

ORIGINAL ARTICLE

EFFICACY OF PNEUMATIC LITHOCLAST IN THE MANAGEMENT OF URETERIC CALCULI

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Background: To assess the efficacy and safety of pneumatic lithoclast in the management of ureteric calculi.

Methods: One hundred and four patients with ureteric calculi were treated by pneumatic lithoclast at department of Urology Services Hospital Lahore from Jan 2005 to December 2006. Record of the patients was analyzed retrospectively. Patients above 15 years from both sexes with calculi measuring more than 0.5cm (in the largest diameter) were treated in upper, middle, and lower ureter. Calculi were approached with 8fr ureteroscope and fragmented with Swiss lithoclast. After the completion of the procedure, ureter was stented. Patients were followed up till they became stone free. Following parameters were assessed: stone size, site, laterality, degree of fragmentation, success rate, stone migration, type and duration of stenting, post operative hospital stay and complications. Requirement of another procedure or inability to enter the ureter were considered failure.

Results: One hundred and six ureteric calculi were treated in 104 patients. Amongst those, 22 stones were in upper ureter, 16 in the middle ureter and 68 stones were in lower ureter. Mean stone size was 11.2mm (largest diameter). Overall success rate was 89.2%. Whereas success rate in upper, middle and lower ureter was 63.6 %, 87.5% and 95.6% respectively. Mean postoperative hospital stay was 26.5 hours. There were no major complications.

Conclusions: Pneumatic lithoclast with URS is effective and safe in the management of the ureteric calculi. However, success is limited in the upper ureter.

Key Words: Ureteric stones, Ureterorenoscopy, Pneumatic Lithoclast.

Introduction

Management of ureteric calculi still remains a challenge for practicing urologists. Spontaneous passage is the most favoured treatment. Spontaneous passage for 6.3 mm calculi is about 55%, however, rate is much higher for smaller stones. Stones upto 8 mm should be managed expectantly unless contraindicated.² Various interventions for ureteric calculi include: extra corporeal shock wave lithotripsy (ESWL), ureterorenoscopy (URS) with intracorporeal lithotripsy, percutaneous and open surgery. With the advent of modern urological equipments, ureterolithotomy is almost obsolete in bigger centers.

Electrohydraulic and ultrasound lithotriptors were used to fragment ureteric calculi through rigid URS in 1980s. Since the advent of pneumatic lithotripter in 1990 it has rapidly gained popularity in the management of ureteric calculi because of its superior efficacy.³ Pneumatic lithoclast comprises main unit (**Fig-1**), air compressor (**Fig-2**) generating 0-4 Mpa of pressure at frequency of 12 Hz and a handset (**Fig-3**) into which pressure is transmitted. Handset contains a projectile that oscillates with pressure, which is transmitted into that probe. It provides jack hammer effect against the stone.⁴

We present our initial experience of the management of ureteric calculi by using URS with

pneumatic lithoclast.

Patients and Methods

One hundred and four patients underwent pneumatic lithoclasty for ureteric stones in department of Urology Services Hospital Lahore from Jan 2005 to December 2006. Record of the patients was analyzed retrospectively.

Patients above 15 years from both sexes with ureteric calculi measuring more than 0.5cm (in the largest diameter) were treated in upper, middle, and lower ureter. Patients were evaluated by history, physical examination, routine blood, urine examination, blood sugar and serum creatinine. Ultrasound and plain film of abdomen were mandatory. IVU was done in patients with radiolucent calculi and where kidney function required assessment. Patients were operated under general anaesthesia in lithotomy position. Peri operative antibiotics were given to all patients. Eight fr URS (wolf), 435cm long, with 5fr working channel was used with 8mm lithoclast probe. Swiss lithoclast with power 1-4 was used for fragmentation. Bladder was continuously drained by 6fr feeding tube. First 0.38" guide wire was introduced in the ureter followed by URS without dilatation. On approaching the calculus, wire was removed, lithoclast probe was introduced and calculus was fragmented.

Single pulse was applied in most of the cases. Goal was to break the stone in 2-3mm fragments which can pass spontaneously. Safety wire was used only for bigger calculi. After the completion of the procedure, ureter was stented with 5fr ureteric catheter or JJ stent depending upon the volume of the fragments. A plain X-ray was done after 24 hours to assess clearance of fragments and ureteric catheter was removed in majority of patients. JJ stent was kept till clearance of fragments. Patients were followed up at weekly intervals till they became stone free. Following parameters were assessed: stone size, site, laterality, degree of fragmentation, success rate, stone migration, type and duration of stenting, post operative hospital stay and complications. Inability to reach the calculus with URS, proximal migration of stone or requirement of another procedure was considered failure.

Fig-1: Pneumatic Lithoclast(main unit)



Fig-2: Air-compressor



Fig-3: Ureterorenoscope with hand piece and probe



Results:

106 ureteric calculi were treated in 104 patients. Two patients had bilateral calculi which were treated simultaneously. Mean age of the patients was 38.5 years. There were 62 males and 42 females. Sixty patients had calculi in right ureter, 42 in left and 2 patients had bilateral ureteric calculi. Amongst those, 22 stones were in upper ureter, 16 in the middle ureter and 68 stones were in lower ureter. Mean stone size was 11.2mm (largest diameter).

In five patients ureter could not be negotiated because of narrow orifice. They were stented and URS after 2 weeks was successful. In one patient, a kink in the upper ureter could not be negotiated, so open ureterolithotomy was performed.

Satisfactory fragmentation was achieved in 89.2% patients. Five calculi in upper ureter were pushed up in the kidney during the procedure which was later treated with ESWL. Two patients required second session of lithoclasty for incomplete fragmentation.

Ureter was stented with ureteric catheter in 56(52.8%) patients and 6fr JJ stent was left in 49(46.2%) patients. Overall success rate was 89.2%. Whereas success rate in upper, middle and lower ureter was 63.6 %, 87.5% and 95.6 % respectively (fig4). There were no major complications (fig5). Mean postoperative hospital stay was 26.5 hours.

ESWL is an effective modality of treatment. It is noninvasive and does not require anaesthesia or hospitalization. Complications rate is also low. However, most of the patients require multiple sessions and clearance of stone fragments may take a long time. Clearance rate in upper, middle and lower ureter is 67.9%, 63.4% and 66.5% respectively.⁷ Attacks of colic due to stone fragments following ESWL can limit daily activities. Success rate of ESWL

decreases with increase in stone size and need for auxiliary procedure rises. Requirement of auxiliary procedure is 12% for 10mm calculi.⁸ Moreover, ESWL has limited success in impacted ureteric calculi because of lack of space and fluid medium around the stone.⁹ Some studies have published comparable results of URS and ESWL with new generation of lithotriptors, however, URS remains a preferred modality in impacted stones, stones with distal obstruction, pregnancy and anatomic abnormalities.¹⁰ Availability of modality of treatment also influences choice of treatment. Ureterorenoscopy with lithoclast is minimally invasive and requires general anaesthesia. It has quickly gained popularity because of superior efficacy in the management of ureteric stones. The procedure results in rapid fragmentation and clearance of ureteric calculi. Clearance of stone fragments is much faster as compared to ESWL.¹¹

Fig- 4: Ureteric stones and success

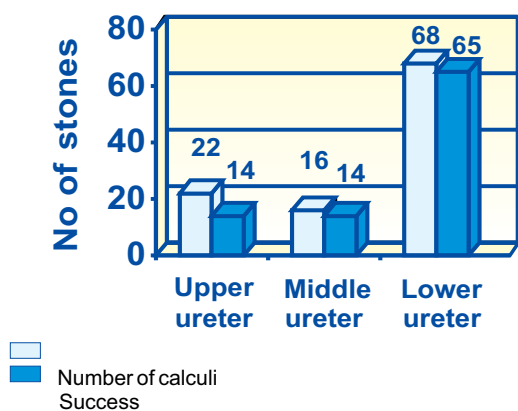
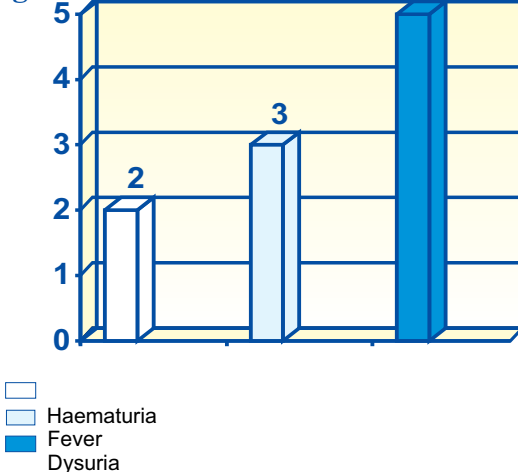


Fig-5: Complications



Safety of ureterorenoscopy with intracorporeal lithotripsy has been established. Because of its

minimal morbidity, experts are now advocating it as day care surgery.¹⁴ The procedure has also been tried in pregnant women without adverse effects.¹⁵

Proximal migration of ureteric stone or stone With the advent of small caliber and flexible ureteroscopes, safety of the procedure has considerably improved. Stone clearance rate following URS is very high. Different studies have reported overall success rate of 85-90%. Success rate in our series was comparable with other studies.^{12,13}

Proximal migration of ureteric stone or stone fragments is a known problem. Flow of the fluid can push the calculus in proximal ureter or kidney. Impact of the lithoclast probe can also result in proximal migration.⁵ Raising the head end of the table and decreasing flow of irrigating fluid is sometimes helpful in preventing proximal movement of the stone. Using lithoclast at single pulse also prevents stone push up.¹² Lithoclast with suction (lithovac) is also available; however, its efficacy is controversial. Proximal migration may also be prevented by engaging the calculus in basket.

Ureteric stenting following fragmentation is routine in most of the centers, however, their overuse has been questioned. Jeong et al have recommended use of stents only in selected cases.¹⁶ We routinely stented the ureter and found it safe with good patient tolerance. Flank pain and lower urinary tract symptoms due to stents respond to 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.¹⁷ There were no major complications in our study. Two (1.9%) patients had significant haematuria requiring extra hospital stay. Blood transfusion was not needed. Three (2.9%) patients developed high-grade fever with rigors, which settled in 48 hours with intravenous antibiotics. There was no perforation of ureter.

Conclusion

Management of ureteric calculi by ureteroscopy and pneumatic lithoclast provides high success rate. However, success is limited in upper ureter. Majority of the patients are stone free within 48 hours. Intra operative and post operative complications are minimal in expert hands.

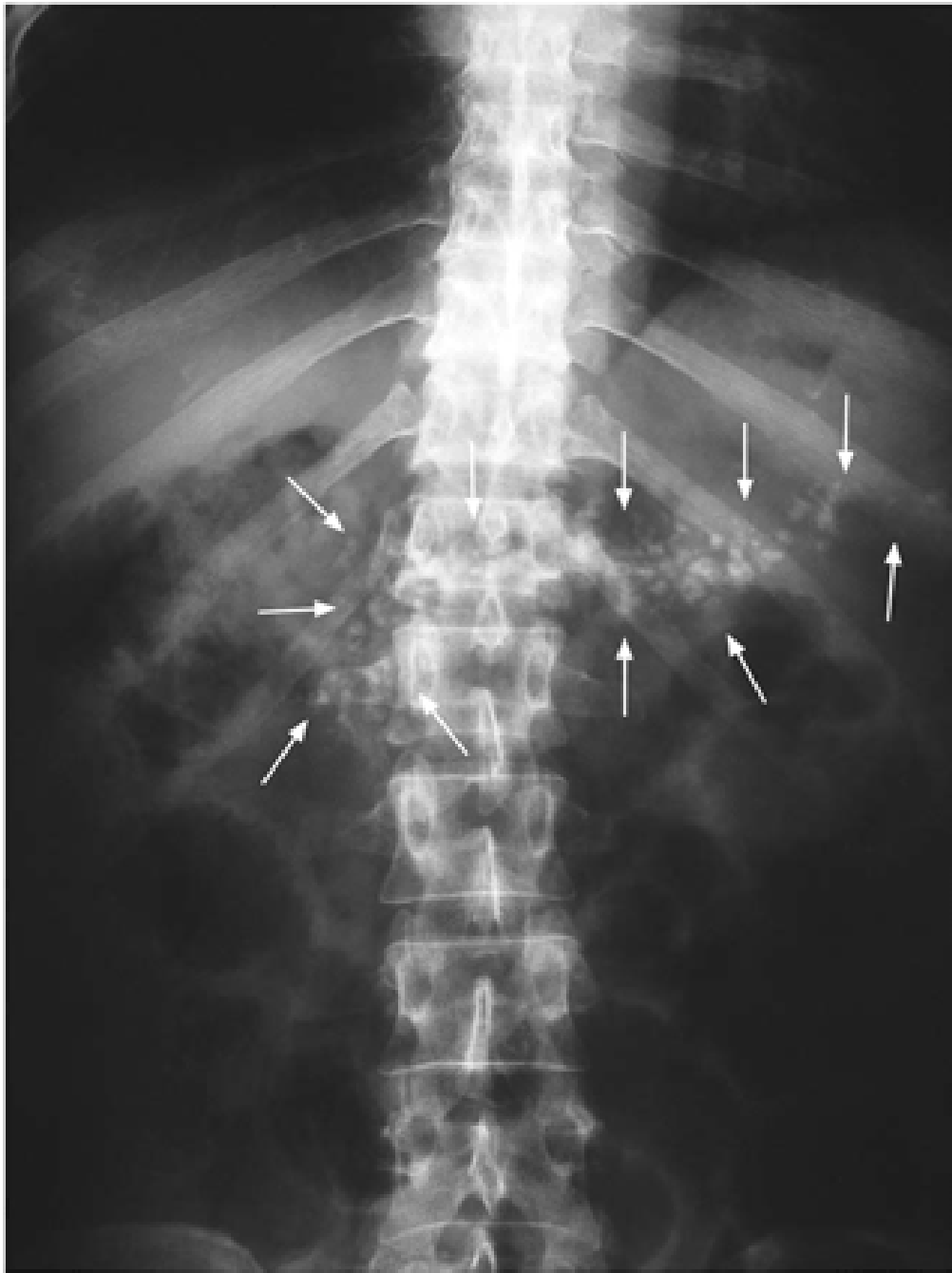
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PICTURE QUIZ

A 40-year-old man was admitted for chronic recurrent epigastric pain. He had been drinking alcohol for over 15 years. No one in his immediate family had diabetes mellitus. On further questioning, he reported passing bulky, foul-smelling stools, which were difficult to flush, for more than 3 months. He also reported decreased night vision, although his visual acuity was normal. The serum lipase level was 468 U per liter, and the glucose level was 432 mg per deciliter. His liver-function tests were unremarkable. A plain radiograph of the abdomen is shown below.



[Answer of Picture Quiz on Page 24](#)