of the cases (11/15). While this protocol appears concerning, it can be used successfully

in well selected cases, saving the cats from stressful catheterisation and hospitalisation, and the owners from a large bill. However, it is important to note that just because a cat has previously obstructed with of FIC-associated spasm, it does not mean that it does not have an FIC-associated urethral plug this time, or that it could have a urethral stone; cats that have obstructed with one pathology have an increased risk of blocking again for a different reason (Kaul *et al.* 2019)

With a recent study (Slater *et al.* 2020) identifying that 21% of cases have a urethral stricture, either as a response to the obstruction or previous catheterisation, interventional procedures may be considered dependent upon the imaging studies.

Imaging

Abdominal ultrasound is a good first line diagnostic test. It will provide information about the bladder wall thickness and contours, as well as highlighting uroliths or masses or any radiodensity that may not be visualised on plain radiographs. It also allows for the evaluation of the rest of the abdominal cavity, and other organs, as to whether there are concurrent conditions such as an uroabdomen or hydronephrosis. The major limitations of ultrasound examination are the inability to evaluate the distal urethra and results will be dependent upon operator skill level.

Evaluation of the urethra in these cases is essential. Even if catheterisation has been successful, small urethroliths remain a possibility which could result in re-obstruction following catheter removal. Contrast urethrography is the best method to assess this. The contrast should be instilled with enough pressure that stenotic areas of the urethra can be identified. A double contrast pneumocystogram can then be performed to evaluate for urolithiasis or soft tissue lesions within the bladder if ultrasound is not available (Figures 10 and 11). ***N.B. Only contrast urethrography and rectal examination can examine the distal two thirds of the urethra. If neither of these procedures have been performed the cat's lower urinary tract has <u>not</u> been fully examined and underlying problems may have been missed.***

Unsuccessful catheterisation

In cases where a urinary catheter cannot be passed retrograde there are alternatives. Fluoroscopic or surgical normograde catheterisation can be considered, but often requires specialist equipment, particularly for the less invasive approaches.

For recurrent or refractory cases, surgical intervention to perform a urethrostomy could be considered. A recent study evaluating the owner's perception of their cat's quality of life following surgery demonstrated that the majority had a quality of life comparable to pre-surgery or better (Slater *et al.*). However, that paper reviewed cases that had been operated on by predominantly specialist surgeons, which may have had an impact on the results achieved. Perineal urethrostomy is often a salvage procedure that should not be undertaken lightly. Unless the obstruction is in the penis it may not provide permanent relief, so the cats are likely to continue to display clinical signs and risk re-obstruction in the remaining urethra. It also risks recurrent UTIs, and stricture formation.

Care after the urethral catheter has been placed

Daily catheter care involves cleaning the perineal region with antiseptic solutions and wiping down the catheter tubing. The sites of suture placement should be checked for signs of infection or loosening.

Fluid therapy considerations

Following catheter placement and re-establishment of urine flow, there can be significant changes in urine production. The back pressure will have altered the medullary interstitium and any acute kidney injury will affect the nephrons, consequently reducing their concentrating ability. This can result in the production of large quantities of urine, which is termed ***post obstruction diuresis.***

If this is not addressed sufficiently it can lead to dehydration as well as potassium loss. Somewhat counterintuitively, this can then require electrolyte monitoring and may necessitate potassium supplementation.

Monitoring fluid balance at this stage is key and can be achieved a number of ways:

- Hydration status

- Packed cell volume, total solids, azotaemia, electrolytes
- Weighing the patient every 8 – 12 hours
- Recording 'ins' (voluntary intake, wet food, intravenous fluids)
- Recording 'outs' (urine production, vomit, diarrhoea)

In the initial phase of post obstruction diuresis, the volumes leaving the body (outs) are likely to be higher than the volumes administered or taken in voluntarily (ins). Having a record of the ins and outs and calculating the difference between them is critical in these patients. At this point the IV fluid rate should be tailored to match that of the urine output. Once the ins are matching the outs, then the rate of IV fluid supplementation can be gradually reduced. If the post obstructive diuresis is resolving and urine output is being driven by the IV fluid therapy instead, it should decrease as fluid therapy is tapered.

If urine output appears to decrease rapidly or urine production stops, the first step should be ***'troubleshooting the urinary catheter'***. This involves checking that any clamps on the tubing are open and the urinary bag is lower than the patient. Flushing the catheter with sterile saline can also help, as if there is any debris accumulating it could be causing an obstruction. To check that the catheter is patent, an ultrasound probe can be placed over the bladder and the catheter tip identified, saline is then infused, which should be seen as fluid disturbance in the bladder, confirming patency.

How long should the catheter be left in place?

It is not benign to leave a urinary catheter *in situ*. They risk ongoing urethral and bladder trauma, as well as predisposing to UTIs, and requiring the cats to wear a stressful Elizabethan collar and remain hospitalised. If the catheter was easy to place with no resistance and there is no evidence of remaining obstruction, as is often the case with a urethral spasm or mucoid plug, then the catheter can be removed after lavaging the bladder. The patient can then be monitored to see if they can pass urine for themselves. Incontinence pads can be weighed in and out of the kennel to give a surrogate marker for urine production, with one gram equating to one millilitre. Intravenous (or subcutaneous) fluids are maintained during this time and prazosin is given (see below). These cases usually urinate quite quickly, after which they can be sent home where it is hopefully less stressful

than in the clinic, with a 7-10 day tapering course of prazosin (see below) which hopefully prevents immediate re-obstruction.

However, the most common approach is to leave the catheter in place until the urine becomes clear. It can be a tricky balance as while the urine will become clear as the initial inflammation resolves, at some point the catheter itself will cause inflammation, so the urine becomes cloudy again. The catheter should be removed before this, as soon as the initial signs of inflammation resolve. This typically occurs 12 hours to 3 days after catheter placement. Daily urine analysis should be performed, and sediment examined for signs for a developing UTI. As above, they should be maintained on prazosin during this time, then sent home with a 7-10 day tapering course of prazosin (see below).

Medications

Analgesia

These patients are unstable and will be so for some time. There is the possibility of dehydration in the post catheterisation period and re-obstruction is most likely to occur in the week following the initial episode. During this period, opioids such as methadone or buprenorphine are appropriate choices to provide analgesia. As these patients are not likely to eat for the initial days and renal perfusion is not guaranteed, NSAIDs should be avoided during this period. Their use can be reconsidered in the chronic management of these cats following discharge when they are eating consistently.

Antibiotics

Only a minority of cats presenting with urethral obstruction have a concurrent UTI or have a UTI as the primary cause of their urinary obstruction. Urine sediment evaluation is indicated in all patients to exclude infection, particularly in older cats where the incidence is higher, but antibiotic therapy is not indicated without confirmation of UTI.

Most cats with a urinary obstruction will typically have a urinary catheter in place for 2-3 days; if they are treated with antimicrobial therapy at this time they are at a high risk for developing a resistant UTI. Evaluate a urine sample (and/or send it for culture) once the

urinary catheter has been removed; consider starting antibiotics (e.g. amoxicillin clavulanate) pending those results.

Anti-spasmodics

Medications which act on the urethral muscle to minimise the spasm can help in preventing recurrence during the initial recovery period in cats. These medications are normally started whilst the patient is hospitalised and improving clinically, with the aim of being continued as part of their outpatient regime. There are two broad categories of medication which can be considered:

Prazosin (Hypovase) is one of the most commonly used drugs for this indication. It is an alpha-1 receptor antagonist that acts primarily on the smooth muscle of the urethra reducing muscular spasm. This can help to prevent recurrence of urethral obstruction in cats following discharge. Phenoxybenzamine is an alternative, although the limited evidence available suggests that prazosin may be more effective, especially as phenoxybenzamine is believed to take up to 5 days to start working. These drugs act upon the alpha-1 receptors of vascular muscle, so they can cause vasodilation and hypotension. For this reason, it is advisable to measure blood pressure to confirm patients are normotensive before starting this treatment. Azotaemia should also have resolved before they are administered, as any hypotension may incur additional injury to the kidneys.

Skeletal muscle relaxants such as dantrolene can also be considered, although there is less evidence for the use of this drug. Oral diazepam has been associated with idiosyncratic hepatic necrosis, and there is no evidence it will improve muscle relaxation in these cats, so its use should be avoided.

Anti-spasmodic medications are typically given for 1-2 weeks following discharge to prevent patients re-obstructing, after which they should be weaned off. Do not stop these drugs abruptly as this may lead to rebound urethral spams. The long-term effects of their use are unknown. If patients are representing frequently then the current management should be considered (e.g. multimodal environmental modification and stress reduction for FIC; see part 3 of this series of papers in In Practice) rather than simply treating the spasm. However,

in patients where finances or owner's wishes will not address the underlying cause, then long-term use of these drugs should be discussed, emphasising the unknown consequences.

Discharge

If all has gone well with the initial management and the patient has recovered from the obstruction, going home will usually help their recovery as most cases have FIC, so the stress of the clinic will exacerbate their underlying disease. The plan for discharge should involve continued analgesia (such as transmucosal buprenorphine or NSAIDs) plus prazosin, and wet diet is advised.

Where possible, owners should be encouraged to give phone or e-mail updates about their cat. The stress of visiting the vet practice can result in a significant setback, so it is best avoided if possible.

Long-term management

If episodes of cystitis become recurrent then further investigation is necessary to determine what management changes need to be introduced. The nature and history of the urethral obstruction should suggest whether FIC, uroliths, or something else appears to be the cause of the cat's bladder and urethral dysfunction. However, details about further in-hospital investigation to rule out complicating factors is beyond this article, as is the detailed questioning about the provision of key resources and assessment of potential inter-cat relationships that is needed to determine the triggers for FIC. These and the multi-modal aspects of FIC management are discussed in part 3 of this series of papers in In Practice.

Prognosis

Whether the cat obstructed because of FIC-associated plugs or spasm, or because of urethral stones, the risk of the cat developing recurrent signs of FLUTD is ~60%, of developing recurrent urethral obstruction 30-60%, and of being euthanased because of it 5-20% (Segey *et al.* 2011, Kaul *et al.* 2020). When urethral obstruction recurs it is commonly within the first seven days of leaving the veterinary clinic. The long-term prognosis is dependent on whether or not owners are willing and able to undertake the environmental, nutritional and potentially long-term medical care that cats with FIC need. If they do, the

risk of recurrent obstruction can be significantly reduced, with 85-95% of cats staying well long-term (Gunn-Moore *et al.* 2004, Buffington *et al.* 2006). However, if the owners are unwilling or unable to make the necessary changes, the risk of recurrent FIC, and repeated urethral obstruction remains. It is important to discuss the prognosis with the owner; some owners may choose to have the cat euthanised rather than try to re-establish urethral patency.

Summary

Cats with urethral obstruction (aka 'Blocked cats') are a common general practice emergency. Whilst they are challenging cases, they can also be extremely rewarding, with the condition carrying a good initial prognosis, and a reasonable longer-term prognosis so long as significant changes can be made within the home. Taking the time to stabilise these cats can make all the difference, greatly facilitating safe anaesthesia, which allows the best chance of successful, and non-traumatic, urethral catheter placement.

Tips that really help in the management of these cases include rectal examination to determine the nature of the obstruction, allowing for the selection of the most appropriate method for removing the obstruction, and straightening the urethra which significantly aids successful retrograde passage of a urethral catheter. Monitoring and addressing post-obstruction diuresis is essential. Analgesia and prazosin are needed in the initial days following the treatment of the obstruction. Most cats are able to leave the clinic within 1 – 3 days. Counselling owners as to the likelihood of recurrence and the ongoing nature of the underlying condition is essential.

CPD Quiz

According to the one published paper, what is the impact of flushing the bladder with saline after successful catheterisation?

- **A. No clinical benefit**
- **B.** Flushing shortens the time the urinary catheter needs to be left in place
- **C.** Flushing improves pain scores
- **D.** Flushing shortens hospitalisation times

What are the main side effects to be monitored for when starting Prazosin?

A. Azotaemia and hypotension

B. Pruritus and vomiting

C. Vomiting and azotaemia

D. Hypotension and hyperkalaemia

Which percentage of cats are likely to experience a recurrence of obstruction in the future after the initial episode?

A. 10%

B. 40%

C. 60%

D. 80%

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