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### Endourology

Original article

# Outcome of retrograde flexible ureterorenoscopy and laser lithotripsy for treatment of multiple renal stones

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#### KEYWORDS

Renal stones;  
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#### Abstract

**Objective:** To evaluate the efficacy and safety of retrograde intrarenal surgery (RIRS) using flexible ureterorenoscopy (F-URS) and laser lithotripsy as a treatment option for multiple renal stones greater than 1 cm.

**Patients and methods:** Between June 2015 and February 2017, 42 patients who were treated with RIRS via F-URS and laser lithotripsy were evaluated. Stones were divided into two categories according to stone burden, 11–20 mm and 21–30 mm. Patient's demographics, stones characteristics, operative outcomes and complications were evaluated prospectively. Stone free rate (SFR) was determined 4 weeks postoperatively using findings on non-contrast computed tomography (NCCT).

**Results:** Mean stones burden was 25.7 mm (range from 1.3 to 30 mm), 8 patients had 11–20 mm stones burden with SFR 100% and 34 had 21–30 mm stone burden with SFR 91.2%. The overall SFR was 92.8%. Multiple stones were two in 31 patients (73.8%), three in 9 (21.4%) and four in 2 (4.8%). Regarding stone number per kidney and SFR, SFR was 100%, 77.7% and 50% for kidneys with two, three and four stones respectively. In terms of stone location in the pelvi-calyceal system and corresponding SFR, there were renal pelvic stones in 6 (14.3%) patients with 100% SFR, upper calyx and or mid calyx and or renal pelvis in 12 (28.6%) with SFR 91.6% and lower calyx with or without other locations in 24 with SFR 91.6% also. Complications were minor and included, UTI in 3 patients (7.1%), hematuria of 4 days duration in 2 (4.8%), severe DJ stent irritative symptoms in one (2.4%) and minor ureteral perforations in one (2.4%).

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**Conclusion:** RIRS via F-URS and laser lithotripsy is a safe and effective treatment option with high success rate for patients with multiple renal stones of 11–30 mm stone burden. It is indicated when other stone treatment modalities contraindicated or have failed. However, for complex or challenging stones, staged procedures may be required.

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## Introduction

Technical developments and patients requests for rapid stone removal have led to changes in clinical stone management. According to European Association of Urology (EAU) guidelines, extracorporeal shock wave lithotripsy (ESWL) is recommended as a first line treatment for renal stones <20 mm and percutaneous nephrolithotomy (PCNL) for renal stones >20 mm. However, there has not been any consensus about management of multiple intrarenal stones in both EAU and American Urological Association (AUA) guidelines [1]. When ESWL is used for managing multiple intrarenal stones success rate drops to 50%, especially for lower calyx stones [2]. Moreover, because of unfavorable calyceal anatomy, hard stones and obesity, renal stones often require repeated treatment or auxiliary procedures [3]. Although the stone free rate (SFR) following PCNL is between 78% and 96%, the invasive nature of the procedure and significant possible associated complications are still a matter of concern. Additionally, in patients with significant co-morbidities such as morbid obesity and bleeding diathesis, PCNL may be not the best choice [4]. Because of the limitations of ESWL and PCNL, and with recent advances in flexible ureterorenoscopy (F-URS), and laser technology, urologists have been exploring non-invasive procedure such as RIRS in the management of renal stones in the pelvicalyceal system with a wide range of SFR of 50% to 94.2% has been reported [5]. The indication of RIRS using flexible URS with laser lithotripsy were broadened to include ESWL failure, morbid obesity, musculoskeletal deformities, bleeding diathesis, and occupations that require complete stone clearance (e.g. pilots) [6,7]. In this study, our purpose is to evaluate flexible URS and holmium laser lithotripsy for treating multiple unilateral renal stones greater than 1 cm.

## Patients and methods

Between June 2015 and February 2017, 42 patients treated using F-URS and holmium–YAG laser stone fragmentation were prospectively evaluated. Patients with unilateral, multiple renal stones, distributed anywhere in pelvicalyceal system of 11–30 mm stone burden were selected. Stones burden was determined by the sum of the largest diameter of each stone as detected by non-contrast computed tomography (NCCT) of kidney ureter and bladder. According to the stones burden, stones were divided into: 11–20 mm and 21–30 mm stones. Retrograde intrarenal surgery (RIRS) was indicated according to patient's preference, certain patient's characteristics like morbid obesity, coagulopathy, congenital renal anomalies and ESWL or PCNL treatment failure. Patients with associated ipsilateral ureteric stone or stricture, calyceal diverticular stones, stag horn stones, pelvi-ureteric junction obstruction or medullary sponge kidney were excluded. Operations were performed after informed consents were taken from all patients and

ethical board approval was obtained. Patient's demographics, stones characteristics, operative procedures and postoperative data were recorded.

Ureteroscopy using semi rigid ureterorenoscope (9.5 Fr Karl Storz Ureterorenoscope, Germany) was performed to exclude presence of any pathology and to dilate the ureter avoiding ureteral trauma related to blind insertion of ureteral access sheath (UAS). The UAS (12/14 Fr Cook Medical, Bloomington, IN, USA) has been advanced over the guide wire up to pelvi-ureteric junction (PUJ) under fluoroscopic x-ray control. If the access sheath (UAS) cannot be inserted, F-URS (Karl Storz-X™ Tuttlingen, Germany) was advanced directly over guidewire into renal pelvis. However when intrarenal access cannot be achieved because of ureteral tightness, double J (DJ) stent was passed and RIRS procedure was postponed for two weeks. Stone fragmentation was performed with holmium–YAG laser using either laser machines of different power (Versa Pluse Power Suit 100W, Lumenis, USA) in combination with 200 μm fiber or (Calculase- || 20W, Holmium Laser, Karl Storz, Germany) with 270 μm laser fiber. Energy level was set at 0.6–1.4 J and a rate of 5–10 Hz frequency levels was adjusted. A zero tip nitinol basket (Nagage nitinol stone basket extractor 2.2 Fr 115 cm basket, Cook Medical, Bloomington, IN, USA) was used for relocation of lower pole stones to upper calyx or renal pelvis. When the lower pole stone was too big to be engaged in the basket, it was divided by laser into two or three parts then re-located. Painting maneuver (painting like movement of laser fiber tip, 2–3 mm from the stone after adjusting the laser machine sitting at a relatively lower power and higher frequency) was used to induce stone dusting which produced tinny pieces easily washed and could be passed out spontaneously when a pressurizing irrigation system was used. However, stones fragment larger than 3 mm were extracted using tipples nitinol stone basket catheter. At the end of the procedures, Patients with incomplete stone fragmentation or residual stone fragments had DJ stent fixation and a second stage RIRS procedure two weeks later. Stone free rates were evaluated four weeks postoperatively using un-enhanced CT KUB. Success was defined as complete stone clearance or residual stone fragment less than 3 mm. All patients had postoperative follow-up assessment at the 3rd and 6th month with NCCT KUB. Data were analyzed by using standard statistical software, SPSS ver., 18.0 (SPSS Inc., Chicago, IL, USA). The results for continuous variables were expressed as mean ± standard deviation. The chi-square test was applied to compare categorical variable and *t*-test and ANOVA test were used to compare non-categorical variables. *P* value <0.05 was considered statistically significant.

## Results

RIRS was performed in 42 patients (32 males and 10 females), mean patient age was 42.69 ± 10.54 (range from 22 to 65) years. Mean

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