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UPPER URETERIC STONES;

COMPARISON OF EXTRA CORPOREAL SHOCK WAVE LITHOTRIPSY WITH PNEUMATIC LITHOTRIPSY IN THE MANAGEMENT.

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ABSTRACT… Objectives: Compare the efficacy of Extracorporeal Shock Wave Lithotripsy with Pneumatic Lithotripsy in the management of upper ureteric stones. **Settings:** Department of Urology, Lahore General Hospital, Lahore. **Duration of Study:** From November 2008 to August 2009. **Results:** In our study, the patients were divided into two groups ie; Extracorporeal Shock Wave Lithotripsy group (ESWL) and Pneumatic Lithotripsy group (PnL). The mean age in Pneumatic Lithotripsy (PnL) was 39±15.23 years, whereas mean age was 40.6±14.62 years in Extracorporeal Shock Wave Lithotripsy group (ESWL). In Extracorporeal Shock Wave Lithotripsy group (ESWL), 38(76%) patients were male and 12(24%) patients were female while number was 34(68%) and 16(32% in Pneumatic Lithotripsy group (PnL) respectively. In both groups, there was male preponderance. In ESWL group, majority of patients were treated as outdoor patients. 95% of them received intramuscular analgesia where as 5% required intravenous sedation. All patients were followed at two weekly interval up till 6 weeks. Fifty patients required more than 125 sessions of ESWL with mean shock waves 2960±222.23 at at mean energy 6.46±0.503kv, 2952±327.77 at 6.45±0.504 kv and 2842±410.03 at 6.76 0.436 kv at 2, 4 and 6 weeks respectively. The partial clearance was achieved in 34 patients at 2 weeks, 26 patients at 4 weeks and 5 patients at 2 weeks. Stone free status at 2 weeks, 4 weeks and 6 weeks were 18%, 40% and 84% respectively. In Pneumatic Lithotripsy group (PnL) all of the 50 patients were given general anesthesia. DJ stent was placed in all patients after the procedure for six weeks follow up. 42(84%) of patients received shots of Pneumatic Lithotripsy on pulse mode while in 8(16%) patients, shots were on continuous mode. The partial clearance was achieved in 5(10%), 3(6%) and 2(4%) patients at 2, 4 and 6 weeks respectively. Stone free status was 48%, 52% and 54% at 2, 4 and 6 weeks respectively. In 20(40%) patients, stone migrated into calyces. Only in 1(2%) patients, there was no effect on stone. All patients in both groups were needed two weekly follow up till six weeks. Stone clearance was 84% in Extracorporeal Shock Wave Lithotripsy (ESWL) group while it was 54% in Pneumatic Lithotripsy group (PnL), $p<0.001$. **Conclusion:** Extracorporeal Shock Wave Lithotripsy offers higher stone free rates with minimal invasiveness and high safety compared to Pneumatic Lithotripsy, which provides immediate high stone free rates, but with high risk of treatment failure.

Key words: Upper Ureteric Stones, Management, Extra Corporeal Shock Wave Lithotripsy, Pneumatic Lithotripsy, and Efficacy.

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INTRODUCTION

Urinary track infections are most common affliction of the urinary tract after BPH and bladder cancer third one are the urinary stones. Stone disease affecting human population since ancient times. Prevalence of stone disease among the population is 2–3%.[1] The recurrences increases with time, about 10% within one year, 34% within five years, and 51% within 10 years. The life time recurrence rate is approximately 50%.[2] industrialization and urbanization (including the increase intake of minerals and proteins) have led to rise in the incidence of urinary stones. Ethnicity, race and regions also have a major part to play.[3]A seasonal variation is also seen, with high urinary calcium oxalate saturation in women during winter and in men during summer.[4]

In modern days there is a new trend towards minimally invasive techniques.[5]

Every stone is a challenge to the physician and the patient, in the era in which different management option are available. The treatment of ureteric calculi has revolutionized in the last two decades due to advances in technology. Previously, open ureterolithotomy and stone basket manipulation were the main treatment. But advent of lithotripsy is a breakthrough in management of urolithiasis.[6]

Ureteric calculi can be removed by different ways. The invention of ESWL &Uretertscope has revolutionized the early management of these calculi. Due to significant innovations in the treatment options, open surgical stone removal is almost obsolete nowadays, comprising only 0.5% of all cases of ureteric calculi. The success rate of ESWL in upper ureteric stones is approximately 83%. While in the middle ureter and small stones in the lower ureter, the success rate is less and ranges between 57% and 73%. Due to the need of high rate (38%) of retreatment sessions in ESWL, ureteroscopy considered the method of choice for complete stone removal. It takes less time as well.[7]

ESWL was introduced in 1980. It has changed the management of ureteric calculi. There was uncertainty about the efficacy in the treatment of ureteral stones initially. Important concerns were mobility of ureteric stones and suspected lateral damage but ESWL proven to be effective in these areas.[8]

Large, impacted upper ureteric calculi proposed a challenge to urologists. These calculi are commonly associated with deranging renal function and obstructive uropathy. Success rate of (ESWL) is relatively less for large impacted upper ureteral stones no matter its least invasive technique. American Urological Association guidelines regarding ureteral calculi published in 1987, the effectiveness of ureteroscopy decreases when stone size exceeds 1 cm. The success rate of treating proximal ureter calculi has increased significantly by using advance ureterorenoscopy techniques.[9]

MATERIAL AND METHODS

A total of 100 cases having upper ureteric calculi (from PUJ to upper margin of sacrum), of size 0.6 cm - 1.5 cm with $\geq$ 12 years of age of either gender were included in the study whereas the cases having pregnancy, UTI, coagulation disorders, previous ureteral reimplantation, poor functioning kidney and congenital anomalies of kidney and ureter were excluded from the study. Patients were explained the pros and cons of both modalities. The choice was given to choose between one of the two modalities. Based on the type of modality, patients were divided into two equal groups. Thorough history, physical examination and investigation were done prior to admission. Those patients which were chosen for Pneumatic lithotripsy were treated in the ward and with choice of ESWL were treated on OPD basis in

Department of Urology, Lahore General Hospital, Lahore. Data included for statistical analysis was age, sex, side of stone, stone location, size, stone access, stone fragmentation, stent placement, hospital stay and stone clearance in follow up and complications there in.

In group-I, ESWL was performed using MODULITH(R) SLX F-2 lithotriptor. Patients were given I/M or I/V analgesics before starting the procedure. Then patients were positioned prone. Stone was localized with fluoroscope. Radiolucent stone was localized with USG. Patients were instructed about the procedure, followed by administration of shock waves to the focused stone. The frequency of shock wave was kept at 1/second throughout the procedure. Initially the energy was 1.5 kv but gradually it was increased up to 7kv for satisfactory stone fragmentation while remaining within the patients' comfort. The total number of shock waves per procedure was from 2500 to 3500.At the end of procedure the patients were advised to about the post-operative management and follow up after every 2 weeks till 6 weeks.

In group-II, Pneumatic Lithotripsy was carried out under general anaesthesia. Patients were placed in lithotomy position and draped after painting the area with povidone-iodine solution under aseptic measures. Cystourethroscopy was performed

in every patient prior to ureteroscopy with 17 Fr cystoscope and 25 degree telescope to rule out any pathology in the bladder and around ureteric orifice. Ureteroscopy was performed with 8-9.8 Fr, 10degree Wolf (R) semi-rigid ureteroscope. First ureteric orifices were identified. Guide wire (0.035 in / 0.038 in) with flexible straight end was passed in to the requisite side and then ureterscope was gently guided over it, into the ureteric orifice. It was rotating upto 180 degree and advanced to get entry in to the ureter. Ureteroscope was passed upto the stone over the guide wire. Then guide wire was removed and lithoclast probe introduced through respective channel. We used 0.8mm probe for PnL. The pneumatic pressure was kept at 1.5 bar and single/continuous pulse was used in the procedure. Once the stone localized, it was dealt with Swiss Lithoclast. On the principle of Jack Hammer a mechanical lithotripsor works. By the movement of a bullet facilitated by air pressure control in the form of pulses from the generator pneumatic energy is produced This energy was directly transmitted from the hand piece to the stone by a rigid probe, resulting in breakage of stone. Stones were broken to the size smaller than the tip of the probe. Stone debris were left in sites so that they pass spontaneously in urine.

Different maneuvers used to prevent stone migration were:

i) Patients were positioned with slightly elevated head side.
ii) Use of single pulse mode sometimes continuous when required.
iii) Irrigating fluid under low pressure by decreasing height of fluid or intermittent use of irrigation.

After complete fragmentation DJ was placed in ureter depending upon stone burden, mucosal injury or perforation. All patients were catheterized after the procedure. Plain x-ray KUB was taken after 24 hours to assess the stone fragmentation and stone clearance and to see the placement of DJ. Inadequately fragmented stone pieces in the ureter were treated with repeat lithotripsy in follow up period. Patient with stone fragments migrated to kidney were advised to undergo extra corporeal shock wave lithotripsy (ESWL).

Possible complications observed during the procedure like failure to fragment the stone, hematuria, perforation, stone migration and incomplete fragmentation of stone were noted and managed accordingly.

Stone fragmentation was assessed on direct vision and post-operatively by radiographic evaluation. Stone was considered to be completely fragmented, if all the stone fragments were equal to or less than the size of tip of the probe. Stone clearance was assessed post-operatively on the basis of radiography.

The data was collected after obtaining permission from the hospital authorities. Fully informed, understood and voluntary consent of parents or guardians was obtained on consent form with the assurance of ensuring confidentiality of the data on a consent form.

RESULTS

The mean age for Pneumatic Lithotripsy (PnL) was 39$\pm$15.23 years, where as in Extracorporeal Shock Wave Lithotripsy group (ESWL) mean age was 40.6$\pm$14.62 years. In Pneumatic Lithotripsy group (PnL), 34 (68%) patients were male and 16(32%) patients were female while in Extracorporeal Shock Wave Lithotripsy group (ESWL), 38(76%) patients were male and 12(24%) patients were female. In both groups, there was male preponderance.

Fifty patients treated with Pneumatic Lithotripsy group (PnL) were given general anaesthesia and DJ stent was placed in all patients after the procedure for six weeks follow up. In 42(84%) patients, the shots of Pneumatic Lithotripsy group were on pulse mode and in 8(16%) patients, shots were on continuous mode. The partial clearance was achieved in 5(10%), 3(6%) and 2(4%) patients at 2 weeks (Table-I), 4 weeks (Table-II) and 6 weeks (Table-III) respectively. Stone free status at 2 weeks, 4 weeks and 6 weeks were 48% (Table-I), 52% (Table-II) and 54% (Table-III) respectively. In 1(2%) patients, there was no effect on stone and in 20(40%) patients, stone migrated into calyces (Table-I).

In Extracorporeal Shock Wave Lithotripsy (ESWL) group, majority of the patients were treated as outdoor patient and 95% received intramuscular analgesia and 5% received intravenous sedation. All patients were needed two weekly follow up till six weeks. A total of fifty patients required more than 125 sessions of Extracorporeal Shock Wave Lithotripsy (ESWL) with mean shock waves 2960±222.23 at mean energy 6.46±0.503 kv, 2952±327.77 at 6.45±0.504 kv and 2842±410.03 at 6.76 0.436 kv at 2 weeks, 4 weeks and 6 weeks respectively. The partial clearance was achieved in 34, 26 and 5 patients at 2 weeks (Table-I), 4 weeks (Table-II) and 6 weeks (Table-III) respectively. Stone free status at 2 weeks, 4 weeks and 6 weeks were 18% (Table-I), 40% (Table-II) and 84% (Table-III) respectively. Results at 6 weeks fallow up were 84% and 54% for Extracorporeal Shock Wave Lithotripsy (ESWL) group and Pneumatic Lithotripsy group (PnL) respectively, p<0.001. (Table-III)

	Two Weeks Follow up					
	Partial Clearance		Complete Clearance		Failure of Clearance	
	No.	%age	No.	%age	No.	%age
PnL	5	20%	24	48%	21	42%
ESWL	34	68%	9	18%	7	14%

Table-I.Clearance of stone after Two weeks

Groups	Four Weeks Follow up					
	Partial Clearance		Complete Clearance		Failure of Clearance	
	No.	%age	No.	%age	No.	%age
PnL	3	6%	26	52%	21	42%
ESWL	26	52%	20	40%	4	8%

Table-II. Clearance of stone after four weeks

Groups	Six Weeks Follow up					
	Partial Clearance		Complete Clearance		Failure of Clearance	
	No.	%age	No.	%age	No.	%age
PnL	2	4%	27	54%	21	42%
ESWL	5	10%	42	84%	3	6%

Table-III. Clearance of stones after six weeks

P-value after 2weeks, 4weeks and 6weeks fallow up for both procedures <0.001

Pearson chi-square test value for both procedures at 2weeks was 35.38 and df value (02)

Pearson chi-square test value for both procedures at 4weeks was 30.58 and df value (02) Pearson chi-square test value for both procedures at 6weeks was 18.04 and df value (02)

During Pneumatic Lithotripsy, stone migration was noted in 20(40%) patients, haematuria in 8(16%) patients and ureteric avulsion in 1(2%) patient. In 1(2%) patient stone was not fragmented which was removed by ureterolithotomy.

During Extracorporeal Shock Wave Lithotripsy (ESWL) group, all patients were complaining of mild pain but 4(8%) patients had severe pain and required intravenous sedation.

In Pneumatic Lithotripsy group (PnL), 8(16%) patients developed UTI and 2(4%) patients were diagnosed as case of septicaemia which were managed conservatively. 38(76%) patients were complaining of severe pain and required intravenous sedation. Post-operative hematuria was noted in 16(32%) patients. They all were managed conservatively.

In Extracorporeal Shock Wave Lithotripsy (ESWL) group, 4(8%) patients developed UTI and 1(2%) patient was diagnosed as a case of septicaemia

and managed conservatively. 38(76%) patients were complaining of mild pain and 4(8%) patients developed severe pain and required I/V sedation. After undergoing Extracorporeal Shock Wave Lithotripsy 38(76%) patients were complained of mild haematuria. They advised to take plenty of fluid and thus haematuria subsided. The post-operative haematuria was significant in Extracorporeal Shock Wave Lithotripsy (ESWL) group as compare to Pneumatic Lithotripsy (PnL) group, p-value<0.001.

CONCLUSION

Extracorporeal Shock Wave Lithotripsy offers higher stone free rates with minimal invasiveness and high safety compared to Pneumatic Lithotripsy, which provides immediate high stone free rates, but with high risk of treatment failure. Personal experience, patients preference and local equipment are significant factors in deciding appropriate treatment for the patients. Due to minimal invasiveness, more efficacy and safety we recommend Extracorporeal Shock Wave Lithotripsy as preferred mode of treatment for upper ureteric stones.

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Never stop learning,
because life never stops teaching.

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