Original Research Article

Does size of semi-rigid ureteroscope make any difference in the management of ureteric stones in adult patients?

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Abstract

Background: Ureteroscopic lithotripsy is the standard of treatment for ureteric stones. Varying size of ureteroscopes provide their own advantages and drawbacks. We explored this issue further in our study by comparing outcomes of two different sized ureteroscopes.**Methods**: Forty adult patients of ureteric stones of Indian origin were taken. They were divided into two groups. Group A utilized 6.4/7.8Fr ureteroscope; while group B used 8.6/9.8Fr ureteroscope. Baseline demographic, clinical and stone parameters were compared. Outcome was assessed in form of stone free rate (SFR), operative time, hospital stay and occurrence of perioperative complications. Student-T and Chi-square tests were used in analysis.**Results**:Mean age and BMI were 42.1±13.9 years and 28.6±4.3. Both groups were comparable in age (p=.446), gender (p=.592), BMI (p=.453), stone size (p=.512), side (p=.393) and location (p=.387). Operation time was high in group A (38.8 ± 13.0 v/s 33.8 ± 6.8), while hospital stay was similar among groups (p=.878). Replacement of ureteroscope was more in group B (8/21 v/s 4/19). SFR in group A and B without ureteroscope exchange was 73.7% and 57.1%; while replacement improved SFR to 84.2% and 90.5% respectively (p=.000). SATAVA intraoperative complications were modestly high in group B. Occurrence of Clavien-Dindo postoperative complications were also similar (p=.672).**Conclusion**:Small ureteroscope was better in a narrow or proximal ureter, while large size offered better vision with quick stone clearance. Though complications were slightly high with large caliber ureteroscope, most were of low grades. Replacement to other size in difficult situations ensures best SFR.

Keywords:ureteroscopy, lithotripsy, size, ureteric stone.

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Introduction

Ureteric stones constitute a significant burden to the urology practice. They account for upto 12.5%of upper urinary tract stones [1]. Management depends upon the duration of symptoms, severity of symptoms, stone size, location, laterality, renal function status and presence of co-morbidities [2]. Unilateral ureteric stones upto 5 mm size in an otherwise healthy patients can be treated with trial of medical expulsive therapy [3]. However large size, long duration of symptoms and failure of medical expulsive therapy require surgical extraction of stone. Ureteroscopic stone removal is a significant advance in medical technology. It enables stone fragmentation as well as removal via utilization of natural orifices, urethra and ureter in this scenario. Lithotripsy can be completed by using laser or pneumatic lithoclast [4]. Recently miniaturization of ureteroscope has made possible the lithotripsy in small caliber ureters and with minimum trauma to the ureteral wall [5]. This however is, not without problems, in all the situations. Small ureteroscope are less sturdy and vision is less distinct due to small size irrigation channel [6].Small ureteroscope may also not allow passage of additional instruments for removal of stone fragments, especially in large size stones.We explored this issue in this observational study.Two different size ureteroscopes of 6.4/7.8 Fr and 8.6/9.8Fr were used in surgical management of ureteric stones. Intraoperative parameters, stone free rate and complications were recorded and analyzed.

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Material & methods

Study Design

Prospective observational study was conducted in the department of urology from October 2019 to February 2021. An informed consent was taken from all the patients. As it was an observational study involving routine surgical steps of an established procedure and no randomization or separate intervention was allotted to study patients, ethical clearance was not sought. Declarations of Helsinki were followed. It included all the adult patients undergoing ureteroscopic lithotripsy for single ureteric stone. Patients of age less than 18 years, unable to be positioned in lithotomy position, active UTI, prior DJ stented, multiple ureteric stones, past ureteric reimplantation and whose data collection was inadequate were excluded from the study.

Study protocol

All the patients were evaluated by detailed history, examination, routine blood investigations, urine culture, ultrasound and X-ray of KUB region. Few patients underwent CT scan, where stone details were not clear on X-ray and ultrasound. Patient's age, gender, symptoms, duration, stone size, location, laterality, BMI and co-morbidities were recorded. Preoperative I.V. antibiotic was administered in all the cases. Patients were given spinal anesthesia and positioned in lithotomy position.Hydrophilic guide wire was passed across ureteric stone upto the renal pelvis. Group A patients underwent ureteroscopic lithotripsy using 6.4/7.8 Fr ureteroscope, while in group B patients 8.6/9.8 Fr ureteroscope (Olympus, USA) was utilized [Figure 1]. Lithotripsy was completed with pneumatic lithoclast and fragments were removed via grasping forceps. DJ stent

was inserted after completion of procedure in all the cases. In case where large ureteroscope was not reaching the stone or was not able to fragment stone, it was replaced by smaller one and vice versa.

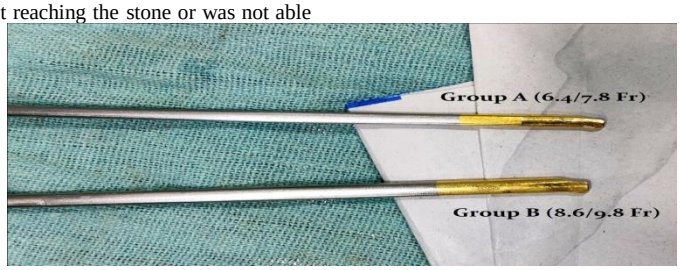

Fig 1: Distal tip of two size ureteroscopes used in the study groups.

Outcome & Analysis

Primary outcomes were stone free rate, SATAVA intraoperative complication grade and postoperative Clavien-Dindo complication rate. Stone free rate was assessed on X-ray KUB taken on 1st postoperative day.Secondary outcomes were procedural time, duration of stay,ureteroscope replacement rate and need for additional procedures. Descriptive data was presented in form of mean and standard deviation. Both groups were compared to demographic and stone parameters by student T-test and Chi-square test.Outcome was also analyzed with the above tests.Statistical analysis was completed with SPSS software, IBM Corp, version 21. P value was set at 0.05 and confidence interval was 95%.

Results

Baseline characteristics:A total of 40 patients were taken for analysis. 32 patients were male and rests were female. Mean age and BMI were 42.1±13.9 years and 28.6±4.3 respectively. Mean stone size was 10.8±4.8 mm. 55% of stones were in lower ureter and 45% were in upper ureter. In 23 patients, stone was in right side. Group A had 19 cases, while group B had 21. Both groups were comparable in baseline and stone characters [Table 1].

Table 1: Baseline demographical and stone characteristics of study groups.

S.No.	Parameter	Group A (n=19)	Group B (n=21)	*p Value*
1	Age (years)	43.9 ± 14.7	40.5 ± 13.3	.446
2	Gender			
	Male	15	17	.592
	Female	4	4	
3	BMI	29.2 ± 4.2	28.1 ± 4.4	.453
4	Location			
	Upper ureter	9	9	.512
	Lower ureter	10	12	
5	Side			
	Right	9	8	393
	Left	10	13	
6	Stone size (mm)	11.5 ± 6.2	10.1 ± 3.0	.387
7	Duration of symptoms (days)	7.6 ± 8.5	6.9 ± 6.3	.769

Operative parameters comparison: Operation time was shorter but not statistically significant in Group A (6.4/7.8 Fr) than group B (8.6/9.8 Fr) [Table 2]. Stone retrieval forceps were utilized in 14 cases in group B than in 10 cases in group A. Smaller size scope in group A facilitated easy entry in ureter without guide-wire in around half of the cases (10/19). Hospital stay was similar in both groups. Additional procedures for stone clearance were required in both groups (4 v/s 6). Replacement of ureteroscope to smaller size in group B was required more often, than replacement to bigger size in group A (8 times v/s 4 times). Stone free rate improved significantly after replacement of ureteroscope in both group A (73.7% to 84.2%) and B (57.1% to 90.5%) (p=.000).

Table 2: Comparison of operative parameters in both groups in the study.

S.No.	Parameter	Group A (n=19)	Group B(n=21)	*p Value*
1	Operation time (min)	38.8 ± 13.0	33.8 ± 6.8	.134
2	Length of stay (days)	5.1 ± 3.8	4.9 ± 2.4	.878
3	Replacement of ureteroscope			
	Yes	4	8	
	No	15	13	.204
4	Use of stone retrieval forceps			
	Yes	10	14	
	No	9	7	.281
5	Guide-wire use			
	Yes	9	12	
	No	10	9	.382
6	Stone free rate without exchange of ureteroscope (n/total, %)	14/19 (73.7%)	12/21 (57.1%)	.000
	Stone free rate after exchange of ureteroscope (n/total, %)	16/19 (84.2%)	19/21 (90.5%)	
7	Additional procedure required			
	PCNL	1	0	
	Repeat URSL	2	4	
	Laparoscopic ureterolithotomy	1	0	

	Open ureterolithotomy	0	1	
	Open tear repair	0	1	.340

Comparison of complications: Grade 1 SATAVA intra-operative complications were seen in 4 and 5 cases of group A and B [Table 3]. These were managed by observation only. Grade 2 SATAVA complications, which required further endoscopic treatment, were seen in 3 cases in both groups. Open surgery was required twice in group B and once in group A to manage Grade 3 SATAVA complications.Most post-operative complications were of grade 1, occurring in 4 and 5 cases in group A and B. Only one case of sepsis was reported in group B. No death occurred in the study patients.

Table 3: Description of SATAVA complication grade and Clavien-Dindo complication grade in the study patients.

S. No.	Parameter		Group A (n=19)	Group B (n=21)	*p Value*
1	SATAVA intraoperative complication	Grade 1 (Observation) - Mucosal tears / Mild bleeding / Malfunction or breakage of instruments / Proximal stone migration	4	5	.951
		Grade 2 (Requiring endoscopic retreatment) - Proximal stone migration / false route or thermal injury / Inability to reach stone / Ureteral perforation / Severe bleeding	3	3	
		Grade 3 (requiring open surgery) - Inability to access ureter/ ureteral perforation / ureteral avulsion	1	2	
2	Clavien-Dindo postoperative complication	Grade 1 - Fever / hematuria	4	5	.672
		Grade 2 - Urinary tract infection	0	1	
		Grade 3 - Renal Colic / stone migration	2	1	
		Grade 4 – Sepsis	0	1	
		Grade 5 – Death	0	0	

Discussion

Ureteroscopic lithotripsy in well selected patients provides excellent stone clearance with minimum trauma. Different size of scope allows greater variability in surgeon's armaments to deal with various challenges. We further explored this issue in our study. Age and gender distribution in our study was comparable to other studies [7, 8]. Mean stone size was similar to the studies by Kilinc MF et al. and Uzun H et al. [7, 8], but was larger than those reported by Atar et al. [9]. A higher incidence of lower ureteric stones was reported by all authors including us, except one of Uzun H et al. BMI in our study was slightly less than that of Uzun H et al. [8].Left sided stones were more frequent in our and few other studies [7, 9, 10], while right side was frequents in others [11]. Operation time increased as the ureteroscope size decreased in our and other studies [7, 8]. This may be due to larger irrigation channel allowing clear vision and possibility of removal of larger fragments with easier usage of stone forceps. Small size ureteroscope mostly allows insertion of LASER fiber only, where complete stone dusting may take a longer time. However Atar M et al. reported a slight less operative time with use of 4.5 Fr scope than 7.5 Fr [9].Hospital stay similar in both groups and in the literature. Replacement of ureteroscope was required more often with large size scope. It was mainly done due to non-progression of the procedure in a tight edematous ureter or due to inability to visualize the stone. In small size of scope, replacement was necessary when poor vision hampered the stone fragmentation. Stone free rate (SFR) drastically improved with availability of alternate size ureteroscope in our study. Uzun H et al. also found a high success rate with replacement to other size compare to non-replacement of ureteroscope [8]. Guidewire use was also seen more with larger scope. Similar finding were also seen in other studies [8, 9]. SFR in our study was little higher in large size scope group, but it was not significant statistically. Atis G et al. also found comparable SFR with different size scopes [12], however studies of Kilinc MF and Atar M et al. reported better SFR with small size ureteroscope. Intraoperative SATAVA grade complications were seen decreasing with the lesser size of scope used in the literature [8, 9, 13]. We also found the similar trend in our study, though most compilations were of grade 1.One incidence of ureteric perforation was noted in group B. it occurred while negotiating across the edematous ureteric wall. Similar incidents are also reported in few studies with use of large size scope [14, 15].Postoperative complications were almost similar in both groups. One case of sepsis was noted in group B and was managed conservatively.Limitations of this study are small sample size, anatomical variation in ureteral anatomy, lack of uniform lithotripsy type, stone shape and composition variation.

Conclusion

Ureteroscopy provides excellent stone clearance for ureteric stones. Large size offered quick clearance of stone but was associated with slight increased morbidity. Smaller size on the other hand was a safer option, but was challenging in case of compromised vision in bleeding or edematous ureteral wall. Replacement was necessary in both cases to achieve the best success. Final stone free rates were comparable in both groups. Intra and postoperative complications were slightly increased with large ureteroscope, but most were of low grades.

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