The S.A.F.E. Approach to Unobstructing the Urethra in the Male Cat

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We use the following acronym, S.A.F.E. to remind the important steps to safely unobstruct the urethra of male cats.

S=Stabilize First
A= Accurate Diagnosis
F=Flush, don’t force catheters through the urethra
E= Extend the urethral caudally when inserting catheters to flush the urethra

Stabilize First
Cats with urethral obstruction and bladder over-distension are often experiencing a high degree of pain and anxiety. To facilitate physical examination, radiography and safe bladder decompression; provide prudent amounts of analgesia (butorphenol 0.2 to 0.3 mg/kg and midazolam 0.2mg/kg IM or IV; for cats experiencing higher degrees of anxiety consider adding 2 to 5mg/kg of ketamine; some have advocated buprenorphine (5 to 20 µg/kg ) but the onset of analgesia make take up to 20 minutes). Then, consider placing an IV access line, complete the physical exam, and perform abdominal radiography to verify bladder size and to determine the cause of urethral obstruction. In very sick cats, these steps can be combined with stabilization of the patient (table 1) which usually includes decompressive cystocentesis (Table 2). Once stabilized (table 1), patients can be more safely anesthetized (a variety of protocol are available. We use ketamine at 2 to 3 mg/kg and valium 0.2 to 0.3 mg/kg (valium can be replaced with midazolam 0.1 to 0.2mg/kg) and we add 0.05mg/kg of acepromazine) to flush the urethra.

Table 1. CORRECTING METABOLIC CONSEQUENCES OF URETHRAL OBSTRUCTION

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Indications to treat</th>
<th>Therapy</th>
</tr>
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<tbody>
<tr>
<td>Hypothermia</td>
<td>Core temperature less than 99oF or cardiac decompensation</td>
<td>Heating pad, Heat lamps, Infuse only warm saline</td>
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<tr>
<td></td>
<td></td>
<td>Replace deficits in 2 to 12 hours with 0.9% saline. Consider an initial bolus of fluids to rapidly correct hypovolemia if needed (10 to 30 ml/kg). Although saline has been recommended because patients are often hyperkalemic, any balanced replacement electrolyte solution will help.</td>
</tr>
<tr>
<td>Hypovolemia</td>
<td>Azotemia, Cardiovascular collapse</td>
<td>Replace deficits in 2 to 12 hours with 0.9% saline. Consider an initial bolus of fluids to rapidly correct hypovolemia if needed (10 to 30 ml/kg). Although saline has been recommended because patients are often hyperkalemic, any balanced replacement electrolyte solution will help.</td>
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</table>
Azotemia  
If serum creatinine is greater than 2 to 3mg/dl  
Replace fluid deficits with balanced electrolyte solutions  
Decompressive cystocentesis to promote renal excretion

Acidemia  
If blood pH <7.1-7.2  
Administer 1/3 to ½ of the dose of NaHCO3 (0.3 x BW in kg x base deficit) administered over 15 min. Rapid or excessive administration of bicarbonate may exacerbate hypocalcemia.  
Fluid Administration to correct hypovolemia  
Decompressive cystocentesis to promote renal excretion.

Hyperkalemia  
Weakness or shock due to cardiovascular depression  
To promote potassium excretion;  
1) Decompressive cystocentesis  
2) Fluid administration with potassium sparing fluids.  
To promote intracellular translocation of potassium:  
Correct metabolic acidosis with sodium bicarbonate (mmol = 1/3(0.3 x BW in kg x base deficit)  
Administer 0.1 U/kg regular insulin IV with 1 gram of glucose per unit of insulin administered.  
To antagoize adverse cardiac effects: 50 to 100 mg/kg Calcium gluconate slow (2 to 5 min) IV.  
Concomitant hypocalcemia and acidemia contribute to worsened heart function.

Hypocalcemia  
Hypocalcemic tetany or hyperkalemic cardiac decompensation  
50 to 100mg/kg calcium gluconate slow (2 to 5 min) IV with cardiac monitoring

### TABLE 2. ADVANTAGES OF DECOMPRESSIVE CYSTOCENTESIS
- Appropriate sample for urinalysis and culture  
- Reduce discomfort and pain associated with bladder over-distension  
- Reduce biochemical consequences of obstruction (e.g., acidemia, hyperkalemia, azotemia, etc.).  
- Decreased resistance to urethral retrograde flushing

### ACCURATE DIAGNOSIS
Knowing the cause of urethral obstruction is essential to develop a feasible therapeutic plan (tables 3 and 4) for alleviating obstruction and preventing recurrence. Therefore, survey radiography is an essential diagnostic step for all cats. Remember to include the entire urethra. Urethroscopy may provide a more accurate method to verify, localize and determine the cause of obstruction, but is technically difficult and cumbersome during an emergency.
FLUSH, DON’T FORCE
There are several techniques to un-obstruct the urethral lumen (tables 3 and 4). Selection of the procedure depends on the cause of the obstruction and the severity of life-threatening metabolic abnormalities. In some cases cost may also dictate the extent of diagnosis, treatment, and monitoring.

To prevent urethral trauma, do not force catheters through the urethral lumen. First, clear the lumen by using a catheter to flush sterile saline. Once cleared, a lubricated catheter of appropriate size should easily traverse the urethral lumen and enter the urinary bladder.

EXTEND THE URETHRA CAUDALLY
To prevent damage to the urethral, stretch the urethra caudally and dorsally before advancing catheters. Pulling the urethra caudally eliminates the flexure in the distal urethral that is easily ruptured during forceful catheterization.

Table 3. CHARACTERISTICS OF METHODS TO RELIEVE URETHRAL OBSTRUCTION IN MALE CATS

<table>
<thead>
<tr>
<th></th>
<th>Retrograde flushing without urethral occlusion</th>
<th>Retrograde flushing with urethral occlusion</th>
<th>Antegrad expulsion via bladder expression</th>
<th>Antegrad expulsion via pharmacological manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indications</td>
<td>Matrix crystalline plugs</td>
<td>Matrix crystalline plugs</td>
<td>Matrix crystalline plugs</td>
<td>Matrix crystalline plugs Blood clots Solid Foreign Material</td>
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<tr>
<td></td>
<td>Blood Clots</td>
<td>Urethroliths Blood clots</td>
<td>Mural edema/inflammation Urethral Spasm</td>
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<tr>
<td></td>
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<td>Solid Foreign Material</td>
<td></td>
<td></td>
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<tr>
<td>Contra-indications</td>
<td>Mural edema/inflammation Urethral Spasm</td>
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<tr>
<td>Analgesia/Sedation</td>
<td>Consider</td>
<td>Consider</td>
<td>Consider</td>
<td>Consider</td>
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<tr>
<td>Anesthesia</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Decompressive Cystocentesis</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes, multiple</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Urethral catheterization</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Potential Advantages</td>
<td>No need for cystocentesis Rapid reversal of azotemia</td>
<td>Very successful Rapid reversal of azotemia</td>
<td>Avoid iatrogenic urethral trauma Reduced cost</td>
<td>Avoid iatrogenic urethral Reduced</td>
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<tr>
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<td>Urethral</td>
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</table>
TABLE 4. TECHNIQUES TO RELIEVE URETHRAL OBSTRUCTION IN MALE CATS

General Recommendations
1. Insure that the patient is suitably prepared for anesthesia (e.g. normothermic, normotensive, normokalemic, and less azotemic, etc.)
2. Administer appropriate and sufficient anesthesia to abolish urethral pain to facilitate urethra manipulation
3. Make every effort to protect the patient from iatrogenic complications associated with urethral catheterization (infection, trauma).

Retrograde Flushing Without Occluding the Distal Urethra
1. Massage the distal urethra by rolling it between your thumb and forefinger with the goal of disrupting the continuity of a urethral plug. Exteriorizing the penis may facilitate this process.
2. Assemble the urethral catheter, intravenous extension tubing, and large syringe filled with normal saline. Evacuate air from these lines by flushing saline through the assembled supplies.
3. Exteriorized penis caudally and dorsally (i.e., parallel with the spine).
4. Without using excessive force, slowly insert the tip of the urinary catheter into the urethra and advance the catheter to the site of obstruction.
5. Flush large quantities of physiologic saline into the urethral lumen allowing it to reflux back out of the external urethral orifice. As the plug disrupts, advance the catheter slowly toward the urinary bladder.
6. When the tip of the catheter reaches the urinary bladder, empty the bladder through the catheter.

Retrograde Flushing While Occluding the Distal Urethra
1. If the bladder distended even moderately, perform decompressive cystocentesis* using a 22gauge, 1.5 inch needle attached to an intravenous collection set, 3-way stop cock and syringe.
2. Select an olive-tip urethral catheter (or other suitable catheters). Assemble the urethral catheter, intravenous extension tubing, and small syringe (3 to 12ml) filled with normal saline. Evacuate air from lines by flushing saline through the assembled supplies.
3. Exteriorized penis caudally and dorsally (i.e., parallel with the spine).
4. Without using excessive force, slowly insert the tip of the urinary catheter into the urethra and advance the catheter to the site of obstruction.
5. With the catheter in place, occlude the urethra around the catheter shaft using your first finger and thumb. Placing a moistened gauze sponge or pad between the urethra and your fingers will minimize trauma to the surface of the urethra.
6. Stretch the urethra caudally and dorsally while an assistant depresses the plunger of the syringe to flush the urethra clear of its obstruction. By preventing reflux of
solutions out of the external urethral orifice, this maneuver dilates the urethra and flushes the plug into the urinary bladder.

7. Once the urethral lumen is cleared, advance the catheter slowly toward the urinary bladder. Additional flushing may be needed to continue to clear the urethral. When the tip of the catheter reaches the urinary bladder, empty the bladder.

**Antegrade Evacuation via Bladder Compression**

1. Massage the distal urethra by rolling it between your thumb and forefinger with the goal of disrupting the continuity of a urethral plug. Exteriorizing the penis may facilitate this process. The plug can also be disrupted by flushing large quantities of saline into the urethra (see retrograde flushing without occluding the distal urethra for this technique).
2. Provide steady, but not excessive manual pressure on the urinary bladder to evacuate the plug. Avoid excessive pressure because it may result in trauma to the bladder wall, reflux of potentially infected urine into the ureters, and/or rupture of the bladder wall.
3. Submit ½ of the plug (dry) for quantitative mineral analysis and the other half for histopathologic evaluation.

**Antegrade Evacuation via pharmacologic relaxation of the urethra**

1. Administer buprenorphine (0.1mg/kg) and acepromazine (0.25mg/cat) intramuscularly three times a day. In one study cats were also administered 0.1mg medetomidine intramuscularly once a day.
2. Some also advocate placing cats in a dark, quiet environment to minimize stimulation.
3. Perform decompressive cystocentesis as needed to keep bladder small (at least three times a day)
4. Cats are expected to begin urinating in three days. If unsuccessful, reassess the diagnosis and the need to select another method of clearing the urethra.

References