

# Feasibility and safety of bilateral same-session flexible ureteroscopy (FURS) for renal and ureteral stone disease

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**Introduction** With rising incidence of urolithiasis, treatment of stones (both symptomatic and asymptomatic) in multiple locations including bilateral stones can be controversial and challenging. We report our experience and treatment outcomes in patients undergoing bilateral, same-session ureterorenoscopy (BS-URS) for bilateral ureteric and/or renal calculi, and discuss the advantages and disadvantages of such procedures.

**Material and methods** Between May 2012 and October 2013, 251 patients underwent ureteroscopic surgery for stone disease at our institution. Of these, 21 patients underwent 25 bilateral same-session ureterorenoscopy (BS-URS) procedures during this period. Stone-free status was defined as endoscopically stone-free or radiological fragments <2 mm.

**Results** The mean bilateral stone size was 21mm (range: 4-63 mm) with a mean operating time of 70 minutes (range 35-129 minutes). Fifteen procedures (60%) were done as day case procedures with a mean stay of 0.9 days (range 0-7 days). Of the 42 renal units treated, 80% (34/42) were stone-free after a single bilateral ureteroscopy session. A further 12% (5/42) were cleared after a re-look procedure making the overall stone free rate 92.8% (39/42). There were no major complications and 3 minor complications (2 early stent removals due to stent symptoms and 1 pyelonephritis requiring intravenous antibiotics).

**Conclusions** Bilateral same-session ureteroscopy is a safe and effective treatment option for patients with bilateral ureteric and/or renal calculi, even with stones in multiple locations and increasing stone loads. However, as with all surgery, proper patient and equipment selection is crucial in terms of reducing complication rates and improving treatment outcomes.

**Key Words:** bilateral <> flexible ureteroscopy <> renal stones <> ureteral stones <> laser

## INTRODUCTION

In the past, management of urolithiasis mainly focused on treating symptomatic stones. However, in recent years, given the high recurrence rates seen in stone disease, there has been a move towards achieving stone-free status for patients wherever possible to increase the time to disease recurrence and the risk of subsequent symptomatic stone episodes, whilst minimising intervention-related morbidity. It is not uncommon for these patients to present with multiple and bilateral stones [1, 2, 3] necessitating bilateral stone treatment. However,

the optimal management of bilateral stones remains a controversial issue. For small to moderate sized upper urinary tract stones shockwave lithotripsy (SWL) is widely accepted as the least invasive of all treatments. However, stone multiplicity is proven to be associated with adverse stone-free rates and recurrence rates after SWL, particularly when compared to ureteroscopy [4, 5, 6]. In this study, we report our experience and treatment outcomes in patients undergoing bilateral, same-session ureterorenoscopy (BS-URS) for bilateral ureteric and/or renal calculi, and discuss the advantages and disadvantages of such procedures.

## MATERIALS AND METHODS

Between May 2012 and October 2013, 251 patients underwent ureteroscopic surgery for stone disease at our institution, details of which were maintained in a prospective database. Of these, 21 underwent bilateral same-session ureterorenoscopy (BS-URS); 13 females and 8 males. Of these 21 patients, 4 underwent a second BS-URS procedure, resulting in a total of 25 BS-URS procedures during this period. Patients were imaged pre-operatively with a combination of CT KUB (Non contrast CT) and/or Renal USS and X-Ray KUB. Assessment of stone size was done by measuring the maximal diameter on CT KUB. Further pre-assessment included urine culture and renal function blood tests. Patients with bilateral stones suitable for BS-URS were given the opportunity to discuss this option versus a staged ureterorenoscopy (URS) procedure. Patients with a positive urine culture were treated pre-operatively and were given additional antibiotics intra-operatively.

### Technique

All patients received intravenous gentamicin at induction unless pre-operative urine culture suggested a different antibiotic choice. URS was carried out as a day case procedure for the majority of patients by the same surgeon (BKS), under general anaesthesia in the dorsal lithotomy position. The technique involved Storz Flex X2 ureteroscopes, nitinol baskets and a Holmium laser for fragmentation, with the use of an access sheath where possible. A pre-operative/anaesthetic protocol was used with paracetamol (1 g) along with ibuprofen (400 mg) orally given pre-operatively. General anaesthetic using a spontaneous breathing technique and laryngeal mask airway was used. Intraoperative analgesia was provided with intravenous fentanyl and morphine. Antibiotic prophylaxis and 500-1000 ml of intravenous crystalloid along with a single dose of ondansetron was also given.

A 6.5/8.9Ch semi-rigid ureteroscope was first used to map the ureteric anatomy and locate and/or treat ureteric stones. Access sheaths (9.5/12Ch) were used in the majority of cases for renal stones especially if the stone burden was large or a prolonged procedure was anticipated. Flexible ureterorenoscopy using a Storz Flex X2 was then used to locate and treat any renal calculi. Stones were fragmented using laser lithotripsy with active retrieval of fragments using a nitinol basket. In cases where a ureteric stent was placed post-operatively, this was removed 2-3 weeks post-operatively if the patient was stone-free. For patients with residual stone after the first

ureteroscopic stone treatment, a second procedure was scheduled 4-6 weeks after the initial procedure. All patients were then followed-up in clinic with up-to-date radiology with X-Ray KUB or ultrasound scan (USS), 8-12 weeks post-operatively. Stone-free rate (SFR) was defined as endoscopically stone-free or radiological fragments <2 mm.

## RESULTS

Table 1 lists the patient, stone, and operative characteristics. Mean patient age at time of surgery was 46 years (range 22-76 years). Pre-operatively, 3 patients had a positive urine culture and 3/21 (14%) had a pre-operative stent in-situ. Patient co-morbidities included morbid obesity (n = 1), advanced renal failure (n = 1), spinal injury (n = 1) and obesity associated with diabetes (n = 3).

**Table 1.** Patient and stone characteristics

Patients	21
Total no. of bilateral procedures	25
Male: female	8:13
Stone location (including multiple stones) (%)	
Upper ureter	4.3% (n=2)
Middle ureter	8.5% (n=4)
Lower ureter	2.1% (n=1)
Renal pelvis	25.5% (n=12)
UPJ	6.4% (n=3)
Upper pole	14.9% (n=7)
Middle pole	10.6% (n=5)
Lower pole	27.7% (n=13)
Distribution of calculi	Number of procedures = 25
Renal only	48% (n=12/25)
Ureteric only	8% (n=2/25)
Renal and ureteric	44% (n=11/25)
Mean bilateral stone size (mm)	21 (range 4-63)
Mean operating time (min)	71 (range 35-129)
Stone composition	
Calcium oxalate	(n=5)
Calcium oxalate & calcium phosphate	(n=4)
Calcium phosphate carbonate & magnesium ammonium phosphate	(n=4)
Cysteine	(n=2)
Calcium oxalate & calcium phosphate carbonate	(n=2)
Calcium phosphate	(n=1)
Uric acid	(n=1)
No stone analysis available	(n=6)

There were only 4 isolated (single) ureteric stones. The remaining stones were either in the UPJ, kidney, or in multiple renal and/or ureteric locations. The mean bilateral stone size was 21 mm (range: 4-63 mm).

### Operative time

The mean operating time (calculated from the time of insertion of the cystoscope to completion of stent insertion) was 70 minutes (range 35-129 minutes). While the access sheath was used in two-thirds ( $n = 14$ ) of these procedures a post-operative stent was left behind in all cases (unilateral after 7 procedures and bilateral after 18 procedures).

### Length of stay

Fifteen procedures (60%) were done as day case procedures with a mean stay of 0.9 days (range 0-7 days).

### Number of procedures/Stone free rate

Of the 42 renal units treated, 80% (34/42) were stone-free after a single bilateral ureteroscopy session. A further 12% (5/42) were cleared after a re-look procedure making the overall stone free rate 92.8% (39/42) in this series. Of the 3 renal units not stone-free in this series, one was a buried stone in a closed infundibulum, one was a residual 4 mm lower pole stone in a high-risk patient refusing further treatment, and one was a residual stone in a cysteinuric patient where there was a multi-disciplinary team decision for conservative management.

### Complications

No major complication such as ureteric perforation was observed. Minor complications were seen in 3 cases (Clavien I-II), including 2 patients who required re-admission for stent-related symptoms, which resolved after early stent removal (within 48 hours), and one case of loin pain that was treated as pyelonephritis and settled with intravenous antibiotics and early stent removal. None of the patients developed ureteric stricture during our follow-up.

## DISCUSSION

The first documented ureteroscopic stone procedure was performed by Marshal in 1964 in order to observe a distal ureteric stone [7]. Since then, technological advancements have resulted in smaller and more sophisticated ureteroscopes and associated techniques for intracorporeal stone fragmentation

and removal. This has led to the safer usage of ureteroscopy to treat more proximal stones, with high success rates approaching results previously only seen in the treatment of more distal stones. However, optimal management of bilateral stones remains controversial. Indications for BS-URS are similar to those for unilateral ureteroscopy. However, in patients with bilateral stones, bilateral ureteroscopy, and in particular same-session ureteroscopy may reduce overall operative time and anaesthetic requirements, as well as reduce the length of stay and duration of convalescence, compared to staged procedures [8, 9, 10]. Nevertheless, many surgeons remain concerned over the potential increased risk for intra-operative complication, particularly the risk of exposing both ureters to injury that could lead to significant morbidity. Contrary to this, there is growing evidence in line with our own findings to support the view that bilateral same-session ureteroscopy is safe and feasible [10-19]. In addition to this we have recently published [20] our data for lower pole stones managed by flexible ureteroscopy. Sixty-two patients underwent flexible ureteroscopy and laser stone fragmentation (FURSL) with a mean stone size of 13.4 mm (4-53 mm), and a stone free rate of 92.6% with a complication rate of 6% ( $n = 4$ ) that included one stent pain, one UTI and two cases of urosepsis treated with intravenous antibiotics. Our data from lower pole stones (FURSL) also supports ureteroscopy, even for patients with bilateral lower pole renal stone disease.

A total of 390 patients undergoing bilateral same-session ureteroscopy for stone disease have been reported on in the literature to date [7, 10-20]. The reported stone free rate ranges from 85-98.7% [10-19]. Although earlier series were associated with high complication rates (up to 45%) including post-operative fever and ureteric injury [10], in subsequent series including our own, the complication rates seem to be much lower. This is likely due to the fact that in these early series, larger calibre 12 & 10.5Ch ureteroscopes were used, compared to the smaller 8 and 6.9Ch ureteroscopes of the more contemporary studies. Major complications such as ureteric stricture and perforation in particular, have been certainly shown to be directly related to ureteroscope diameter [7]. It is also likely that morbidity and complications associated with this procedure are progressively decreasing with time as surgeon experience improves [12].

We acknowledge the limitations of the study including a small study sample, but BS-URS is not routinely performed in most centres and our study confirms the feasibility of this technique. Although we discussed BS-URS technique with all patients where

a staged URS procedure would have been otherwise offered, we did exclude patients with very large stones where a percutaneous nephrolithotomy would have been the treatment choice.

Our study is the first reported series on BS-URS from the UK and shows that it is a safe and feasible option in patients with bilateral stones with a good SFR. Moreover, these cases can now be done as a day case procedure, although all patients needed either a unilateral or bilateral stent insertion post-operatively. Larger studies, ideally multi-centric are necessary to see the generalizability of our findings for patients with bilateral urolithiasis.

## CONCLUSIONS

Bilateral same-session ureteroscopy is a safe and effective treatment option for patients with bilateral ureteric and/or renal calculi, even with stones in multiple locations and increasing stone loads. However, as with all types of surgery, proper patient and equipment selection is crucial in terms of reducing complication rates and improving treatment outcomes.

## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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