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Our Experience of Semi-rigid Ureteroscopy with Pneumatic LithoClast for Impacted Upper Ureteric Calculi

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Abstract

Objective: The aim of this study was to evaluate the outcome of using the semi-rigid ureteroscope and intracorporeal pneumatic lithotripsy on the impacted upper ureteric stones.

Methods: This is a retrospective study on patients who underwent ureteroscopy with pneumatic lithoclast fragmentation at Hamdard University Hospital from May 2018 to December 2021. Patients with impacted upper ureteric calculi > 1 cm and having a prior extracorporeal shock wave lithotripsy or medical expulsive therapy of more than 4 weeks were included. Those with persistent pain were also included. Patients <13 years of age, having a distal obstruction, who are pregnant, having spinal deformity, having morbid obesity, or on aspirin were excluded.

Results: Out of 72 patients, 53 (73.6%) were males, and the mean age was 39.57 ± 8.81 years. There was a single stone in 66 (91.6%) and multiple in 6 cases. The mean stone diameter was 1.12 ± 0.4 cm. The mean duration of surgery was 32.13 ± 9.71 minutes. The stone-free rate was 79.2% (n = 57), while it migrated in 15 (20.8%) patients which required additional extracorporeal shock wave lithotripsy sessions. A double-J stent insertion was done intraoperatively in 21 (29.1%) patients. No major operative or postoperative complications were observed.

Conclusion: Semi-rigid ureteroscope with pneumatic lithotripsy in an experienced hand is still a safe and useful treatment modality for impacted upper ureteric stones with good clearance rates and minimal complications.

Keywords: Ureteric calculi, ureteroscope, renal stones, lithotripsy

Introduction

Stone disease currently possesses an important place in the field of urological surgery. There is a 5%-12% lifetime risk of urolithiasis (formation of stones/calculi in the kidneys, ureter, and/or urethra) in Europe and the USA, affecting about 13% of males and 7% of females.[1,2] Pakistan falls into the Afro-Asian stone-forming belt extending from the Arab Republic of Egypt, Iran, India, and Thailand to Indonesia and constitutes about 40%-50% of the urological workload, with an estimated prevalence of 12%.[3]

Globally, multiple treatment options are being used for the management of upper ureteric calculi. The introduction of extracorporeal shock wave lithotripsy (ESWL) in 1980 has revolutionized the treatment of kidney stones as well as those of the ureters. However, the success rate of ESWL for impacted ureteric calculi is reportedly low.[4] Moreover, an impacted ureteric calculus is difficult to fragment with ESWL because of the lack of space for natural expansion for the stone in the ureter and is better managed via ureterorenoscopy (URS).[5] The advancement of URS and related working instruments to manipulate or fragment ureteric calculi has significantly increased its application in urology. For impacted proximal ureteric stones, URS has become the most common treatment method due to the development of semi-rigid, small-caliber, flexible endoscopes. In the context of ureteric calculi, the combination of ureteroscopy and intracorporeal pneumatic lithotripsy/laser has proven to be a useful alternative to SWL.[6,7]

In this study, we evaluate our results on the management of the impacted upper ureteric stones using the semi-rigid ureteroscope and intracorporeal pneumatic lithotripsy.

Methods

We retrospectively reviewed our data of patients who underwent ureteroscopy with pneumatic lithoclast fragmentation at Hamdard University Hospital, Karachi, from May 2018 to December 2021. Ethical approval was obtained from the institutional review board of the involved institution (Date: June 25, 2022, Number: VP(C)/HCM&D/2022/050). Patients with impacted upper ureteric calculi >1 cm in maximum diameter were included. These were the patients who had a prior ESWL (outside our setup) or medical expulsive therapy of more than 4 weeks or those with persistent pain. Impacted ureteric calculus is defined as a stone fixed on the same site for more than 2 months with no contrast enhancement distally in the ureter. We term impacted stone on the basis of both preoperative computed tomography scan findings of the ureteric wall thickness/peri-ureteric stranding and intraoperative inability to pass guidewire or ureteric catheter beyond the stone.[8]

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Patients with distal obstruction (secondary to distal ureteric stricture or concomitant distal ureteric stones), who are pregnant, with spinal deformity, with morbid obesity, or on aspirin were excluded. Those less than 13 years of age were also not registered.

The data were analyzed for indications, stone clearance, and complications. Patients were taken as an inpatient. All procedures were performed under general anesthesia with perioperative antibiotics. All patients were positioned in the reverse Trendelenburg position. Intravenous furosemide 40 mg intraoperatively was given to prevent stone migration/retropulsion during stone fragmentation.

We used a 6.5 Fr semi-rigid ureteroscope and a Swiss lithoclast with a 0.9 Fr probe for stone fragmentation. A double-J stent/ureteric catheter was placed in situ if needed.

On the first postoperative day, a radiological assessment (x-ray/ultrasonogram) was done to assess stone clearance. Here, a stone of <0.4 cm was considered an insignificant residual stone.

Results

Out of 72 patients, 53 (73.6%) were males, while 19 (26.4%) were females. The mean age of patients was 39.57 ± 8.81 years (range 15-55).

There was a single stone in 66 (91.6%) and multiple stones in 6 cases (2 stones in 5 patients and 3 stones in 1). The mean stone size (maximum longitudinal length) was 1.12 ± 0.4 cm.

The mean duration of surgery was 32.13 ± 9.71 minutes. The stone-free rate was 79.2% (n = 57). Stone migration was seen in 15 (20.8) patients which required additional ESWL sessions. A double-J stent insertion was done in 21 (29.1%) patients, of which 15 (20.8%) were inserted due to stone fragment migration and 6 (8.3%) were inserted due to upper ureteric mucosal erosion/extravasation of contrast. No major operative or postoperative complications were observed.

There were 12 (16.6%) patients who developed low-grade fever (100-100.5˚F) postoperatively managed with antipyretics and antibiotics, 3 (4.1%) patients who developed high-grade fever managed with broad-spectrum antibiotics, and 14 (19.4%) patients who had mild hematuria that was settled conservatively in 24 hours.

Discussion

Ureteric stone disease is an important and most frequently encountered problem in urological practice. Options for upper ureteric stone management are ESWL, ureteroscopy, percutaneous nephrolithotomy, laparoscopic ureterolithotomy, and open ureterolithotomy.

Small, unimpacted stones are best treated with ESWL due to the minimally invasive technique and lesser morbidity. Calculi larger than 1 cm and impacted ureteral stones are resistant to ESWL because of the lack of space for natural expansion during fragmentation for the stone in the ureter.[9] International citations also reported stone-free rates of ESWL as 72.4% for stone size <1 cm and 42.1% for stone size >1 cm after a single session for proximal ureteral stone indicating the importance of stone size. Ureterorenoscopy, however, can easily fragment stones larger than 1 cm and impacted upper ureteric stones.[10]

A meta-analysis evaluating 13 randomized controlled trials concluded that for impacted upper ureteric stones, ureteroscopy is far superior to ESWL.[11] We have successfully seen clearance of stones in 57 out of 72 patients (79.2%). There was no major complication reported in our study. International citations also reported clearance rates of 91% and 80.3% with complication rates of 0% and 4.9%.[12,13]

Hence, ureteroscopy with pneumatic lithotripsy provides an effective and safe modality for ureteric stones with excellent clearance.

Conclusion

Semi-rigid ureteroscope with pneumatic lithotripsy in an experienced hand is still a safe and useful treatment modality for impacted upper ureteric stones with good clearance rates and minimal complications.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Hamdard University (Date: June 25, 2022, Number: VP(C)/HCM&D/2022/050).

Informed Consent: Informed consents were not required for retrospective review of the medical and radiological data of the patients.

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