

Original Article

Determination of Necessity of Ureteral Stenting after Uncomplicated Ureteroscopic Lithotripsy for Distal Ureteral Calculi

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Abstract

Objectives: To determine the necessity of ureteral stenting after uncomplicated ureteroscopic lithotripsy for distal ureteral calculi ($\leq 15\text{mm}$).

Materials & Methods: This prospective comparative study was conducted in the Department of Urology at Dhaka Medical College, Dhaka from July 2016 to June 2018. Study population included the patients aged 18 to 60 years who attended in the outpatient Department of Urology, Dhaka Medical College Hospital, Dhaka with distal ureteric stone ($\leq 15\text{mm}$). After admission patients were studied clinically and was selected for treatment and study purpose as per selection criteria. A total of 60 patients included with distal ureteric stone underwent uncomplicated ureteroscopic lithotripsy using a pneumatic device without ureteral dilatation. They were randomized equally into non-stented Group-A (n=30) and stented Group-B (n=30). All the cases were evaluated by history taken and relevant investigations were done. Each patient was followed up and evaluated at immediate (day1-3), after 2 weeks (1st visit) and after 90 days (2nd visit) postoperatively. Test statistics were used to analyze the data are Chi-square Test, Student “t” test (unpaired) and Fisher’s exact probability test. $P < 0.05$ was considered as significant.

Result: Considering age, gender and stone size there was no significant difference in between two groups. Stone clearance was 100% in both groups. Mean operative time was much higher in group B (stented) patients as compared to that of group A patients. It was statistically significant ($P < 0.05$). Mean hospital stay was $1.42 (\pm 36)$ days in group A and $2.38 (\pm 54)$ days in group B (stented). It was statistically significant ($p < 0.05$). Difference between group A and B in immediate postoperative evaluation was significant ($p < 0.05$). That means group A was better than group B. Comparative evaluation after 2 weeks (1st visit) shows some differences (higher in Group-B). Irritative bladder symptoms were staggeringly less frequent in Group-A. In between two groups, medical revisit and urinary tract infection were not different statistically. Evaluation of study groups after 90 days (2nd visit) none of both groups had ureteral stricture or stone fragments residue. Other outcome variables included were also insignificant and commonly less in group A, statistically insignificant ($p > 0.05$).

Conclusion: This present study revealed that non-stented uncomplicated ureteroscopy is a safe and effective procedure and also a better option for the management of distal ureteric stone ($\leq 15\text{mm}$) using rigid ureteroscope in terms of less complication, less operative time and cost effective. So, ureteral stenting following uncomplicated ureteroscopic lithotripsy for distal ureteral stone ($\leq 15\text{ mm}$) may be avoided or selectively used instead of routinely used.

Keywords: Ureteral Stenting, Ureteroscopy, Lithotripsy, Distal Ureteral Calculi

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Introduction

Urolithiasis is a major clinical problem and creates an economic burden on our healthcare systems. It is a highly prevalent condition with a high rate of recurrence and a substantial impact on quality of life.¹ The incidence and prevalence of stone disease are increasing, most likely due to changes in nutritional and environmental factors.² The surgical management of

ureteric stones has been changed over the past few decades because of advances in instruments and techniques. Extracorporeal shock wave lithotripsy (ESWL) and ureteroscopy are currently the most treatment options in clinical practice.³

Treatment of ureteral stone depends on stone size, composition, location and degree of obstruction, pain, presence of infection, single kidney, abnormal ureteral anatomy.⁴ For the convenience of selecting a modality of stone management, clinician divided ureter into proximal and distal part. Ureteral stone seated below the sacroiliac joint is referred to the distal and above the sacroiliac joint is proximal ureteric stone.⁵ Distal ureteral stone size less than 5 mm usually passes spontaneously.⁶ Stones that are more distal (closer to bladder) are more likely to pass than stones that are more proximal (closer to kidney). In the 1980s, proximal ureteral stone had been mostly treated with extra corporeal shock-wave lithotripsy, whereas distal ureteric stones had been treated with ureteroscopic lithotripsy.⁷ Extracorporeal shock wave lithotripsy is not an easy procedure for distal ureteric stone, because it is not easy to locate with certainty, bony part causes obstruction. Ureteroscopy has a higher stone free rate 90% to 97%.⁸ In situ extra corporeal shock wave lithotripsy for treatment of larger (>1cm) ureteral stone has a stone free rate of 76%.⁵ Pneumatic lithotripsy is a common procedure done in Bangladesh. Laser lithotripsy is one yet to be a common practice in Bangladesh. Rigid ureteroscope is primarily utilized in the distal ureter, whereas flexible ureteroscope is used in the proximal ureter.⁹ It is a common practice in these patients to place a ureteral stent post operatively. Some untoward complications may occur after ureteroscopy including bleeding, infection, flank pain (from injury, oedema and ureteral obstructions) and late ureteric stricture formation. It was previously thought that ureteral stent use would minimize postoperative complications including flank pain secondary to ureteral edema and ureteral stricture development; and possibly aids the passage of small stone fragments. Stenting may promote ureteral healing.¹⁰ However, the ureteral stent itself causes morbidity including bladder irritation, loin pain, haematuria, infection, pyelonephritis, stent migration, encrustation, breakage and even stent fragmentation requiring subsequent endoscopic or open surgical procedure. Stents need to be removed later on at the scheduled visit. These problems plus the additional cost of a stent have brought into question the necessity for stent placement after ureteroscopy for distal ureteral calculi.¹¹

It was shown that routine placement of a ureteral stent following uncomplicated ureteroscopy for distal ureteral calculi was not mandatory.¹² Randomised prospective trials have found that routine stenting after uncomplicated ureteroscopy is not necessary because stenting might be associated with higher morbidity.¹³ But in Bangladesh, most urologists are commonly practicing D-J stenting even after uncomplicated ureteroscopic lithotripsy (URS & ICPL, D-J stenting). Hence, the present study has been designed to compare the success rate and complications after uncomplicated ureteroscopic lithotripsy for the management of distal ureteral calculi (≤ 15 mm) with or without stent placement whether ureteral stenting is necessary or not.

Materials and Methods

This prospective comparative study was conducted in the Department of Urology at Dhaka Medical College, Dhaka from July 2016 to June 2018. Study population included the patients aged 18 to 60 years who attended in the outpatient Department of Urology, Dhaka Medical College Hospital, Dhaka with distal ureteric stone (≤ 15 mm). After admission patients were studied clinically and was selected for treatment and study purpose as per selection criteria. Out of 65 patients, finally a total of 60 patients (N=60) were randomized equally into non-stented Group-A (n=30) and stented Group-B (n=30). 5 patients were excluded due to dropout (2 cases), mucosal injury (1 case, stenting done) and non engagement of ureteric orifice (2 cases, stented for passive dilatation requiring second ureteroscopic procedure after 4 weeks). A total of 60 patients with distal ureteric stone underwent uncomplicated ureteroscopic lithotripsy using a pneumatic device without ureteral dilatation. All the cases were evaluated by history taken and relevant investigations were done. Each patient was followed up and evaluated at immediate (day 1-3), after 2 weeks (1st visit) and after 90 days (2nd visit) postoperatively.

In this procedure ureteroscopy followed by pneumatic lithotripsy was done to make uniformity. After spinal anesthesia patient with lithotomy position antiseptic wash and draping was done. Cystoscopy was done for identification of ureteric orifice and guide wire was passed within the ureteric orifice under visual and fluoroscopic monitoring.

None of the cases had ureteral orifice or ureteral dilatation. The ureteroscope (8.5fr.) was advanced next to the guide wire. Some times a second guide wire was helpful. As soon as the stone was seen and assessed, the

stone fragmentation was started by pneumatic lithotripter. Meticulous care was taken to avoid injury of ureter and also an eye was kept on stone fragment migration, when any. After completion of ureteroscopic lithotripsy final checkup was done for complete stone clearance and any ureteral injury by direct ureteroscopy under fluoroscopic monitoring. In group A patients, stenting was not done. In group B patients, D-J stents (6 Fr.) were placed under combined fluoroscopic and cystoscopic guidance. Operative time from cystoscopy to removal of endoscope was recorded for each case. Patients were released within 1-3 days of operation and recorded. Stents were retrieved from group B patients after 2 weeks.

During immediate postoperatively (day1-3), all patients were followed up properly and evaluated for all operative complications including haematuria, flank pain, lower abdominal pain and irritative bladder symptoms (dysuria, urgency).

All the cases were evaluated after 2 weeks (1st visit) of ureteroscopic lithotripsy. Patients were followed up with history and investigations, urinalysis to detect presence of any urinary tract infection and haematuria, plain X-Ray of KUB region to see stone clearance, stent migration if any. All patients were evaluated for other operative variables including flank pain, lower abdominal pain and irritable bladder symptoms, and medical revisit also to see the differences in between two groups.

After 90 days (2nd visit), urine examination (R/E and C/S) was done to detect presence of any urinary tract infection and haematuria, IVU was done to see ureteral stricture development and stone recurrence. Also other operative variables including flank pain, lower abdominal pain and irritable bladder symptoms (dysuria, urgency) were evaluated to see the differences in between two groups.

Informed consent was taken from each patient. Data was collected in a predesigned data collection sheet. Data was processed and analyzed using SPSS (Statistical Package for Social Sciences) software version-17. Test statistics were used to analyze the data are Chi-square Test, Student "t" test (unpaired) and Fisher's exact probability test. $P < 0.05$ was considered as significant.

Results

Table I shows the immediate postoperative evaluation of complication(day 1-3) of the study groups were haematuria, 30% and 56.67%; flank pain, 20% and 46.67%; lower abdominal pain, 10% and 36.67% and irritative voiding symptoms, 6.67% and 63.33% in

group A and group B respectively, which was statistically significant ($p < 0.05$).

Table-I: Immediate postoperative evaluation of complication of the study groups (N=60)

Immediate postoperative evaluation (day 1-3)	Study group		Total	p value
	Group-A (non-stented) (n=30)	Group-B (stented) (n=30)		
Haematuria	9(30%)	17(56.67%)	26	0.03
Flank pain	6(20%)	14(46.67%)	20	0.02
Lower abdominal pain	3(10%)	11(36.67%)	14	0.01
Irritative voiding symptoms	2(6.67%)	19(63.33%)	21	<0.001

Chi-square test was used for statistical analysis. n=number of patients, * $p < 0.05$ =significant.

Table II shows the postoperative evaluation of the study groups after 2 weeks were haematuria, 20% and 43.33%; flank pain, 10% and 30%; lower abdominal pain, 3.33% and 26.7% and irritative voiding symptoms, 3.33% and 46.7% in group A and group B respectively, statistically significant ($p < 0.05$). Stone clearance was same percent in both study groups and one had stent migration in group B.

Table-II: Postoperative evaluation of stone clearance and complication of the study groups after 2 weeks (n=60)

Postoperative evaluation after 2 weeks	Study group		Total	p value
	Group-A (non-stented) (n=30)	Group-B (stented) (n=30)		
Haematuria	6(20%)	13(43.33%)	19	0.05
Flank pain	3(10%)	9(30%)	12	0.05
Lower abdominal pain	1(3.33%)	8(26.7%)	09	0.02
Irritative bladder symptoms	1(3.33%)	14(46.7%)	15	<0.001
Stone clearance	30(100%)	30(100%)	60	1
Stent migration	0	1(3.33%)	1	

Chi-square test was used for statistical analysis. n=number of patients, * $p < 0.05$ =significant.

Table III shows the postoperative evaluations of the study groups after 90 days were haematuria, 6.7% and 23.33%; flank pain, 3.33% and 13.33%; lower abdominal pain, 3.33% and 10% and irritative voiding symptoms, 3.33% and 20% in group A and group B respectively, statistically insignificant ($p > 0.05$). Stone clearance was same percent in both groups with no ureteral stricture or stone recurrence.

Table-III: Postoperative evaluation of complication of the study groups after 90 days (n=60)

Postoperative evaluation after 90 days	Study groups		Total	p value
	Group-A (non-stented) (n=30)	Group-B (stented) (n=30)		
Haematuria	2(6.7%)	7(23.33%)	9	0.07
Flank pain	1(3.33%)	4(13.33%)	5	0.35
Lower abdominal pain	1(3.33%)	3(10%)	4	0.61
Irritative voiding symptoms	1(3.33%)	6(20%)	7	0.1
Ureteric stricture	0	0	0	
Stone recurrence	0	0	0	

Chi-square test was used for statistical analysis. n=number of patients,* $p<0.05$ =significant.

Discussion

The present study was designed to observe the treatment success rate and complications of uncomplicated ureteroscopic lithotripsy (URS & ICPL) without stent for the management of distal ureteric stone. In addition a group of cases was also observed and compared with added interest to evaluate the study observation more perfect by using stent after uncomplicated ureteroscopic lithotripsy (URS & ICPL, DJ Stenting) for distal ureteric stone up to 15 mm. The findings derived from data analysis leave some scope for discussion to arrive at a conclusion. All the included baseline and operative variables of two groups considering statistical rigors also are discussed chronologically.

At immediate post-operative evaluation, some immediate complications found in this present study. Haematuria, flank pain, lower abdominal pain and irritative bladder symptoms, considerably higher in Group B than these of Group A. In this present study, haematuria was observed in 9(30.0%) cases of Group A compared to 17(56.67%) cases in Group B which was statistically significant ($p=0.03$). Hence it might be concluded that stent was a cause of haematuria in more cases.

In a study conducted by Jeong et al.¹⁴ haematuria was observed in 23 (51.1%) cases in stented group and 15 (33.33%) cases in non-stented group and author commented that it was more severe and prolonged in stented group and found statistically significant ($p=0.001$).

In the present study flank pain was observed in 6 (20%) patients of Group A and 14 (46.67%) patients of Group B

and it was statistically significant ($p=0.02$). In a study conducted by Cheung et al.¹⁵, a total of 58 patients with ureteral stones were randomized into stented or no stented group. Flank pain was 66% in stented group and 21% in non-stented group, which was similar to present study.

Another study among 58 patients randomized into non-stented (29) and stented (29) ureteroscopic lithotripsy, done by Denstedt et al.¹⁰ showed that nonstented group had an improved early postoperative score with respect to flank pain compared to the stented group (mean score 1.7 versus 4.1; $p=0.001$).

Lower abdominal pain in this study was in 3 (10%) patients of Group-A (non-stented) and in 11 (36.67%) patients of Group-B (stented) which was statistically significant ($p=0.001$). In a study patients with stents had more postoperative lower abdominal pain, statistically significant ($p<0.001$) compared to the no stented group.¹¹ This study was conducted among 113 patients with distal ureteral calculi amenable to ureteroscopic lithotripsy.

Irritative bladder symptoms were present in this present study in 2(6.67%) patients of Group A (non-stented) and 19(63.33%) patients of Group B (stented), which was statistically significant ($p<0.001$).

Borboroglu et al.¹¹ showed that patients with stents had statistically significantly more irritative bladder symptoms ($p=0.002$) compared to those without stents. This study was conducted among 113 patients with distal ureteral calculi amenable to ureteroscopic lithotripsy. Another study showed irritative bladder symptoms were significantly more in stented group than non-stented group, mean score was 5.1 versus 1; $p=0.001$.¹⁰

In present study, it was observed and compared the outcomes and complications after 2 weeks of operation in between two groups. Irritative bladder symptoms were staggeringly less in the nonstented group than that of the stented group 1 versus 14 ($p<0.001$). Among rest of the Complications like haematuria, flank pain and lower abdominal pain were also different, statistically significant ($p<0.05$) in between two groups, commonly less in group A. Stone clearance was 100% in both groups. 4 patient (13.33%) in group A and 4 patients (13.33%) in group B developed urinary tract infection and were treated according to urine culture sensitivity.

1(3.33%) patient in non-stented group developed ureteral obstruction (radionuclide scan) in the post-operative period that necessitated stenting, and 1 patient in the stented group experienced stent migration necessitating removal. 6(20%) cases of group A(n=30) and 5(16.7%) cases of group B(n=30) needed medical revisit for pain, fever and or vomiting. With X-Ray KUB region done, none of both groups had stones.

Aghaways et al.¹⁶ found at day 14 post-operative visit of their study similar to present study, flank pain for stenting group was significant ($p=0.038$). Dysuria ($p=0.02$), urgency ($p=0.011$) and haematuria (0.001) were higher in the stented group.

Stent migration is also a complication associated with indwelling ureteric stents. Faqih et al.¹⁷ reported an incidence of stent migration of 3.7% cases. Richter et al.¹⁸ in a study demonstrated that 8% of the stent migrated. Ringel et al.¹⁹ showed in a study that stent migration was 8.2%. Although silicone stents have a lower risk of calcification, their smooth regular surface renders them susceptible to migration.

At 2nd follow-up visit after 90 days, evaluation of the subjects after 90 days of operation revealed that none of them in either group had stone or ureteral stricture (IVU) and significant complaints. Urinalysis showed 1(3.33%) patient of stented group had urinary tract infection and was treated accordingly. All the outcomes evaluated thus demonstrated that the non-stented group was still better than the stented group. This inference was also compliant to those done by Denstedts et al.¹⁰ & Chen et al.²⁰

Results of the study by Cheung et al.¹⁵ showed that there was no significant difference in stricture formation rate with omission of a ureteral stent. In a study of 48 patients undergoing ureteroscopy for distal ureteric stone, Srivastava et al.²¹ had done radiologic follow-up at the end of 90 days. None of the patients had evidence of ureteral stricture formation.

A prospective nonrandomized study by Rane et al.²² followed 27 patients without stents after distal ureteroscopy for stones. Postoperative imaging was performed in 94% of their patients with no evidence of ureteral stricture. A second study was done by Wollin et al.²³ where 28 patients were randomized into stented and unstented groups after ureteroscopy for distal ureteral stones. They found that patients without stents had less bladder irritative symptoms compared to those

with stents. Although neither of these studies included patients undergoing intra-operative ureteral dilation, both demonstrated that leaving patients without stents after distal ureteroscopy was safe and often well tolerated.

Conclusion

This present study revealed that non-stented uncomplicated ureteroscopy is a safe and effective procedure and also a better option for the management of distal ureteric stone (≤ 15 mm) using rigid ureteroscope. So, ureteral stenting following uncomplicated ureteroscopic lithotripsy for distal ureteral stone (≤ 15 mm) may be avoided or selectively used instead of routinely used.

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