

Semi-rigid Ureteroscopy for the Management of Ureteric Calculi: Our Experience and Complication Encountered

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ABSTRACT

Background: Semi-rigid ureteroscopy lithotripsy have become standard of treatment for ureteral calculi. The aim of this study isto review outcome of Semi-rigidureteroscopy lithotripsy and to report the complications encountered.

Methods: After approval from institutional committee of Public Health Concern Trust Nepal,we retrospectively reviewed the chart of all patients of ureteral stone who underwent ureteroscopy and pneumatic lithotripsy at Kathmandu Model Hospital between January 2013 and September 2017. Patient characteristics, stone size, success rate and complications were assessed. Intraoperative complications were graded using modified Satava classification system and the postoperative complications graded according to modified Clavien classification system. The success rate was based on stone free status after primary semi-rigid ureteroscopy lithotripsy, without the need of any other secondary procedures.

Results: Total 232 patients underwent semi-rigidureteroscopy lithotripsy. Mean age was 46 (16-76) years, with 128 males and 104 females. Size of the stone ranges from 5-18mm. The success rate of primary semi-rigidureteroscopy lithotripsy was in218 (93.9%) cases.Most intraoperative complications were modified Satava grade I (41.7%) andII(3.87%).Four(1.7%) patient had grade III complication, requiring conversion to open surgery. Ureteral avulsion was seen in 1(0.43%) patient, requiring ureteral reimplantation.The postoperative complication were modified Clavien grade I(10.7%), grade II(5.17%), grade III (4.6%) and grade IV(0.43%). Double J stents were inserted in all the patients postoperatively.The mean hospital stay was 2.2(1-14)days.

Conclusions: Semi-rigid ureteroscopy lithotripsy for the management of ureteral stones is efficacious and have a lesser major complications.

Keywords: Ureteric calculus; ureteroscopic lithotripsy; Semi-rigid ureteroscopy lithotripsy.

INTRODUCTION

Semi-rigid Ureteroscopy (URS) for ureteral stone treatment is the most frequently performed endourological procedure worldwide. Review of published series on the treatment of ureteric calculi with ureteroscopy, using a variety of ureteroscopes and intracorporeal lithotripsy devices, revealed success rates of 86-100%.¹ Despite its widely applicable diagnostic and therapeutic benefits, URS may be associated with noticeable complications.² The overall complication rate was reported as 9-25%.³ Most complications are minor and do not require intervention. The major risk of complications during semi-rigidureteroscopy lithotripsy (URSL) remains the ureteric perforation (2-4%) and ureteric avulsion (0.5-2%).⁴

Several classification of complication scoring can be found in the literature, such as Modified Clavien-Dindo,⁵ the modified Satava⁶ and Post-Ureteroscopic lesion scale⁷ (PULS) classification system. Modified Satava and PULS scoring system are URS specific.

The present study will provide an added value in understanding the perioperative course of ureteral stone management using semi-rigid ureteroscope.

METHODS

The study was approved by the institutional research committee of Public Health Concern Trust Nepal. The chart of all patients treated for ureteral calculi between January 2013 and September 2017 were retrospectively reviewed. The patients older than 16 years, diagnosed

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to have ureteral calculi, treated with different semi-rigid ureteroscope (8\9.8 F Wolf, 8\9.8 F Stema, 8/9.8F Rema) by different surgeons with variable experience, at Kathmandu Model Hospital were included. Patient with urinary tract infection, urinary tract abnormalities, coagulopathy, pregnancy, simultaneous URS with PCNL, diagnostic URS, ureteroscopy for non-calculus lesion and ESWL preceding URS were excluded from our study. Preoperative evaluation were done with urinalysis, urine culture, renal function test, ultrasonography, IVU or CT.

Standard technique for ureteroscopy was used. Cystoscopy performed and a flexible tipped hydrophilic guide wire passed into the ureteric orifice under direct vision. The ureteroscope was then passed over or alongside the guidewire under vision. We don't do regular dilation of intramural ureter. If difficult negotiating into intramural ureter, a double pigtail stent was placed and ureteroscopy performed two weeks later. After the visualization of the stone, it was either removed using alligator forceps or disintegrated intracorporeally using pneumatic lithotripsy. Double J stent was placed in all the patients. Immediate postoperative evaluation done using x-ray KUB to establish stone free status.

Patient characteristics, stone size, success rate and perioperative complications were recorded. Intraoperative complications were graded according to the modified Satava classification system and the postoperative complications were graded according to modified Clavien classification system. Success rate was based on stone free status after primary URSL, which was evaluated during surgery and with immediate postoperative x-ray KUB examination. Stone clearance rate defined as complete removal of stone after primary URSL.

RESULTS

Between January 2013 and September 2017, 232 patients underwent URSL for ureteric stone. Patients characteristics shown in Table 1. Mean age was 46 years ranging from 16-76 years, with Male: Female 1.23:1. Size of the stone ranges from 5-18mm. Six(2.5%) patient had multiple stone at different segment of the ureter and three(1.3%) patient were treated for bilateral stones. Complete stones clearance after primary URSL was achieved in 212 patient i.e. 91.3% of the cases. The success rate of URSL was 93.9%.

Most intraoperative complications were modified Satava grade I (41.7%) Table 2. Nine (3.87%) patient had grade II complication which were managed endoscopically. The procedures were converted to open surgery in

4(1.7%) patient due to inability to access ureter or reach stone (grade III complication). And the ureteral avulsion was seen in 1(0.43%) patient, requiring ureteral reimplantation. The postoperative complication were mostly modified Clavien grade I(10.7%) and II(5.17%). Hematuria was the most common complication seen in 15(6.4%) patients. Three patients with severe bleeding required revisit to theatre for clot evacuation. One of them needing repair of bladder rupture that occurred during evacuation. Grade III complications was seen in 11(4.6%) patients. Postoperative colic was present in 5(2.1%) cases and the stone migration was seen in 6(4.31%) patients. Sepsis (grade IV) seen in 1(0.43%) which was managed conservatively. The mean hospital stay was 2.2(1-14) days.

Table 1. Patients characteristics.

No. Patients	232
Age (years)	46(16-76)
Sex	
Male	128
Female	104
Stone size (mm)	(5-18)
Stone side	
Right	117
Left	115
B/L	3
Stone clearance rate	91.3%
Success rate	93.9%

Table 2. Intra and postoperative complications.

Intraoperative complications	
Satava I (Observation)	
Mucosal tears	48(20.6%)
Mild bleeding	49(21.1%)
Satava II (Requiring endoscopic treatment)	
Proximal stone migration treated with PCNL in the same sessions	4(1.7%)
Mucosal injury requiring secondary URS	1(0.43%)
Inability to reach the stone requiring secondary URS	4(1.7%)
Satava III (Requiring open surgery)	
Inability to access ureter or reach stone requiring conversion to open surgery	4(1.7%)
Ureteral avulsion	1(0.43%)
Postoperative complications	
Clavien I	
Fever	10(4.31%)

Hematuria	15(6.4%)
Clavien II	
UTI	12(5.17%)
Clavien III	
Renal colic	5(2.1%)
Stone migration	6(2.5%)
Ureteral perforation	0
Clavien IV	
Sepsis	1(0.43%)

DISCUSSION

Ureteroscopy have developed rapidly and have quickly achieved widespread acceptance over the past quarter century as part of a trend in minimally invasive surgery. Semi-rigid ureteroscopy was greatly simplified with advent of efficient technologies for stone fragmentation and equipment miniaturization. High success rate with low morbidity have been reported in most of the series. Published URS series have demonstrated stone free rates of 85-99% depending on stone location.⁷⁻¹⁰ We have a success rate of 93.9% which is similar to previous studies. Despite its effectiveness and significant technologic advances, however, surgical misadventures still occur.

Several classification system for grading the complications of URS can be found in the literature, such as Modified Clavien-Dindo⁵ classification system, the modified Satava⁶ classification system. Modified Satava classification is URS specific, quick and simple for describing intraoperative complications. Postoperative complications graded using Clavien-Dindo system.

In this study, 111 patients had intraoperative complications, of which majority were Satava I. Fourteen patients were classified as grade II (3.87%) and III (2.24%) requiring endoscopic retreatment and open surgery respectively. Mucosal tears and mild bleeding was the common complication of URS observed in our study. This type of injury usually occurs during insertion of ureteroscope, guide wire and while introducing the working instruments.¹¹ Brandt et al found minor bleeding that impaired visibility was the most common reason for secondary URS in their series of 346 procedures.¹² Bleeding associated with ureteroscopy in our study was usually minor and self-limiting and did not affect our success rate. Intraoperative proximal stone migration was seen in 1.7%, which were all managed by percutaneous nephrolithotomy at the same sessions. All the migrated stones were located in upper ureter. High incidence of secondary procedures for the management of upward stone migration after ureteroscopic procedures for

proximal ureteral stones have been reported.⁹

Ureteral perforation was less in our study (0.43%) as compared to others (0.65%-3.3%).^{2,11,13} Perforation was seen due to direct impact of pneumatic lithotripter on the mucosa. Stoller and Wolf mentioned 6.1% of ureteral perforation in their review.¹⁴ In recent study ureteral perforations have been reported less than 2% by using small calibre ureteroscopes.^{2,11} We do not perform retrograde ureteropyelogram intraoperatively which can be the possibility of low perforation rate observed in our study.

We found failure of ureteroscopy to reach the stone in 8 cases (3.4%) because either due to distal stenotic area of the ureter lumen and due severe impaction of the stone. Four needed DJ stenting followed 2 weeks later with secondary URS and remaining four stone cleared after open ureterolithotomy in the same sessions. This is higher compared to other study,^{11,13} may be due to inclusion of calculi at all the segments of ureter and due to use of large size of the scopes in our study. It can be reduced by proper case selection i.e. distal ureteric stones and by miniaturization of the instruments. Semi-rigid ureteroscopy with lithotripsy, success is higher in distal ureteric stone with minimal complications.^{8,13} But stone location is not the predictive for the success of URS when the flexible ureteroscope and holmium laser were used.⁴

The most devastating of these complications is ureteral avulsion and was seen in one patient (0.43%). The published literature also showed the rate of ureteral avulsion during URS is low which ranges from 0% to 0.5%.^{11,13,15} The best known mechanism for this complication is attempting to remove a stone that is too large to pass through the ureteral lumen. Here the avulsion occurred at ureterovesical junction and was due to continuous application of force to introduce the ureteroscope through a narrow distal ureter. This complication occurred during the early period of our study and since then we practice keeping d-j stent for some duration, in all the case with difficult negotiating through the ureteric orifice, followed by secondary URS.

Although most complications occur intraoperatively, a few complications arise in postoperative period as well. Early postoperative complications were seen in 49 patients and most of them were Clavien grade I and II. Hematuria was the commonest one (6.4%) mostly managed conservatively. Three patient needed revisit to the theatre for cystoscopy and clot evacuation, one of them had to go to the theatre again for the repair of the bladder tear that occurred during clot evacuation.

In spite of using prophylactic antibiotics we had 5% of postoperative urinary tract infection which is comparable.¹³ All these cases had urinary infection preoperatively, which were managed according to sensitivity profile. The risk of postoperative infectious complication is increased by the existence of urinary infection preoperatively.¹¹ Urinary infection may occur despite a sterile preprocedure urine culture. Because of the potential for infection or the presence of infected calculi, routine antibiotic prophylaxis is indicated when ureteroscopy is performed for the treatment of urinary tract calculi. Infectious complications can also be reduced by minimizing the use of pressure irrigation and continuous or intermittent drainage of the collecting system.¹⁶

Postoperative pain and renal colic have been reported in 4% to 18% patients undergoing ureteroscopic procedures.^{13,17} Renal colic were seen in 2.1% of our cases which was quite low in comparisons to other study. Mucosal trauma after instrumentation can lead to obstruction caused by local oedema, blood clots or ureteral spasm. Routine placement of ureteral stent may be the cause for low postoperative colic in our study. Generally the obstruction is self-limiting and can be managed with anti-inflammatory and alpha-blockers.

Insignificant stone fragment retropulsion were seen in 2.5% of cases. Most retropulsion was associated in the proximal ureteric stones treatment and prolong double J stent placement were advised for all the cases. No patient needed auxiliary procedure for stone clearance.

The incidence of sepsis associated with ureteroscopy is low, as seen in 0.43% of patients. Schuster et al¹⁰ reported 0.3% of sepsis in 322 ureteroscopic procedures.

Apart from the extensive discussion on the success and complications of URSL, this study is not without limitation. Retrospective study can have some degree of bias. The intraoperative data were all collected from the operative notes which again depends on the knowledge and perception of the person writing the notes, who usually use to be the junior most. The procedure was performed by different surgeons with variable experience, which is most important factor that can change the outcome of the study. We also did not include the long term complications of ureteroscopy.

Prospective study performed by experienced surgeons with the inclusion of long term complications should be aimed to have complete picture and possibility of

further reduction of the perioperative complications.

CONCLUSIONS

Ureteroscopy is safe and effective for the management of ureteral stones. The size and location of ureteral stones, instrument miniaturization and experience and ability of the operating surgeon all had a role in the success of semi-rigid ureteroscopy with low complications.

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