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Single-session ureteroscopic pneumatic lithotripsy for the management of bilateral ureteric stones

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ABSTRACT

Purpose: In nowadays there is no consensus on single-session ureteroscopic lithotripsy (URSL) for the management of bilateral ureteric stones. The aim of this study was to evaluate efficacy and safety of single-session URSL in patients with bilateral ureteric stones.

Materials and Methods: 41 patients who have undergone bilateral single-session URSL were evaluted in this study. A 8/9.8 Fr Wolf semi-rigid ureteroscope was used for the procedures, and the stones were fragmented with pneumatic lithotripter.

Results: A high stone-free rate was achieved (90.2%) after single endoscopic procedure with a retreatment rate of 9.8%. The procedure was most successful for distal ureteric stones with a 96.2% stone-free rate followed by middle ureteric stones with a 81.8% stone-free rate while the least success was achieved for proximal ureteric stones with a 77.7% stone-free rate ($p < 0.05$). A greater stone-free rate was obtained in those with stones less than 10 mm (93.7%) than in those with stones larger than 10 mm (77.7%) ($p < 0.05$). Ureteral perforation occurred in only one patient (2.4 %). No long-term complication was observed in any patient.

Conclusions: Bilateral single-session URSL can be performed effectively and safely with a low complication rate in patients with bilateral ureteric stones. It can reduce the need of anaesthetics and hospital stay.

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INTRODUCTION

Ureteroscopic lithotripsy (URSL) is a highly effective and minimal invasive procedure in the treatment of ureteric stones. Nowadays, most of the ureteric stones can be treated with URSL. Traditionally, staged URSL is performed for the management of bilateral ureteric stones. With the recent development of small-caliber ureteroscopes and with the advances in intracorporeal lithotripsy devices, it is now possible to perform bilateral single-session URSL in adults, and ureteric stones may be fragmented successfully. The procedure may reduce costs and the need for a second anesthetic procedure (1,2). There are few reports in the literature about single-session URSL for the management of bilateral ureteral stones. Deliveliotis et al. reported that bilateral ureteroscopy in single-session can be performed safely in selected patients (1). Günlüsoy et al. reported that bilateral single-session pneumatic lithotripsy can be performed safely and has high success rates with minimal morbidity and short hospital stay (2). In contrast, Hollenbeck et al. reported that bilateral ureteroscopy carries out an increased risk of postoperative morbidity (3). Thus, today, there is still no consensus on single-session URSL for the management of bilateral ureteric stones.

Herein, experience of single-session URSL in the treatment of bilateral ureteric stones is presented and discussed with previous relevant publications.

MATERIALS AND METHODS

From February 2006 to May 2010, 41 patients with bilateral ureteric stones were evaluted in this study. All patients were assessed by whole blood counts, BUN, serum creatinine, urinalysis, urine culture, plain abdominal X-ray (KUB), renal ultrasonography, non-contrast abdomino-pelvic CT or intravenous urography (IVU) if needed. The stone size was determined by the sum of the maximum diameters of the calculi on KUB or non-contrast abdomino-pelvic CT. Informed consent was provided from all patients. The procedure was performed under spinal anesthesia or general anaesthesia. Cystoscopy was initially performed to evaluate the lower urinary tract and ureteral orifice. Ureteroscopic procedure was initially started at the side in which stone size was smaller than the other. Ureteroscopy was carried out with video guidance, (using a 8/9.8 Fr Wolf semi-rigid ureteroscope in all patients). Ureteral orifice dilation was necessary in one patient. Pneumatic lithotripter (Karl Storz, Calcusplit 276300 20, Germany) and a 1.0 mm probe were used for stone fragmentation. After the identification of the stone, fragmentation was started with continuous mode and continued with single mode until the fragments became as small as three fold of the tip of probe. Stone forceps were used to remove stone fragments ≥ 4 mm. A stone cone™ Nitinol Retrieval Device was used during pneumatic lithotripsy to prevent retrograde stone migration in all patients who had proximal ureteral stones. Endoscopic inspection was done at the end of the procedure to rule out any residual calculi ≥ 4 mm or trauma. DJ stents (4.8 f) were placed through the ureteroscopic operative channel or over a guidewire via the cystoscope. All patients received first generation cephalosporin preoperatively that was maintained until discharge. The operative time was calculated from the time the cystoscope was introduced to the final removal of all endoscopes. Stone fragments were sent for biochemical analysis whenever possible. The stents were removed by using rigid or flexible cystoscope under local anesthesia. All patients were evaluated by KUB, ultrasonography, or non-conrast abdomino-pelvic CT if needed at postoperative one week. Follow-up non-contrast abdomino-pelvic CT, or IVU if needed was performed 3 months postoperatively. Fragmentation of stones < 4 mm was considered successful fragmentation, and complete removal of all fragments was considered a stone-free outcome. Chi-square and Fisher exact tests were used for statistical analysis.

RESULTS

Patient's characteristics, operative data and complications are shown in Table-1. Male/female ratio was 0.7. The mean operative time

Table 1 - Patient's characteristics, operative data and complications.

Mean age, years (range)	41.2 (28-76)
Male/female ratio	17/24
Mean stone size, mm (range)	8.8 (7-16)
Mean operative time, minutes (range)	58.4 (36-81)
Mean hospitalization time, days (range)	1.2 (1-3)
Successfull fragmentation (%)	74 (90.2)
No.stones requiring a second URSL (%)	7 (8.5)
No. stones requiring ESWL (%)	1 (1.3)
Complications (%)	
Fever	3 (7.3)
Mild hematuria	21 (51.2)
Flank and pelvic pain	12 (29.2)
LUTS	27 (65.8)
Post-obstructive diuresis	3 (7.3)
Mucosal injury	2 (4.8)
Perforation	1 (2.4)
Stone migration	1 (2.4)
Fever	3 (3/42)

was 58.4 minutes, and the mean hospital stay was 1.2 days. Successfull fragmentation (90.2 %) was achieved after single endoscopic procedure. A second URSL was performed in 7 (8.5%) of the stones. Stone forceps were performed to retrieve large stone fragments (≥ 4 mm) in 30 (36.5%) of the procedures. Minor complications such as LUTS, mild hematuria, flank and pelvic pain improved in one week after DJ stent removal. Perforation occured in only one patient due to difficult ureteroscopic manipulation because of bleeding. Mucosal injury occurred in 2 patients, and the reasons for the mucosal injury were inadvertant positioning of an pneumatic probe and stone forceps. These patients were treated with DJ stenting for 3 weeks. Although stone cone was used to prevent migration of calculi, proximal migration was observed in 1 patient. The patient was treated successfully with DJ stent insertion and subsequent ESWL after one week. Fever (> 38º) was successfuly managed with antibiotic regimen in 3 patients. Post-obstructive diuresis was observed in 3 (7.3%) patients who had high serum creatinine level in a volume range of 6 to 10 liters in the first 24-48 hours, and serum creatinine level returned back to normal level within 2 to 3 days. The stone location and size and stone free rate are shown in Table-2. Aproximately, two third of stones were located in the distal ureter. The stone-free rate of distal ureter stone (96.2%) was significantly higher compared with those of middle (81.8%) and proximal (77.7%) ureter stones ($p < 0.05$). For patients with calculi less than 1 cm and greater than 1 cm, the initial stone-free rate after ureteroscopy was 93.7% and 77.7%, respectively ($p < 0.05$). Stone analysis results were available in 8 (19.5%) patients: calcium oxalate in 7, calcium phosphate in 2 and uric acid in 1. No long-term complication was observed in any patient.

Table 2 - Stone-free rate after bilateral single-session URSL according to stone location and stone size.

Location	No of stones (%)	Mean stone size, mm (range)	SFR (%)
DU	55 (67.6)	8.6 (7-16)	53 (96.3)
MU	11 (14.6)	8.7 (7-12)	9 (81.8) $p < 0.05$
PU	16 (18.2)	8.8 (7-13)	12 (75.0)
LDU-RDU	36 (43.9)	8.7 (7-16) - 8.9 (7-14)	17 (94.4) - 18 (100)
LDU-RMU	6 (7.3)	8.6 (7-11) - 8.3 (7-11)	2 (75) - 3 (100)
LDU-RPU	12 (14.6)	8.8 (7-14) - 8.6 (7-13)	6 (100) - 5 (83.3)
LMU-RMU	4 (4.8)	9.5 (8-11) - 9.0 (8-10)	2 (100) - 1 (50)
LMU-RDU	6 (7.3)	9.0 (7-12) - 8.3 (7-10)	2 (75) - 3 (100)
LMU-RPU	2 (2.4)	9.0 (7-11)	1 (100) - 1 (100)
LPU-RMU	-	-	-
LPU-RDU	14 (17.0)	8.7 (7-12) - 8.8 (7-13)	4 (57.1) - 7 (100)
LPU-RPU	2 (2.4)	9.0 (8-10)	1 (100) - 1 (100)
Stone size			
≤ 10 mm	64 (78.0)	7.8 (7-10)	60 (93.7) $p < 0.05$
> 10 mm	18 (22.0)	12.1 (11-16)	14 (77.7)

DU: Distal ureter, **MU:** Middle ureter, **PU:** Proximal ureter, **LDU:** Left distal ureter, **RDU:** Right distal ureter, **RMU:** Right middle ureter, **LMU:** Left middle ureter, **RPU:** Right proximal ureter, **LPU:** Left proximal ureter, **SFR: S**tone free-rate.

COMMENTS

Today, URSL is one of the daily urologists' practices, and regardless of the location of the ureteric stone, access and definitive treatment is commonly achieved with a minimal risk of complications. The main advantages of URSL are immediate relief of symptoms and stone fragmentation. Quick ureteral stone removal may be important in patients with bilateral ureteric stones because these patients are more likely to have acute obstructive renal failure. The classic procedure for the management of bilateral ureteric stones is staged URSL. In recent years, some authors advocate single-session bilateral URSL for the management of bilateral ureteric stones due to successfull rates and minimal morbidity. The procedure may decrease the number of anaesthesia and surgical sessions, and hospital stay (1,2). In contrast, some authors reported that this procedure may also increase postoperative morbidity (3).

Single-session bilateral URSL for the management of bilateral ureteric stones has not been well documented. Only a few reports have been reported in the literature about single-session bilateral URSL for the management of bilateral ureteric stones. Deliveliotis et al. investigated the possibility to perform bilateral ureteroscopy in one session and to determine the procedure's indications and complication rate. Twenty-two patients underwent bilateral ureteroscopy in one session. No major complication was observed. They reported that bilateral ureteroscopy in one session can be performed safely in selected patients (1). In contrast, Hollenbeck et al. reported that bilateral ureteroscopy carries out an increased risk of postoperative morbidity. The cumulative risk for staged and single-session bilateral URSL were 14% and 29%, respectively. However, there was no difference in cumulative morbidity and stone free rates at 1 month between the two approaches (3).

In a recent study, Günlüsoy et al. evaluated the feasibility and safety of bilateral single-session ureteroscopy in 38 patients for the management of bilateral ureteric stones with different localizations. The stones were located in the lower, middle and upper ureter in 44 (57.9%), 21 (27.6%) and 11 (14.5%) of the cases, respectively. Fifty-one stones (67.1%) were less than 1 cm. Of the 76 stones, 67 (88.1%) were fragmented in a single procedure. The stone free rate was 93.1% after the second session. According to the localization of the stones, the stone clearance rate after single endoscopic session was 72.7% for upper ureteric stones, 80.9% for midureteric stones and 95.4% for lower ureteric stones. For patients with calculi less than 1 cm and greater than 1 cm, the initial stone-free rate after ureteroscopy was 94.1% and 76%, respectively. No major complication was observed. They reported that bilateral single-session pneumatic lithotripsy can be performed safely and has high success rates with minimal morbidity and short hospital stay (2).

In the present study, 41 patients with bilateral ureteral stones were evaluted. A high stone-free rate was achieved (90.2%) after single endoscopic procedure with a retreatment rate of 9.8%. The stones were located in distal ureter (67.6%), in middle ureter (14.6%) and in proximal ureter (18.2%). 78.0% of the stones were less than 1 cm. The procedure was most successful for distal ureteric stones with a 96.2% stone-free rate followed by middle ureteric stones with a 81.8% stone-free rate while the least success was achieved for proximal ureteric stones with a 77.7% stone-free rate. A greater stone-free rate was obtained in those with stones less than 10 mm (93.7%) than in those with stones larger than 10 mm (77.7%). Major complication was observed in only one patient (2.4%) during the procedures, and this patient was managed successfully with DJ stent. The results of this study indicate that the procedure can be performed in all ureteric stones; however, success rate can be affected by stone size and ureteric localization. Similar with the study of Günlüsoy et al. (2), single-session bilateral URSL can be performed effectively and safely with a low complication rate in patients with bilateral ureteric stones.

Two most common lithotripters that are used in urologic fields are pneumatic and Ho:YAG laser. Pneumatic lithotripsy is more popular among the urologists because of its low cost, easy set up, and high success rate. Ho:YAG laser is a reliable

method for the treatment of ureteral stones especially in proximal and impacted ureteral stones, but it is expensive and not available in most of the urologic centers (4-7). EAU-EBU update series reported that ballistic lithotripsy can be regarded as a standard for stones < 15 mm, because of its better efficacy and shorter operative time, while for stones > 15 mm a laser lithotripsy should be advised because of its minimal risk of ureteral injury (4). In the present study, a pneumatic lithotripter was used for stone fragmentation in all patients, and high success rate and acceptable retreatment rates were achieved. However, pneumatic lithotripsy has some disadvantages. It produces larger fragments that potentially may cause more problems in terms of spontaneous passage or retropulsion during the procedure (8). Therefore, some authors recommended using forceps or stone cone to reduce re-treatment rate (9-11). Similarly, in this study, stone forceps were used to remove stone fragments ≥ 4 mm, and stone cone were used to reduce stone migration for proximal and middle ureteric stones.

Stents have been placed routinely after URSL to minimize the risk of flank pain and hydronephrosis due to ureteric edema, to facilitate the passage of residuel stone fragments and decrease the risk of ureteric stricture. Recently, AUA and EAU guidelines on urolithiasis reported that stenting after uncomplicated URSL is optional (12). Generally, bilateral DJ stenting is performed on patients who had undergone single-session bilateral URSL. However, in this study, bilateral DJ stenting was only performed in the patients who had high serum creatinine levels or bilateral ureteral mucosal injury. The other indications for bilateral DJ stenting are bilateral ureteral perforation and stone migration. Bilateral ureteric endoscopic procedures can cause bilateral ureteric edema, and to obtain normal serum creatinine levels may take longer periods of time. In my opinion, for patients with high serum creatinine level, bilateral DJ stenting are necessary to achieve normal serum creatinine level as soon as possible. In other patients, a DJ stent was placed on one-side due to minimize risk of acute obstructive renal failure due to bilateral ureteric edema and flank pain.

CONCLUSIONS

On the basis of my experience, single-session bilateral ureteroscopy with pneumatic lithotripsy can be considered an acceptable treatment modality for bilateral ureteric stones. The procedure has high success rates with minimal morbidity and short hospital stay. It can reduce the need of anaesthetics and overall costs.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Deliveliotis C, Picramenos D, Alexopoulou K, Christofis I, Kostakopoulos A, Dimopoulos C: One-session bilateral ureteroscopy: is it safe in selected patients? Int Urol Nephrol. 1996; 28: 481-4.
2. Gunlusoy B, Degirmenci T, Arslan M, Kozacioğlu Z, Nergiz N, Minareci S, et al.: Bilateral single-session ureteroscopy with pneumatic lithotripsy for bilateral ureter stones: feasible and safe. Urol Int. 2008; 81: 202-5.
3. Hollenbeck BK, Schuster TG, Faerber GJ, Wolf JS Jr.: Safety and efficacy of same-session bilateral ureteroscopy. J Endourol. 2003; 17: 881-5.
4. Papadoukakis S, Stolzenburg JU, Truss MC: Treatment strategies of ureteral stones. Eur Urol EAU-EBU Update Ser. 2006; 4: 184-90.
5. Gettman MT, Segura JW: Management of ureteric stones: issues and controversies. BJU Int. 2005; 95(Suppl 2): 85-93.
6. Tan PK, Tan SM, Consigliere D: Ureteroscopic lithoclast lithotripsy: a cost-effective option. J Endourol. 1998; 12: 341-4.
7. Küpeli B, Biri H, Isen K, Onaran M, Alkibay T, Karaoğan U, et al.: Treatment of ureteral stones: comparison of extracorporeal shock wave lithotripsy and endourologic alternatives. Eur Urol. 1998; 34: 474-9.
8. El-Nahas AR, El-Tabey NA, Eraky I, Shoma AM, El-Hefnawy AS, El-Assmy AM, et al.: Semirigid ureteroscopy for ureteral stones: a multivariate analysis of unfavorable results. J Urol. 2009; 181: 1158-62.
9. Teichman JM, Vassar GJ, Bishoff JT, Bellman GC: Holmium:YAG lithotripsy yields smaller fragments than lithoclast, pulsed dye laser or electrohydraulic lithotripsy. J Urol. 1998; 159: 17-23.

10. Isen K, Bogatekin S, Em S, Ergin H, Kilic V.: Is routine ureteral stenting necessary after uncomplicated ureteroscopic lithotripsy for lower ureteral stones larger than 1 cm? Urol Res. 2008; 36: 115-9.
11. Gonen M, Cenker A, Istanbulluoglu O, Ozkardes H: Efficacy of dretler stone cone in the treatment of ureteral stones with pneumatic lithotripsy. Urol Int. 2006; 76: 159-62.
12. Preminger GM, Tiselius HG, Assimos DG, Alken P, Buck C, Gallucci M, et al.: 2007 guideline for the management of ureteral calculi. J Urol. 2007; 178: 2418-34.

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