

EXTRA CORPOREAL SHOCK WAVE LITHOTRIPSY AND INTRACORPOREAL LASER LITHOTRIPSY FOR DISTAL URETERIC CALCULI - A COMPARATIVE STUDY ON EFFICACY AND SAFETY

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Abstract:

Purpose: We compared the efficacy, safety and treatment outcome after ESWL and URS & Laser lithotripsy for distal ureteric stones.

Materials and Methods: We evaluated 60 consecutive patients who underwent ESWL (n=30) and URS & Laser lithotripsy (n=30) for a single radio-opaque distal ureteric stone. Stone fragmentation and clearance was checked by fluoroscopy at the end of procedure. Stone free rates defined as no visible fragment on a plain x-ray, complication and patients' satisfaction were compared.

Result: Immediate stone clearance, complication rate, operation time and hospital stay were compared between two groups. Immediate stone clearance was significantly higher in group-B (86.66%) than that in group-A (66.66%) $p < 0.05$. The complication rate were lower in group-B (33.30%) than that of group-A (50%) but the difference did not turn to significant $p > 0.05$. The mean operation time was significantly less in group-A than that in group-B (31.17 ± 3.87 vs 49.83 ± 4.99 minutes, $p < 0.001$). However no significant difference was observed between the groups in terms of hospital stay (2.17 ± 0.379 vs 2.50 ± 0.938 days, $p > 0.05$) suggesting that ureteroscopy laser lithotripsy is better option than extracorporeal shockwave lithotripsy for clearance of distal ureteric stone.

Conclusion: URS & Laser lithotripsy is better option for the management of distal ureteric stone in term of better immediate stone clearance and less complication.

Key words: ESWL, URS, Laser lithotripsy, distal ureteric stone.

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Introduction:

Urinary Stone disease is a systemic, metabolic, recurrent and lifelong disease. The prevalence of the urinary tract stone disease is estimated 2%-3%¹. Male to Female ratio is 3:1² the peak incidence of urinary calculi is from twenties to forties³. Treatment of ureteric stone depends on stone size, composition, position and degree of obstruction, pain, presence of infection, single kidney, abnormal ureteral anatomy. Ureteric calculi are associated with pain and or renal obstruction; care must be taken to prevent irreversible damage to the kidney, whether choosing expectant or active

treatment. The goal of surgical management of ureteric calculi is to achieve complete stone clearance with minimal morbidity to the patient. Treatment of stone disease moved dramatically from an open operative procedure to endoscopic, minimally invasive and noninvasive procedure, mainly extracorporeal shock wave lithotripsy (ESWL) and ureteroscopy with lithotripsy. ESWL and URS with lithotripsy are both treatment modalities that have been established for the treatment of ureteric calculi. For both modalities stone free rates of more than 90% have been reported⁴. ESWL and

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URS are regarded as effective modalities with low complication rate for distal ureteric stone. Due to advancement in lithotripsy design and fluoroscopic imaging has currently allowed successful identification and in situ treatment of calculi in distal ureter. With ESWL ureteric calculi are fragmented into smaller fragments by shock waves and can then pass spontaneously as small fragments. ESWL is non invasive, requires fewer anaesthesia than other treatment for ureteric stones, and may render patients stone free without surgical intervention or endoscopic procedures. In situ extra corporeal shock wave lithotripsy for treatment of distal ureteric stone has a stone free rate of 76%⁵. Ureteroscopy is a common procedure in Bangladesh and most of the urologist use pneumatic lithotripsy for distal ureteric stone. Laser lithotripsy is a new procedure in our country and is used for urinary calculi fragmentation. Holmium: YAG laser is commonly used in different field of urology. With the introduction of this type of laser ureteric stone irrespective of location can be managed by semi rigid ureterorenoscopy. It has been shown that Holmium:YAG lithotripsy is better among other energy source in terms of efficacy and safety. Many comparative studies between ESWL and Laser lithotripsy for the management of distal ureteric stone has been under taken in different parts of the world, no such study has yet been done in Bangladesh. This present study has been designed to compare the outcome of ESWL and Laser lithotripsy for fragmentation of distal ureteric stone.

Methods:

The study was a prospective comparative study, conducted in the Department of Urology, Dhaka Medical college Hospital from January 2005 to December 2006. Study population included the patients who attended in out patients department of urology, Dhaka Medical College Hospital, Dhaka with distal ureteric stone. A total 60 patients were evaluated by their history, physical findings and investigation (Urinalysis, USG of KUB, S. creatinine and IVU) and were primarily selected for admission.

Inclusion criteria were patient between age ranges 18 to 70 years and patients with distal

single ureteric stone. Stone present in proximal part of ureter, multiple ureteric calculi, stone with infection, bleeding disorder, pregnancy and patient previously treated by ureterolithotomy were excluded.

After admission patients were again studied clinically and 60 patients, ages ranging from 18 to 70 years were selected for this study as per selection criteria.

All the cases were numbered chronologically, and odd numbers grouped as group A and was treated by ESWL, even number as Group B and were treated by URS and Intra corporeal laser lithotripsy. Patients of group A were treated by in situ ESWL by Siemens Lithostar machine, where electromagnetic shock wave energy is used to fragment the stone. Procedure done under sedation with injection diazepam 10 mg I/M and diclofenac sodium 50mg I/M was given as analgesic. Patient was in prone position; stone was visualized with fluoroscopy and centered to the shock wave generator. Coupling was done later on and the level of shock energy was progressively stepped up till satisfactory stone fragmentation within patient's comfort. Maximum 3000 wave can be generated for single session. Completion of fragmentation was visualized by fluoroscopy.

Patients of group B were treated by URS and Intra corporeal laser lithotripsy. The procedure was done under spinal anaesthesia. Cystoscopy was done for identification of ureteric orifice and guide wire was passed within ureteric orifice under visual and fluoroscopic monitoring. As soon as stone was seen the laser fiber was pushed to stone, it was fixed to the stone, laser source was on and stone fragmentation started, care has to taken to avoid injury of ureter and keeping eye on stone fragment migration, placement of D-J stent at the end of procedure was left to the discretion of the operating surgeon. Ureteric injury is noted when abrasion of ureteral mucosa is identified and ureteral perforation is noted when any hole is identified within the ureter. Stone clearance was checked by ureteroscopy and fluoroscopy at the end of procedure.

Data was collected of variable of interest (stone size, operation time, stone clearance,

haematuria, hospital stay) using a structured data collection sheet. Data were processed and analyzed using software SPSS. Test statistics used to analyze the data Chi-square test, student t-test (unpaired), Fisher’s Exact probability test.

Result:

There was no significant difference in demographic and clinical variables between two groups in terms of age, sex, stone size, operation time (p>0.05).

Table-I demonstrates the comparison of stone size that might have influence on the outcome of intervention. The variables chosen were stone size, IVU excretion delayed, IVU (P-C) system dilated. None of these variable was found to vary between groups as evident by p.0.05.

Table-I

Clinical variables	Group-A (n=30)	Group-B (n=30)	P- Values
Stone size (Mean ±SD)	10.20±1.88	10.63±2.31	0.429
IVU, excretion delayed,n(%)	8(26.7)	10(33.3)	0.573
IVU(P-C) system dilated, n(%)	17(56.7)	18(60.0)	0.793

Table-II : compare the outcome of the two groups. The outcome variables were immediate stone clearance, complication rate, operation time and hospital stays. Immediate stone clearance rate was significantly higher in group –B (86.66%) than that in group–A (66.66%); p<0.05. The complication rate was lower in group-B (33.3%) than that of group –A (50%) but the difference did not turn to significant; p>0.05. The mean operation time was significantly less in group- A than that in group –B (31.17±3.87 vs 49.83± 4.99 minutes, p<0.001). however, no significant difference was observed. Between the groups in terms of hospital stay (2.17± 0.379 vs 2.50±0.938 days, p>0.05) suggesting that ureteroscopic laser lithotripsy is better option than extracorporeal shockwave lithotripsy for clearance of distal ureteric stone.

Table-II

Clinical variables	Group-A (n=30)	Group-B (n=30)	P- Values
Immediate stone clearance, n (%)	20(66.66)	26(86.66)	0.012
Complication rate, n(%)	15(50.0)	10(33.3)	0.190
Mean operation time(Minutes)	31.17±3.87	49.83±4.99	<0.001
Mean hospital stay(Days)	2.17±0.379	2.50±0.938	0.079

Discussion:

The findings derived from data analysis leaves some scope for discussion to arrive at a conclusion. Ureteroscopic Holmium: YAG laser lithotripsy was used in 168 patients of ureteric calculi (mostly distal ureteric stone 108). The stone free rate was 94% (102/108) of distal ureteric stone. The complication rate was 5 % (8 cases). They concluded Holmium: YAG laser lithotripsy is highly effective and safe treatment modalities (Pang LL et al. 2004) ⁶.

47 ureteroscopic laser lithotripsy were performed in 44 patients, out of them 37 patients had stone in the lower ureter, the success rate was 91 % (yiu MK, et al 1996) ⁷. In a retrospective study they evaluated the efficacy of ureteroscopic lithotripsy and ESWL in the treatment of middle and lower ureteric stone from Jan 1996 to march 1997 by SKH Yip, et al⁸. Total 61 patients treated by URS using Holmium laser and 49 patients treated by ESWL. Single session stone clearance rate of 100% and 95% for middle and lower ureteric stone respectively. ESWL had a single session rate 67% and overall success rate of 87% after retreatment.

To determine the efficacy and cost of ESWL compared with URS in the treatment of mid and lower ureteric stone were analyzed retrospectively. Treatment with ESWL included 63 patients and URS in 105 patients. ESWL for mid and lower ureteric calculi resulted in a success rate of 90% and 81% respectively compared with 96% and 99% for URS. The cost of URS were higher than those of ESWL⁹.

In a prospective non randomized study of total 124 patients with distal ureteric calculi done by P. Honeck, et al 2006¹⁰ among them 62 patients treated with ESWL and 62 patients with URS and laser lithotripsy. 84% have stone free occur rate within 7 days, 98% after URS. This result shows a significant success $p=0.005$ in favour of URS.

A prospective non randomized study was conducted to compare the success, efficacy and complication of URS and ESWL for the treatment of symptomatic small non obstructing lower ureteric calculi, a total 280 patients were included in this study of those 160 patients were treated by URS and 120 patients were treated by ESWL. URS achieved complete stone clearance in 98.7% of patients, of the 120 patients treated by ESWL 90% achieved stone free status at 3 months¹¹.

Ureteroscopic holmium: YAG laser lithotripsy was used in 168 patients of ureteral calculi (mostly distal ureteric stone 108). The stone free rate was 94% (102/108) of distal ureteric stone. The complication rate was 5% (8 cases). They concluded ureteroscopic holmium :YAG laser lithotripsy is a highly effective and safe treatment modalities¹².

Conclusion:

URS & Laser lithotripsy is better option for the management of distal ureteric stone in term of better immediate stone clearance and less complication.

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