

Same-Session Surgery for Bilateral Ureteral Stones in Adult Patients: Safety, Efficacy, and Clinical Outcomes

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Abstract

Objective: To evaluate the efficacy, safety, and impact on renal function of same-session bilateral ureteroscopy and laser lithotripsy in patients diagnosed with simultaneous bilateral ureteral stones.

Materials and Methods: The data of 80 primary patients who underwent bilateral ureteroscopy for simultaneous bilateral ureteral stones between December 2015 and December 2025 were retrospectively reviewed. Thin-tipped semirigid ureteroscope and a Holmium:YAG laser (1J/10Hz) were used in all procedures. Surgical success (stone-free) was defined as complete clearance or the presence of fragments <4 mm on imaging performed at the 4th postoperative week.

Results: The mean age of the 80 patients included in the study was 43.6 ± 15.4 years, the mean total stone burden was 19.9 ± 5.3 mm, and the median operative time was 60.0 (IQR: 48.75–75.0) minutes. The median hospital stay was 2.0 (IQR: 2.0–4.0) days. The stone-free rate (SFR) after the first session was 88.75%, while the final SFR reached 96.25% after additional interventions. Serum creatinine levels showed a significant decrease from a preoperative median of 1.16 mg/dL to a postoperative level of 0.9 mg/dL ($p < 0.001$). The overall complication rate was 12.5% ($n = 10$), all of which were Clavien-Dindo Grade I-II (minor). No major complications such as ureteral perforation or avulsion were observed in our series.

Conclusion: Same-session bilateral ureteroscopy is a safe and effective method for the treatment of simultaneous bilateral ureteral stones, offering high success rates, a low morbidity profile, and rapid improvement in renal function. With appropriate patient selection, bilateral ureteroscopy should be considered a standard approach in bilateral stone disease.

Keywords: bilateral ureteral stone, bilateral ureteroscopy, laser lithotripsy, stone-free rate, complication

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INTRODUCTION

Urolithiasis is accepted as an important public health problem due to its worldwide prevalence and increasing incidence (1). It is known that in approximately 15% of patients diagnosed with urinary system stone disease, both renal units are affected at the same time (2). Within these presentations, simultaneous bilateral ureteral stones are a rarer and clinically more critical condition, accounting for approximately 1% of all stone patients (3). Bilateral ureteral stones are considered a urological emergency due to the risk of potentially leading to anuria, acute kidney injury, and severe electrolyte imbalances.

In traditional urology practice, the management of bilateral ureteral stones has generally been implemented in the form of staged procedures, with the concern that exposing both ureters to surgical trauma in the same session could put renal functions at risk and create bilateral ureteral edema/injury (4). However, this staged approach leads to the patient receiving anesthesia multiple times, prolongation of the total hospital stay, increased loss of workforce, and rising treatment costs (5,6).

In the last two decades, revolutionary developments in endoscopic equipment technology—particularly miniaturized ureteroscopes and the widespread use of laser technology—have fundamentally changed the surgical treatment of ureteral stones (3,5). These technological advancements and increasing surgical experience have allowed the same-session bilateral ureteroscopy (B-URS) procedure to be offered as a safe and effective alternative in selected case groups (5,6). American Urological Association (AUA) and European Association of Urology (EAU) guidelines also currently recommend same-session bilateral intervention as a treatment option in appropriate patients (7,8).

Comprehensive meta-analyses in the literature have revealed that bilateral URS provides high stone-free rates such as 96% in the distal ureter, 85% in the middle ureter, and 72% in the proximal ureter, and that most complications remain at a minor (Clavien I-II) level (9). Relieving the obstruction through urgent bilateral ureteroscopic intervention, especially in bilateral ureteral stone patients presenting with acute renal failure, plays a critical role in the restoration of kidney functions and the rapid decline of serum creatinine levels (10).

The aim of this study is to evaluate the operative results, success rates according to anatomical localization, and the level of improvement in renal functions of our 80-patient series who underwent same-session single-stage URS and laser lithotripsy solely for simultaneous bilateral ureteral stones, in light of current literature data.

MATERIAL AND METHODS

In this study, the data of 80 patients who underwent same-session bilateral ureteroscopy and laser lithotripsy with a diagnosis of simultaneous bilateral ureteral stones between December 2015 and December 2025 at the urology clinic of a tertiary care training and research hospital were retrospectively reviewed. This study was approved by the Ethics Committee of Harran University (Decision Number: HRÜ/25.08.09, Date: April 28, 2025) was obtained for the study. Only adult patients with obstructive or symptomatic stones in both ureters were included in the study. Patients with unilateral ureteral stones, those who underwent concurrent retrograde intrarenal surgery (RIRS), those who underwent ureteroscopy for non-stone reasons, those with a solitary kidney, and pediatric patients were excluded from the study.

The preoperative complete blood count, serum biochemistry (especially serum creatinine levels), urinalysis, and urine culture results of all patients were recorded. Patients with positive preoperative cultures received appropriate targeted antibiotic therapy according to antibiogram results until a negative culture was obtained before surgery. For patients with negative cultures, prophylactic antibiotics were administered intravenously 30–60 minutes before anesthesia induction. Stone localization, size, and burden were determined using non-contrast abdomino-pelvic computed tomography (CT). Total stone burden was calculated as the sum of the widest diameters of the stones in both ureters. For patients with multiple stones in the same ureter, the total stone burden was calculated by summing the largest diameters of each individual stone as recorded on preoperative CT. All procedures were performed by a single experienced endourology team to maintain technical consistency. All procedures were performed under general or spinal anesthesia, in the dorsal lithotomy position, and under fluoroscopic guidance. Surgery was generally initiated on the side with the lower stone burden or the symptomatic side.

A 7–9.5 Fr semirigid ureteroscope (Karl Storz, Knittlingen, Germany) was used for distal ureteral stones; flexible ureteroscopes and ureteral access sheaths were preferred for proximal stones when needed. Stone fragmentation was performed using a Holmium:YAG laser device (Sphinx Jr 30; LISA Laser Products GmbH, Katlenburg-Lindau, Germany) with 200–365 μm laser fibers using “dusting” (0.5–0.8 J / 15–20 Hz) or “fragmenting” (1.0–1.5 J / 5–10 Hz) techniques. In cases of proximal stone migration (push-back) to the kidney, we either performed concurrent RIRS in the same session if available or placed a DJ stent for a later staged procedure. At the end of the operation, a ureteral Double-J (DJ) stent was placed in the patients. These placed stents were routinely removed between the 2nd and 4th postoperative weeks. Postoperative serum creatinine levels of the patients were checked and compared with preoperative values. Complications were categorized according to the Clavien-Dindo classification system.

Stone-free status (SFR) was evaluated 4 weeks after the operation using CT, ultrasonography, or plain abdominal radiography (KUB). The absence of residual fragments on CT or the presence of asymptomatic fragments <4 mm in size was considered success (stone-free). Data analysis was performed using SPSS (Statistical Package for Social Sciences) version 25.0 software. The normality of continuous variables was evaluated using the Shapiro-Wilk test. Continuous variables with a normal distribution were expressed as mean $\pm$ standard deviation (SD) and compared using the paired sample t-test. Variables with a non-normal distribution were expressed as median (interquartile range [IQR]) and compared using the Wilcoxon signed-rank test. Categorical variables were presented as numbers and percentages and analyzed using the Chi-square or Fisher's exact test. P-value of <0.05 was considered statistically significant.

RESULTS

The study included 80 patients, consisting of 57 (71.3%) males and 23 (28.7%) females; the mean age of the patients was determined to be 43.6 ± 15.4 years. While the median preoperative serum creatinine level was 1.16 (IQR: 0.9–1.95) mg/dL, 5 patients (6.25%) were found to present with anuria or oliguria at the time of admission. The mean total bilateral stone burden was calculated as 19.9 ± 5.3 mm (range 3.2–26 mm), and it was observed that the stone burden was 20 mm or

more in 32.5% ($n = 26$) of the patients. When the anatomical localization of the stones was examined, the largest group consisted of bilateral proximal stones at 27.5% ($n = 22$); this was followed by proximal+middle ureter location at 23.75% ($n = 19$). The demographic characteristics and stone features of the patients are detailed in Table 1.

Table 1. Patient Demographic Data and Stone Characteristics ($n = 80$)

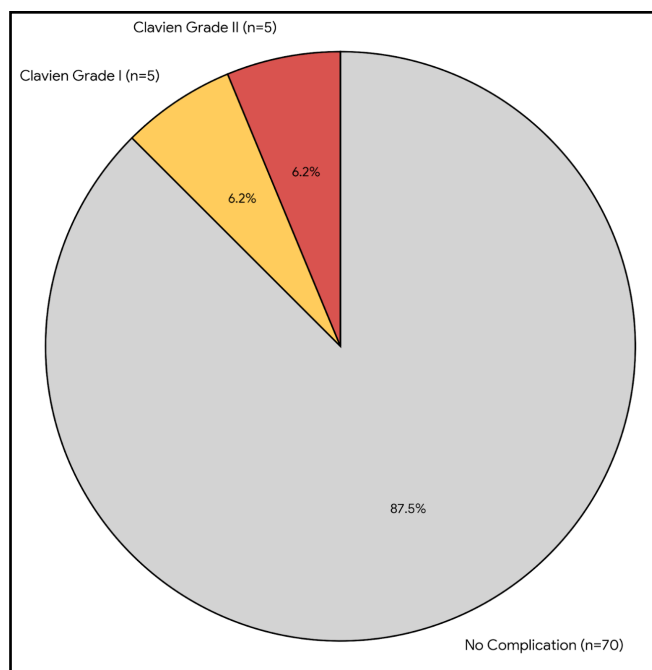
Variable	Value
Gender (Male/Female)	57 (71.3%) / 23 (28.7%)
Age (Years, Mean $\pm$ SD)	43.6 ± 15.4
Preoperative Creatinine (mg/dL, Median)	1.16 (IQR: 0.9–1.95)
Bilateral Mean Stone Size (mm)	19.9 ± 5.3
Total Stone Burden (Patient-Based)	
< 20 mm	54 (67.5%)
≥ 20 mm	26 (32.5%)
Stone Localization Distribution (n, %)	
Proximal + Proximal	22 (27.5%)
Proximal + Middle	19 (23.75%)
Proximal + Distal	16 (20.0%)
Middle + Middle	6 (7.5%)
Middle + Distal	6 (7.5%)
Distal + Distal	11 (13.75%)

The median operative time was recorded as 60.0 (IQR: 48.75–75.0) minutes (range 15–130 min). The median hospital stay was 2.0 (IQR: 2.0–4.0) days (range 1–15 days). While the stone-free rate (SFR) after the first session was 88.75% ($n = 71$), the total stone-free rate reached 96.25% ($n = 77$) after additional interventions (URS/RIRS or SWL) for residual stones. In the localization-based analysis, 100% success was achieved for distal ureteral stones, while it was observed that the first-session success rate was lower for proximal stones. Following successful surgical decompression of the bilateral obstruction, the median postoperative serum creatinine level significantly decreased to 0.9 (IQR: 0.8–1.3) mg/dL, with a median change of -0.20 (IQR: -0.55 to -0.07) mg/dL ($p < 0.001$). Operative and clinical results are presented in Table 2.

Table 2. Operative and Clinical Results (n = 80)

Variable	Value
Operative Time (min, Median)	60.0 (IQR: 48.75–75.0)
Length of hospital stay (days, Median)	2.0 (IQR: 2.0–4.0)
Postoperative Creatinine (mg/dL, Median)	0.9 (IQR: 0.8–1.3)
Change in Serum Creatinine (mg/dL)	-0.20 (IQR: -0.55 to -0.07) (p < 0.001)
Overall Complication Rate (n, %)	10 (12.5%)
Clavien Grade I	5 (6.25%)
Clavien Grade II	5 (6.25%)
Stone-free Rate (SFR) – First Session	71 (88.75%)
Stone-free Rate (SFR) – Total	77 (96.25%)

When the complication analysis was performed according to the Clavien-Dindo classification, the overall complication rate was found to be 12.5% (n = 10). All complications were minor; Grade I (stent pain, mild hematuria) was observed in 5 patients (6.25%) and Grade II (febrile urinary tract infection resolving with medical treatment) was observed in 5 patients (6.25%). No Grade III or higher major complications (ureteral perforation, avulsion, or conversion to open surgery) were detected in our series (Figure 1).

**Figure 1.** Postoperative Complications According to Clavien-Dindo Classification in Patients (n = 80).

DISCUSSION

Simultaneous bilateral ureteral stones, although rare (1–3%) among urinary stone diseases, represent a clinically critical condition that can present with anuria and acute renal failure. Historically, it was thought that surgical intervention to both sides in these cases carried risks of bilateral ureteral edema and loss of renal function; however, modern endourological equipment and increasing surgical experience have shown that same-session bilateral ureteroscopy can be performed safely(4,5). Our series of 80 patients is one of the largest single-center B-URS studies in the literature, proving both the high success and safety of the procedure.

Comprehensive meta-analyses in the literature report total stone-free rates (SFR) after B-URS between 87% and 95%(9,11). The total stone-free rate of 96.25% obtained in our series is at the upper limit of these data. One of the most important factors affecting success is the anatomical localization of the stone in the ureter. In the meta-analysis performed by Ge et al., SFR was 96% in the distal ureter, while this rate decreased to 72% for stones located proximally (9). Despite a high rate of bilateral proximal stones (27.5%) in our series, high success rates consistent with the literature were achieved using laser lithotripsy and appropriate surgical techniques.

The main concern regarding bilateral ureteroscopy is the risk of major surgical complications. Although complication rates up to 29% were reported in past series using large-caliber (>10 Fr) devices (12), this rate has decreased to 10–17% in current literature (4,9). The 12.5% complication rate observed in our series is parallel with the safety data (15–16%) in the CROES Global study presented by Pace et al. (13). Most importantly, the absence of major (Grade III-IV) complications, such as ureteral perforation or avulsion in our series, confirms that B-URS is as safe as unilateral interventions in selected cases.

The literature reports that rapid relief of obstruction preserves renal functions and normalizes creatinine levels. In our series, the significant decrease of -0.20 mg/dL (p < 0.001) from a preoperative creatinine level of 1.16 mg/dL demonstrates that B-URS is not only a stone-clearing procedure but also a renal function-saving one.

The greatest advantage of B-URS compared to staged surgery is that the patient is cleared of the stone burden in a single anesthesia session and the total hospital stay is reduced. In addition to reducing operative burden and hospitalization, same-session treatment eliminates the need for a second anesthetic exposure and improves patient satisfaction by avoiding repeated hospital admissions and cumulative stent-related symptoms. Fiscus et al. demonstrated that single-session bilateral surgery significantly reduces operative time and costs (14). The median operative time of 60 minutes in our series is consistent with the 45–100 minute range reported in meta-analyses (9). This efficiency contributes to reducing the burden on the healthcare system, particularly in high-volume centers.

The main limitations of our study are its retrospective design, the reflection of a single-center experience, and the relatively small patient population. Additionally, the lack of direct comparison between our B-URS results and staged bilateral procedures is another limitation. The lack of routine computed tomography for evaluating stone-free rates in every case and the inability to perform stone composition analysis and stone density (HU) measurements in all patients limit the detailed analysis of our results. Finally, longer-term follow-up data are needed to detect rare late-term complications such as ureteral stricture.

CONCLUSION

Same-session single-stage B-URS is a safe and effective treatment method for the management of simultaneous bilateral ureteral stones, offering low complication rates, high stone-free success, and rapid improvement in renal functions. In accordance with modern surgical guidelines, with appropriate patient selection and an experienced surgical team, B-URS can be considered a standard approach for bilateral stone disease.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval: This study was approved by the Ethics Committee of Harran University (Decision Number: HRÜ/25.08.09, Date: April 28, 2025).

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