

Original Research Article

Comparative study of perioperative morbidities of the conventional and ultrasound-guided suprapubic catheterization in the patients of urinary retention during emergency

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ABSTRACT

Background: Urinary retention is one of the common urological emergencies and conventional 'blind' SPC frequently used comfortable as well superior procedure for patients. During conventional SPC, the distended bladder is identified by palpation or percussion without proper attention to intervening bowel segment and other structures. However, the recently published data suggests that if, ultrasound is used during SPC, and it identifies not only bladder but also intervening bowel segment which complications. Therefore, the objective of this study was to assess and compare the perioperative complications of both methods.

Methods: This prospective study was conducted between years November'2017 to June'2019. Sixty patients (n=60) of urinary retention were randomized to undergo ultrasound guided or conventional SPC procedures. Patients were divided into two equal groups of 30 patients in US-SPC (Group-A) and C-SPC (Group-B). After either SPC, the patients were closely observed for development of complications.

Results: Overall, the patients had mean age of 53.87±21.418 and 53.87±21.418 years in C-SPC and US-SPC group, respectively. Mean operative time and subsequent initial urine drainage were almost equal in both groups. However, in C-SPC group, 5(16.7%) patients developed complications in the form of 03 misplaced catheters outside bladder, 01 into retro pubic space and another 01 into rectum. All patients in Group-A required ultrasound guided revision of SPC compared to none in Group-B.

Conclusion: Overall, the ultrasound-guided SPC (US-SPC) is safer procedure compared to conventional 'blind' C-SPC in relieving urinary retention in emergency, thus it should be recommended procedure whenever need arise for SPC procedure.

Keywords: Bladder, Catheterization, Conventional, Complications, Ultrasound, Urine

INTRODUCTION

Urinary retention is a common urological emergency and urethral catheterization is most used procedure to provide immediate relief to these patients.¹ However, when per urethral catheterization is difficult or not possible, then these patients may require a least invasive procedures in

the form suprapubic catheterization (SPC), which is comfortable and superior procedure for patients of urinary retention due various causes.² Various common cause of urinary retention include benign prostatic hyperplasia (BPH), urethral stricture, carcinoma prostate, clot retention, calculus, neurological bladder.³ Suprapubic drainage of the bladder was first describe in the year

1556.⁴ Among the gynecologists, it became common a procedure after Hodgkinson and Hoodari described their success in placing suprapubic catheters using trocar cystostomy in year 1966.⁵ Now, the conventional 'blind' SPC is usually done using commercially available Supra Pubic Catheter with Trocar after bladder has been identified by palpation or percussion in the patients of urinary retention. However, this remains a blind technique as intervening bowel and other structures may not be recognized, thus prone to injury during this SPC procedure. Therefore, conventional SPC is associated with various complications like hemorrhage (hematuria and intra-abdominal bleeding), infections, intra-abdominal organ injury, misplacement of catheter/balloon, injury to dome or posterior wall of bladder.⁶ The risk of these complications increases further, when C-SPC is done in patients of inadequately distended bladder, obesity, lower abdominal scar, incisional and inguinal hernia. This rate of various complications may increase further.⁷ Complications rate of 10-25% and mortality of about 1.8% have been reported by several authors for C-SPC procedures.⁸

Aguilera et al, performed real-time ultrasound guided SPC insertion in 17 patients of acute urinary retention with no complication.⁹ Even, the British Association of Urological Surgeon (BAUS) recommends USG guided SPC in the management of urinary retention to prevent complications and mortality.

However, till date, as per best of knowledge no study has been done to compare the complications of conventional and ultrasound guided SPC. Therefore, the objective of our study was to evaluate and compare the perioperative morbidities in patients of urinary retention undergoing either C-SPC or US-SPC procedures.

The aim of this study was to evaluate the safety, efficacy and perioperative morbidities of conventional and ultrasound guided suprapubic catheterization. Authors also compared complications rate of both the procedures.

METHODS

This prospective, randomized study was carried out from November 2017 to June 2019 in the department of urology of our tertiary level institution, after taking clearance from the local Ethical Committee. A total of sixty (n=60) patients of clinically diagnosed urinary retention were randomized to undergo either ultrasound-guided or conventional suprapubic catheterization procedure using computer generated random number. All the patients were male barring one female patient. Depending on the procedure, the patients were divided into two equal groups of 30 patients in each, Group-A underwent ultrasound guided SPC (US-SPC) and Group-B underwent conventional SPC (C-SPC) procedures. The patient's inclusion criteria included: all patients age \geq 18 years, difficult or failed per urethral catheterization (PUC), complete urethral stricture, complete rupture of

urethra (in which realignment is not indicated), clot retention after urethral surgery (e.g. urethroplasty, hypospadias repair) and when PUC was contraindicated (e.g. prostatitis). The patient's exclusion criteria included: all patients who were unable to give consent, had bleeding disorder, midline abdominal scar, bladder cancer and immunosuppressive state (e.g. HIV infection, immunosuppressive agents, chemotherapy or steroids).

All collected data was entered in the Microsoft Excel Sheet under predefined variables. Discrete data was presented as number (%); continuous data as mean \pm SD, range or median or interquartile range whatever is appropriate. Normality of quantitative data was checked using Kolmogorov Smirnov tests and the skewed data of two groups were compared using Mann-Whitney test. The Student t-test was used to compare 2 groups with normally distributed data. The Wilcoxon Signed rank test was used for time related variables & Paired t-test for normally distributed data of patient's visits (2-visits). Proportions were compared using Chi-Square or Fisher's exact test. The statistical tests were two-sided performed at a significance level of $\alpha=0.05$. Analysis of data was done using IBM-SPSS Statistics (Version-22).

Techniques

A. Conventional SPC (C-SPC)

After explaining the procedure to patients and relatives, a written, informed consent was obtained for procedures. All patients received a single dose of antibiotic (Inj. Ciprofloxacin I.V. Infusion 200mg/100ml) for prophylaxis before start of the procedure. We used commercially available Supra Pubic Catheter with Trocar (Supra Cath[®] Plus, Romsons[®], M/s Romdox, UK Ltd.) to perform C-SPC (Figure 1). Each Supra Cath set has catheter with trocar inside which is made of stainless steel with one small bevelled opening at tip and another at proximal button end, both connected through an internal channel. In supine position, the suprapubic area was sterilized using 5% betadaine lotion, draped using sterile towel and skin was infiltrated with 2-4 ml of 2% lignocaine solution. The superior border of pubic symphysis identified by palpation and SPC site was marked 2-4 cm above this border. After this, distended bladder was identified confirmed using palpation and percussion. A small 2-3 mm size midline incision was made into skin and linea alba. Supra Cath or Cystocath was held in right arm and advanced through skin into distended bladder with twisting and pushing motions directed down towards pelvis, maintaining a constant and controlled pressure. Once the entry of Supra Cath was confirmed into bladder by flow of urine, the trocar was removed, the catheter was pushed 5-8 cm into bladder and balloon inflated with 10cc of 0.9% normal saline to retain catheter inside bladder after obturator removal. An urobag was attached and gentle traction was applied on SPC catheter for about 5 minutes to ensure haemostasis and catheter was fixed to lower abdominal skin using 1-0

silk suture on cutting needle before gradually decompressing bladder and a small antiseptic dressing was also applied.



Figure 1: Supra Pubic Catheter with Trocar (Supra Cath® Plus, Romsons®, M/s Romdox, UK LTD.).

B. Ultrasound guided SPC (US-SPC)

In US-SPC, majority of steps were similar except that Ultrasound Machine was used to access bladder size, depth and to guide entry of Supra Cath into distended bladder. After informed consent, position, antibiotics prophylaxis, local area sterilization using 5% betadaine lotion and draping, the Supra Cath entry point 2-4 cm above pubic symphysis was marked (Figure 2). There are two techniques for scanning urinary bladder for US-SPC which includes transverse and longitudinal scans. In all cases, a preliminary assessment of urinary bladder was made using ultrasound and a real time US-SPC was done using Supra Cath. A continuous ultrasound imaging of bladder and trocar needle as it traversed the body structures allowed an optimal path before advancing Supra Cath into bladder. A prior ultrasound scanning of suprapubic area for bladder size, its depth from skin was highly ensuring. Echo-free or echo-poor bladder contents were identified in midline deep to lower anterior abdominal wall. Intervening bowel loops between bladder and abdominal wall were ruled out before marking SPC puncture site. The advancing bright echogenic trocar tip was seen piercing into subcutaneous space, linea alba, bladder wall and into its lumen (Figure 3). After, Supra Cath entered into bladder lumen, the trocar was removed, and catheter balloon was inflated with 10cc of 0.9% normal saline. The position of inflated balloon was confirmed by appearance of smooth, round, echogenic structure inside bladder lumen. As usual, the SPC catheter was fixed to skin using 1-0 silk suture, outlet attached to urobag and a small sterile dressing was applied.

In postoperatively, patients in both groups were kept under observation for atleast 24 hours to observe for any perioperative complication. If no complications, then patients were discharged after 24 hours and asked to

follow up in Urology Outpatient Department at 1 week, 2nd week and 4th week or till definitive management.



Figure 2: Position of ultrasound probe and direction of Supra Cath.

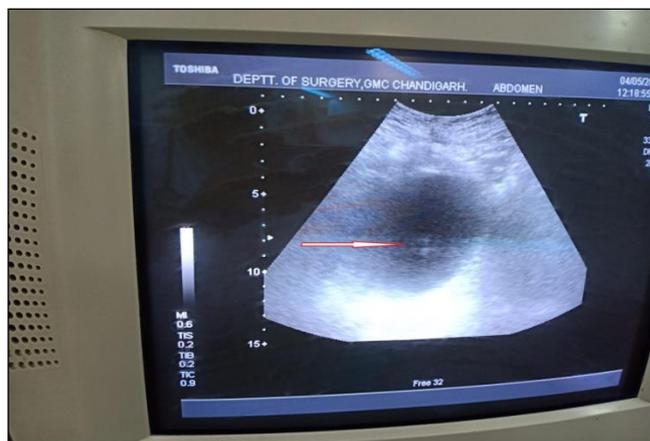


Figure 3: Showing supra Cath with trocar inside urinary bladder.

RESULTS

A total of sixty patients were eligible for this study. Out of 60 patients included in the study, equal number patients were allocated for convention 'blind' C-SPC group and ultrasound guided US-SPC groups after a standard urological evaluations.

Age of the patients

The mean age of patients in C-SPC group (Group-A) was 53.87 ± 21.418 compared to 54.33 ± 19.716 in US-SPC group (Group-B) and difference between two groups was not statistically significant (p- value -0.930).

Out of all 60 patients included in the study, almost all 59 (98.33%) patients were males except only 1(1.66%) female (Table-1).

Table 1: Various measured parameters of SPC.

Parameters	Groups	Number (N)	Mean value	Std. Deviation	p-value
Age of patients (in years)	C-SPC	30	53.87	21.418	0.930
	US-SPC	30	54.33	19.716	
Attempts to pass SPC	C-SPC	30	1.17	0.379	0.019
	US-SPC	30	1.00	0.000	
Operative-time (min)	C-SPC	30	2.68	0.914	0.266
	US-SPC	30	2.44	0.742	
Urine-drained (in ml)	C-SPC	30	748.17	161.931	0.987
	US-SPC	30	749.00	239.890	

Causes of urinary retention

In Group-A, 33.33% (10) patients had urethral stricture, 33.33% (10) BPH, 13%(4) urethral rupture, 3.33% (1) clot retention, 6.66% (2) neurogenic bladder, 3.33%(1) Foley’s retention and 6.66% (2) posttraumatic catheterization as cause for urinary retention, thus they underwent C-SPC procedures. However, in Group-B, 43.33% (13) patients had urethral stricture, 30% (9) BPH, 13.33% (4) urethral stone, 3.33% (1) urethral rupture and equal number of Foley’s retention and posttraumatic catheterization, urethral growth as cause for urinary retention, thus they underwent US-SPC procedures.

Attempts required for SPC procedure

Out of the 30 patients allocated to C-SPC group, 5(16.7%) patients with urinary retention required at least 2 attempts (numbers of trocar passes) for correct placement of Supra Cath into urinary bladder lumen. However, in us-SPC group, no patients required more than single attempt for correct placement of Supra Cath into urinary bladder lumen. Therefore, the use of ultrasound during SPC is leads to decreased numbers of trocar passes in the US-SPC procedures, although difference was not statistically significant (p- value - 0.019) (Figure 4).

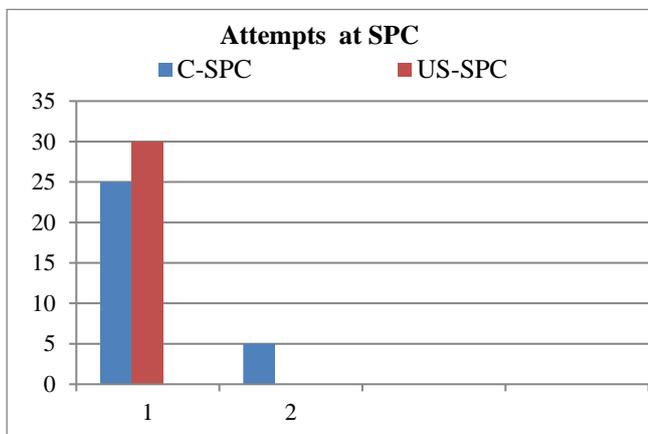


Figure 4: Number of attempts for SPC procedure in both groups.

Operative time for SPC procedure

Out of 30 patients allocated to C-SPC group, the mean time taken for this blind SPC was 2.68±0.914min compared to 2.44±0.742min in US-SPC group. Although, compared to C-SPC, the time taken for US-SPC was less but the difference between two groups was not statistically significant (p-value-0.266) (Table 1).

Amount of urine drained

Of the 60 patients included in the study, there was no difference in total urine output noted in both the group. Mean urine output in C-SPC group was 748.17± 161.931ml and in US-SPC group 749.00± 239.890 ml. Overall, the difference between two groups was not statistically significant (p-value-0.987) (Table-1).

Complications

Patients in both groups had some mild haematuria which stopped its own and urine became clear. Out of 30 patients allocated to C-SPC group, 5(16.7%) patients had perioperative complications in the form of catheter misplacement compare none in the patient allocated to US-SPC group.

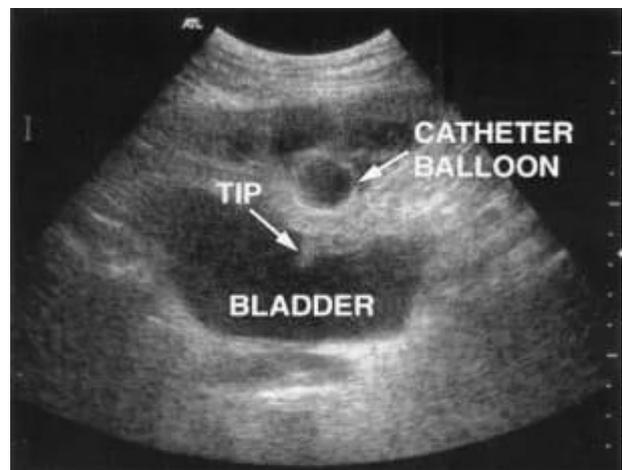


Figure 5: Misplaced SPC with balloon outside bladder.

In the postoperative period, 03 patients had no urine drainage in urobag, thus a repeat ultrasonography was done which revealed that these 03 patients had their catheter tip misplaced anterior to bladder wall with balloon also inflated outside bladder (Figure 5).

In another two patients, one had catheter tip misplaced into retro pubic space and second into the rectum. The reason for catheter tip misplacement in 03 patients was found to be initial partial distended bladder containing urine ≤ 150 ml and in the remaining 01 patient, the exact depth of Supra Cath penetration could not be appreciated due to obesity. The fifth had history of undergoing laparoscopic meshplasty for bilateral inguinal hernia. All five patients had their SPC revised under ultrasound and catheter tip as well inflated balloon was confirmed on ultrasound in the bladder.

DISCUSSION

In urology emergency, an initial attempt is made to provide relief to patients of urinary retention using per urethral catheterization (PUC) which is quick and easily available. However, when PUC is difficult or fails, then suprapubic catheterization is employed which is comfortable, superior and also least invasive with pending investigations.¹⁻³ PUC may be difficult in large BPH (benign prostatic hyperplasia), urethral stricture, urethral false-passages and in rupture of urethra.⁴

PUC may also be contraindicated in acute prostatitis, prostatic abscess and acute urethritis due to potential risk of bacteremia and septicemia. In these patients, probably the suprapubic catheterization is safest, which is a surgically created percutaneous connection between urinary bladder and exterior to relieve distended bladder

In our study, 33.33% (10) patients had urethral stricture, 33.33% (10) BPH, 13% (4) urethral rupture, 3.33% (1) clot retention, 6.66% (2) neurogenic bladder, 3.33% (1) Foley's retention and 6.66% (2) posttraumatic catheterization in C-SPC group compared to 43.33% (13) urethral stricture, 30% (9) BPH, 13.33% (4) urethral stone, 3.33% (1) urethral rupture and equal number of Foley's retention, posttraumatic catheterization and urethral growth in US-SPC group. However, in the study by Asante EKA et al, 47.08% (201) patients had BPH, 32.88% (141) urethral stricture, 7.69% (33) urethral injury, 6.29% (27) prostate cancer, 1.86% (8) neurogenic bladder, 1.63% (7) clot retention, 0.93% (4) post-prostatectomy bladder neck stenosis, 0.93% (4) meatal stenosis, 0.47% (2) recurrent UTI/severe urethritis and 0.3% (1) had cervix cancer.¹⁰ Therefore, the most common indications were almost similar to our study. Additionally, in our study, 01 patient had urethral growth and another 01 impacted urethral stone in the prostatic urethra which could not be repositioned in the bladder, thus SPC.

In our study, the mean time for both procedures and mean urine drainage was almost similar in both groups with no statistically significant difference. Although, the C-SPC was considered a safe procedure but published literature suggest that C-SPC has 10-25% complications rate with 1.8% mortality. Ahluwalia et al, audited their experience with suprapubic catheterization and reported about 10% intraoperative complication rate, which is lowest and catheter misplacement accounted for total of 6 cases.⁷ However, in our study perioperative complication rate was 16.7% (5), mostly misplaced catheter (p-value < 0.052). The low rate of perioperative morbidities in our study can be explained by the fact that our team had past experience of using ultrasound in urology patients.

In the study by Asante EKA et al, they reported that 8(1.86%) patients had urinary peritonitis, 1(0.23%) bladder dome perforation, 1(0.23%) posterior bladder wall perforation, 3(0.70%) small bowel perforation and 2(0.47%) misplaced catheter with total complication in 15(3.49%).¹⁰ Another largest published, to date, retrospective series of 157 patients study by Sheriff et al reported 10% complications with 2.7% incidence of bowel perforation with one fatal outcome.¹¹ However, in our study, we did not observe such complications which can be also explained by the fact that author were sufficiently experienced, thus easily identified bladder and bowel segment on advanced generation of ultrasound machine.

In the study by Cronin et al, in 583 patients, the minor complications occurred in 7.2% (42) patients with 19 cases of hemorrhage, 02 catheter malposition, 05 pain, 05 urinary tract infection, 11 urinary leak.¹²

Major complication occurred in 0.17% (1/583) patients in the form of bowel perforation, which required exploratory laparotomy and closure of bowel perforation. Although, we had 16.7% complications in C-SPC group but no major complication was encountered. In the study by Chiou RK et al, 56 patients underwent suprapubic catheterization using peel-away introducer with no complications and this procedure took 5-8 minutes.¹³ Hans Wolf et al, carried out 31 C-SPC over 03 years period by using trocar and balloon catheter with no serious complication but two attempts at SPC were unsuccessful with hemorrhage in four cases, which stopped after bladder irrigation.¹⁴

Muhammad et al, reviewed 07 years complications of ultrasound guided SPC and reported stoma bleeding and hematuria in 01 (0.7%) patient and 02 (1.5%) required revision of SPC due to catheter displacement.¹⁵ However, in our study, 05 (16.7%) patients developed complication in C-SPC group, which needed their SPC revision (p-value < 0.019) and only single attempt for SPC was successful in US-SPC group and no patients required SPC revision or developed complications such as hematuria or stoma bleeding.

CONCLUSION

As per best of our knowledge, our study is first to compare conventional 'blind' and ultrasound guided SPC and suggested that complications are more in patients undergoing conventional SPC. Ultrasound helps in identifying intervening structures between lower abdominal wall and bladder (e.g. small bowel segments), reduces number attempts to pass Supra Cath in the bladder and decreases failed SPC procedures and its complications. Therefore, it may be concluded that ultrasound guided SPC procedure is more safe, easy with decreased rate complications than conventional 'blind' SPC. Further, as ultrasound accurately guide puncture even in partially distend bladder, thus US-SPC should employ more frequently in urology emergency to decrease SPC failures and perioperative morbidities.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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