IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 12 Ser.5 (December. 2021), PP 31-39
www.iosrjournals.org

Efficacy of Lidocaine jelly for prevention of inadvertent retrograde stone migration during pneumatic lithotripsy of ureteric stone

Md. Mohidul Islam[1], Nitai Pada Biswas[2], Md. Abdul Alim Shaikh[3], Md. Liaquat Ali[4], S. M. Quamrul Hassan[5], Zannat-ul-Sarmin[6]

[1]*Medical Officer, Department of Urology, Dhaka Medical College, Dhaka, Bangladesh*
[2]*Professor and Head, Department of Urology, National Institute of Kidney Diseases and Urology, Dhaka, Bangladesh*
[3]*Associate Professor, Department of Surgery, North Bengal Medical College, Sirajganj, Bangladesh*
[4]*Associate Professor, Department of Paediatrics, North Bengal Medical College, Sirajganj, Bangladesh*
[5]*Associate Professor, Department of Paediatrics, Shaheed M Monsur Ali Medical College, Sirajganj, Bangladesh*
[6]*Registrar, Department of Paediatric Nephrology, Dhaka Medical College, Dhaka, Bangladesh*
**Corresponding author: drhillol35@gmail.com*

Abstract
Background: *Intracorporeal lithotripsy modalities and stone removal devices have been created to facilitate endoscopic management of ureteral stones. These devices, along with improved techniques, have resulted in stone-free rates greater than 95% with low morbidity. However, problems remain that preclude consistent 100% stone-free rates with endoscopic treatment of ureteral calculi. Retrograde migration during ureteroscopic procedures remains a significant problem.*
Objective: *The aim of this study was to assess efficacy of instilling 2% Lidocaine jelly in prevention of retropulsion during ureteroscopic lithotripsy.*
Method: *This study included 60 patients suffering from ureteral stones that were treated with intracorporeal lithotripsy using the pneumatic lithotriptor. Patients were divided into two equal groups; Group A patients underwent pneumatic lithotripsy without using 2% Lidocaine jelly. Group B patients underwent the pneumatic lithotripsy using Lidocaine jelly proximal to the ureteric stone.*
Results: *Among 60 patients, the mean age was 39.87±11.89 years (range 17-65 years) in group A and 37.23±11.59 years (range 18-62 years) in group B. There was no significant difference between the groups with regards to stone site, size or state of the upper urinary tract by excretory urography. The pneumatic lithotriptor allowed successful fragmentation of all calculi. Upward migration occurred in 6 patients (20%) in Group A while in Group B, it occurred in only 1 patient (3.33%), which was a statistically significant (p= 0.04). The mean operative time was slightly longer in the group B (51.17±10.80 minutes) than in the group A (49.83±14.11minutes), the difference was not significant (p=0.68).*
Conclusions: *Instillation of 2% Lidocaine jelly just proximal to the stone in the ureter before starting ureteroscopic guided fragmentation of the stone using a pneumatic lithotripsy device is a simple and inexpensive option that can significantly reduce inadvertent stone migration, result in a higher stone free rate & obviates need for second procedures.*

Keywords: *Intracorporeal lithotripsy, Pneumatic lithotripter, 2% Lidocaine jelly*

Date of Submission: 02-12-2021 Date of Acceptance: 16-12-2021

I. Introduction

Urinary stones have plagued humans since the earliest records of civilization. Between 5-12% of population will have a urinary tract stone during their lifetime and recurrence rates approach 50%.The peak incidence of lithiasis appears to be between the ages of 45-64 years. Male have more than twice the rate of stone formation than females. The stone that obstructs a patient's ureter originate in the kidney. Ureteric colic occurs as a result of obstruction of the urinary tract by calculi at the narrowest anatomical areas of the ureter: the pelviureteric junction (PUJ), near the pelvic brim at the crossing of the iliac vessels and the narrowest area, the vesicoureteric junction (VUJ).

Long-term obstruction can cause permanent damage to the kidney function; therefore, regardless of the absence of pain or infection, a stone must either pass spontaneously or be surgically treated. Key to the passage of a stone is ureteral peristalsis, not hydrostatic pressure. When the ureter is not otherwise obstructed, the chief determinant of stone passage is the diameter of the stone in its transverse orientation. Next most important is the location of the stone within the ureter at presentation, with a review of the literature demonstrating a 71% chance of passage of a distal ureteral stone versus 22% for proximal stones.

Improvements in technology over the last 10-15 years have led to an increased ability to successfully manage ureteral calculi using a variety of methods. Although extracorporeal shock-wave lithotrypsy (ESWL), antegrate percutaneous approaches & laparoscopic ureterolithotomy are options, the mainstay in the treatment of patients with ureteral calculi continues to be retrograde ureteroscope (URS) stone removal. Refinements in URS technology, as well as the development of improved laser techniques and advances in ancillary equipments, such as baskets, graspers and others, have led to a situation in which almost all ureteral calculi can be successfully managed in a single procedure using URS. The management of ureteral calculi has changed considerably over the past decade with the advent of progressively smaller ureteroscopes and more efficient lithotripsy modalities. These changes have allowed urologists to remove ureteral calculi more safely and with a higher rate of success.

Stones with diameter of 5-20 mm can be managed by retrograde URS with the success rate of more than 90%. Rigid, semi-rigid & flexible URS are used with different energy sources for stone fragmentation like pneumatic lithotripter, electrohydraulic lithotripter, ultrasonic lithotripter, laser lithotripter & combined pneumatic & ultrasonic lithotripter. Despite the undoubted value of these techniques some fundamental obstacles remain and limit their success. For example, retrograde displacement of a calculus occurs during irrigation to maintain patency and vision, but more frequently it is due to application of kinetic energy used for stone fragmentation. The reported migration rate varies from 2% to 60%. The wide variation in migration rate is related to the stone site because proximal ureteral stones have a higher retropulsion rate.

Retrograde calculus migration during ureteroscopic procedures remains a significant problem. Clinical studies have reported an incidence of 40-50% for ureteral stone migration from the proximal ureter and 5-10% for migration from the distal ureter. The risk of proximal fragment migration is influenced by the pressure of the irrigant fluid, type of energy source used for intracorporeal lithotripsy, site and degree of calculus impaction, and degree of proximal ureteral dilatation. Pneumatic and electrohydraulic lithotrites cause more retrograde propulsion of the ureteral stones than holmium: YAG laser and ultrasonic lithotrites. Proximal stone migration is more likely with smaller stones and greater proximal ureteral dilation or hydronephrosis. Retrograde stone migration results in a longer operating time, more invasive endoscopy, and an increase in residual stones and the need for secondary procedures, leading to higher morbidity, and greater expense. In addition, residual stone fragments may serve as a source of recurrent stone growth, persistent infection and renal colic.

To prevent stone migration, surgeons have traditionally used a number of maneuvers, including reverse Trendelenburg position, to optimize the effects of gravity and decreased irrigation pressure and flow rate. Various techniques have been described including the use of ureteral baskets, lithocatch ™, lithovac™, passport™ balloon, dretler stone cone (Boston Scientific), backstop gel etc. These antiretropulsive devices are placed proximal to stone and are then deployed in a configuration that prevents stone migration as fragmentation occurs. All of these disposable devices add to cost.

This study was designed to ascertain the efficacy of 2% Lidocaine jelly instillation proximal to ureteric stone during intracorporial pneumatic lithotripsy using a semirigid ureteroscope for the prevention of retrograde migration and improvement in stone free rate.

II. Methods

This hospital based prospective quasi experimental study was conducted on the patients with lower and mid ureteric calculus underwent URS stone removal, admitted in department of Urology, National Institute of Kidney Disease & Urology (NIKDU), Dhaka during January 2016 to December 2016 to evaluate efficacy of 2% Lidocaine jelly as an antiretropulsive measure. Patients with age ≥ 16 years, having single stone, stone size- 5-20 mm (measured on X-ray KUB), stone located below pelvic brim (Lower and mid ureter on radiograph of KUB), having radio opaque stones were included in the study. Patients were excluded who had any degree of ureteral stricture distal to the stone, impacted stone, coexistence of a kidney stone on USG or x-ray of kidney, ureter & urinary bladder (KUB) region, where stone was removed without any energy source and having radiolucent stone.

All patients was evaluated by detailed history, physical examination & necessary investigation including urine analysis, complete blood count, serum creatinine, coagulation profile, ultrasonogram of KUB, x-ray of KUB, Intravenous urography and an x-ray KUB on the day of surgery were done. Patients with documented urinary tract infection (UTI) were treated with appropriate antibiotic and optimization of comorbid conditions were achieved before surgery. Patients were randomly divided into two equal groups; group-A patients were undergone pneumatic lithotripsy without using 2% Lidocaine jelly. Group-B patients underwent

the pneumatic lithotripsy using Lidocaine jelly proximal to the ureteric stone. The ureteroscopy was be done under spinal anaesthesia using 9.5 Fr. Semirigid ureteroscope with 5Fr. working channel & 9 degree lens. Patients were placed in standard lithotomy position. The ureteroscope was passed in to the ureter with the aid of 0.035 inch guide wire. After placing the guide wire and reaching the stone with the semirigid ureteroscope. an open end ureteral catheter (5 Fr.) was advanced through the working channel until it reached beyond the stone and 2ml of 2% Lidocaine jelly will be instilled in the ureteral lumen proximal to the stone using a 5 ml syringe. Then the ureteral catheter was withdrawn and the probe of the pneumatic lithotriptor was advanced through the working channel to start the process of stone fragmentation. Continuous low- pressure fluid flow was necessary to maintain visibility of stone. The stone fragments were removed by stone grasper and the remaining amount of Lidocaine jelly was washed out with saline irrigation. A 5Fr double J stent was inserted over the guide wire up to pelvis and left indwelling for four weeks. The procedure was considered successful in either group if no proximal stone migration occurred, and if the stone was fragmented completely.

X-ray KUB was obtained after 24 hours to exclude migration and after 2 weeks to assess the stone free rate. All cases of stone migration were treated by ESWL or ureteroscopy after 4 weeks. Outcome variables of the study were therefore included stone migration, operative time, post-operative complications, duration of hospital stay, stone free rate in 2 groups. Chi-square test done to analyze the data

III. Results

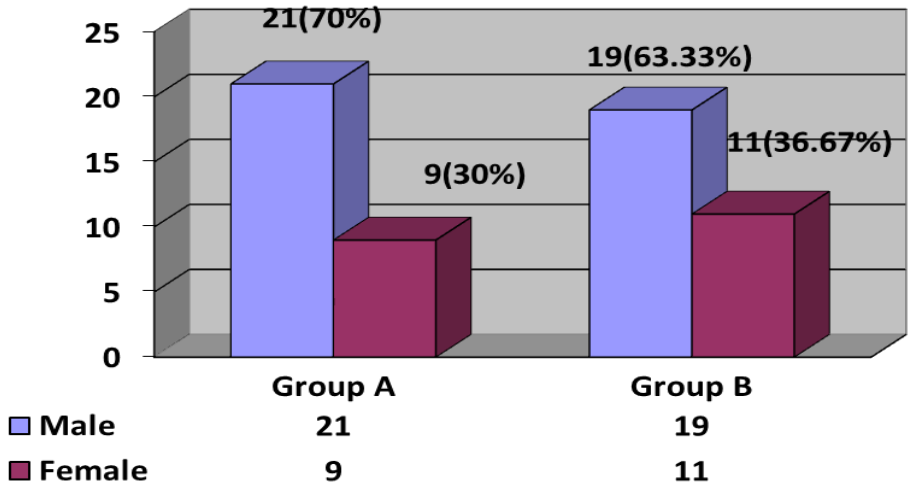
Majority of the ureteral stones was found in the age range 31-45 years. The mean age of Group-A and Group–B were 39.87±11.89 and 37.23±11.59 years respectively. The lowest and highest age in Group - A was 17 and 65 years respectively and those in Group-B were 18 and 62 years respectively. Age categories were almost homogenously distributed in both groups (p>0.05) (Table-I).

Table I: Comparison of age incidence of ureteric stone between groups:

Age	**Group A (n=30)**		**Group B (n=30)**		**P value**
	No	%	No	%	
16-30 y	7	26.67	8	23.33	
31-45 y	13	46.67	14	43.33	
46-60 y	8	23.33	7	26.67	0.39
61-75 y	2	3.33	1	6.67	
Mean± SD	**39.87±11.89**		**37.23±11.59**		
Range	**17-65 years**		**18-62 years**		

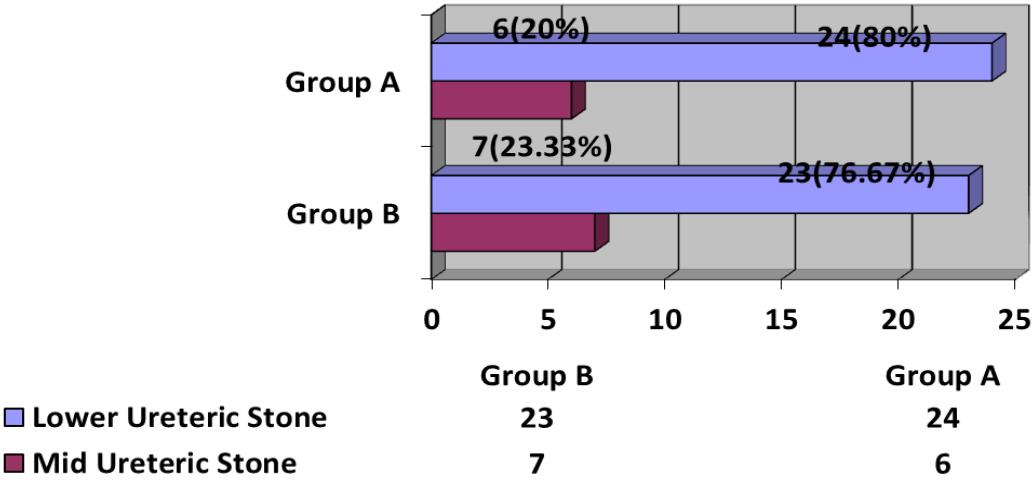
Group-A: Patients with URS & ICPL done without Lidocaine jelly. Group-B: Patient with URS & ICPL done with Lidocaine jelly. Student's T-test (Unpaired) done to analyze the data.

Figure I: Comparison of sex distribution between groups:
Majority of the subjects in both the groups (70.00% in Group–A and 63.33% in Group–B) were male and the rest (30.00% in Group–A and 36.67% in Group–B) were female. Gender distribution was statistically insignificant (p>0.05) between two groups.



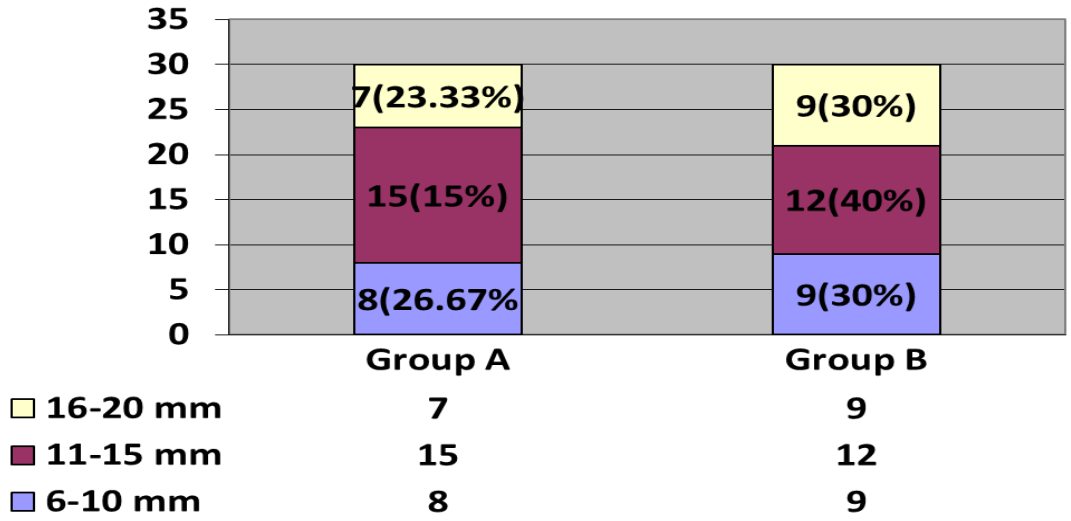
Chi-square test done to analyze the data

Figure II: Comparison of location of stone between groups:
Most of the stones were located in lower ureter (80% and 76.67% in group A and group B respectively). Calculated p value was 0.75 which is not significant (p >0.05).



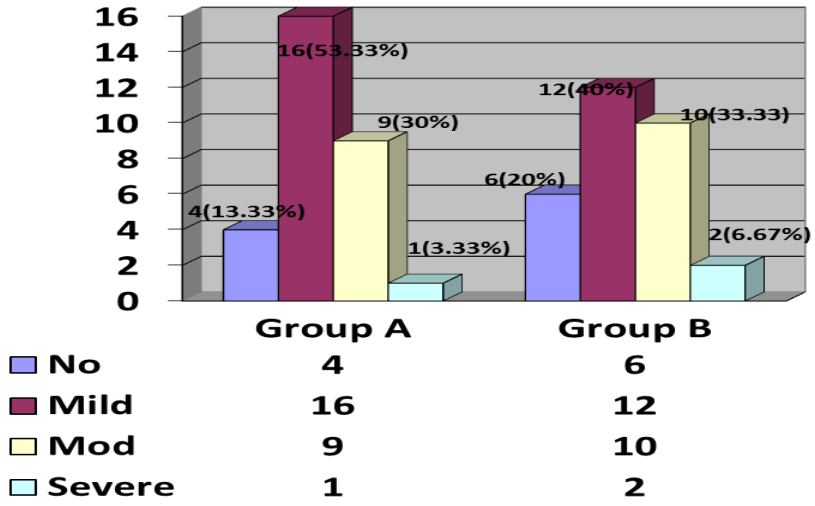
Chi-square test done to analyze the data

Figure III: Comparison of stone size between groups
Size of the stone was within 6-20 mm in both the groups. Mean size of the stones were 12.77±3.89 mm in group A and the size of the stones were 13.20±3.99 mm in group B. Calculated p value was 0.67 which is not significant (p >0.05).



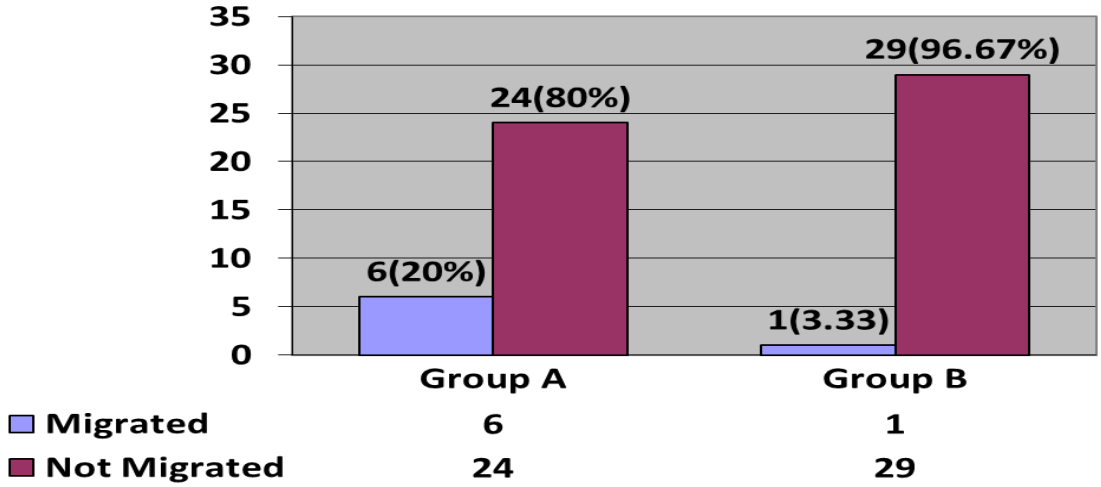
Students T-test (Unpaired) was done to analyze the data.

Figure IV: Presence of hydroureteronephrosis in groups:
Presence of hydroureteronephrosis might have influence on outcome of intervention. This figure shows most patients have mild to moderate hydroureteronephrosis distributed in both groups. The difference was insignificant in between groups (p>0.05).



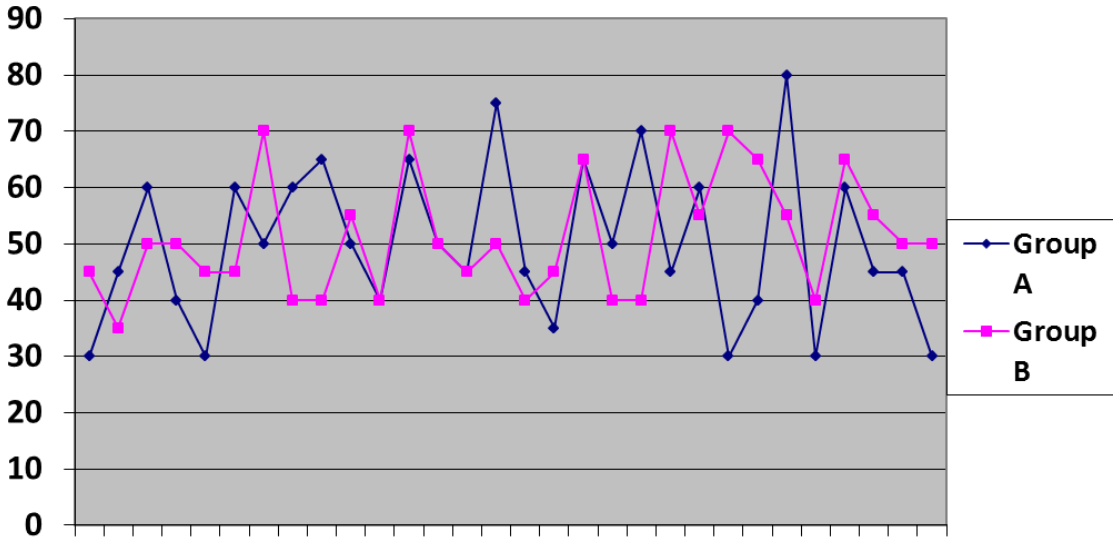
Chi-square (x2) test was done to analyze the data

Figure V: Comparison of proximal migration of stone between groups:
Chart shows a major difference in proximal migration of stones in between two groups. Group A shows 20% (6 patients) retropulsion where group B shows only 3.33 %(1 patient). The difference was significant (p<0.05).



Chi-square (x2) test was done to analyze the data

Figure VI: Comparison of operating time between groups:
The mean operating time in group A and group B were 49.83±14.11 minute and 51.17±10 minutes respectively, which is slightly high in group B but insignificant (p>0.05).



Student's T-test (Unpaired) done to analyze the data

Table II: Comparison of immediate post-operative complications between groups:
Haematuria (>24 hours) was observe d in 3 patients in group A and 1 patient in group B (p>0.05) during postoperative period. Severe colic was observe d in 1 patient in group A and 2 patient in group B (p>0.05). Only 1 patient had UTI in group A (p>0.05).

	Group A (n=30)		Group B (n=30)		P value
	No	%	No	%	
Haematuria (>24 hrs)	3	10.00%	1	3.33%	0.30
Severe Colic	1	3.33%			0.55
			2	6.67%	
UTI/Sepsis	1	3.33%	0	0.00%	0.31

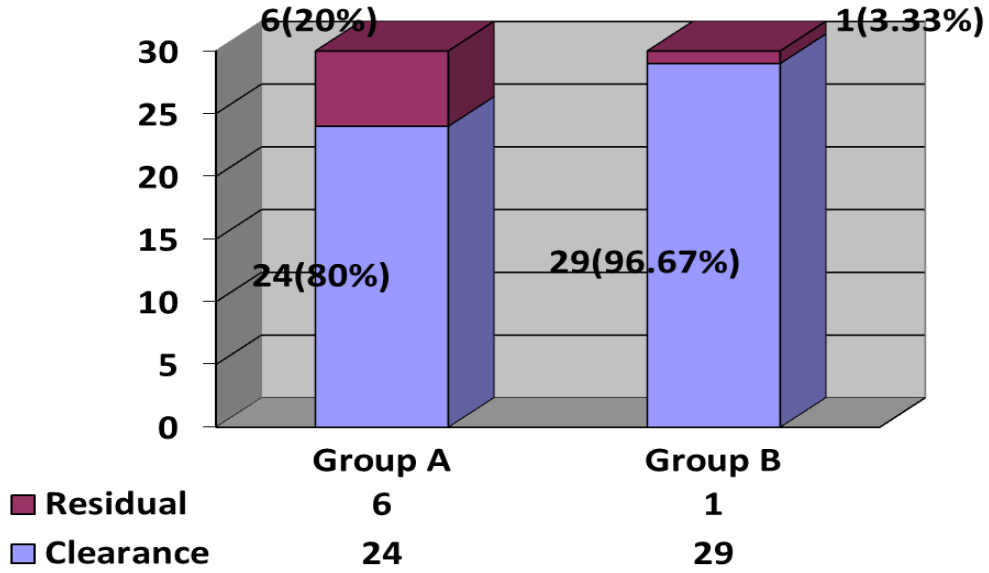
Chi-square test done to analyze the data

Table III: Comparison of post-operative hospital stays between groups:
Days in hospital in post-operative period in group A and group B were 2.63±1.03 and 2.37±0.96 respectively. Days in hospital in post-operative period were not significant (p>0.05) between groups.

Hospital stay(days)	Group A (n=30)		Group B (n=30)		P value
	No	%	No	%	
2	2	6.67%	5	16.67%	
3	7	23.33%	10	33.33%	
					0.30
4	13	43.33%	10	33.33%	
5	8	26.67%	5	16.67%	
Mean ±SD	**2.63±1.03**		**2.37±0.96**		
Ranges	**2-5 days**		**2-5 days**		

Student's T-test (Unpaired) done to analyze the data

Figure VII: Comparison of stone clearance between groups:
An overall stone clearance rates was 80.00% in group A and 96.67% in group B. Stone clearance rate was slightly higher in group B & it was statistically significant (P<0.05).



Chi-square (x2) test was done to analyze the data

IV. Discussion

Stone migration and retropulsion during ureteroscopic lithotripsy represents a major challenge. It may be caused by irrigation flow and/or by energy transmission into the stone during stone disintegration. Undesired push back is observed most frequently in pneumatic lithotripsy; it ranges from 5 to 40% depending on stone localization;during Ho:YAG laser lithotripsy, the risk of retro manipulation is lower. An obstructed upper tract with a dilated ureter beyond the impacted stone increases the risk of stone migration considerably; moreover, a high position of the stone and surgeon's experience appear to be predictive for stone migration. Centers with extensive experience in ureteroscopy report on migration rates of only 4–7%.Different stone-trapping strategies have been developed to minimize stone migration to the pelvicaliceal system[1].

In this prospective quasi experimental study 60 patients were enrolled and divided in to two groups – group A & group B. Mean age was 39.87±11.89 years (range 17-65 years) in group A and 37.23±11.59 years (range 18-62 years) in group B which were almost homogenously distributed. There were total 40 male & 20 female patients & male to female ratio in group A & group B was 1.7:1 & 2.3:1 respectively.Some studies i.e. Al-Sammarraie, AL-Dabbagh & Ahmed (2016) Bastawisy et al. (2011) have similar groups distribution regarding to age as like the recent study[2,3].

In present study, stone size ranged from 6-20 mm in both group A & group B with mean stone size was 12.77±3.89 mm & 13.20±3.99 mm in group A & group B respectively. In group A, 80% stones were located in lower ureter & 20% stones were found in mid ureter while in group B, 76.67% stones were located in lower ureter & 23.33% stones were in mid ureter. In study done by Al-Sammarraie, AL-Dabbagh & Ahmed (2016) showed stone size ranging from 6-12mm. Bastawisy et al. (2011) in their study found size of stones ranged from 6 to 20 mm, with a mean stone size of 12.6±0.8 mm, which is similar to recent study. In proximal ureter, the stone size was ranged from 8 to 20 mm (mean, 13.9±0.4). In the midureter, the stone size was ranged from 7 to 18 mm (mean, 12.6±0.8) while in the distal ureter the stone size was ranged from 6 to 16 mm (mean, 11.9±0.7)[2,3].

In recent study, in group A 4 patients (13.33%) had no hydroureternephrosis, 16 patients (53.33%) had mild hydroureternephrosis, 9 patients (30%) had moderate hydroureternephrosis & 1 patient (3.33%) had severe hydroureternephrosis, that was similar with some studies[1,2].

The pneumatic Lithotriptor allowed successful fragmentation of all calculi into small fragments. In recent study, upward stone or fragment migration occurred in 6 patients (20%) in group A (having moderate to severe hydroureteronephrosis) while in Lidocaine jelly group (group B) it occurred in only 1 patient, (3.33%) having severe hydroureteronephrosis, which was a statistically significant difference (p= 0.04). Later all the patients in both group required axillary procedures like URS or ESWL for stone clearance. This finding was comparable to study done by Al-Sammarraie, AL-Dabbagh & Ahmed (2016) , showed only one patient (5%) in

the group A (received Lidocaine 2% jelly instillation before intracorporeal lithotripsy), while migration had been occurred in 6 patients (30%) in the control group (conventional method without jelly), which was a statistically significant difference (p=0.03). Mohseni, Arasteh & Alizade (2006) showed stone or stone fragment migration occurred in 12.4% of the treatment group (jelly instillation) and 44.4% of the controls, statistically significantly different (P = 0.046), which is higher than recent study. Bastawisy et al. (2011) compared the Stone Cone device and instillation of lubricating Lidocaine jelly as two methods to prevent retrograde stone migration during ureteroscopic lithotripsy & found upward stone migration did not occur in patients in the Stone Cone group, while in the Lidocaine jelly group it occurred in 3 patients (15%). Zehri et al (2008) study showed 4% stone migration in 24 patients and Sozen et al (2002) study of 500 patients reported stone migration rate of 2%[2,8,18].

In present study no significant complications including ureteral perforation or avulsion had been occurred in either group. However, one patient (3.33%) in the group A and 2 patietns (6.67%) in group B had had significant postoperative colic requiring parenteral analgesics. UTI/Sepsis was seen in one patient (3.33%) in the group-A postoperatively needed admission to the hospital and giving parenteral antibiotic and intravenous fluid. Hematuria persisting >24 hours was noted in 4 patients (3 in group A and 1 in group B) which lasted up to 48 hours postoperatively and resolved conservatively with high fluid intake and diuretics (not significant between two groups). Complication rate of present study was similar in the study done by Al-Sammarraie, AL-Dabbagh & Ahmed (2016), where one patient in the group using Lidocaine gel had significant postoperative colic and one in the control group without using Lidocaine gel had fever postoperatively. Bastawisy et al. (2011) found mild hematuria in 11 patients out of 20 patients in the Lidocaine jelly group, which is higher than present study[2,3].

Mean hospital stay in group A was 2.63±1.03 and in group B was 2.37±0.96, which was not statistically significant (p= 0.30). Study done by Bastawisy et al. (2011) showed, hospital stay was ranged from 1 to 5 days (mean, 1.9±0.1) and the patients returned to normal daily activities after 2-5 days (mean, 3.1±0.4) in Lidocaine jelly group[3].

The stone-free rate after 2 weeks follow up X-ray KUB (100%) was 96.67 % in the group B, 80% in the group A and the difference between the two groups was statistically significant (p= 0.044352) in recent study. The result is comparable to study done by Al-Sammarraie, AL-Dabbagh & Ahmed (2016) , where stone-free rate at 1-month follow up with ultrasound and CT scan was 95% in the group received Lidocaine 2% jelly instillation before intracorporeal lithotripsy, and 65% in the control group and the difference between the two groups was statistically significant (p=0.0). But Mohseni, Arasteh & Alizade (2006) found stone-free rate 93.7% and 83.3% in the treatment (received Lidocaine 2% jelly instillation) and control groups, respectively. The rates did not improve after 2 weeks, and the difference was not statistically significant between the two groups (P = 0.384)[2,8].

It is seen that group B patients (received Lidocaine 2% jelly instillation) has overall better outcome than group A patients in term of stone clearance, shorter hospital stay, low complication rate & less requirement of axillary procedures due to effective prevention of stone retropulsion by instillation of Lidocaine jelly proximal to ueretral calculi during pneumatic lithotripsy.

V. Conclusion

Instillation of 2% Lidocaine jelly just proximal to the stone in the ureter before starting ureteroscopic guided fragmentation of the stone using a pneumatic lithotripsy device is a simple and inexpensive option that can significantly reduce inadvertent stone migration, result in a higher stone free rate & obviates need for second procedures

Recommendations

•Large scale, multicenter study with proper randomization is needed to disclose more details about the efficacy of 2% Lidocaine jelly to prevent retrograde stone displacement during ureteroscopic guided fragmentation of the stone.

•Factors related to stone migration like stone size & location of the stone should be considered

Acknowledgements: We would like to thank, Department of Urology, National Institute of Kidney Diseases and Urology, Dhaka, Bangladesh for kind cooperation.

Conflict of interest: There is no conflict of interest.

References

[1]. Ahmed, M, Pedro, RN & Kieley, S 2009, 'Systematic evaluation of ureteral occlusive devices; insertion, deployment, stone migration, and extraction', The journal of urology, vol. 73, pp. 976-980.

[2]. AI-Sammarraie, SH, AL-Dabbagh, AD & Ahmed, SB 2016, 'The efficacy of using Lidocaine jelly 2% for prevention of inadvertent retrograde stone displacement during pneumatic lithotripsy of upper ureteral stone', International Journal of Science and Research, vol. 5, no. 7, pp. 2166-2169.

[3]. Bastawisy, M, Gameel, T, Radwan, M, Ramadan, A, Alkathiri, M & Omar, A 2011, 'A comparison of Stone Cone versus Lidocaine jelly in the prevention of ureteral stone migration during ureteroscopic lithotripsy', Ther Adv Urol, vol. 3, no. 5, pp. 203-210.

[4]. Bravo-Castroa, El, Campos-Salcedob, JG, Torres-Gomeza, JJ, CastelanMarti neza, JA, Lopez-Silvestrec, JC, Zapata-Villalbac, MA, Estrada-Carrascoc, CE, Rosas-Hernandezc, H, Diaz-Gomezc C & Calderon-Garcia, JG 2014, 'Polymer gel use for preventing migration during lithotripsy in a patient with ureteral lithiasis', Rev Mex Urol, vol. 74, no. 3, pp. 193-196.

[5]. Jayram, G & Gerber, GS 2012, 'Uretesoscopic management of ureteral calculi', in Smith, AD, Badlani, GH, Preminger, GM, Kavokssi, LR (Eds), Smith's Textobook of Endourolgy, 3rd edn, pp. 412-417, Blackwell publishing Ltd, West Sussex.

[6]. Leavitt, DA, Rosette, JJMCH & Hoenig DM 2012, 'Strategies for Nonmedical Management of Upper Urinary Tract Calculi', in LR Kavoussi, AC Novick, AW Partin, AJ Wein, CA Peters, (eds), Campbell-Walsh Urology, 10th edn, pp. 1234-1259, Elsevier Saunders, Philadelphia.

[7]. Mirabile, G, Philips, CK & Edelstein, A 2008, 'Evaluation of a novel temperature sensitive polymer for temporary ureteral occlusion', J Endourol, vol. 22, no. 10, pp. 2357-2360.

[8]. Mohseni, MG, Arasteh, S & Alizade, F 2006, 'Preventing retrograde stone displacement during pneumatic lithotripsy for ureteral calculi using Lidocaine jelly', Urology, vol. 68, no. 3, pp. 505-507.

[9]. Olbert, Keil, C, Weber, J, Schrader, AJ, Hegele, A & Hofmann, R 2009, 'Efficacy and safety of the Accordion® stone-trapping device: in vitro results from an artificial ureterolithotripsy model', UrolRes, DOI 10.1007/s00240-009-0232-2

[10]. Rane A, Sur. R & Chew B 2010, 'Retropulsion during intracorporeal lithotripsy: what's out there to help?', BJU International, vol. 106, pp. 591 -594.

[11]. Sabnis, RB 2013, 'Urinary tract stone disease', in Salam, MA (Ed), Principles and Practice of Urology, 2nd edn, pp. 543-552. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

[12]. Segura, JW, Preminger, GM & Assismos, DG 1997, 'Ureteral stones clinical guidllines panel summary report on the management of ureteral calculi', The Journal of urology, vol. 158, pp. 1915-1921.

[13]. Seitz, C, liatsikos, E & Porpiglia, F 2009, 'Medical therapy to facilitate the passage of stone: what is the evidence?', European Journal of Urology, vol. 56, pp. 455-471.

[14]. Sen, H, Bayrak, O, Erturhan, S, Urgun, G, Kul, S, Erbagci, A & Seckiner, I 2014, 'Comparing of different methods for prevention stone migration during ureteroscopic lithotripsy', Urol Int., vol. 92, no. 3, pp. 334-8.

[15]. Shabana, W, Teleb, M & Dawod, T 2015, Safety and efficacy of using the stone cone and an entrapment and extraction device in ureteroscopic lithotripsy for ureteric stones', Arab Journal of Urology, vol. 13, pp. 75-79.

[16]. Stoller, ML 2013, 'Urinary Stone Disease', in JW McAninch, TF Lue, (eds), Smith & Tanagho's General Urology, 18th edn, pp.249-279. McGraw-Hill, USA.

[17]. Sudan AM 2013 'Intracorporeal Lithotripsy', in Salam, MA (Ed), Principles and Practice of Urology, 2nd edn, pp. 566-569. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

[18]. Zehri, AA, Ather, HM, Siddiqui, KM & Sulaiman, MM 2007, 'A Randomized clinical trial to Lidocaine Jelly for prevention of inadvertent Retrograde stone migration during pneumatic lithotripsy of ureteral stone', The Journal Urology, vol. 180, pp. 966-968.

Md. Mohidul Islam, et. al. "Efficacy of Lidocaine jelly for prevention of inadvertent retrograde stone migration during pneumatic lithotripsy of ureteric stone." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(12), 2021, pp. 31-39.