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Original Article

Urological Complications in Patients with Voiding Dysfunction Managed by Percutaneous Trocar Suprapubic Cystostomy

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Abstract

Objective: **To study the quality of life and urological complications in patients with voiding dysfunction managed by percutaneous trocar suprapubic cystostomy.**

Materials and Methods: **A total of 50 patients who underwent percutaneous trocar suprapubic cystostomy (SPC) between 2006 and 2012 were retrospectively reviewed. Demographic data, comorbidity, urine culture, glomerular filtration rate (CKD-EPI formula), indication for SPC, complications, and quality of life were compared between patients who had previous urethral catheterization and those who had SPC.**

Results: **Glomerular filtration rate before SPC was higher than that after SPC, but not statistically different (P>0.05). The incidence of symptomatic urinary tract infection (UTI) after SPC was lower than that before SPC (20% vs 48%), a significant difference (P<0.05). The most common pathogen found on urine culture was Escherichia coli. Patients' satisfaction rate for SPC was 86%. Reasons for preference included less frequent symptomatic urinary tract infection (UTI), less discomfort, easier catheter management, and improved daily activity.**

Conclusions: **Percutaneous trocar SPC is a simple and effective outpatient procedure for long-term bladder drainage in patients with voiding dysfunction. But clinicians should be aware of complications related to SPC, and attempt to reduce these complications. SPC had lower symptomatic urinary tract infection (UTI), and greater patient satisfaction compared with urethral catheterization.**

Keywords: **Voiding dysfunction, percutaneous trocar suprapubic cystostomy, complication, quality of life**

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Introduction

Voiding dysfunction is defined by the inability to completely empty the urinary bladder. In a normal voiding cycle the bladder stretches easily when it is filled with urine and contracts fully during voiding. During the normal emptying phase there should be no premature contractions of the bladder or increase in pressure and the external urethral sphincter muscle should be completely relaxed so the urine released from the bladder could flow smoothly and completely without interruption. Interrupted or intermittent flow of urine and incomplete emptying are symptoms of voiding dysfunction.

There are three different methods of bladder drainage used for spinal shock or spinal cord injury patients, namely, suprapubic fine-bore cystostomy, indwelling Foley catheter, and intermittent catheterization. Patients on intermittent catheterization or cystostomy had fewer complications than those treated with indwelling Foley catheter[1]. Suprapubic cystostomy (SPC) has been reported to be superior to intermittent catheterisation because the rate of urinary tract infection is significantly lower[2]. Barn et al. in 1993 found that in neuropathic bladder patients managed by SPC, after a follow-up of more than two years, accelerated renal deterioration did not occur and acceptance by patients was high (84%)[3].

But long-term complications of SPC drainage in patients with neurogenic bladder were reported by Nomura et al. in 2000, which included formation of bladder calculi in 25%, and urinary leakage through the urethra in 10%, although no fatal complication occurred[4]. In the same year Mitsui et al. reported a comparative study of SPC and clean intermittent catheterization in spinal cord injury patients where no significant difference in complications was found between the two groups, except for bladder stones, which were significantly more frequent in patients with SPC ($P<0.01$)[5]. McPhail et al. in 2006 reported that the suprapubic route for bladder drainage in general surgery was more acceptable to patients and reduced infectious morbidity compared with transurethral catheterization[6]. In 2007, Nwadiaro et al. also reported that in neurogenic bladder and spinal injury patients, SPC was a superior option since it was associated with a lower morbidity, better quality of life and longer life expectancy than urethral catheterization[7].

The objective of the present study was to measure the quality of life and the frequency of long-term urological complications in patients with voiding dysfunction managed by percutaneous trocar SPC.

Materials and Methods

Between 2006 and 2012 a total of 50 patients underwent and retained percutaneous trocar SPC because of voiding dysfunction for at least 1 year. Data were collected retrospectively. Collected data include patients' demographics, comorbidity, urine culture, glomerular filtration rate (CKD-EPI formula), indications for percutaneous SPC insertion, complications and quality of life.

Symptomatic urinary tract infection (UTI) was defined by the presence of clinical symptoms and signs (fever, chill, suprapubic pain, flank pain, dysuria, etc.) with a positive urine culture of $> 10^5$ microorganisms/mL of urine, with no more than two species of microorganisms.

In this study, percutaneous SPC was performed as follows. The patient is placed in the lithotomy position. The bladder is palpated, and if not distended, then 200 - 300 mL of Normal Saline Solution (NSS) is pushed through the urethral Foley catheter to distend the bladder. A 4 cm skin incision is made at the suprapubic region above the symphysis pubis in the midline (Figure 1). One percent lidocaine is used to anesthetize the skin, subcutaneous tissues, rectus fascia and retropubic space. At the site of bladder puncture, a 1 cm incision is made with a No.11 blade. A trocar with sheath is then advanced towards the bladder. Two hands are used to provide a forceful, but controlled, push through the abdominal wall. One hand can be positioned on the obturator at a site marking the depth of the bladder. Once the bladder is penetrated, urine leakage can be seen through the sheath, and the entire system is advanced 2 to 3 cm. The trocar is then removed (Figure 2), and a Foley catheter No.16 Fr is inserted through sheath into the bladder. Ten mL of NSS is used to blow the catheter balloon. The sheath is then removed, the Foley catheter gently withdrawn until the catheter balloon is against the anterior bladder wall, then advanced 2 cm back into the bladder to allow for movement, and pulled away from the bladder trigone to reduce bladder spasm. The Foley catheter is fixed to skin using nylon 3/0 (Figure 3).

Figure 1 Skin incision

Figure 2 Trocar and sheath insertion

Figure 3 Foley catheter is fixed to skin.

Contraindications to percutaneous trocar SPC included a nonpalpable bladder, previous lower abdominal surgery, coagulopathy, known bladder tumor, and clot retention. Statistical analysis was done using paired *T*-test and McNemar chi-square test. Statistical significance was defined as a p-value less than 0.05 ($p < 0.05$).

Results

There were 50 patients in the study, all of whom were men. The mean age was 70 years (range, 23 to 92 years). The mean follow-up time was 25 months (range, 12 to 72 months). All patients had some medical comorbidities as indicated by a mean ASA (American Anesthesiologist Association) score of 3.6 (range, 3 to 4). Patients' demographics, baseline glomerular filtration rate, and presence of UTI are given in Table1. Indications for SPC included neurogenic bladder (28 or 56%) and bladder outlet obstruction (22 or 44%). The most common primary cause in this study was inoperable benign prostatic hyperplasia (Table 2). All patients had urethral indwelling catheter before SPC. Almost all patients (47 or 94%) had SPC insertion as an outpatient procedure.

The most common urological complication in this study was symptomatic urinary tract infection (UTI) in 10 patients (20%). Intraoperative complications occurred in 4 cases (8%) (Table 3).

Glomerular filtration rate before SPC was slightly higher than that after SPC (74.7 ± 31.8 and 74.5 ± 31.8, respectively), which was not clinically or statistically significant. The incidence of symptomatic UTI after

Table 1 Characteristics of patients

Characteristics	Summary (n = 50)
Age (years): mean (SD) [range]	70 (16.33) [23 to 92]
Mean follow up time (months): mean (SD) [range]	24.8 (15.2) [12 to 72]
Mean ASA scores: mean (SD [range]	3.6 (0.5) [3 to 4]
Glomerular filtration rate (mL/min): mean (SD) [range]	74.7 (31.8) [12.7 to 120]
Symtomatic urinary tract infection (yes): number (%)	24 (48)

Table 2 Indications for percutaneous suprapubic cystostomy and primary causes

Neurogenic bladder	Number (%) N = 28	Bladder outlet obstruction	Number (%) N = 22
Lower spinal cord injury	12 (24)	Inoperable BPH	20 (40)
Cerebrovascular accident	5 (10)	Prostate cancer	1 (2)
Diabetic cystopathy	5 (10)	Urethral stricture	1 (2)
Spinal stenosis	4 (8)		
Parkinsonism	1 (2)		
TB meningitis	1 (2)		

BPH: benign prostatic hyperplasia

Table 3 Urological complications of percutaneous suprapubic cystostomy

Complications	Number (%) N = 50
Intra operative	4 (8)
- Catheter malposition	2 (4)
- Urethral leakage	2 (4)
Postoperative	21 (42)
- Symptomatic urinary tract infection	10 (20)
- Catheter blockage	9 (18)
- Skin infection	2 (4)

SPC was lower than baseline UTI (20% vs 48%), which was a statistically significant difference ($P < 0.001$).

Urine culture in patients who had symptomatic UTI before and after SPC, showed that Escherichia coli was the most common pathogen in this study. More bacteriuria developed in the patients before SPC than after SPC (Table 4).

An outpatient satisfaction survey revealed an 86% satisfaction rate. Reasons for the preference for SPC included less frequent symptomatic UTI, less discomfort, easier catheter management and increased daily activity.

Discussion

The goals of management in patients with voiding dysfunction should consist of preservation or improvement in upper urinary tract function, absence of infection, and maintenance of a low pressure bladder[8]. Continuous intermittent catheterization (CIC) is still considered the ideal management for voiding dysfunction if the patient is willing physically and mentally to perform the task. This is due to increasing possibility of complications associated with in dwelling catheterization compared with CIC, such as UTI, renal failure, bladder and ureter stones, urethral fistulas or strictures and erosion, and bladder cancer[9-10].

SPC is also a popular alternative method of long-term bladder drainage in voiding dysfunction[11-14,17-19]. In the present study all patients had urethral catheterization before SPC, so the rate of symptomatic UTI was higher before SPC than after (48% vs 20%). This was similar to a report by Nwadiaro et al. in 2007 where urethral catheterization was associated with a UTI rate of 65% while this was 14% for SPC ($P < 0.05$)[7].

In the present study we found more voiding dysfunction patients with neurogenic bladder than those with bladder outlet obstruction. This was similar

Table 4 Urine culture results in patients with symptomatic urinary tract infection

Microorganism	No. of positive urine culture (> 105 CFU/ml) Before SPC Number (%); N = 50	After SPC Number (%); N = 50	P-value
Escherichia coli	21 (42)	10 (20)	0.001
Enterobacter species	2 (4)	0	0.050
Proteus species	1 (2)	0	0.999

Table 5 Comparison of urological complications after SPC

Complications	Present series Number (%) N = 50	Ahluwalia et al.[11] Number (%) N = 219	Park et al.[9] Number (%) N = 46
Intraoperative			
- Catheter malposition	2 (4)	6 (3)	-
- Urethral leakage	2 (4)	-	3 (6)
Postoperative			
- Symptomatic urinary tract infection	10 (20)	10 (5)	5 (11)
- Catheter blockage	9 (18)	5 (2)	7 (15)
- Skin infection	2 (4)	8 (4)	3 (6)
Total	25 (50)	29 (13)	18 (39)

to the report by Ahluwalia et al.[11] where the most common type of voiding dysfunction was also neuropathic bladder, followed by bladder outlet obstruction (56% and 38%, respectively). But the most common primary cause was different; in our series this was inoperable benign prostatic hyperplasia while in the Ahluwalia et al. series it was urethral stricture.

Although SPC insertion is a safe and simple procedure, and can be done in an outpatient setting there can be a few complications. Ahluwalia et al.[11] and Park et al.[9] reported urological complications related to SPC which could be compared with those of our series (Table 5).

From Table 5, our series had more urological complications than Ahuwalia et al. (50% and 13%, respectively). However, when compared with the report of Park et al. the urological complication rates were similar (50% and 39%, respectively). The incidence of symptomatic UTI was more common in our series because all our patients had previous indwelling urethral catheters, but patients in Park's series were on CIC prior to SPC. Thus our patients were predisposed to urinary bacterial contamination. Singh et al.[10] also reported that the incidence of UTI and other urological complications was lower in spinal cord injury patients on CIC when compared with the incidence in patients on indwelling catheters[10].

We found the incidence of catheter malposition to be 4% comparable to the 3% in the series of Ahluwalia et al. The two series consist most commonly of neurogenic bladder patients (56% vs 56%). It is particularly difficult to insert a SPC catheter in this group of patients, because their urinary bladders are severely contracted and often inadequately distended. We suggested distending the bladder with 100-200 mL of NSS before SPC.

The incidence of catheter blockage was 18% in our series, compared with 15% in the series of Park et al. which was similar. The most common cause of catheter blockage was catheter encrustation[15]. Strickler et al.[16] reported that infection by Proteus mirabilis was the main cause of the crystalline biofilm that encrust and block Foley catheters. He suggested elimination of Proteus mirabilis as soon as it appears in the urinary tract by antibiotic therapy. For patients with persistent blockage and recurrent stones, increasing fluid intake with citrated drinks could control the problem until the bladder stone can be removed[16].

In our series the patient satisfaction rate for SPC was 86%, similar to the rate reported by Ahluwalia et al. (89%) in 2006, and patients with previous urethral catheter reported preference for SPC drainage[11].

Conclusions

Percutaneous trocar SPC is a simple and effective outpatient procedure for long-term bladder drainage in patients with voiding dysfunction. Clinicians should be aware of the potential complications related to SPC and focus on ways to reduce these complications. The procedure should be performed by experienced surgeons. In the present study, we found that SPC had less symptomatic UTI and more patient satisfaction compared to patients with previous retained urethral catheter.

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