

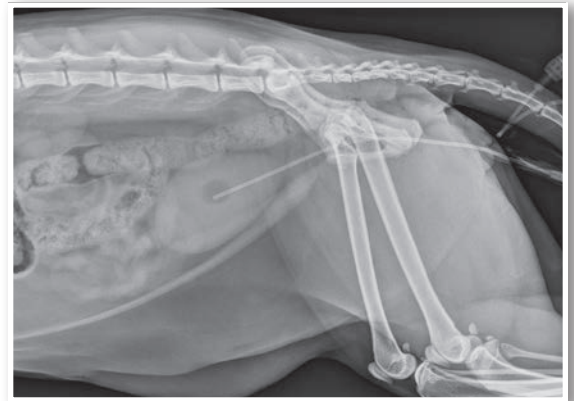
Urinary Catheter Placement for Feline Urethral Obstruction

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Clinically, urethral obstructions typically occur because of a mucus plug, calculus, or stricture. Other causes include a mechanical obstruction secondary to urethral spasm or a neoplastic process. While both male and female cats may develop clinical signs consistent with lower urinary tract disease (eg, stranguria, hematuria, pollakiuria), the male urethra is narrower, longer, and predisposed to obstruction.

Pathophysiology

The most common cause of urethral obstruction in cats is an underlying idiopathic sterile cystitis. Idiopathic cystitis may result from a neurohumoral alteration, notably an imbalance between the sympathetic nervous system and the hypothalamic–pituitary–adrenal axis, causing blood flow alterations, increased circulation of inflammatory mediators and subsequent edema, smooth muscle spasm, and discomfort. Ultimately, the combination of inflammation, a mucus plug, and urethral spasm can result in urethral obstruction.



In addition to relieving the obstruction, life-threatening sequelae must be addressed. In complete urethral obstruction, the bladder distends until increased internal pressure results in necrosis and mucosal injury. This pressure is transmitted to the ureters and subsequently to the kidneys, exceeding the glomerular filtration pressure and resulting in azotemia, electrolyte derangements (eg, hyperphosphatemia, hyperkalemia), acidosis, and decreased urine production.

History & Clinical Signs

Patient history may include vocalization, stranguria, pollakiuria, hematuria, periuria, possible constipation, lethargy, excessive grooming of the perineal region, increased litter box visits, vomiting, and/or inappetence. Clinical signs vary depending on duration of obstruction. Patients presented early in the disease process may be clinically normal, aside from a firm, inexpressible urinary bladder that may be painful on palpation. Dehydration is also common; the patient is often anorexic, not drinking, and has ongoing losses (eg, vomiting). Signs are likely to occur when the obstruction has a longer duration (>24 hours).

More severe systemic signs may include weakness, collapse, and cardiac arrhythmia. Hyperkalemia, common in cats with prolonged obstruction, affects the electrical conduction through the heart by raising the resting membrane potential of myocytes. As the resting potential becomes less negative, sodium channels are affected, resulting in bradycardia. Severe hyperkalemia may result in bradycardia, sinoatrial arrest, and the potential for asystole.

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Initial Assessment & Diagnostics

Initial assessment and stabilization are often achieved simultaneously with IV catheter placement. To reduce the need for repeated phlebotomy, blood samples are obtained during catheter placement. Initial blood work should include PCV/TP, blood glucose, creatinine, venous blood gas analysis, and electrolytes. CBC and serum chemistry panel should also be conducted later.

When a patient is presented with suspected urethral obstruction, initial actions should include

- Checking for dehydration, cardiovascular shock, bradycardia, and hypothermia
- Performing an ECG
- Measuring electrolytes and acid-base status and evaluating azotemia

Classic ECG changes associated with hyperkalemia include prolonged P-R interval, absent P waves, widened QRS complex, and tall or tented T waves.

Emergency Stabilization

After catheter placement and phlebotomy, isotonic crystalloid fluid therapy (eg, lactated Ringer's solution, 0.9% NaCl) is often started to address common abnormalities (eg, dehydration, hypotension, electrolyte derangements).

Despite concern about IV fluids distending the bladder further (with the potential for rupture), this rarely occurs. The pressure transmitted from the bladder to the kidneys reduces the glomerular filtration rate and decreases urine production, so the bladder is not often impacted in this early phase of treatment.

Unless the patient is unstable, urethral catheter placement is impossible or the bladder is distended to the point that the clinician feels uncomfortable flushing during unblocking, cystocentesis should

Interventions to Protect the Heart

Calcium gluconate

- A dose of 50–100 mg/kg IV administered slowly (over 10–20 min) will antagonize the cardiac effects of hyperkalemia.
- The effects are immediate, lasting ~20–30 min.

Regular insulin or dextrose

- A dose of 0.1–0.25 U/kg of regular insulin IV can be used to promote an intracellular shift of potassium. It takes about 20–30 min following administration to see an effect.
- To prevent hypoglycemia, insulin administration is followed by a glucose bolus of 1–2 g per unit of insulin given.
- Following insulin administration, blood glucose is monitored q2–4h for 6–12 hours with glucose supplementation as needed to maintain normoglycemia.

Sodium bicarbonate

- Sodium bicarbonate lowers plasma potassium concentration by raising the blood pH and driving potassium intracellularly.

- The formula used to calculate the MEq of sodium bicarbonate is:

$$0.3 \times \text{body weight (kg)} \times \text{base units in MEq/L deficit}$$

This gives an approximation of the total bicarbonate deficit. One-third to one-fourth of this dose is administered slowly by IV followed by patient and blood work reassessment to determine response and whether additional dosing is needed.

- It usually takes 20–30 min to see an effect with this medication.

be avoided. There is considerable risk for rupture if the large, distended, firm bladder—already at risk for pressure necrosis or mucosal injury—is pierced.

Although urinary catheter placement to relieve obstruction and IV fluid administration ultimately reverse the adverse effects associated with hyperkalemia, uremia, and acidosis, these treatments alone do not result in rapid effects. If the patient exhibits severe complications from hyperkalemia, particularly sinoatrial arrest and bradycardia (heart rate, <140 bpm), immediate intervention to protect the heart from hyperkalemia should be implemented (see **Interventions to Protect the Heart**).

Catheter Placement

This life-threatening illness is ultimately treated by placing a urinary catheter to relieve obstruction. The effects on each patient must be evaluated individually to determine the degree of chemical restraint required. In severely azotemic, hyperkalemic, and obtunded patients, limited chemical restraint may be required.

While general anesthesia can be considered, the author commonly uses a combination of ketamine, diazepam, and butorphanol (or buprenorphine) for heavy sedation along with supplemental oxygen via flow-by or mask placement. For patients in which ketamine is less

What You Will Need

For initial stabilization

- #40 clipper blade
- Chlorhexidine solution or scrub
- Peripheral IV catheter
- Isotonic crystalloid
- Calcium gluconate 10%
- Regular insulin (Humulin-R)
- Dextrose 50%
- Sodium bicarbonate

For the procedure

- Sterile gloves
- Sterile lubricating jelly
- Antimicrobial scrub
- 3-, 6-, 12-, or 20-mL sterile syringes
- Sterile saline
- Semirigid, open-ended polypropylene urinary catheter (ie, Tomcat catheter)
- 3.5- to 5-French red rubber catheter
- Polytetrafluoroethylene (PTFE)

- catheter with end hole (ie, Slippery Sam urethral catheter)
- 1-inch white adhesive tape
- 2-0 or 3-0 nylon suture
- Urine collection bag
- Sterile catheter adapter
- Sterile urine bag and connection tubing
- Sedative or anesthesia (eg, ketamine, diazepam, butorphanol or buprenorphine)



desirable (eg, heart disease), propofol can be substituted. After the patient has been sedated or anesthetized, urinary catheter placement can begin.

Postprocedural Care

Most patients remain hospitalized for 36 to 48 hours for continued monitoring (including urine volume), balanced fluid therapy, and assessment of urine character.

Patients with more serious illness or azotemia are also monitored for postobstructive diuresis, a clinical syndrome leading to significant urine production resulting from osmotic diuresis and medullary washout. These patients must be monitored closely, as their urine volume may

be as high as 100 to 150 mL/hr. Some cats require high fluid rates to match the significant urine production.

Other important postprocedural treatment goals include pain management (buprenorphine, 10–15 µg/kg IV q4–6h or butorphanol, 0.1–0.4 mg/kg IV q4–6h), urethral spasm treatment (phenoxybenzamine, 0.25–0.5 mg/kg PO q12–24h; prazosin, 0.25–1 mg PO q8–12h), and electrolyte monitoring. Electrolytes should be monitored q12–24h, or more often if significant abnormalities exist. Hyperkalemia may be noted on presentation, but hypokalemia may be seen after obstruction relief and postobstructive diuresis.

Antibiotics are often unnecessary; few

cats have a true bacterial urinary tract infection on presentation, and inappropriate antibiotic use may result in a drug-resistant infection. Urine culture should be submitted if the urinalysis sediment examination shows evidence of bacteria, either via cystocentesis or after initial catheterization.

Renal values (blood urea nitrogen, creatinine) are often evaluated q24h, with abnormalities expected to resolve in 24 to 48 hours with appropriate fluid therapy and urinary volume monitoring, provided there is no underlying renal disease.

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PTFE = polytetrafluoroethylene

Step-by-Step ■ Urinary Catheter Placement for Feline Urethral Obstruction

Step 1

Place the patient in lateral or dorsal recumbency. If there is significant fur around the prepuce, clip gently to maintain a sterile field. Pull the prepuce caudally to straighten out the urethra so that it is parallel with the spine.



Author Insight Gentle massage of the extruded penis is advised before catheter placement as a mucous plug or small urethral stone is often massaged out of the urethra, relieving the obstruction and allowing for easier catheter placement.

Step 2

Without excessive force, insert a lubricated 3.5-French semirigid, open-ended polypropylene urinary catheter into the tip of the urethra (A) and advance it to the site of obstruction (B). Once the catheter is inserted into the distal penis, flush gently using 0.9% sterile saline to relieve the obstruction and then advance the catheter into the bladder (C).



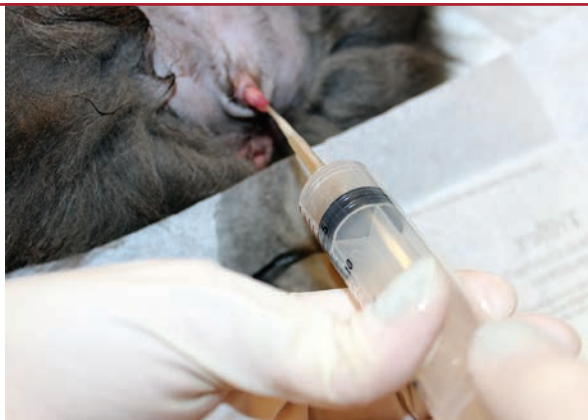
Author Insight The amount of saline used to flush the bladder varies. Some clinicians flush until the aspirated urine runs clear. However, a bladder that is very inflamed may have sloughing, which could lead to worsening inflammation and blockage.

Author Insight

Catheter placement may require several tries. The clinician must be patient to avoid rupturing the urethra.

Step 3

Once the obstruction is relieved, empty and flush the bladder.



Step 4

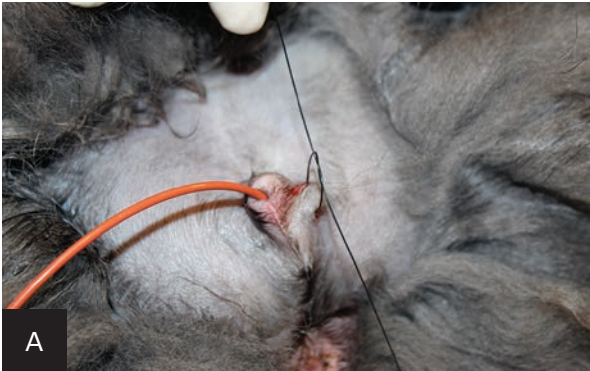
Remove the urinary catheter and replace with a softer catheter, such as a red rubber (feeding tube catheter, 3.5- or 5-French) or PTFE (Slippery Sam) catheter with end hole (A and B). Ultimately, this catheter is used as an indwelling catheter and is connected to a sterile closed collection system. When the catheter tip reaches the urinary bladder, remove any remaining urine from the bladder with a sterile syringe.



Author Insight During urinary catheter placement, obtain a sterile urine sample. At minimum, a urinalysis should be performed with a sample saved for culture and sensitivity testing if indicated.

Step 5

Place stay sutures into the prepuce (A), then place white adhesive (waterproof) tape on the red rubber catheter adjacent to the prepuce (B). Use nylon (nonabsorbable) suture to secure the white tape to the stay sutures (C and D).



Author Insight The method used to attach the indwelling catheter to the prepuce depends on the catheter type. A PTFE (Slippery Sam) catheter with end hole has a flange near the end with preplaced holes for suture material to pass through. A red rubber (feeding tube) catheter (pictured here) requires adhesive (waterproof) white tape for suturing.

Step 6

Once the obstruction is relieved, obtain a lateral abdominal radiograph to assess for cystic or urethral calculi and to confirm proper catheter placement. If further clarification of a potential abnormality is needed based on a single lateral radiograph, obtain an orthogonal view. It is best to use a closed collection system. ■ **cb**

See **Aids & Resources**, back page, for references & suggested reading.

