

Management of Urinary Retention in an Austere Environment: Suprapubic Catheter Placement

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Abstract

Urinary retention is a true urologic emergency. First-line treatment with a transurethral catheter can and will fail. SOF medics need a reliable and durable method to resolve this problem using a minimal amount of resources and time. Current SOF Medical Handbook guidance for the management of unsuccessful urethral catheterization is inadequate. This article and accompanying video link, functions as a starting point for incorporating suprapubic tube placement in the training regimen and therapeutic armamentarium of SOF medical personnel.

Case Scenario #1

You are a SOF medic assigned to a remote area in Africa. A Soldier is brought to you after a rollover MVA. He is noted to have an obvious pelvic fracture and on physical exam is found to have blood at the urethral meatus. On digital rectal exam his prostate is not palpable. You suspect a posterior urethral injury. A gentle pass with a transurethral catheter is unsuccessful – resistance is encountered and blood returns through the catheter, so no further advancement is attempted. The patient’s suprapubic area is distended and he complains of an unbearable urge to urinate. How do you manage this soldier’s urinary retention?

Case Scenario #2

You are a SOF medic assigned to a remote firebase in Afghanistan. A prominent and influential tribal chief is brought into your clinic complaining of an inability to urinate. He gives a long history of urethral stricture disease treated in the past with rudimentary urethral dilations. On physical exam, he has a palpable mass to the level of the umbilicus that is dull to percussion and he describes a strong and painful urge to void when pressure is applied. You are unsuccessful in your attempts to pass a transurethral catheter. You do not have the ability or resources to perform urethral dilation. Aerial evacuation assets are not available. What do you do next?

Introduction

Urinary retention is a true urological emergency. Failure to drain the bladder is not only painful for the patient but can lead to significant comorbidities (i.e. urosepsis, uremia, or, rarely, intraperitoneal bladder rupture and subsequent peritonitis). Drainage of urine is also vital to monitoring urine output in a critically ill patient and also to confirm adequate fluid resuscitation. First-line treatment of urinary retention is transurethral placement of a self-retaining Foley balloon catheter. However, transurethral catheterization is either contraindicated or may not be possible under certain conditions. SOF medics need a reliable and durable method to resolve this problem using a minimal amount of resources and time.

Current SOF Medical Handbook guidance for the management of unsuccessful urethral catheterization is inadequate.¹ On the one hand, it describes suprapubic bladder aspiration using a

long spinal needle. While this method is a useful one-time treatment, repeated attempts to manage a casualty in this manner over time risks inadequate bladder drainage, troublesome hematuria, or injury to adjacent organs (i.e. bowel, blood vessels) and interferes with a medic's ability to manage other casualties.

Suprapubic catheter placement allows for continuous and, when necessary, long-term bladder drainage and monitoring of fluid output following a single procedure. Unfortunately, the current SOF medical handbook chapter provides scant detail on suprapubic tube placement: "For suprapubic catheter placement, follow instructions on the specific catheter package insert. Do not attempt suprapubic catheter placement if you have not previously been instructed in the technique as misplacement can result in serious bowel or vascular injury."² These cautionary notes are well-founded, but with appropriate training and in properly selected patients, this procedure can be safely performed by the SOF medic with low risk. This article and accompanying video link describe in detail the indications for and technique of suprapubic tube placement.

Indications

Table 1. Common Indications for Suprapubic Catheter Placement
Urethral Injury
Urethral Obstruction
Bladder Neck Mass
Benign Prostatic Hyperplasia
Prostate Cancer

Urethral trauma is anatomically divided into posterior urethral and anterior urethral components. Posterior urethral trauma is usually associated with pelvic fractures and multi-system trauma (for example resulting from a MVA or fall) (Figures 1 & 2). Up to 10% of males and 6% of females with pelvic fractures also suffer from a posterior urethral injury.³ The typical presenting triad includes blood at the meatus, urinary retention, and a palpably full bladder (Figure 3). Anterior urethral trauma is usually an isolated injury commonly found after a straddle accident involving blunt trauma to the bulbar urethra. A minority of anterior urethral injuries result from direct trauma to the penis or scrotum (Figure 4). Penetrating injuries to the genitalia or perineum or blast injuries with contusion, laceration, or shrapnel entry may also result in urethral injury.

Urethral trauma can occur during transurethral catheter placement. Traumatic catheterization usually results from either balloon inflation within the bulbar or prostatic urethra or false passage creation during Foley insertion. Men with known prostate enlargement, or those in whom significant resistance is encountered on a straight Foley placement attempt, should be catheterized with a curved tip or coude catheter, with the curved tip facing towards the patients head during insertion. While urethral trauma resulting in the inability to catheterize the urethra is uncommon in women, pelvic fracture or direct perineal trauma may injure the female urethra and require suprapubic tube insertion. The presence of blood on vaginal exam or an obvious vaginal or perineal laceration, especially in the setting of a suspected pelvic fracture, should raise suspicion of a female urethral injury, and should be addressed through the same treatment algorithm as for men.

Urethral strictures are another possible indication for suprapubic catheter placement. They commonly are associated with prior urethral trauma but also can be the result of inflammatory urethritis induced by gonorrheal infection or lichen sclerosus–balanitis xerotica obliterans (LS-BXO) disease. In addition, prior lower urinary tract surgical procedures (i.e. Transurethral Resection of the Prostate—TURP, Radical Prostatectomy) can also induce urethral scar formation. Finally, locally advanced prostate cancer may produce obstruction causing difficulty with urethral catheterization.

Contraindications

Suprapubic catheters should not be placed in individuals in whom the bladder is not readily palpated or percussed during physical exam or clearly identified as distended based on ultrasound examination, if available. It should also be aborted if urine is not easily aspirated using a narrow finder needle (i.e. spinal needle). This procedure should not be performed in patients with coagulation disorders and caution should be exercised in patients with evidence of prior lower abdominal surgery or pelvic radiation treatment as this may increase the risk of adherence of adjacent organs (such as bowel) to the bladder or pubis with resultant injury.

Types of Introducers

There are different model types of suprapubic catheters available on the market. Some introducers use a catheter that is passed over a metal trocar. In this author's personal experience, it can sometimes be difficult to disengage and pass the catheter over the trocar and into the bladder. A second model type is one in which the catheter is passed through a sheath after the bladder is punctured by a trocar/sheath combination. Some catheters have self-retaining features (i.e. inflatable balloon or mallecot tip) while others require a suture to fix in place. Important factors to consider using one of these models is the size of the drainage tube the sheath can accommodate as smaller tubes can frequently kink or obstruct. Also, any system that minimizes the procedure complexity and packaging requirements would be advantageous to the SOF medic. The Lawrence Add-a-Cath® Suprapubic Catheter Introducer (Femcare-Nikomed Limited, UK) allows for placement of a self-retaining Foley catheter up to 16 Fr in size with a simple device that is small and lightweight (Figure 5).

Suprapubic Catheter Placement Procedure (Lawrence Add-a-Cath®)

(A video recording of the suprapubic procedure can be viewed using the following link: <http://www.socom.mil/JSOM/Pages/default.aspx>)

Three steps should occur before placement of the suprapubic introducer. First the abdomen should be prepped with an antiseptic solution. Second, mark a point two fingerbreadths superior to the pubic bone in the midline (Figure 6). Next, inject a local anesthetic through the marked point targeting the skin and the rectus fascia, with the injection extending into the soft tissues near the bladder. Finally, using the same syringe, the bladder should be “tapped” by inserting the needle below the rectus fascia until urine is aspirated. This will confirm that the bladder is indeed full and will also provide information on the depth of insertion required to enter the bladder. Ultrasound, if available, can be an aid in diagnosing bladder retention as well as in guiding needle and introducer placement.

Using a scalpel or blade, make a small incision in the previously anesthetized skin. Insert the introducer using a twisting motion as pressure is applied, orienting the introducer directly posterior. One should feel a “pop” or give as the rectus fascia is punctured. Continue to apply the same steady twisting pressure and insert the introducer further until urine can be seen travelling up the groove in the sheath (Figure 7). With a very controlled motion, insert the introducer 3-4 cm further so that sheath will be completely within the bladder. Care should be taken not to pass the sharp introducer beyond the bladder lumen and into or through the posterior bladder wall. Flip the tab unlocking the trocar from the sheath. Now remove the trocar—a large amount of urine should drain from the sheath (Figure 8). Place a Foley catheter through the sheath and into the bladder. Inflate the balloon with 10 ml of sterile water or normal saline taking care not to introduce any foreign material into the balloon lumen (which can cause difficult balloon deflation). Withdraw the sheath from the patient's abdomen as the tab is peeled downward. Remove the sheath from the Foley catheter and gently withdraw the catheter.

The catheter may be withdrawn until the balloon is located against the bladder wall, or some portion of the catheter shaft may safely remain within the bladder. In some pelvic fracture

cases, an enlarging retropubic/prevesical hematoma can cause the bladder to pull further away from the anterior abdominal wall, resulting in migration of the catheter out of the bladder; in such cases, it is safer to not withdraw the catheter fully to the anterior bladder wall upon insertion. A suture if available can be used to help further secure the suprapubic catheter at the skin entry site (i.e. a moderate-sized bite of skin is included in the stitch which is then tied down; the strands are then wrapped around the catheter and snugged down and tied to secure it (i.e. Sandal Wrap), taking care not to tie it so tight as to occlude drainage.

Complications

Complications include gross hematuria—generally this is self-limited if related to introducer placement and can be managed with saline irrigation of the catheter on a prn basis. Occasionally troublesome hematuria with clot formation may occur after suprapubic tube placement, potentially due to pre-existing concomitant bladder injury. Again, periodic irrigation with normal saline may be necessary. The risk of clotting is mitigated by placement of a larger caliber suprapubic tube. Injury to bowel or pelvic vasculature can be prevented or minimized by avoiding suprapubic catheter placement in those at risk of bowel/vessel adherence (e.g. prior pelvic surgery/radiotherapy), using a small caliber spinal needle +/- ultrasound (if available) to localize and confirm bladder distension before passing the larger suprapubic introducer, and using caution not to pass the introducer through the posterior bladder wall. Post-obstructive diuresis can occur, particularly in cases of prolonged retention and azotemia (i.e. elevated serum BUN). Treatment begins with self-hydration for thirst but can require intravenous fluid administration and electrolyte monitoring and replacement in extreme cases.

Disposition

Once a suprapubic tube is placed, the patient should be evacuated to higher level medical care at the earliest opportunity for treatment of his/her underlying urologic condition. If higher level medical treatment is not available (e.g. remote area, indigenous population), then the initial catheter change should occur 4 weeks after placement (i.e. to allow the tube tract to mature) by a healthcare provider. Subsequent tube changes should occur every 3-4 weeks (i.e. family members can now be instructed on tube change procedure) to prevent infection and tube occlusion or encrustation.

The suprapubic catheter should only be discontinued after the underlying medical condition is treated or, alternatively, if transurethral access is obtained. Under these circumstances, the suprapubic catheter can be discontinued by removing the stitch if present, deflating the catheter balloon, and removing the catheter. The suprapubic wound should be left open for secondary closure and managed with sterile gauze dressings. The bladder opening will usually seal off within several hours of tube removal although the skin wound may take a couple weeks to completely heal. Finally, although not ideal, urinary retention can be managed with suprapubic tube drainage on a long-term or permanent basis as long as the catheter is changed with regularity (i.e. every 3-4 weeks).

Conclusion

SOF medics operating in austere environments need the skills, resources, and equipment to effectively manage urinary retention that cannot be treated by transurethral catheterization. This article and accompanying video link, functions as a starting point for incorporating suprapubic tube placement in the training regimen and therapeutic armamentarium of SOF medical personnel. SOF medics can gain further exposure and experience with the various suprapubic tube kits and placement techniques by observing such procedures in the military or civilian urological office, emergency center, trauma center, or hospital procedure setting. Specific questions can be addressed by contacting Doc Smith at: christopher.patrick.smith@us.army.mil

References

1. Waxman, Steve and Soderdahl, Douglas (2008). Chapter 30: Basic Medical Skills: Suprapubic Bladder Aspiration (Tap) or Catheter Placement. In *Special Operations Forces Medical Handbook, Second Edition*, Washington, DC, U.S. Government Printing Office 2008, p. 8-31-8-32.
2. Waxman, Steve and Soderdahl, Douglas (2008). Chapter 30: Basic Medical Skills: Suprapubic Bladder Aspiration (Tap) or Catheter Placement. In *Special Operations Forces Medical Handbook, Second Edition*, Washington, DC, U.S. Government Printing Office 2008, p. 8-32.
3. Koraitim, MM. (1999). Pelvic fracture urethral injuries: The unresolved controversy. *Journal of Urology*; 161:1433-41.

Legends

1. Stress cystogram with extraperitoneal bladder rupture in a patient with pelvic fracture; extravasation noted on right side. Patient with a head injury, distended bladder, and unable to void. A urethral catheter would be first choice. However, if this injury was accompanied by a posterior urethral distraction injury, a suprapubic tube would be the preferred management.
2. Extensive extravasation on retrograde urethrogram after pelvic fracture and posterior urethral distraction injury. Contrast is noted in soft tissue both above and below the urogenital diaphragm, demonstrating the extent of pelvic floor injury. Note the “pie in the sky” bladder – a percutaneous suprapubic tube was placed under ultrasound guidance.
3. Blood at the urethral meatus, a typical finding after pelvic fracture with posterior urethral distraction injury. A percutaneous suprapubic tube was placed in the Emergency Center for urinary retention and planned delayed realignment.
4. Severe external genital injury – penile laceration. A suprapubic tube was placed preoperatively while awaiting surgery (urethra was transected, and the patient was in urinary retention with a palpably distended bladder).
5. A: The Lawrence Add-a-Cath® Suprapubic Catheter Introducer incorporates a stainless steel point (beneath orange cap) that allows for controlled penetration using a gentle twisting motion with minimal trauma to surrounding tissues. B: The introducer contains an inner trocar connected to an outer sheath via a tab on the sheath that “locks” with the handle of the trocar. Once the introducer is placed within the bladder, the tab is pulled back to disengage the trocar from the sheath.
6. The insertion site for suprapubic tube placement is in the mid-line, two fingerbreadths above the pubic bone.
7. After the rectus fascia is pierced (“pop”), the introducer is passed several centimeters posterior until the bladder lumen is entered and urine can be visualized exiting the groove between the trocar and sheath. Note the inset photo demonstrating view from inside the bladder (cystoscopic view) as the introducer tip punctures the bladder wall.
8. As the trocar is removed from the sheath, a large amount of urine should drain, confirming proper placement of the introducer within the bladder (see inset photo of cystoscopic view from within the bladder demonstrating sheath adequately placed through dome of bladder). A Foley catheter should be placed through the sheath and the balloon inflated with 10 ml of sterile water (preferable).