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Feasibility of urolithiasis management after studer neobladder urinary diversion: A multicenter center study

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ABSTRACT

Background: Stones formation is a common complication after cystectomy including stones of the upper urinary tract and reservoir or conduit. Advances in instrumentation and techniques have expanded treatment options, while minimizing morbidity. **Aims and Objectives:** Feasibility of urolithiasis management after urinary diversion surgery. **Materials and Methods:** Eleven patients of diversion with stone were observed from January 01, 2015, to July 30, 2022. Operative procedures were decided on basis on stone locations and size. Perioperative parameters were observed and compared with similar studies. Percutaneous nephrolithotomy, percutaneous-based antegrade ureteroscopy with semi-rigid or flexible ureteroscope, transurethral reservoir lithotripsy, percutaneous pouch lithotripsy, and open operation were performed. The operative finding and complications were retrospectively collected and analyzed. **Results:** The mean age of the patients was 53.2 ± 8.1 years and mean pre-operative stone diameter was 3.1 ± 3.5 cm. Three patients suprapubic cystolithotomy, two patients percutaneous cystolithotripsy, two patients percutaneous nephrolithitomy, two patients extracorporeal shock wave lithotripsy, one patient per urethral cystolithotripsy/cystolitholapexy, and one patient ureteroscopy/flexible ureteroscopy were done. The male-to-female ratio was 9/2. Stone-free rate was 100% after single session of treatment. In the post-operative period, fever was observed in two patients, and urinary leakage through wound site in one patient. **Conclusion:** Stone surgery after urinary diversion is challenging, success of treatment depends on experience of surgical team, pre-operative preparation, and correct instrumentations.

Key words: Urinary diversion; Neobladder; Urolithiasis; Surgical management; Feasibility

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INTRODUCTION

Bowel segments placement in the genitourinary tract leads to many long-term complications like metabolic complications, poor vitamins absorptions, gall stones, renal stones, and infections. The spectral range of these long-term complications depends on the type and length of segment used.[1]

Upper urinary tract stone formation as well as neobladder stone formation is one of the common long-term complications post-cystectomy. Similar stones were develop frequently in patients with neurogenic bladder secondary to spinal cord injury.[2]

Management of urolithiasis in urinary diversion patients is challenging for urologists. Ureteric orifices visualization and entry in the ureter through the pouch due to change in classical anatomy of ureteric orifices after surgery are the main problem. Therefore, in these patients, extracorporeal shock wave lithotripsy (ESWL), semi-rigid, or flexible retrograde ureteroscopic lithotripsy and antegrade ureteroscopy through percutaneous tract are choices of treatment in upper tract stone. Neobladder stone treatment options are suprapubic cystolithotomy (SPCL),

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percutaneous cystolithotripsy (PCCL), and endoscopic per urethral cystolithotripsy/cystolitholapexy (PUCL).[2-4]

In our study, we have shared our experiences and feasibility of urolithiasis management in post-cystectomy neobladder patients.

Aims and objectives

Feasibility of stone management after urinary diversion surgery.

MATERIALS AND METHODS

This study was a retrospective observational study. It was conducted in multiple centers with tertiary care urology facility in India, from January 01, 2015, to July 30, 2022. Declarations of Helsinki were followed in this study. Informed consent for their participation was taken from the patients. The Institutional Ethical Committee approval (IEC/2022/8469 on August 30, 2022) was taken before embark this study.

Inclusion criteria

The following criteria were included in the study:

1. Stone present in urinary tract post cystectomy with studer neobladder
2. Functional renal units.

Exclusion criteria

The following criteria were excluded from the study:

1. Uncorrected coagulopathy
2. Pyonephrosis or urosepsis
3. Patient not fit for surgery.

All the patients as per the inclusion and exclusion criteria, after explaining about the study and getting written informed consent from the patient for participating in the study and publishing the data selected. The procedures adhered to the ethical guidelines of Declaration of Helsinki and its amendments. Pre-operative evaluation included detailed medical history, physical examination, and hematological investigations. Patients with positive urine cultures were given intravenous antibiotics preoperatively for 5 days. Intravenous urography or computerized tomography for assessment of stone size, site, and anatomy of pelvicalyceal system was done to plan optimal access of calculi. The size of the stone was measured by analyzing the stones longest diameter.

Depends on stone locations and stone size in neobladder procedure were chosen if stone was up to 2 cm PUCL, 2–4 cm stone size PCCL (Figures 1 and 2), and >4 cm size stone and multiple stones SPCL was performed (Figures 3 and 4).

Stone in ureter treated by semi rigid ureteroscopy/flexible ureteroscopy (URSL) or ESWL, kidney stone treated by ESWL, or percutaneous nephrolithotomy (PCNL).

Figure 1: Multiple medium size neobladder stones on X-ray KUB

Figure 2: Stone removed by percutaneous cystolithotripsy surgery

Figure 3: Large neobladder multiple stones on X-ray KUB

All procedures performed by highly expert surgical team in tertiary care centers with highly equipped operation theaters where all advanced facility for stone intervention were available.

Surgical procedures

PCNL

a. Patients with renal stone first retrograde catheterization were tried if it is possible then fixed it by urinary Foleys catheter. Patient shifted to prone position, dye injected fluoroscopy guided desired calyx puncture, and dilatation done according to size of stone, fragmentation, and stone retrieval done using nephroscope DJ stent inserted.
b. If retrograde catheterization not possible then catheter inserted, prone position taken, ultrasonography-guided puncture, and dilatation done remaining steps same previously as discussed.

Retrograde URS

In ureteric stone, first ureteroscope was tried to insert in ureter if successful then stone fragmented and extracted then DJ stenting done.

ESWL

Small stone (<1 cm) and soft stone in ureter and kidney (<1000 HU) stone fragmentation using ESWL was done.

Suprapubic cystolithotomy (SPCL)

Very large stones in neobladder deal by skin incision then opening of bladder stone delivered out, bladder closure by Vicryl and skin closure done by ethilon.

PCCL

Medium size stone in bladder dealt with this method, stone fragmentation done by percutaneous route access using cystoscopy guidance nephroscope used for stone fragmentation, and extraction then bladder and skin closed.

Transurethral cystolithotripsy/cystolitholapaxy

Small size stone either fragmented or crushed using lithotripter or stone punch. After stone removal in patient of PCNL and retrograde URS, DJ stent was inserted for 1 month. In SPCL and PCCL, catheter inserted for 2 weeks. Operative time, hospital stay, complications, and success rate complications were observed.

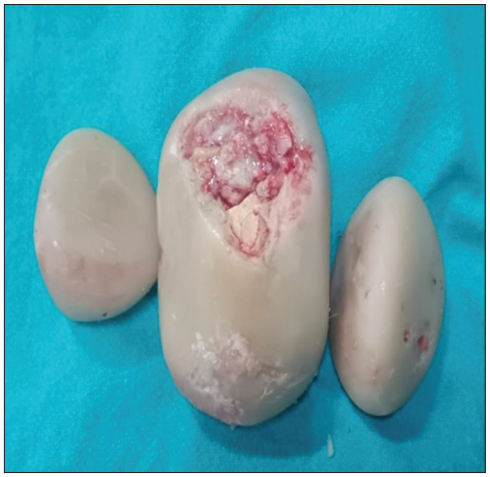

Figure 4: Stone removal after open suprapubic cystolithotomy operation surgery

Follow-up

Measures of stone recurrence such as timed voiding, complete emptying of reservoir, correction of infection by antibiotics, and correction of metabolic abnormality taught to patients.

Statistical analysis

All statistical analyses were performed with SPSS 24.0 (IBM Corp., Chicago) for Windows. The mean ± SD was used for parametric data and the median and minimum-maximum values were used for non-parametric data.

RESULTS

Total number of patients were 11 in our study. The male-to-female ratio was 9/2. The mean age of the patients was 53.2±8.1 (32–69) years. Common comorbidity detected preoperatively was diabetes and hypertension which were seen in four and three patients, respectively (Table 1). The most common location of stone was neobladder pouch in six patients, two patients ureteric stone, and three patients kidney stone were present.

SPCL in three patients, PCCL in two patients, PCNL in two patients, ESWL in two patients, PUCL in one patient, and URSL in one patient were performed. In PNL patients, one patient fluoroscopic guided access obtained after retrograde access, in other patient retrograde access not possible, so USG-guided access was obtained. Mean hospital stay was 72 h. Complete stone clearance was seen in all patients. Overall success rate was 100%.

Complications of surgery were febrile UTI and urinary leak from wound site present, respectively, two and one patient. Fever subsides after 3 days of antibiotics use and urine leak from wound site stop after prolong Foleys catheter insertion for 3 weeks.

Table 1: Patients characteristics

Total number of patients	11
Male	9
Female	2
Most common location of stone	Bladder
Co morbidity	
Diabetes	4
Hypertension	3
Mean age	53±8.1
Most common surgery	Suprapubic cystolithotomy
Most common complication	Fever
Mean hospital stay	72 h

Table 2: Comparison with other studies

Study	Diversion type/ configuration	Number of patients	Stone location	Other features	Success rate	Complications
Breda et al.[13]	Not recorded	74	Reservoir	Percutaneous access with fluoroscopy,	95%	12% minor post-operative Complications
Lam et al.[14]	Bladder augmentation: 6, appendicovesicostomy: 1 Indiana pouch: 1	8	Ureters: 2 Reservoir: 6	Laparoscopic with endourology combine	100%	No intra/ post-operative complications
El-Assmy et al.[15]	Ileal W neobladder: 11, Bricker conduit: 8, Kock pouch: 6, rectal bladder: 2	27	Kidneys: 21 Ureter: 3	Repeated ESWL, PNL.	81.5%	7.4% minor post-operative complications
El-Nahas et al.[8]	Ileal neobladder: 10, ileal conduit: 4, hemi-Kock pouch: 7, rectal: 3	24	Kidneys: 20 Ureters: 4	Percutaneous management of large burden kidney and ureteric stones	87.5%	12.5% complication rate
Paez et al.[16]	Not recorded	12	Reservoir: 12	Ultrasound-guided percutaneous access	58%	Five (42%) stone recurrences with the mean time to recurrence of 18 months
Our study	Studer neobladder	11	Neobladder 6 ureteric-2, kidney-3	Percutaneus, endoscopic open	100	27.2% minor complication rate

DISCUSSION

Urolithiasis is the most common long-term complication with prevalence of 2.6–15.3% in patients with urinary diversion. Main causes of urolithiasis are chronic infection, metabolic causes, mechanical, and structural changes in urinary tract. It leads to stasis at upper urinary tract results in secondary hydronephrosis and anatomical structural changes.[5-7] Mucus production from intestinal mucosa causes urine stasis and retention of urine which leads to stones formation. Secondary metabolic changes are metabolic acidosis, hypercalciuria, hyperoxaluria, and hypocitraturia which lead to calcium stone formation. Cause of struvite stone formation is secondary to chronic infection. It is commonest stone after urinary diversion surgery.[8-10]

Retrograde ureteroscopy was technically challenging in patients after urinary diversion, as it was hard to get through the neoureteral orifice in reservoir. In the study from Delvecchio et al.,[11] antegrade advancement of guide wire into neobladder, and a subsequent retrograde approach to upper urinary tract stones with flexible ureteroscopy was feasible. However, the time consuming procedure and the need for patients' position changing did not demonstrate significant advantage when compared to the antegrade flexible ureteroscopy. In addition, sometimes, the passage of guide wire through an impacted ureteral stone was impossible. Percutaneous based antegrade ureteroscopy provided an alternative approach for management of ureteral stones. It was possible to inspect the renal pelvis and upper ureter up to L4 through a middle pole percutaneous access with semi-rigid ureteroscope. Furthermore, in the present study, the antegrade flexible ureteroscopy could get to the distal ureter. The management of reservoir stone differed depending on the urinary diversion type, stone location, and burden. A transurethral approach in patients with orthotropic urinary diversion, or a transstoma approach in patients with continent diversion, seemed to be ideal. However, excessive torque during the operation might damage the stomal continence mechanism, and also risking in stomal stenosis in a long term.[12] This approach was therefore only recommended in patients with minor stone burden. Percutaneous pouch lithotripsy has been recommended in the previous studies. The new generation ultrasonic lithotripter was powerful enough in stone fragmentation and provided stone fragments suction out simultaneously, making the stone extraction procedures much more efficient. However, it was still time consuming for stones with large stone burden. In the other hand, the potential reservoir outlet obstruction required further management rather than an endourological procedure. Open operation for stone extraction and reservoir re-establishment could be performed in some cases, but with great challenge since the tissue scar and adhesion.[11]

We have compared our study with similar studies (As shown in Table 2) of urolithiasis in urinary diversion patients.

Limitations of our study

1. Study was retrospective in nature
2. No control group was present
3. Data on recurrence of stone not available
4. Metabolic work up data not available.

CONCLUSION

Management of urolithiasis after studer neobladder urinary diversion depends on size, location of stone, and feasibility of entry in ureteric orifice. Success of urolithiasis management had many factors such as correct pre-operative surgical preparation, instrument preparation, as well as surgical team experience. Advancement of endourology instruments and techniques significantly reduces the morbidity.

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Authors' Contributions:
PP- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **AK**- Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **PL**- Design of study, statistical analysis and interpretation; **AD**- Review manuscript; **APST**- Review manuscript; **FSS**- Literature survey and preparation of figures, coordination and manuscript revision.

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