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Surgical Technique

Safety and efficacy of Mini-Percutaneous Nephrolithotomy in the treatment of large impacted Proximal Ureteral Stones

Introduction

The management of large, impacted upper ureteric calculi remains challenging for urologists. Various treatment options include extracorporeal shock wave lithotripsy (ESWL), ureterorenoscopic lithotripsy (URSL), percutaneous nephrolithotripsy (PCNL), laparoscopic and open ureterolithotomy. ESWL has poor overall success rate in the treatment of large stones with a significant possibility of residual fragments. Semi-rigid or flexible ureterorenoscopy with Holmium: YAG laser lithotripsy (URSL) has a stone-free rate of 89-100% in managing proximal ureteral calculi [1-7]. However, large and impacted proximal ureteral stones are difficult to approach. PCNL was introduced as an alternative treatment for large renal and proximal ureteric stones and achieved success in the 1980s [8]. The modified version of PCNL using a miniature endoscope by way of a small access tract, can be routinely performed to manage stones in the kidney and proximal

ureter [9]. PCNL has been widely accepted as the treatment of choice for renal stones since the 1980s and is shown to have a higher success rate compared to other minimally invasive procedures, thus became the gold standard treatment for complex and large renal stones. However, bleeding and fever are the common complications. Laparoscopic ureterolithotomy [10,11], is associated with a shorter period of convalescence when compared to an open procedure, but is associated with a higher learning curve. Open ureterolithotomy is indicated for failure of all minimally invasive modalities, in presence of a concomitant open procedure, and the presence of large impacted stone where patients don't consent for multiple procedures [12].

So, to evaluate the efficacy and safety of mini-PCNL in impacted proximal ureteral calculi, we started this hospital based study (2014-2018) to use mini-PCNL (14F semi-rigid nephroscope via a 16-Fr percutaneous tract) for the treatment of large (≥15mm) impacted proximal ureteral calculi (from PUJ to lower border of L4 vertebra).

Material and Methods

After obtaining the ethical clearance, this study was conducted in the Postgraduate Department of Surgery, Government Medical College, Srinagar (December 2014 to January 2018). The study comprised of 60 patients with large (>15mm), impacted (diagnosed when there was failure to visualize the ureter distal to a stone with proximal hold up of contrast material as long as 3 hours of excretory urography or stone remaining at the same site in the ureter for more than 2 months or inability to pass guide-wire beyond the stone at initial attempts), upper ureteral (from PUJ to lower border of L4) stones.

Each patient/attendant(s) was fully explained the nature of procedure and the possible inherent complications associated with the procedure. Informed consent was taken from patients/attendants before procedure. The patients/attendants were explained for the possible need of tube thoracostomy and consent was taken pre-operatively for same.

The inclusion criteria were: (1) stones located between the pelviureteric junction and the upper border of the 4th lumbar vertebra, (2) upper ureteral stone ≥15 mm in largest diameter by plain film/ultrasound (3) with split glomerular filtration rate of the affected kidney ≥20 ml/min and (4) patients with a stone diameter ≥12 mm with previous history of abdominal surgery or repeated sessions of ESWL treatment were also included. Exclusion criteria were uncorrected coagulopathy, pyonephrosis, or glomerular filtration rate < 20 ml/min. Preoperatively, patients were evaluated by a urine routine test, urine culture and sensitivity test, plain radiography of kidneys, ureters and bladder (KUB), and intravenous urography. Ultrasonography or unenhanced helical computed tomography for the degree of hydronephrosis, computed tomography

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urography (CTU) and radionuclide imaging were also performed if necessary. Antibiotics were administered prophylactically to all patients with WBC-positive urine. Calculus clearance was assessed on postoperative day 2 with a plain film of KUB. 'Stone-free' was defined as no residual stones or fragments ≤ 3 mm detected on KUB, as fragments ≤ 3 mm have a likelihood of passing spontaneously. The operative time was calculated from performing the puncture to placing of the nephrostomy, which is also called skin-to-skin time. The time from insertion of the ureteric catheter to the turn in the prone position was not included (Figure 1,2).

Operative technique of mini-percutaneous nephrolithotripsy (mini-PCNL)

Under general anaesthesia, patient was placed in dorsal lithotomy position. Cystoscopically, the retrograde ureteric catheterization (5F) is done over a guide-wire and position confirmed under fluoroscopy. This ureteric catheter is used to perform real-time fluoroscopic contrast and/or air-pyelography; which helps in making the puncture accurately into the intended calyx. After confirming the position of ureteric catheter, the indwelling catheterization is done and both the ureteric catheter and ID catheter are tied and secured over postero-lateral aspect of opposite thigh. The patient is now positioned in "Swimmer's" prone position and the C-arm adjusted and fixed. In prone position, the puncture is made by using a 16 cm long (18G) puncture needle by Bull's eye technique. This is also called as 'eye of the needle' or 'end-on technique'. In patients where ureteric catheter could not be negotiated, ultrasonography (USG) - guided puncture is made. The position of the needle is confirmed, in the pelvicalyceal system, by observing free flow of normal saline through the puncture needle injected from below. After the successful puncture is made, a 0.035" Turemo guide-wire is introduced into the pelvicalyceal system and if possible into the corresponding ureter and thus urinary bladder. The puncture needle is removed and the tract is dilated over a 0.035" hydrophilic Turemo guide-wire using a 14F fascial screw dilator mounted over by a 16F Amplatz sheath. The mounted Amplatz sheath is then introduced through the dilated tract into the PCS under C-arm guidance. The 14F semi-rigid nephroscope is introduce and the stone(s) visualized. The stones, once identified are fragmented using a Swiss Lithoclast for lithotripsy, most stone fragments (< 4 mm) could be flushed out, by infusion of normal saline irrigation, along with the backflow through the Amplatz sheath, while the remaining big fragments are extracted with stone forceps. Once complete intra-operative, i.e, nephroscopic and C-arm clearance is achieved, a 5F DJ stent is then placed in. Nephrostomy tube is placed in, when required. In the immediate post-operative period, the X-ray chest is done to rule out any possibility of pneumothorax/hydrothorax/hemothorax. At the same time X-ray KUB is done to look for DJ stent position and residual stone fragments, if visualized.

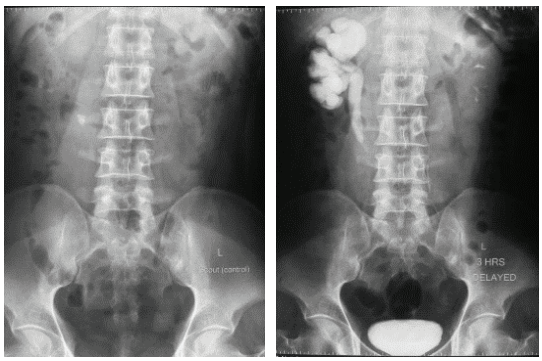

Figure 1: Preoperative KUB/ IVP.

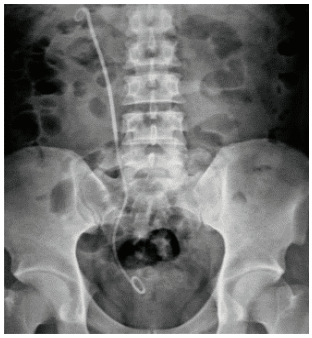

Figure 2: Postoperative KUB with DJ STENT INSITU.

Follow-up: Patients with residual fragments in both the groups were followed up for a period of four weeks with X-ray-KUB for assessment of residual stones. The patient was deemed stone free when there was complete clearance of all stone fragments or the presence of fragments < 3 mm, seen on non-contrast CT scan). The procedure was defined as unsuccessful when the procedure was converted into some alternative treatment modality, or the stone could not be reached or fragmented in a single sitting, or fragments >3mm were seen on non-contrast CT scan at 1 month follow-up.

Statistical Analysis: The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were summarized in the form of means and standard deviations and categorical variables were summarized as percentages.

Results

All patients were treated with one session of percutaneous surgery. Among these 60 patients none required second puncture. Demographically, the mean age of patients was 38.5±9.31 years and range of 22-58, male to female ratio was 40:20, the disease laterality (right:left) was 48:12 and mean stone size was17.6±2.11 mm (Table 1). None of the patients had previous history of ESWL.

The mean operative time was 62±2.11 minutes. The mean hospital stay 2.8±1.08 days. At discharge from the hospital, stone free rates were 86.7% and at 1 month follow-up, the stone free rates were 96.7% (Table 2). Thus the overall success rate was 96.7% (58/60). In our study, the overall complication rate was 25%; with 5 patients (8.33%) developing post-operative fever and 4 patients (13.3%) had prolonged hematuria, 1

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patient required (350ml of blood) blood transfusion in the post-operative period. Four patients (i.e, 6.67%), in our study, developed thoracic complications (Table 2). One patient developed pneumothorax and three hydrothorax. All required intercostal tube thoracostomy. Two patients (3.33%) had stone/fragment(s) migration (Table 2) and all patients required auxiliary procedures (Table 2). The mean analgesia requirement (in the form of injectable tramadol) was found to be100 + 40.45 mg (Table 2). At 1 month follow-up, patients with residual fragments were re-assessed. 1 patient had residual stone/fragment(s) more than 3 mm. Two patient with persistant distal ureteral fragments (>7 mm in size) were cleared with URSL. Therefore, in our study, the rate of auxilliary procedures was 3.3%, i.e, was required in both patient (Table 2). No loss of follow-up was noted.

Discussion

Ureteric calculi is a common entity encountered in urology clinics. With increasing size and degree of impaction, ureteric calculi pose a serious threat to the function of the kidney on the affected side and, thus, the health of the patient. Therefore, timely effective treatment is the key to preventing irreversible damage.

Technical achievements have revolutionized the methodology for the removal of ureteral stones. Open ureterolithotomy, once used to be the standard treatment for impacted, upper ureteric stones, however, with the advent of lithotriptors, endourology and laparoscopy, less invasive procedures are preferred. Both PCNL and retrograde ureteroscopy are accepted treatment modalities for large, impacted, proximal ureteric calculi. ESWL has proved to be safe and relatively effective for treating upper ureteral stones. Many centers state in their studies ESWL as first-line treatment for ureteral stones.

Although traditional PCNL has many advantages, such as clear vision, high stone clearance rate and short operation time, the indications were strictly limited for a number of serious complications [13]. Besides, the usual 26- to 34-Fr tract size of standard PCNL may be too large to be used in pediatric kidneys and in some adult undilated kidneys. Some urologists have modified the technique of standard PCNL by performing it with a miniature endoscope via a small percutaneous tract (11- to 20-Fr) and termed it as minimally invasive PCNL or mini-PCNL, making the treatment of upper ureteral stones with mini-PCNL a potential option.

A longer mean operative time, longer mean hospital stay and higher stone clearance rate in antegrade than in retrograde approach for large, impacted, upper ureteric stones has been reported previously [14-16]. In our study, a significantly longer mean operative time was seen (Table2). In our study, the mean hospital stay was significantly longer (Table2).

The main aim of stone operation is to get a high stone clearance rate, so it is important to deal with the stone fragments effectively. Clinically insignificant residual fragments (CIRFs) after PCNL remains a major concern, e.g. Skolarikos and Papatsoris [17], believed that if CIRFs were left untreated, approximately half of the patients would experience a stone-related event for which more than a half would also need a secondary surgical intervention. In our study, at discharge from the hospital, stone free rates was 86.7% and at 1 month follow-up, the stone free rates were 96.7%, i.e, 6 patients had a successful spontaneous passage of residual fragments. A significantly higher success rate (96.7%) was noted in our study. Similar comparisons were observed in various previous studies [15,18]. Fever and hematuria are known complications of the procedure [14,15,19]. In our study, a higher number of patients developed post-operative fever and prolonged hematuria (8.33% and 6.67% respectively). One patient required blood transfusion. Supracostal approach is known to lead to thoracic complications ranging from 5 to 25% [20-23] . Two patients in our study, with supracostal approach, developed thoracic complications. One patient developed pneumothorax and three had hydrothorax. All the patients were diagnosed peri-operatively and all required tube thoracostomy. In our study, the stone/fragment(s) migration was 3.33% and required auxiliary procedure in the form of ureteroscopic removal of the fragments.The overall complication rate of mini-PCNL was 25%. We did not experience any major complications such as hemorrhage necessitating transfusion/embolization/or nephrectomy, urinary leakage, visceral injuries or sepsis.

The mean analgesic requirement (in the form of injectable tramadol) was found to be on higher side (100+40 mg), which signifies that the post-operative pain is significantly more.

Table 1: Demographic characteristics

Mean age (yrs) (Range)	38.5+9.31 (22-58)
Male to Female ratio	40:20
Disease laterality (R/L ratio)	48:12
Mean stone size (mm)	17.6+2.11

Mini-PCNL → mini-percutaneous nephrolithotripsy; R/L ratio → right to left

Table 2: Treatment Results and Complications

VARIABLES	RESULTS
Mean operative time (mins)	*62+9.62*
Mean hospital stay (days)	*2.8+1.08*
Success rate	*96.7%*
Stone free rate on discharge	*86.7%*
Stone free rate at 1 month	*96.7%*
Overall Complication rate	*25%*
1. Fever 2. Prolonged hematuria 3. Stone migration 4. Thoracic complications	*1.) 8.33%* *2.) 6.67%* *3.) 3.33%* *4.) 6.67%*
Ureteral injury	-
Analgesia requirement (mg)	*100+40.45*
Auxilairy procedures	*3.33%*
Retreatment	-

Mini-PCNL → mini-percutaneous nephrolithotripsy

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More pain and analgesia requirement in antegrade than in retrograde approach for impacted, upper ureteric calculi has been reported [18].

Our experiences are the following: (a) A thorough preoperative examination can effectively reduce the chance of sepsis. (b) Percutaneous renal access was carried out by a skillful surgeon; when there is difficulty with the puncture, combined ultrasound guidance and fluoroscopic guidance may be useful. (c) Skilled teamwork is greatly helpful in shortening the operative time, which can in turn reduce the complications of a longer operation time associated with both septic shock and severe renal bleeding [24].

Conclusion

In conclusion, mini-PCNL is a safe and more effective method for the management of large (>15 mm), impacted, upper ureteral stones with a higher success rate and stone free rate. Mini-PCNL greatly reduces the complications of PCNL. Though the primary treatment of impacted proximal ureteral calculi is still controversial, mini-PCNL provides another option for urologists.

References

1. Scarpa RM, DeLisa A, Porru D, Usai E (1999) Holmium: YAGlaser ureterolithotripsy. Eur Urol. 35: 233. Link: https://goo.gl/MM1C1q
2. Dretler SP (2006) Prevention of retrograde stone migration during ureteroscopy. Nat Clin Pract Urol. 3: 60-61. Link: https://goo.gl/JBURah
3. Salem HK (2009) A prospective randomized study comparingshock wave lithotripsy and semirigid ureteroscopy for the management of upper ureteral calculi. Urology. 74: 1216–1221. Link: https://goo.gl/HwGLHG
4. Preminger GM, Tiselius H, Assimos DG (2007) guideline for the management of ureteral calculi. Eur Urol. 52: 1610–1631. Link: https://goo.gl/eiYJv4
5. Lam JS, Greene TD, Gupta M (2002) Treatment of proximalureteral calculi: holmium:YAG laser ureterolithotripsy versus extracorporeal shock wave lithotripsy. J Urol. 167: 1972–1976. Link: https://goo.gl/wT8Ayf
6. Preminger GM, Tiselius HG, Assimos DG (2007) guideline for the management of ureteral calculi. J Urol. 178: 2418–2434. Link: https://goo.gl/Et5exK
7. Araki M, Wong C (2007) Direct comparison of fiberoptic anddigital ureteroscopy for upper urinary tract lithotripsy. J Urol. 4:1826. Link: https://goo.gl/HYPnZL
8. Nahas AR, Eraky I, el-Assmy AM (2006) Percutaneous treatment of large upper tract stones after urinary diversion. Urology. 68: 500–504. Link: https://goo.gl/EEXJUF
9. Li X, He Z, Wu K (2009) Chinese minimally invasive percutaneous nephrolithotomy: the Guangzhou experience. J Endourol. 23: 1693–1697. Link: https://goo.gl/rK8MJC
10. Wickaham JEA (1979) The surgical treatment of renal lithiasis. In: Urinary Calculus Disease. New York: Churchill Livingstone. 145-198. Link: https://goo.gl/QeMTdz
11. Raboy A, Ferzli GS, Laffreda R (1992) Laparoscopic ureterolithotomy. Urology. 39: 223-25. Link: https://goo.gl/N7qD4g
12. Ather MH, Paryani J, Memon A, Sulaiman MN (2001) A 10-year experience of managing ureteral calculi: changing trends towards endourological intervention? Is there a role for open surgery? Br J Urol. 88: 173-7. Link: https://goo.gl/t6htLJ
13. Amer T, Ahmed K, Bultitude M (2012) Standard versus tubeless percutaneous nephrolithotomy: a systematic review. Urol Int. 88:373–382. Link: https://goo.gl/ayYDij
14. Gu Xiao-jian, Lu Jian Lin, Xu Yan (2013) Treatment of large impacted proximal ureteral stones: randomized comparison of minimally invasive percutaneous antegrade ureterolithotripsy versus retrograde ureterolithotripsy. World Journal of Urology. 31:1605-1610. Link: https://goo.gl/2x4kEo
15. Bozkurt I H, Yonguc T, Arslan B (2015) "Minimally invasive surgical treatment for large impacted upper ureteral stones: ureteroscopic lithotripsy or percutaneous nephrolithotomy?" Canadian Urological Association Journal. 9:3-4. Link: https://goo.gl/z6ta7Z
16. Stavros Sfoungaristos, Ioannis Mykoniatis, Ayman Isid, Ofer N (2016) Gofrit, Shilo Rosenberg, Guy Hidas et al. Retrograde versus Antegrade Approach for the Management of Large Proximal Ureteral Stones. Bio Med Research International. 2016:1-4. Link: https://goo.gl/3c9uJw
17. Skolarikos A, Papatsoris AG (2009) Diagnosis and management of postpercutaneous nephrolithotomy residual stone fragments. J Endourol. 23:1751–1755. Link: https://goo.gl/osevWy
18. Moufid K, Abbaka N, Touiti D (2013) Large impacted upper ureteral calculi: A comparative study between retrograde ureterolithotripsy and percutaneous antegrade ureterolithotripsy in the modified lateral position. Urol Ann. 5:140–6. Link: https://goo.gl/ZLoLau
19. Sun X, Xia S, Lu J (2008) Treatment of large impacted proksimal ureteral stones: Randomized comparison of percutenous antegrade ureterolithotripsy versus retrograde ureterolithotripsy. J Endourol. 22: 913–7. Link: https://goo.gl/LPBdSg
20. Lojanapiwat B, Prasopsuk S (2006) Upper pole access for percutaneous nephrolithotomy. Comparison of supracostal and infracostal approaches. J Endourol. 20: 391–395. Link: https://goo.gl/7NeE12
21. Yadav R, Aron M, Gupta NP, Hemal AK, Seth A, et al. (2006) Safety of supracostal punctures for percutaneous renal surgery International journal of urology. 13:1267–1270. Link: https://goo.gl/DjGmmq
22. Mousavi-Bahar SH, Mehrabi S, Moslemi MK (2011) The safety and efficacy of PCNL with supracostal approach in the treatment of renal stones. Int Urol Nephrol. 43:983-98. Link: https://goo.gl/g2kqrN
23. Tarek El-Karamany (2012) A supracostal approach for percutaneous nephrolithotomy of staghorn calculi: A prospective study and review of previous reports. Arab Journal of Urology. 10:358-366. Link: https://goo.gl/BDG5A3
24. Wang Y, Jiang F, Hou Y (2012) Post-percutaneous nephrolithotomy septic shock and severe hemorrhage: a study of risk factors. Urol Int. 88:307–310. Link: https://goo.gl/bGpVBb

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