

ORIGINAL ARTICLE

EARLY EXPERIENCE OF PNEUMATIC LITHOCLAST FOR THE MANAGEMENT OF URETERIC STONES AT PESHAWAR

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Background: Pakistan lies in the Afro-Asia stone belt. Ureteric calculi are common occurrence and a major burden on health care facilities in Pakistan. The objective of this study was to assess the efficacy and safety of pneumatic lithoclast in the management of ureteric calculi. **Methods:** Case series study Department of Urology at Institute of Kidney Diseases Hayatabad Peshawar, from 1st Oct 2010 to 1st Oct 2011. One-hundred adult patients with ureteric calculi ≥ 0.7 cm were evaluated by history, physical examination, routine blood and urine examination after taking their written informed consent and approval of ethical committee. Ultrasound and X-ray KUB were done with IVU if required. All patients underwent ureteroscopy within intracorporeal lithotripsy and JJ stenting. Patients were followed up with post-op X-ray KUB at 24 hours and then weekly intervals till they became stone free. Following parameters were assessed: stone size, site, laterality, degree of fragmentation, success rate, stone migration and complications. Inability to reach the calculus with URS, proximal migration of stone or requirement of another/auxiliary procedure was considered failure. **Results:** One hundred and ten patients were enrolled with a mean age of 38 ± 10 years. There were 72 males and 28 females. Fifty-eight calculi were on right and 42 on left side. 24, 24 and 52 stones were in upper, middle and lower ureter respectively. Forty stones measured 7–10 mm, 52 measured 11–15 mm and 8 measured 16–20 mm in size. 98 stones were broken while 2 calculi migrated proximally. Overall success rate was 90% (Efficiency Quotient =78.95). Success rate in upper, middle and lower ureter was 83.3%, 83.3% and 96.1% respectively. 10 and 2 patients required ESWL and open ureterolithotomy, respectively, as additional treatment. Mean operative time was 33.5 minutes. There were no major complications. **Conclusions:** Pneumatic lithoclast with URS is effective and safe in the management of the ureteric calculi with some limitations in the upper ureter.

Keywords: Ureteric stones; Ureterorenoscopy; Pneumatic Lithoclast.

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INTRODUCTION

Urinary stone disease is a major burden on healthcare facilities in Pakistan.¹ 88.6% of the cases of stone disease are ureteric stones.² Various modalities available for the management of ureteric stones are expectant treatment, open or laparoscopic ureterolithotomy, extracorporeal shockwave lithotripsy (ESWL) and ureteroscopy (URS) with intracorporeal lithotripsy (ICL).³ The success of expectant treatment is inversely proportional to the size of the stone.⁴

The active interventional strategies for ureteric stones are trending towards less invasive forms of therapy such as ESWL and URS plus ICL. In comparison to other modalities, URS with ICL gives better success rates ranging from 76.9-100%.^{2,4-7} The procedure, however can also face failures in the form of inability to reach the stone, inability to fragment stone, upward migration of stone and failure to pass stone fragments.⁸

Like other surgical procedures, URS plus ICL has complications too. The most fearsome complication is avulsion of the ureter followed by ureteric perforation and per-operative bleeding

obscuring vision, whereas the post-operative complications include loin pain, fever and haematuria.^{7,8}

The Institute of Kidney Diseases Peshawar is a new hope for people in our locality, and research work on this matter would certainly help us in formulating and adapting clear-cut guidelines for the management of ureteric stones as studies on the topic in question are virtually non-existing in Khyber Pakhtunkhwa. Hence this study was done to evaluate the efficacy of ureteroscopic lithotripsy in the treatment of ureteric stones at our institute.

MATERIAL AND METHODS

This cross-sectional study was conducted in Urology department at Institute of Kidney Diseases Hayatabad Peshawar. One hundred and ten patients with ureteric calculi measuring ≥ 0.7 cm (in the largest diameter) from 1st Oct 2010 to 1st Oct 2011 were included in the study on consecutive non probability sampling technique. Patients were evaluated by history, physical examination, routine blood, urine examination and serum creatinine after their written informed consent and prior approval of ethical committee. Ultrasound and X-ray KUB were done on

all patients. The Intravenous Urogram (IVU) was done for radiolucent stones or where renal function was in question. All patients were operated under spinal or general anaesthesia in lithotomy position by the same urologist. All patients received intravenous antibiotics at induction. An 8 Fr semi-rigid ureteroscope (Karl-Storz Germany) with 4Fr working channel was used. Hand held pneumatic lithoclast (Having a small disposable cylinder with compressed CO₂) with 0.8 mm lithoclast probe was used for fragmentation. The aim was to break the stone in <4 mm fragments which can pass spontaneously. After completion of the procedure, ureter was stented with 6Fr Cook JJ stent in all cases. A plain X-ray was done after 24 hours to assess the fragmentation of stones and position of JJ stent which was kept for a minimum of two weeks. Patients were followed up at weekly intervals till they became stone free. Following parameters were assessed: stone size, site, and laterality, degree of fragmentation, success rate, stone migration and complications. Inability to reach the calculus with URS, proximal migration of stone or requirement of another/auxiliary procedure was considered failure.

RESULTS

One-hundred (100) patients were treated. Mean age of the patients was 38±10 years. There were 72 males and 28 females. Out of total patients, 58 patients had calculi on right and 42 on left side. Amongst those, 24 stones were in upper ureter, 24 in the middle ureter and 52 stones in lower ureter. Mean stone size was 13.5 mm (7–20 mm). Forty stones were 7–10 mm, 52 were 11–15 mm and 8 were 16–20 mm in size. Two patients had no hydronephrosis while 38, 44 and 16 had mild, moderate and severe hydronephrosis respectively. General anaesthesia was given to 78 patients while 22 patients were operated under spinal anaesthesia. All the stones were reached easily and 98 stones were broken while 2 calculi in upper ureter migrated to the kidney during the procedure, which were later on treated with ESWL. Eight patients had fragments larger than 4 mm so ESWL was also done for later on. 6Fr Double J stent was passed in all cases. Overall success rate was 90%. Whereas success rate in upper, middle and lower ureter was 83.3%, 83.3% and 96.1% respectively. There was no statistically significant difference between the clearance rates in males and females (*p* value=0.341). However, large size of the stone, more proximal location and increased degree of hydronephrosis had a negative impact on clearance rates. Eighty-six patients required no additional treatment while 10 underwent ESWL and 2 required open ureterolithotomy for stone size more than 15 mm. There were no ureteric avulsions and

perforations. Two patients had per operative bleed and 12, 28 and 46 patients had post-operative pain, fever and haematuria respectively. Mean operative time was 33.5 minutes.

Table-1: Stone clearance according to Location

Location of stone	No. of stones	Percentage clearance
Upper ureter	24	83.3
Middle ureter	24	83.3
Lower ureter	54	96.1

DISCUSSION

The ESWL is an effective and non-invasive modality of treatment with low complication rates and does not require anaesthesia or hospitalization. However, most of the patients require multiple sessions and clearance of stone fragments may take a long time. Clearance rate in upper, mid and lower ureter is 67.9%, 63.4% and 66.5% respectively.⁹ Complications are haematuria, pain and fever limiting day to day activities. Stone size has an inverse relation with efficacy of ESWL and necessitates auxiliary procedure. Twelve percent of 10 mm calculi require auxiliary procedure. Moreover, due to lack of space and fluid medium around the stone ESWL has limited success in impacted ureteric calculi.¹⁰ The URS remains a preferred modality in anatomic abnormalities, impacted stones, stones with distal obstruction and pregnancy. However, some studies have published comparable results of URS and ESWL.¹¹

The choice of treatment depends on modality of treatment available. URS with ICL is minimally invasive and requires spinal or general anaesthesia.⁶ In our study, 2 patients with spinal anaesthesia complained of flank pain during the procedure so they had to be sedated. The procedure results in rapid fragmentation and clearance of ureteric calculi. Clearance of stone fragments is much faster as compared to ESWL. Safety of URS with ICL has been established. Because of its minimal morbidity, it can be done as day care surgery.¹² The procedure is also considered as relatively safe in pregnant women. Stone clearance rate following URS is very high. Different studies have reported overall success rate of 76.9–100%.^{2,4-7} Our series has comparable success rate with other studies.^{5,13,17} Our series has revealed an inverse relationship between stone size and efficacy as indicated in the result that auxiliary procedure was required for larger stones more than 15 mm. Same is true for proximal location of stone and degree of hydronephrosis. Proximal migration of ureteric stone or stone fragments is a known problem. Flow of the fluid can push the calculus in proximal dilated ureter or kidney. The forceful impact of the lithoclast probe can also push the stone proximally. This can, to some extent, be

prevented by raising the head end of the table and decreasing flow of irrigating fluid. Using lithoclast at single pulse also prevents proximal migration of the stone.¹³ Lithoclast with suction (lithovac) is also available to prevent such migration. It may also be prevented by engaging the calculus in basket or stone cone. A study has published such prevention by the use of lidocaine jelly injected proximal to stone.¹⁴ Only 2 stones migrated proximally into the kidney in our study, which were later on successfully dealt with by ESWL like those 10 cases where fragmentation was not satisfactory. Requirement of auxiliary treatment was considered failure and efficiency quotient was calculated using the formula: $EQ = \frac{\% \text{ Stone free} \times 100}{100 + \% \text{ Re-treatment} + \% \text{ Auxiliary treatment}}$. It was calculated to be $EQ = 78.95$. Ureteric stenting following fragmentation is routine, however, their overuse has been questioned.¹⁵ It should be used only in selected cases.¹⁶ We routinely stented the ureter because most of the patients belonged to far flung areas with limited access to healthcare centres. Symptomatic complications were treated successfully with symptomatic treatment. In expert hands complications are minimal. Incidence of complications in different studies ranges from 5–30% and complications rate rises with manipulations in upper ureter as in a Korean study.¹⁷ There were no major complications in our study. There were no ureteric avulsions and perforations even in impacted stones as opposed to Arturet *et al.*¹⁸ 2 patients had per operative bleed but it was insignificant and did not cause any problems during the procedure. Twelve, 28 and 46 patients had post-operative pain, fever and haematuria respectively. Blood transfusion was not needed. Pain responded well to analgesics. One patient developed high-grade fever with rigors, which settled in 48 hours with re-admission and intravenous antibiotics.

CONCLUSION

Management of ureteric calculi by ureteroscopy and intracorporeal pneumatic lithotripsy provides high success rate as cleared from our study result of stone clearance and literature review. Intra operative and post-operative complications are minimal in expert hands.

AUTHORS' CONTRIBUTION

All the authors contributed equally in the preparation of manuscript.

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