

Bilateral single-session retrograde intra-renal surgery: A safe option for renal stones up to 1.5 cm

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Abstract

Introduction: Assessment of treatment outcomes in patients undergoing bilateral single-session retrograde intra-renal surgery (RIRS) for bilateral renal stones up to 1.5 cm.

Materials and Methods: Retrospective analysis of 74 patients was done with bilateral renal calculi, who underwent bilateral single-session RIRS at our stone referral hospital from December 2011 to May 2014. The selection criteria for this intervention were patient's preference, failure of other treatments and stone up to 1.5 cm. Patients with creatinine more than 2, pyonephrosis sepsis, bilateral impacted pelviureteric junction calculi were excluded from study. All patients were evaluated with serum biochemistry, urinalysis, urine culture, plain radiography of kidney-ureter-bladder, intravenous urography, renal ultrasonography (USG) and/or computed tomography (CT). Follow-up evaluation included serum biochemistry and postoperative plain film and renal USG. The success rate was defined as patients who were stone-free or only had a residual fragment of less than 4 mm. CT was conducted only in patients with residual stones, which were present in seven patients.

Results: A total of 74 patients (50 male, 24 female) with a mean age 39.2 ± 15.2 were included in the present study. The mean stone size was 11.7 ± 2.4 mm. The stone-free rates were 86.84% and 97.29% after the first and second procedures, respectively. In eight patients (10.8%), minor complications were observed, whereas no major complications were noted in the studied group. There was no significant difference in pre- and post-operative serum creatinine levels.

Conclusion: In patients with bilateral renal stones up to 1.5 cm bilateral single-session RIRS with flexible ureteroscope can be safely performed with low complication rate.

Key Words: Bilateral, retrograde intra-renal surgery, single-session

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INTRODUCTION

The advancement of urologic endoscopic equipment has allowed urologists to access stones in any location in the kidneys.

Wherever clinically appropriate, this approach may represent the preferred treatment option, regardless of stone size.^[1] Most widely used treatment modalities for the management of renal stones are percutaneous nephrolithotomy (PCNL), shock wave lithotripsy (SWL), retrograde intra-renal surgery (RIRS). Either PCNL or RIRS is recommended for stones >15 mm located within the lower pole due to the limited efficacy of SWL for stones of this size.^[2] However, the safety and efficacy of bilateral single-session RIRS has been poorly investigated. In this study, we assessed our treatment outcomes in patients undergoing bilateral single-session RIRS for bilateral renal stones up to 1.5 cm.

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MATERIALS AND METHODS

We performed a retrospective analysis of 74 patients with bilateral renal calculi, who underwent bilateral single-session RIRS at our stone referral hospitals December 2011 to May 2014. The selection criteria for this intervention were patient's preference, Failure of other treatments and Stone up to 1.5 cm. Patients with creatinine more than 2, pyonephrosis, bilateral impacted pelviureteric junction calculi and sepsis were excluded. All patients were evaluated with serum biochemistry, urinalysis, urine culture, plain radiography of kidney-ureter-bladder (KUB), intravenous urography (IVU), renal ultrasonography (USG) and/or computed tomography (CT). The stone size was determined by measuring its maximum diameter using KUB. Patients who had positive urine cultures were treated with the appropriate antibiotics before surgery. Lithotomy position was made under general anesthesia and procedure was first done on the side in which the stone size was smaller. The dilation of the ureteral orifice was performed using balloon dilators. Ureteral access sheath (UAS) was placed over the hydrophilic guide wire in all cases wherever possible. A flexible ureteroscope (f-URS) was placed through the UAS and the stones were fragmented using the Ho:YAG laser with a 200 μ laser fiber at 0.6–1.0 J energy and 10 Hz frequency levels. Relocalization of the lower pole stones was done in case it was difficult to access to a favorable upper or middle calyx, at the end of the procedure, a pigtail stent was placed, according to the surgeon's preference the same procedures were then performed for the contra-lateral side of the renal unit that contained calculi if the first procedure went well without any complications

Follow-up evaluation included serum biochemistry and postoperative plain film and renal USG conducted at the time of stent removal. Repeat serum biochemistry, USG and IVU were performed at 1-month after surgery to determine the presence of obstructions, clinically significant renal fragments and ureteral strictures.

The success rate was defined in patients who had no stone and if the residual fragment was less than 4 mm. CT was conducted only in patients with residual stones, which were present in 7 patients. Statistical analysis was performed using SPSS version 17.0 (IBM corporation). A paired sample *t*-test was used to compare the preoperative and postoperative serum creatinine levels. A *P* < 0.05 was considered as statistically significant.

RESULTS

A total of 74 patients included of which 50 male patients and 24 female patients previous intervention were noted in 18 patients mean stone size was 11.7 ± 2.4 mm. The previous

intervention was found in 20 patients. All 20 patients had stenting during the previous procedure. Lower calyx was the most common site of stone (34.4%) of patients [Table 1]. The mean operative time was 51.08 ± 15.22 min [Table 2]. Two Patients had H/O angioplasty and were taking anticoagulants. Both patients had complete clearance in single sitting 1 patient was morbidly obese. He had undergone bariatric surgery 3 months back. He had complete clearance in single sitting.

Stone clearance after 1st sitting was about 87% and after 2nd sitting was 97.29%. Totally, 10 patients needed 2nd sitting.

- Out of these three patients had mucosal injury causing bleeding
- In three patients, UAS could not be placed
- In two patients stone was cleared on fluoroscopy but stone were visualized on X-ray at the time of stent removal
- Two patients had difficult access in lower calyx on first sitting.

Stone analysis was done in all patients and most common was calcium oxalate stone. UAS was placed in 71 patients (95.9%). The bilateral stent was placed in 65 patients (87.83%). Stent removal was done at 2–3 weeks. The average hospital stay was 1.37 ± 0.72 days [Table 2].

Minor complications (Clavien 1 and 2) were noted in 8 (5.42%). No major complication (Clavien 3 and 4) was

Table 1: Patient and stone characteristics

Variable	Value (%)
Age	39.2 \pm 15.2
Gender	
Male	50 (67.8)
Female	24 (33.2)
Preoperative serum creatinine (mg/dL)	1.21 \pm 0.37
Previous renal intervention	
SWL	4 (2.76)
PCNL	8 (5.42)
Open surgery	3 (2.022)
More than 1	3 (2.022)
Stone location	
Renal pelvis	27 (18.2)
Upper calyx	37 (25)
Middle calyx	33 (22.2)
Lower calyx	51 (34.4)
Stone size (mm)	11.7 \pm 2.4

SWL: Shock wave lithotripsy, PCNL: Percutaneous nephrolithotomy

Table 2: Operative and post operative outcomes

Variable	Value (%)
Mean operative time (min)	51.08 \pm 15.33
Mean fluoroscopy time (s)	51.1 \pm 21.2
Stone clearance rate	
After first sitting	64 (86.84)
After second sitting	72 (97.29)
Postoperative serum creatinine	1.26 \pm 0.41
Minor complication	8 (10.8)
Mean hospital stay (day)	1.37 \pm 0.72

noted. Five patients had fever postoperatively and were treated with antibiotics. All five patients had stones exceeding 1 cm. Three other patients exhibited bleeding without the need for a transfusion.

The mean serum creatinine levels before and after 1-month following the procedures (after 2 weeks following pigtail stent removal) was 1.21 ± 0.37 mg/dL and 1.26 ± 0.41 mg/dL, respectively. There was no statistically significant difference between preoperative and postoperative serum creatinine levels ($P = 0.89$) [Table 2].

DISCUSSION

Several published articles have outlined the treatment modalities used for patients with bilateral renal stones, and one of the primary surgical modalities used to treat these stones is PCNL. This procedure can be administered in either a staged, synchronous or simultaneous manner.^[3-5] The management of bilateral renal stones still represents a therapeutic challenge and synchronous bilateral PCNL appears to be a well-tolerated, safe and relatively rapid procedure with a favorable cost-benefit ratio. Synchronous bilateral PCNL is a relatively safe procedure; it may be performed in selected patients without increasing the morbidity of this surgical manoeuvre. The simultaneous treatment of the contra-lateral kidney may be taken into account only when the PCNL of the first side has been performed quickly and easily without any peri-operative complication.^[6] Overall outcomes reported for synchronous bilateral PCNL include high stone-free rates (SFRs) (95–97%), low complication rates (9–12%), short length of hospital stay (4–6 days), and low blood transfusion rates.^[7] Despite the reported efficacy and safety of bilateral PCNL procedures, some major complications, such as drops in hemoglobin that require blood transfusions and hydropneumotoraces, may still occur.^[3,8]

Shock wave lithotripsy is another treatment modality used to manage bilateral renal calculi, which can also be applied in a simultaneous or staged manner.^[9] Stone size and number independently increase the probability of treatment failure and a repeat procedure ($P < 0.05$). The patients who have stones 20 mm or greater are at higher risk for treatment failure.^[10]

Perry *et al.* evaluated 120 patients who had undergone bilateral synchronous SWL.^[10] They reported a bilateral SFR of 60% after a single treatment without any major complications, such as renal failure or bilateral renal obstruction; however, 16% of the patients required additional procedures for residual stones.^[10]

Current guideline recommendations suggest extracorporeal shock wave lithotripsy (ESWL), as the therapy of first choice

for all intra-renal calculi with sizes < 20 mm, while larger stones should be treated by PNL (69, 70). However, as the results for lower pole stones are poor, primary PNL might be justified for smaller calculi starting from > 15 mm in this location. To date, f-URS has not been mentioned by most guidelines. It may offer an alternative to ESWL or PNL. Unfortunately, only little comparative data is available on the use of f-URS for renal calculi. Last-generation ureteroscopes allow access to almost all calices and together with laser lithotripsy, UASs and national retrieval tools, the removal of most calculi. Reported SFRs for calculi < 1.5 cm are from 50% to 80% while larger stones can also be treated successfully.^[11]

Recommendations

Shock wave lithotripsy remains the method of first choice for stones < 2 cm within the renal pelvis and upper or middle calices.^[11]

Larger stones should be treated by PNL.

Flexible URS cannot be recommended as first-line treatment, especially for stones > 1.5 cm in the renal pelvis and upper or middle calices, for which SFR after RIRS is decreasing and staged procedures become necessary.

For the lower pole, PNL or RIRS is recommended, even for stones > 1.5 cm, because the efficacy of SWL is limited (depending on favorable and unfavorable factors for SWL).

Only a few studies have examined the safety and efficacy of RIRS in treating bilateral renal stones. In 2005, Chon *et al.* first reported the efficacy of simultaneous bilateral RIRS (SB-RIRS).^[1] In another study by the same investigators, they assessed their treatment outcomes in four patients with significant co-morbidities who had undergone SB-RIRS, and the authors observed no major complications.^[12] Bilateral single-session RIRS and laser lithotripsy can be performed safely and effectively with a high success rate and low complication rate in patients with bilateral renal stones. A total of 42 patients (28 male, 14 female) were studied. The mean stone size was 24.09 ± 6.37 mm and the SFRs were 92.8% and 97.6% after the first and second procedures, respectively, and there were no major complications noted.^[13]

Huang *et al.* examined bilateral RIRS in 25 patients with bilateral renal stones and reported an overall SFR of 70%, 92% and 92% after first, second and third procedures, respectively.^[14] Similarly, the SFRs in our study group were 86.84% and 97.29% after the first and second sessions of RIRS, respectively. Although the mean stone size was smaller than that reported in the previously published articles that have evaluated the outcomes of bilateral PCNL, we achieved

a similar SFR to those studies following a bilateral PCNL. Additionally, our SFR was higher when compared with the published articles on bilateral SWL, and only 7.2% of patients in our study group required additional procedures, which is lower than the typical rates following SWL.

Although we did not do a cost analysis, and we did not do CT in all patients postoperatively, which may overestimate SFR, this study is one of the largest series for bilateral RIRS in a single sitting.

CONCLUSION

Bilateral single-session RIRS and laser lithotripsy can be performed safely and effectively in patients with High stone burden that were previously managed by other more invasive or less effective techniques. Further randomized trials are needed comparing with PCNL, SWL and RIRS for this subset of patients.

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