ORIGINAL ARTICLE

Efficacy of Pneumatic Lithoclast in the Management of Different Metabolic Types of Stones in Lower one third of Ureter

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ABSTRACT

Aim: To evaluate the efficacy of pneumatic lithoclast in management of different metabolic types of stones in the lower one third of ureter.
Methodology: Sixty patients of both genders aged above 12 years. Inclusion criteria was patients with a single ureteric stone of size 5mm to 15mm. Stone size was determined with pre op CT scan . Patients were evaluated for stone clearance after 4 weeks, with X-ray KUB, ultrasound. A written informed consent was obtained from parents of every patient. All the data were recorded in a proforma and analyzed in SPSS version 22.
Results: The age of the patients ranged from 12 years to 60 years with a mean of42.68±8.08. Majority of the patients were aged between 35-60 years (83.3%) followed by 12-34 years (16.7%). There were 41 (68.3%) male and 19 (31.7%) female patients in the study group with a male to female ratio of 2.2:1. Stone size ranged from 5mm to 15mm with a mean of 10.82±2.01mm. It was in right ureter in 27 (45%) and left ureter in 33 (55%) patients.Ca. oxalate stones were most frequent and were observed in 32 (53.3%) patients followed by struvite (18.3%), Ca. phosphate (15%), uric acid (8.3%) and cysteine (5%) stones as shown in Pie-Chart 3.Stone clearance was observed in 58 (96.7%) patients. When stratified, there was no significant difference in the frequency of stone clearance across various age (p=0.520), gender (p=0.571), size (p=0.847) and type of stones (p=0.787) and anatomical side (p=0.885) groups.
Conclusion: The frequency of stone clearance was found to be 96.7% with pneumatic lithoclast in patients with single stone of 5-15mm in lower third of ureter which advocate its routine use in future urological practice.
Keywords: Intracorporeal lithotripsy, pneumatic lithotripsy, ureteric stone

INTRODUCTION

Urinary Calculi are the third most normal torment of the urinary tract, surpassed distinctly by UTI's and prostate morbidities[1]. Urinary stones are generally arranged either by their area; in kidney , ureter or urinary bladder, or by their substance organization which are calcium stone that can be isolated into calcium oxalate and calcium phosphate (eighty percent), struvite (ten to fifteen percent),uric corrosive (five to ten percent) and uncommon sorts like cystine and xanthine are related with metabolic mistakes[2,3 . And some drugs can form stones such as indinavir and triamterene[1]. The stones that obstruct a patient's ureter originate in his kidneys, once it is free in the pelvis it may pass into the ureter and can stick anywhere most likely 1) puj 2) upper ureter or 3) lower ureter. The hallmark of stones that obstruct the ureter or renal pelvis cause excruciating intermittent pain called renal colic (one of the strongest pain sensations known, Embryonic link between urinary, gonadal and gastrointestinal systems the basis of radiating pain to gonads and nausea, vomiting[4]. The pneumatic lithoclast developed in 1990 is reported to be very effective procedure for ureteric stones but require anesthesia and hospital stay. The working guideline of the pneumatic lithoclast depends on the energy hypothesis got from this law. Compacted air is being utilized to produce ballistic vitality in the hand bit of the lithoclast. A shot, guided inside accuracy of one micrometer, is quickened to a fast by methods for an exactly controlled eruption of compacted air. At the point when the shot hits the test introduced in the hand piece, a shockwave is transmitted through the test to the analytics. The diverse acoustic attributes of the metal test and the stone lead to a quick and successful lithotripsy[5]. The purpose of this study is to show the efficacy of pneumatic lithoclast in breaking different metabolic types of stones the in Lower one third of the ureter and as the metabolic type can be determined preoperatively with C.T scan so stones worst prognosis could be identified and planned for other options like ureterolithotomy not considered for redo procedures.

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METHODOLOGY

It's a descriptive type of study.Sample size of 60 patients was estimated by using 95% confidence level, 6% absolute precision with expected %age ureterorenoscopy and pneumatic lithotripsy as 94.3%[6]. Patients of either gender except pediatric age group (age>12), with ureteric stones size 5mm to 15mm, Stone location in lower one third of ureter was assessed on C.T scan, Solitary ureteric stone plus patients with no previous history of lithotripsy were included. Patients with any congenital malformation, Patients who had previous failed pneumatic lithotripsy were excluded. 60 patients fulfilling inclusion criteria were admitted in department of Urology and Transplant Mayo hospital Lahore. Informed consent was obtained from patient or attendant. Demographic information (name, age, contact information) was recorded. Patients were undergo

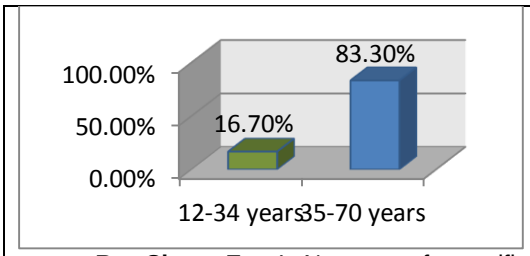
a complete metabolic workup for different stone types including serum calcium, uric acid 24 hour urine analysis, preoperative stone analysis had done with a CT KUB by determining the Hounsfield units for each type of stone. Stone was fragmented via Pneumatic lithoclast and DJ stent inserted afterwards and stone free rates and number of procedures were documented. Data was collected in accordance with to the patient Performa which He/She hadsigned to provide the doctor all necessary information. All data was collected and managed by the researcher himself.All the collected data was entered and analyzed through SPSS version 22.0.Numerical variables; ageandstonesizehave been presented by mean ±SD.Categorical variable i-e gender, anatomical side and stone clearance have been presented by frequency and percentage.

RESULTS

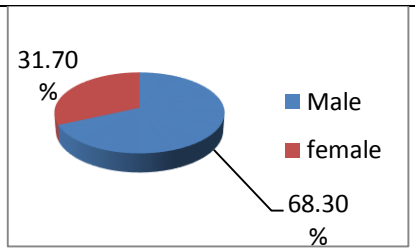
The age of the patients ranged above12years years with a mean of 42.68±8.08 years. Majority of the patients were aged between 35-50 years (83.3%) followed by 12-34 years (16.7%) as shown in Bar-Chart 1. There were 41 (68.3%) male and 19 (31.7%) female patients in the study group with a male to female ratio of 2.2:1 as shown in Pie-Chart 1. Stone size ranged from 5mm to 15mm with a mean of 10.82±2.01mm. 26 (43.3%) patients had stone size in the range of 5-11 mm while 34 (56.7%) patients had stone with size of 11mm or more as shown in Bar-Chart 2. It was in right ureter in 27 (45.0%) and left ureter in 33 (55.0%) patients as shown in Pie-Chart 2. Ca. oxalate stones were most frequent and were observed in 32 (53.3%) patients followed by struvite (23.3%), Ca. phosphate (15.0%), uric acid (8.3%) and no cysteine (0%) stones as shown in Pie-Chart 3.Stone clearance was observed in 58 (96.7%) patients at 1 month follow-up as shown in Figure 1. When stratified, there was no significant difference in the frequency of stone clearance across various age (p=0.520), gender (p=0.571), size (p=0.847) and type of stones (p=0.787) and anatomical side (p=0.885) groups as shown in Bar-Charts 3 to 7.

Table 1: Baseline Characteristics of Study Population (n=60)

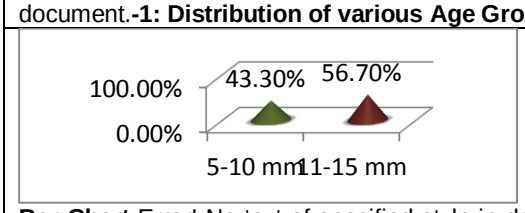
Characteristics	Study Sample
Age (years)	42.68±8.08
• 40-55 years	10 (16.7%)
• 56-70 years	50 (83.3%)
Gender	
• Male	41 (68.3%)
• Female	19 (31.7%)
Stone Size (mm)	10.82±2.01
• 5-10 mm	26 (43.3%)
• 11-15 mm	34 (56.7%)
Anatomical Side	
• Right	27 (45.0%)
• Left	33 (55.0%)



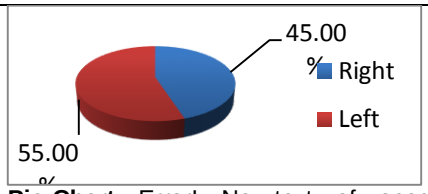
Bar-Chart Error! No text of specified style in document.**-1: Distribution of various Age Groups**



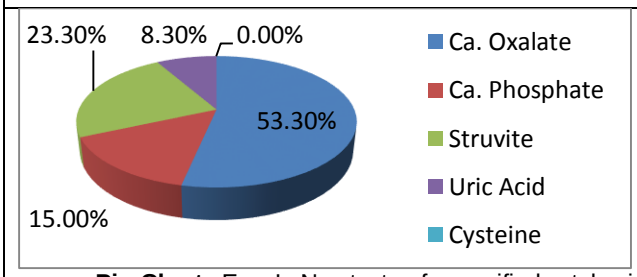
Pie-Chart Error! No text of specified style in document.**-2: Gender Distribution of Study Sample**



Bar-Chart Error! No text of specified style in document.**-3: Distribution of various groups based on Stone Size**



Pie-Chart Error! No text of specified style in document.**-3**: **Distribution of patients according to anatomical side of st**



Pie-Chart Error! No text of specified style in document.**-4: Distribution of patients according to Composition of stone**

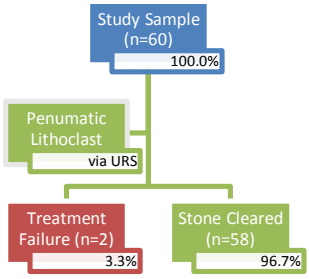
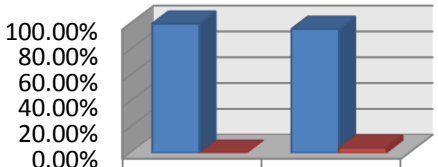


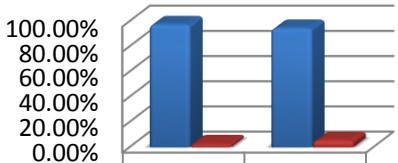
Figure Error! No text of specified style in document.**-5: Treatment Outcome of Pneumatic Lithoclast in Distal Ureteric Stone**



	12-34 years	35-70 years
Stone Cleared	100.00%	96.00%
Treatment Failed	0.00%	4.00%

Chi-square test, observed difference was statistically insignificant (p<0.520)

Bar-Chart Error! No text of specified style in document.**-6: Comparison of Frequency of stone clearance across Age Groups**



	Male	Female
Stone Cleared	97.60%	94.70%
Treatment Failed	2.40%	5.30%

Chi-square test, observed difference was statistically insignificant (p<0.571)

Bar-Chart Error! No text of specified style in document.**-7: Comparison of Frequency of stone clearance across Gender Groups**

	5-10 mm	11-15 mm
Stone Cleared	96.20%	97.10%
Treatment Failed	3.80%	2.90%

Chi-square test, observed difference was statistically insignificant (p<0.847)

Bar-Chart Error! No text of specified style in document.**-8: Comparison of Frequency of stone clearance across Size of Stone**

	Right	Left
Stone Cleared	96.30%	97.00%
Treatment Failed	3.70%	3.00%

Chi-square test, observed difference was statistically insignificant (p<0.885)

Bar-Chart Error! No text of specified style in document.**-9: Comparison of Frequency of stone clearance across anatomical Side of Stone**

	Ca. Oxalate	Ca. Phosphate	Struvite	Uric Acid	Cysteine
Stone Cleared	96.90%	100.00%	90.90%	100.00%	100.00%
Treatment Failed	3.10%	0.00%	9.10%	0.00%	0.00%

Chi-square test, observed difference was statistically insignificant (p<0.787)

Bar-Chart Error! No text of specified style in document.**-10 Comparison of Frequency of stone clearance across type of Stone**

DISCUSSION

The target of this investigation was to assess the viability of pneumatic lithoclast in the board of various metabolic kinds of stones in the lower 33% of ureter. This study included 60 patients of the two sexual orientations matured between 12 years to 70 years. In the current investigation, the mean age of the patients was 42.68±8.08.15±11.19 years. Cai et al. (2014)[7] revealed comparable mean time of 42.83±9.24 years in their examination. A moderately higher mean time of 43.4±14.5 years has been accounted for by Tansu et al. (2014)[8] while Yon et al. (2014)[9] reported it to be 40.6±9.8 3years, and Fan et al. (2007)[10] reported it to be 43.5±8.82 years. It is also comparable with studies carried out by Yin et al. in 2014 (43.9±6.2)[11], He and Bao in (201543.2±2.7)[12] and Manzoor et al. 2015 (42.54 ± 14.07)[13] found in Pakistani patients. Majority of the patients were aged between 35-50 years (81.5%) followed by 18-34 years (16.7%). There were 41 (68.3%) male and 19 (31.7%) female patients in the study group with a male to female ratio of 2.2:1. Our results match with those of Khosoet al. (2016)[14] who reported similar male to female ratio of 2.1:1.While Yon et al. (2014)[9] reported it to be 2.3:1. Cai et al. (2014)[7] reported relatively higher male to

female ratio 1.8:1, Yin et al. (2014) also reported higher ratio1.8:1, Iqbal et al. (2016)[15] reported it to be 2.1:1 and Rajpar et al. (2012)[16] reported it to be 2.1:1 in Pakistani population.Stone size ranged from 5mm to 15mm with a mean of 10.82±2.01mm. 26 (43.3%) patients had stone size in the range of 5-11 mm while 34 (56.7%) patients had stone with size of 11mm or more. Our mean stone size was comparable with Khoso et al. (12.16±5.8mm)[14], Khalil et al. (13.2±2.9mm)[17], Yon et al. (9.8±3.5mm)[9], Khoder et al. (10.7±0.7mm)[18], Iqbal et al. (10.01±6.024mm)[15] and Rajpar et al. (11.44±1.41mm)[16]. Stone was in right ureter in 27 (45.0%) and left ureter in 33(55%) patients. A similar right to left ureter percentage has been observed by Khoso et al. (right ureter 76.6% and left ureter 32.4%)[14], Khalil et al. (right ureter 54.1% and left ureter 45.9%)[17], Degirmenci et al. (right ureter 64.95% and left ureter 35.05%)[15], Yon et al. (right ureter 47.5% and left ureter 52.5%) [9] and Rajpar et al. (right ureter 47.8% and left ureter 52.2%) [16] in Pakistani population.Ca. oxalate stones were most frequent and were observed in 32 (53.3%) patients followed by struvite (23.3%), Ca. phosphate (15%), uric acid (8.3%) and no cysteine (0%) stones. At 1 month follow up in lower ureter the frequency of successful stone clearance observed was 58 (96.7%). When stratified, there was no significant difference in the frequency of stone clearance across various age (p=0.520), gender (p=0.571), size (p=0.847) and type of stones (p=0.787) and anatomical side (p=0.885) groups. Nawaz et al. (2014) observed a similar frequency 96.1% of successful stone clearance and there was no statistically significant difference between the clearance rates in males and females (p value=0.341)[19]. Our study results also closely matches with Khan et al. (2011) who reported Complete stone clearance 94.2% patients at 1 month follow up [20].Subhani et al. (2009) also reported similar stone clearance rate which was 94.74% [21]. In our study, the success rate of stone clearance was 94.2%, which is also in accordance with the frequencies reported by Khan et al. (98.3)[22], Hong et al (96.9%)[23], Kadihasanoglu et al (92%)[24], Nawaz et al (96.1%)[19], and Khan et al (95.23%)[25] were also in accordance with our study.In present study, it was confirmed that Pneumatic lithoclast with URS is effective and safe in the management of the ureteric stone with some limitations in the upper ureter. The limitation of the current study is the relatively small number of patients; however, it was due the strict inclusion criteria of the study for the selection of an actually impacted stone.

CONCLUSION

The frequency of stone clearance was found to be 96.7% with pneumatic lithoclast in patients with single stone of 5-15mm in lower third of ureter which advocate its routine use in future urological practice.

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