fortune Journals

Research Article

ARCHIVES OF NEPHROLOGY AND UROLOGY

ISSN: 2644-2833

Suprapubic Tube Complications Using the Percutaneous Trochar Approach: A Case Series

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Abstract

Suprapubic Tube (SPT) catheters are common urinary diversion techniques for long term maintenance of bladder dysfunction. Multiple SPT placement techniques exist, including open, image-guided, or cystoscope-guided, using either a Seldinger or trochar approach. This case series includes six patients (3 males/3 females, average age = 58.2 years) with neurogenic bladder who underwent SPT placement via trochar technique with subsequent complications. Complications were graded using the Clavien-Dindo (CD) classification and included hematuria, catheter malposition or dislodgement, and organ perforation. Key potential risk factors include history of neurogenic bladder, previous chronic indwelling catheter, altered/abnormal urethral or bladder anatomy, concurrent anticoagulant use, obesity, and prior abdominal surgery. While SPT placement has utility in bladder management, placement with trochar techniques can lead to significant complications. Risk factors must be carefully considered in all patient candidates and alternative placement options via an open approach or with imaging guidance should be considered in select patients.

Keywords: Cystostomy; Suprapubic; Neurogenic Bladder; Complications; Peroperative

Introduction

Suprapubic Tube (SPT) catheters are a common urinary diversion technique, typically placed for long term maintenance of bladder dysfunction. SPTs are often preferred over indwelling urethral catheters because of decreased catheter-related discomfort and pain scores, and decreased risk of erosion with comparable levels of continence and infection.

Though considered relatively benign, SPT placement is known to be associated with numerous complications, including bleeding, surgical site infection, obstruction, and leakage. Early post-procedural complication rates can be as high as 52% within 90 days of placement, though many minor SPT complications can resolve spontaneously with conservative measures [1-5]. However, rare complications including bladder/bowel perforation or urosepsis can result in significant medical intervention requiring reoperation.

One of the more serious complications of SPT placement includes bowel perforation and injury to surrounding structures. Risk factors for this include prior abdominal surgery and prior radiation, but 8% of bowel perforations occurred in patients with no identifiable risk factors [6]. Overall, the mortality rate of the SPT procedure is 1.8% [6], so careful consideration and shared-decision making must take place before the procedure occurs.

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Citation: Cynthia Ong, Minna Blottner, Sarah C Krzastek1, Tyler J Roseman, Adam P Klausner. Suprapubic Tube Complications Using the Percutaneous Trochar Approach: A Case Series. Archives of Nephrology and Urology. 6 (2023): 99-103.

Received: January 09, 2023
Accepted: January 20, 2023
Published: September 08, 2023

Ong C, et al., Arch Nephrol Urol 2023
DOI:10.26502/anu.2644-2833068

While an SPT can be placed in an open fashion, percutaneous tube placement is less invasive and preferred if possible. Multiple percutaneous SPT techniques exist, including image and cystoscope guided or using either a Seldinger or a trochar approach. Our institution primarily utilizes the trochar technique, and the purpose of this paper is to characterize our complications associated with this approach in a case series.

Methods

Six patients who had significant complications requiring re-intervention were identified from Morbidity and Mortality conferences between 2020-2021 at two tertiary care medical centers which provide all adult in-patient and out-patient training for an accredited urology residency training program. All procedures were performed using a trochar technique as follows: The patient was placed in Trendelenburg position. An area approximately 2 cm above the pubic symphysis was identified and anesthetized [7,8]. A 5 cm spinal needle was then advanced to confirm return of urine either blindly or using cystoscopic or ultrasound guidance. A 1 cm incision was then created, and an SPT trochar from a commercially available kit (Utah Medical, Midvale, UT) was then advanced into the bladder. The trochar was then removed leaving a peal-away sheath. Once urine return or visual confirmation was confirmed, a 16Fr Foley was placed, the balloon was inflated, the sheath was removed, and the Foley was secured. As SPT placements are performed by multiple providers both on an elective and emergent basis, this study does not provide an exact rate of complications, although our estimation is approximately 5% [9]. Complications were graded using the Clavien-Dindo (CD) classification and presented as a case series.

Results / Case Presentations

A total of six patients were identified (3 males/3 females, average age = 58.2 years). All patients had neurogenic bladder dysfunction and chronic urinary retention. CD classifications were Grade I (N=2), II (N=2), III (N=1), and IV (N=1) (Table 1). Complications included gross hematuria (early and recurrent), catheter malposition (early and delayed), catheter dislodgement, and bladder perforation

Table 1: Complications and interventions.

Case	Complication	Intervention	CD
1	Early Hematuria	Admission, CBI	II
2	Recurrent Hematuria	Admission,CBI, transfusions	II
3	Early Malposition	Return to OR for Replacement	III
4	Delayed Malposition	SPT Removal	I
5	Dislodgement	SPT Removal	I
6	Bladder Perforation	Exploratory Laparotomy	IV

CD - Clavien-Dindo classification, SPT - Suprapubictube, CBI - continuous bladder irrigation, OR - Operating Room

Case 1: Early Hematuria

A 74-year-old male with a history of neurogenic bladder due to multiple sclerosis underwent urodynamics which demonstrated detrusor overactivity with impaired contractility and incomplete emptying. The patient elected to undergo SPT placement. Comorbidities included insulin-dependent diabetes and hypertension. The patient had no prior abdominal surgeries and was not on any anticoagulants. SPT placement was performed in the operating room without event, and the patient was discharged the same day. However, upon arrival at home, the patient noted absent SPT drainage and significant bleeding per urethra [10,11]. He presented to the emergency department with a drop in hemoglobin, and bedside catheter irrigation evacuated more than 50 mL of clot. Hematuria persisted, and he was admitted on continuous bladder irrigation. After 24 hours, urine remained clear, continuous irrigation was discontinued, and the hemoglobin level stabilized. The patient was discharged home without any further issues. This patient was given a Grade II CD classification.

Case 2: Recurrent Hematuria

A 67-year-old male with a history of neurogenic bladder secondary to incomplete C4 tetraplegia following a motor vehicle accident was previously maintained on timed voiding and the use of condom catheters. Urodynamics demonstrated a large bladder capacity with poor compliance, high detrusor pressure, and bladder outlet obstruction likely due to detrusor sphincter dyssynergia [12]. Given worsening incontinence and steadily rising creatinine, the patient elected SPT placement. Comorbidities included chronic kidney disease, diabetes, hypertension, peripheral vascular disease, and cerebrovascular accident. The patient had no prior abdominal surgeries but was maintained on anticoagulation. He was taken to the OR (after appropriate discontinuation of anticoagulation) for successful SPT placement and discharged home the same day with instruction to resume anticoagulation after 24 hours. The patient returned to the ED nine days later for gross hematuria with SPT blockage. A new concurrent urethral catheter was placed, and the patient was admitted for continuous bladder irrigation (with anticoagulation held). However, the patient developed multiple episodes of recurrent bleeding and ultimately required transfusion with a total of four units of packed red blood cells [13]. Hematuria resolved, continuous irrigation was eventually discontinued, and the patient was subsequently discharged home with removal of the urethral catheter and maintenance of the SPT for drainage. Over the next 6 months, the patient had two additional episodes of recurrent hematuria requiring emergency department visits with one additional transfusion of a single unit of blood, but not requiring in-patient admission or surgical intervention. This patient was given a Grade II CD classification.

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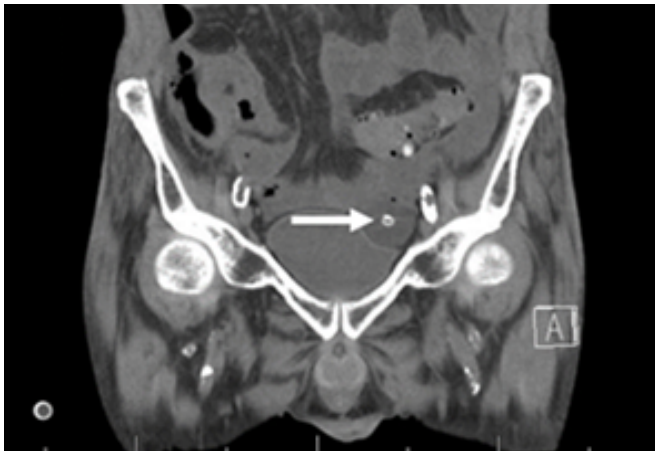

Figure 1: CT image demonstrating malpositioned suprapubic catheter (arrow) in the peritoneal cavity.

Case 3: Early Malposition

A 57-year-old male with a history of hepatitis C, alcoholic liver cirrhosis, chronic obstructive pulmonary disease and hypertension presented to the emergency department with 12 hours of urinary retention and abdominal discomfort. Despite numerous catheterization attempts by the on-call urology team as well as attempts at cystoscopic bladder access, the bladder could not be decompressed. At this point, the patient underwent an emergent bedside SPT placement. The patient was admitted to the medical service for observation and subsequently underwent a CT scan for continued abdominal discomfort which confirmed malposition of the SPT in the peritoneal cavity (Figure 1). The patient was then taken to the OR urgently where a urethral false passage was identified cystoscopically. A new 16Fr council tip catheter was inserted into the bladder, and the mispositioned SPT was removed [14]. The patient was admitted to the intensive care unit for hypotension. However, over the course of a two-week hospitalization, the patient's encephalopathy progressed due to decompensated liver failure, and he was placed on palliative care and expired. This patient was given a Grade III CD classification.

Case 4: Delayed Malposition

A 48-year-old female with a history of neurogenic bladder secondary to multiple sclerosis/neuromyelitis was managed with a chronic indwelling Foley. Previous urodynamics demonstrated detrusor acontractility. Cystoscopy noted Foley-induced erosion of the urethra and urethral meatus. Due to increasing leakage, she elected for SPT placement [15]. Comorbidities included diabetes, hypertension, deep vein thrombosis, and pulmonary embolism. Prior abdominal surgeries included only a tubal ligation. Medications were significant for chronic anticoagulant usage. The patient was stable in the recovery unit and was discharged home. She had her first SPT change performed in the out-patient clinic at six weeks and then monthly thereafter. However, after her third exchange, the patient presented to the emergency department with a severe epigastric pain and minimal SPT urine output. CT scan demonstrated the suprapubic catheter misplaced and lodged within the mesentery of the small bowel (Figure 2). The SPT was removed at bedside, and she was admitted to the hospital for IV antibiotics for an associated UTI and subsequently discharged on PO antibiotics. She then underwent subsequently underwent creation of an obstructing pubovaginal sling to help manage the erosion as well as replacement of the SPT. This patient was given a Grade I CD classification.

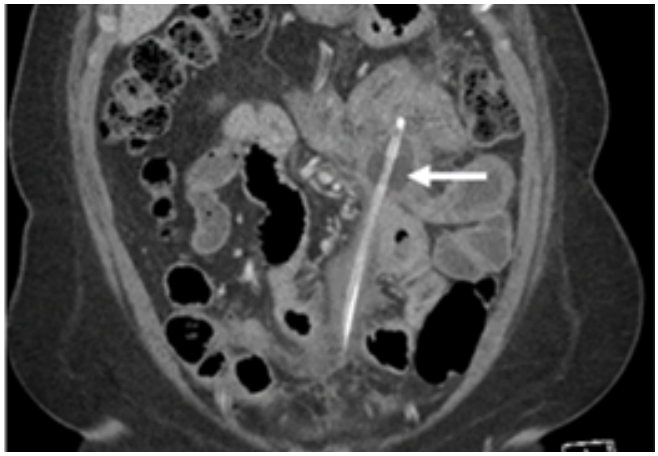

Figure 2: CT image demonstrating malpositioned suprapubic catheter (arrow) in the peritoneal cavity.

CASE 5: Dislodgement

A 65-year-old female with a history of neurogenic bladder following pontine cerebrovascular accident with residual right sided limb weakness was previously managed with a chronic indwelling Foley catheter. Urodynamics demonstrated low bladder capacity with detrusor overactivity incontinence and incomplete bladder emptying. Comorbidities include diabetes, pulmonary embolism, hypertension, and chronic kidney disease. The pahhhhhhtient had no prior abdominal surgeries but was on chronic anticoagulation therapy. The patient was taken to the operating room for SPT placement without difficulty and subsequently discharged the same day [16,17]. The patient returned to office after six weeks for her first SPT exchange without issue. However, one week later, she presented to the emergency department with complaints of clogging of the suprapubic catheter. A 22 Fr SPT was ultimately placed over wire with clear yellow urine output noted. Then, 4 days later, the patient again returned to the emergency department with decreased SPT drainage. A Foley was placed temporarily to provide relief. However, attempts to reestablish the SPT tract were unsuccessful, despite use of a wire and ultrasound guidance. Thus, SPT was removed, and the patient was sent home with a Foley catheter. This patient was given a Grade I CD classification.

Case 6: Bladder Perforation

A 38-year-old female with a history of neurogenic bladder due to C2-C3 incomplete tetraplegia following a gunshot wound was previously managed with a chronic indwelling Foley. SPT placement was recommended due to worsening leakage from bladder neck erosion. Comorbidities included diabetes and hypertension. The patient had no prior abdominal surgeries and was not on any anticoagulants. She was taken to the operating room for SPT placement. Upon insertion of the cystoscope, she was noted to have a patulous urethra and required manual compression of the anterior vaginal wall to achieve bladder distension. Shortly after arrival to the recovery unit, the patient became acutely hypotensive and tachycardic. Ultrasound confirmed significant intra-abdominal fluid, and, due to concerns for intraabdominal bleeding, she was taken back to the operating room for an emergent exploratory laparotomy where the patient had more than 2L of blood evacuated from the peritoneal cavity. The source of bleeding was identified as a perforation in the posterior bladder, which was controlled using absorbable suture. The patient required monitoring in the intensive care unit and continues to have a functioning SPT. This patient was given a Grade IV CD classification.

Discussion

Our case series of complications associated with SPT placement via the trochar approach identified several categories including hematuria, catheter malposition, catheter dislodgement, and organ perforation. In addition, several patients required antibiotics for associated UTIs. Key potential risk factors include neurogenic bladder status (seen in all patients) as well as urethral erosion in women which can prevent adequate distention of the bladder at the time of SPT placement. In addition, severe hematuria was seen in association with chronic anticoagulation, and malposition was seen in a patient with cirrhosis and abdominal ascites. Finally, the risk of complications appears to increase in the setting of altered/abnormal urethral anatomy in the setting of obesity or prior abdominal surgery.

Consistent with our series, previous studies show that the timing of complications can vary widely from the immediate postoperative period to months after initial SPT placement. Looking specifically at more severe complications, one patient in our study had a perforated bladder and subsequent hemoperitoneum that required an exploratory-laparotomy, consistent with a known risk of bladder injury. While none of our patients experienced injury to bowel, bowel perforation is also a significant, known complication of SPT placement. One case report found a perforated ileum eight months after initial SPT placement. Another case report described post-op feculent drainage and peritonitis two months after a first SPT exchange in a patient with a history of abdominal surgery. Given rare but serious complication risks, this routine urologic procedure is associated with a mortality rate of 1.8% [6].

Review of these cases identified additional risk factors that may increase risk of complications including history of chronic indwelling catheters, abnormal urethral anatomy, and concurrent anticoagulation. Longstanding Foley catheters pose a unique complication to SPT placement as chronic indwelling catheters can alter urethral anatomy [4]. Subsequent urethral erosion can make it difficult to fully distend the bladder, impeding visualization of placement, which may pose increased risks of bladder perforation as seen in Case 6. Abnormal urethral anatomy may also pose increased difficulty of catheter placement, increasing risk of catheter malposition and the need for removal and replacement, as seen in Case 3. Finally, concurrent anticoagulation use can result in significant hematuria which may require blood transfusions, as evidenced by Case 2.

This study only includes our institution-specific experiences utilizing the trochar SPT placement kit. Other percutaneous techniques, such as the Seldinger technique, were not analyzed. One study of SPT placements found more minor complications associated with the Seldinger technique, but after regression analysis they found that catheter insertion technique, size, and type were not predictors of complications. Based on our series, we now routinely infiltrate the SPT tract with hemostatic agents to provide tamponade and limit bleeding. Further review and comparison of complications associated with percutaneous SPT placement via the Seldinger method is warranted. Additionally, image-guidance including ultrasound or interventional radiology assistance may be necessary in more complex cases of difficult SPT placements.

Despite complications, suprapubic tubes can be significantly beneficial in the management of chronic urinary retention, with improved overall quality of life and patient satisfaction. In one randomized control trial, patients receiving SPT had significantly less postoperative pain compared to those with transurethral catheters following a robot-assisted radical prostatectomy. Another study comparing long term outcomes of SPT demonstrated a 72% satisfaction rate and 89% preference over transurethral catheters [9].

While this study is limited by the small sample size and lack a clear complication rate or comparison to other percutaneous approaches, it provides insight into risk factors of an important and common urologic procedure.

Conclusion

In conclusion, while SPT placement has utility in bladder management, percutaneous placement using a trochar can lead to significant complications and risks factors for complications including altered anatomy, prior surgery, ascites, and anticoagulation use must be carefully considered in all patient candidates. In addition, where possible,

alternative placement options with imaging guidance should be considered in select patients.

Acknowledgements

There is no funding associated with the current study.

Conflict of interest

The authors report no conflicts of interest related to the current study

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