

# Day surgery urolithiasis management: efficacy and safety of ureteroscopy and laser lithotripsy in a district general hospital setting

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## Keywords

Day Surgery, laser lithotripsy, ureteroscopy, renal calculi, ureteric calculi

## Abstract

### Introduction

Incidence of urolithiasis is rising worldwide and increasingly Ureteroscopy (URS) coupled with laser fragmentation is being used safely within the day surgery setting for ureteral and renal stone management. This study is to explore whether URS guided lithotripsy could be delivered effectively as a day surgery procedure.

### Method

Retrospective analysis of 118 day surgery patients who underwent URS guided laser lithotripsy for ureteric and renal calculi between November 2017 and April 2019. All patients underwent ureteric stenting during acute admission prior to the URS guided lithotripsy. Outcomes were compared against European Association of Urology (EAU) guidelines on the best clinical practice in use of URS in urolithiasis.

### Results

Of the 118 patients who underwent URS and laser fragmentation, mean age was 54 years with 2:1 male:female ratio. 56% were ureteric (67% upper, 8% middle and 25% distal ureter), 44% renal stones. Mean stone size was 9.7mm, with 58% <1cm, 38% 1-2cm and 4% >2cm. 90.6% of patients following URS guided stone fragmentation were stone-free. The complication rate was 8.5% (n = 10), Clavien-dindo 3 in 4 patients and Clavien-dindo 4 in 1 patient.

### Conclusion

This study demonstrated that URS guided stone fragmentation can safely deliver high stone free and low complication rates within day surgery setting.

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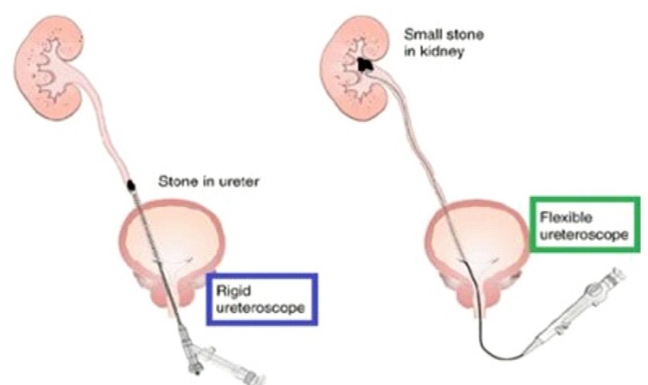
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## Introduction

The prevalence and incidence of nephrolithiasis is reported to be increasing across the world [1] with a peak incidence at between 40 and 50 years of age.[2] Rising levels of obesity and diabetes, environmental factors such as dietary and climate change were noted to be risk factors for increasing trend in urolithiasis.[1] This is evident by a 70% increase in UK hospital attendances with urolithiasis, from 51,035 attendances in 2000 to 86,742 in 2015.[3] Ureteroscopy (URS) guided laser lithotripsy being performed more frequently than other urological surgeries in any urological departments especially in tropical countries like Sri Lanka .[4] Day Surgery is becoming popular in surgical field because of better patient satisfaction and cost efficacy to health care system. The fact that day surgery is more efficient leads to shorter waiting lists and better service to patients [5].

Increasingly ureteroscopy (URS) coupled with laser fragmentation is being used safely within the day surgery setting for ureteral and renal stone management, with associated high stone-free levels and patient satisfaction.[5] Both rigid ureteroscopy(URS) and flexible ureteroscopy are used in most of the renal stone management(Figure 1).Although there are European guidelines for the ureteroscopic management of urolithiasis, this study set out to explore whether URS guided laser lithotripsy could be



**Figure 1:** Types of Ureteroscopy (URS): Rigid URS (Left) and Flexible URS (right)

delivered effectively as a day surgery procedure within the District General Hospital (DGH) setting

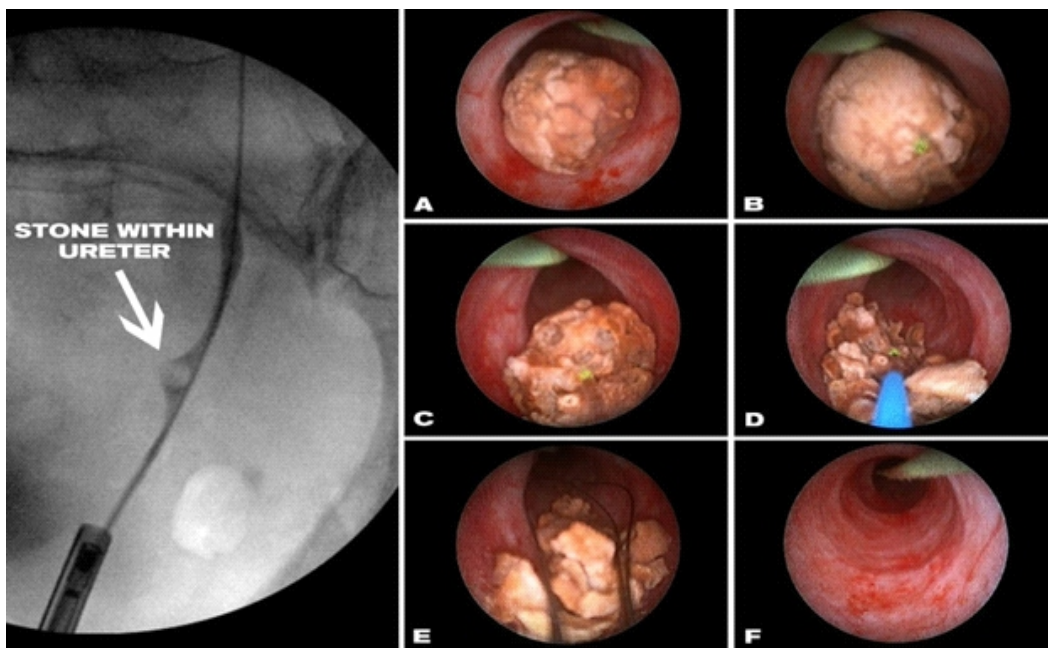
**#Method**

This was a retrospective analysis of hundred and eighteen (n=118) day surgery patients who underwent URS guided laser lithotripsy for ureteric and renal calculi in a DGH in between the period of November 2017 and April 2019. All patients who underwent the URS guided laser lithotripsy had prior ureteric stenting during acute admission with obstructed infected kidney or obstructed kidney with acute kidney injury (AKI). Outcomes were compared against European Association of Urology (EAU) guidelines on the best clinical practice in use of URS in urolithiasis including the Clavien-

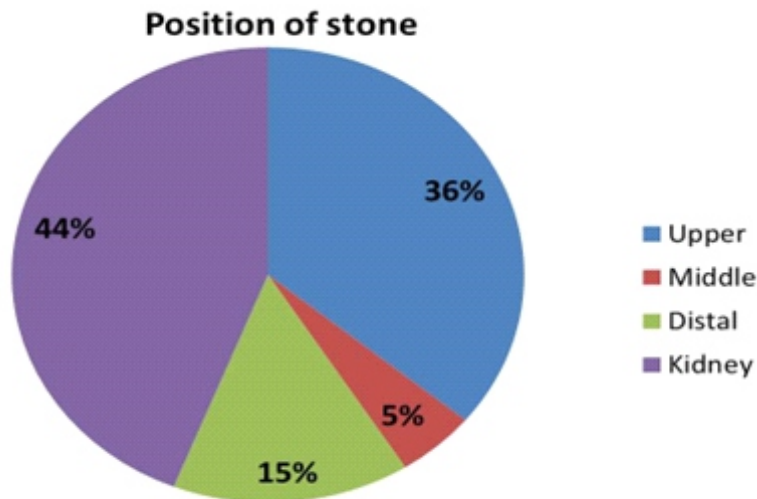
Dindo scale for assessing complications. Standard safety techniques and image documentations practiced during ureteroscopy and laser lithotripsy (Figure 2)

**Results**

The average patient age of the 118 patients who underwent URS laser lithotripsy was 54 years, and 78 (66%) were male and 40 (34%) were female with male: female ratio of 2:1. The total number of stones treated was 166, of which 56% were ureteric (36% upper, 5% middle and 15% distal ureter) and 44% renal (6% upper pole, 18% middle pole, 25% lower pole and renal pelvis 51%) (Figure 3).



**Figure 2:** URS Visualisation of ureteric stone (A,B). Laser lithotripsy(C,D), basket retrieval of fragments(E) and complete stone clearance(E) and Retrograde study reveals distal ureteric calculi(G)



**Figure 3:** Positions of Urolithiasis

The average size of stone was 9.7 mm, with 58 % <1cm, 38% 1-2cm and 4% >2cm. All renal stones treated with both rigid and/or flexible URS laser lithotripsy were <2cm, which is in compliance with EAU guidelines that Percutaneous Nephrolithotomy (PCNL) should be first line for renal stones >2cm and all cases were undertaken with the use of a holmium laser and placement of safety guide wire or ureteral access sheath. 12.69 mm was the average patient stone burden. 1.41 was the average number of stones treated per case, with an average 1.12 Watts of energy used. At three month follow up clinic, 90.6% of patients following day surgery URS laser lithotripsy were found to be stone-free on abdominal X-ray (AXR) and Ultra Sound scan of Kidney Ureter Bladder (US/KUB). Of the 9.4% of patients who were not stone-free at this 3 month follow up, except three re-do URS laser lithotripsy and one PCNL other patients successfully passed their residual fragments after a further 3 month period of surveillance with medical expulsive therapy (Table I).

The complication rate was 8.5% (n=10) following the procedure, which was below '9-25% the acceptable complication rate' stated by the EAU guidelines. The Clavian Dindo classification of these complications would be 5 x(I), 1x(II), 3x(IIIb); 1 x(IV), including two patients requiring overnight admissions for analgesia, two patients representing and requiring intravenous antibiotics for post-operative

**Table 1: Day surgery URS guided laser lithotripsy**

Day surgery URS Guided laser lithotripsy	
Cases	118
Average age	54
Gender ratio (M:F)	2:1
Total Stone treated	166
Average number of stones treated per case	1.41
Mean stone size (mm)	9.7
Average laser energy used per case (Watt)	1.12
Failed URS cases	4
Post operative Urosepsis	2
Re do URS	3

**Table 2: Complications following URS guided laser lithotripsy as day surgery**

Clavian -Dindo Classification	Number of cases
Grade I	5
Grade II	1
Grade III	
a	Nil
b	3
Grade IV	1
Grade V	Nil

urosepsis, three patients requiring repeat Computed Tomography (CT) and one patient requiring a re-do URS (Table 2). Among 118, 4 patients had failed URS due to difficult ureteric anatomy. Three underwent repeat URS later and in one case PCNL was performed due to presence of large fungal ball in renal pelvis which was difficult to retrieve by flexible URS.

## Discussion

Size and location of stone mainly determine the mode of surgical management of urolithiasis, as well as patient preference plus available local facilities and expertise [3]. With the development of technology, management of urolithiasis has drifted towards minimally invasive procedures such as Shock Wave Lithotripsy (SWL), URS Laser lithotripsy and Percutaneous Stone Removal (PSR) rather than open surgery [7, 8]. This is due in great part to the lower rates of morbidity and complications associated with current end urological operations [9]. Over past 10 years the number of URS laser lithotripsies performed in the UK has reported an increment of 127%, in 2015, there were 14,242 instances, compared to only 6283 in 2000. [4, 7] The growing popularity of URS laser lithotripsy can be attributed to technical improvements in optics and endoscope miniaturization, which have made URS faster and more efficient, with higher stone-free rates (SFR) [6]. Fewer ureteral injuries and improved fragmentation efficiency for all type of stone noted due to the transition from electrohydraulic and ultrasonic lithotripsy to Holmium or Thulium laser lithotripsy. [10] Utilization of URS is increasing in complex stone disease and patients with troubling comorbidities such as obesity, bleeding diathesis, pregnancy and solitary kidney as utilized in standard urolithiasis patients [11]. In our study most of the patient presented as emergency admission to casualty ward with AKI or obstructed infected kidney and hot laser lithotripsy not done because of non-availability of laser machine at casualty theatre and movement of laser machines between different complex of hospital was not favored by hospital administration considering damage to laser machine. Rigid URS used for ureteric stone management at day care surgical unit. Single use flexible URS (Lithovue) used in management of most of the renal stones and retro pulsed proximal ureteric stones.

## Conclusion

This study has showed how URS laser lithotripsy is achieving higher SFR (90.6%) and reduced re-do procedures (3.4%) while maintaining complication rate (8.5 %) within acceptable range as a day case procedure. This study has showed that with the facilities available in DGH setting, URS guided stone fragmentation can safely achieve high stone-free and low-complication rate as a day case surgery, which reduce patient stay at hospital and expenditure to health institution.

## Limitations

This study has showed how URS laser lithotripsy is achieving higher SFR (90.6%) and reduced re-do procedures (3.4%) while maintaining complication rate (8.5 %) within acceptable range as a day case procedure. This study has showed that with the facilities available in DGH setting, URS guided stone fragmentation can safely achieve high stone-free and low-complication rate as a day case surgery, which reduce patient stay at hospital and expenditure to health institution.

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