

Semirigid Laser Ureterolithotripsy for Single Large Renal Pelvic Stones

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Abstract

Background and purpose: Large stones located at the renal pelvis are usually managed with Percutaneous Nephrolithotomy (PCNL); however this procedure carries both a substantial morbidity and a considerable risk for complications. Our objective was to assess the safety and efficacy of semirigid ureteroscopy (S-URS) and laser lithotripsy for the treatment of single large (>1.5 cm) pelvic stones.

Patients and methods: Twenty patients (12 women and 8 men, aged 54-72 years) with isolated renal pelvic stone (mean size: 2.1 cm, range: 1.5-3 cm) underwent S-URS under general anaesthesia, over a 2-year period (January 2010 to January 2012). Holmium:yttrium-aluminum-garnet (Ho:YAG) laser was used for the stone fragmentation. In all cases the ureters were stented following completion of the operation. Preoperative data as well as stone-free rate, operative time and associated complications were retrospectively evaluated.

Results: In 17 patients (18%; 12 women and 5 men) the stones were accessible with S-URS. The mean operative time was 69.4 min (37.2-94.5). There were no major complications, however 2 female patients developed fever due to Urinary Tract Infection (UTI) in the early postoperative period. The stone-free rate (assessed with X-ray) following S-URS was 70.6% on the 1st postoperative day and increased to 82.3% after 1 month. The mean hospitalization period was 1.4 (1.1-4.3) days. Adjuvant Extracorporeal Shockwave Lithotripsy (ESWL) was performed in 3 patients with residual stones (mean number of ESWL sessions: 1.5). Multivariate analysis revealed that only sex (female vs. male) significantly influenced the results, in favor of the females.

Conclusions: S-URS is an effective and safe alternative treatment for single large (>1.5 cm) renal pelvic stones, especially in female patients.

Keywords: Ureteroscopy; Semirigid; Ureterolithotripsy; Laser; Renal stones

Introduction

Until recently, percutaneous nephrolithotomy (PCNL) was recommended as the treatment of choice for renal calculi >2 cm in diameter; however this year the European Association of Urology (EAU) guidelines suggest that in such stones ureteroscopy (URS) is another option [1]. This is because PCNL bears several drawbacks such as substantial morbidity, analgesic requirements and high anaesthesiological risk in patients with compromised cardiopulmonary status [2]. Intracorporeal lithotripsy during URS is recommended in patients with ureteric lithiasis refractory to ESWL, nevertheless the development of flexible ureteroscopes has expanded its indications by permitting prompt access into all the renal calices.

We have noticed that in some patients, stones located in the renal pelvis may be reached and fragmented using the semirigid ureteroscope thereby obviating the need for PCNL and/or flexible URS. In the present study we sought to find out whether semirigid ureteroscopy (S-URS) may effectively and safely be carried out in patients with an isolated renal stone >1.5 cm in diameter.

Patients and Methods

A retrospective review of 20 patients (12 women and 8 men, aged 54-72 years, mean age 61.7 years) with an isolated single pelvic stone (mean size: 2.1 cm, range: 1.5-3 cm) consented to undergo S-URS, from January 2010 to January 2012, was conducted. The stone size was evaluated with ultrasonography and plain abdominal (KUB) films whereas Intravenous Urography (IVU) was used in inconclusive cases. Urinalysis, urine cultures and sensitivity tests were also routinely performed to allow for preoperative administration of a proper antibiotic when required. The operations were carried out under general anaesthesia and were fluoroscopy-guided in all patients.

Initially, a retrograde urography was performed and a hydrophilic

guidewire was placed into the renal pelvis. An 8.5/11.5F, 42.5 cm long, semirigid ureteroscope with a 6F working channel (Karl Storz Endoskope, Tuttlingen, Germany) was then inserted without routine ureteric orifice dilatation. The ureteroscope was advanced up to the renal pelvis and the stone was fragmented using the Ho: YAG lasers (10 w/10 Hz/1 J) until the remaining fragments were deemed small enough to pass spontaneously. In case the pelvic stone proved to be inaccessible, flexible ureteroscopy followed after placing a ureteric access sheath into the ureter. Following lithotripsy, a 6F/26 cm JJ stent was routinely inserted to be removed 10 days after the procedure. On the 1st postoperative day, both a plain X-ray KUB and a renal ultrasonography were performed to assess stone clearance and rule out obstruction. These imaging tests were repeated after one month. Various parameters (patient age, sex, body mass index (BMI), grade of hydronephrosis, stone size, operative time, stone clearance rate, length of hospital stay, complications) were retrospectively analysed by using the Statistical Package for the Social Science (SPSS 19.0). Statistical significance was considered as a p values<0.05.

Results

In 17 patients (85%), the renal pelvic stone was accessible with the semirigid ureteroscope and fragmented with the Ho: YAG laser. In the

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remaining 3 patients (15%), flexible URS was required for the stones to be cleared. Semirigid ureteroscopy was successful in all 12 females (100%) and in 5 out of 8 male patients (71.4%). The mean operative time was 69.4 min (range 37.2-94.5).

There were no peri- or post-operative complications, except for 2 cases (10%) of fever due to urinary tract infection (UTI) in female patients; these were treated successfully with the appropriate antibiotics. The stone-free rate following S-URS was 70.6% at the 1st postoperative day and 82.3% after 1 month. In the 3 patients treated with flexible URS the stone-free rate was 100% on the 1st postoperative day. The mean hospitalization period was 1.4 days (range 1.1-4.3).

Adjuvant extracorporeal lithotripsy (ESWL) was required in 3 cases with residual stones (mean number of ESWL sessions: 1.5) and was successful in all these cases. Statistical analysis did not reveal any correlation between the examined variables and the success of S-URS, apart from patient sex (male vs. female), in favor of the females ($p < 0.05$).

Discussion

Retrograde intrarenal surgery (RIRS) has nowadays become a widely used treatment modality for stones located in the upper urinary tract, although PCNL and ESWL were previously recommended as the first-line treatment for renal calculi > 2 cm and < 2 cm, respectively [1,3]. In particular, PCNL has been reported to have a substantial complication rate (0.03-10%) counteracting its high efficacy [4,5]. RIRS has an overall stone fragmentation rate of 75-95% and less frequent complications compared to PCNL [6]. Flexible ureteroscopes have the advantage of allowing easy access into both the renal pelvis and the calices although with the limitations of less durability and higher cost compared to the semirigid instruments [7-9]. Nevertheless, S-URS may be sufficient for renal pelvic stones, in particular those located at a position not necessitating instrument flexibility to be disintegrated.

There is a scant number of series reporting directly and/or indirectly on the efficacy and safety of S-URS for renal pelvic stones. In a recent randomised study in patients with renal stones > 2 cm, S-URS, although less efficacious, was found to be advantageous over PCNL in terms of operating time, drop of haemoglobin and haematocrit, postoperative visual analogue score, need for analgesia and duration of hospital stay [10]. In order to minimise total flexible URS time, Ebert and Schafhauser used the semirigid ureteroscope for laser lithotripsy in 12 patients with resistant renal calculi, after repositioning of the stones in the renal pelvis with the flexible instrument [11].

We achieved an overall 85% success rate in reaching the pelvic stones with the semirigid ureteroscope. In the remaining 3 cases (15%) access of the semirigid instrument into the renal pelvis was prevented by kink of the pelvi-ureteric (PUJ) junction and flexible ureterolithotripsy had to be carried out. Success rate was higher in the females compared to that in the males (100 vs. 71.4%) and this difference reached statistical significance ($p < 0.05$). It has been reported that the ureter in the female is less fixed and has a lower degree of curvature at the level of the iliac vessel bifurcation [12]. In addition, the male urethra requires a greater degree of torque during instrument insertion [13]. All these features make the advance of a semirigid ureteroscope in a female ureter easier which theoretically results in a prompt pass into the renal pelvis, as in our study. Stone fragments following the procedures were left to pass spontaneously and this was finally achieved in all but 3 cases where complementary ESWL was successfully performed. Therefore, apart from the high success rate in reaching pelvic stones, S-URS proved to be efficacious and in eliminating urolithiasis.

In a similar study by Atis et al. [13], 47 patients with an isolated

renal pelvic stone underwent S-URS and holmium laser lithotripsy, over a period of two years. The renal pelvic stones were assessed only in 25 out of the 47 patients. The complication rate was 4% and the mean hospitalization period was 1.5 days. The mean operative time was 72 min, while the stone-free rate was 72% the 1st postoperative day and 76% after 1 month. The authors concluded that S-URS is a feasible alternative treatment modality for isolated renal pelvic stones.

We inserted a JJ stent routinely in all patients after completion of the laser lithotripsy. Although there is much debate on whether stent insertion should be performed in every case of straightforward intracorporeal lithotripsy, this is a common practice in our department. In this series, in particular, stenting was deemed essential also to facilitate alleviation of the high intrapelvic pressure, which inevitably occurs during ureteroscopy causing intrarenal backflow and potentially infectious complications [14]. Generally, routine insertion of a JJ stent to avoid postoperative complications is advocated in the presence of various parameters, such as prolonged operating time, large stones, impacted stones causing oedema of the ureteric wall, narrowed ureteric segments, ignored small caliceal calculi and recent urinary tract infection [15]. Although we administered antibiotics at the induction of anaesthesia, we observed 2 cases of infectious fever in female patients, which responded promptly to antibiotics.

Lastly, our study has several limitations as is a retrospective analysis of a small number of patients from a single institution. Another limitation of our study is that we did not conduct a comparison with the other treatment modalities including cost-effectiveness. Also, we performed a plain X-ray KUB and a renal ultrasonography to exclude residual stone fragments during the follow-up, instead of the more precise computerized tomography.

Epilogue

In the present study, we demonstrated that S-URS was safe and effective for the treatment of a single large (> 1.5 cm) renal pelvic stone. Although PCNL remains the gold standard for these calculi, S-URS often suffice for reaching the renal pelvis and may therefore be used as an alternative procedure, in particular in the female.

Conflict of Interest

None declared.

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