

A RETROSPECTIVE STUDY OF RETROGRADE URETEROSCOPY PERFORMED FOR THE MANAGEMENT OF URETERIC CALCULUS: SIX YEAR EXPERIENCE

H. L. Gupta¹, Manish Gupta², Sameer Deen³

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ABSTRACT: OBJECTIVES: To review and provide a detailed analysis of retrograde ureteroscopy for management of ureteric calculus. **PLACE AND DURATION:** The retrospective study was conducted by the Dept. of Urology, Mahatma Gandhi Medical College and Hospital, Jaipur. We reviewed the medical records of 500 patients who underwent ureteroscopy for ureteric calculus disease from March 2009 to March 2015. **METHODS:** Patients with stones of various sizes and characteristics in the ureter irrespective of its location were included in the study. The duration of the procedure, Peri-operative analysis and intra and post-operative complications were reviewed. Mean age of inclusion were 18 to 60 years. Stones larger than 3cms were managed by open ureterolithotomy. **RESULTS:** There were 500 patients with ureteric calculus disease with obstruction. Among them 437(77.2%) were males and 114(22.8%) females. Left and right ureteric stones were present in 214(42.8%), 198(39.6%) respectively and 88(17.6%) had bilateral ureteric stones. Mean age of the patients was 46 years. The size of the stone in the treated patients was in the range 7-30mm. Ureteric stones were present in the lower ureter in 225(45.0%) patients, in mid ureter 190(38.0%) and 85(17%) patients presented with upper ureteric calculus. Size of the stone was 0.7 cm to 1cm in 316(63.20%) patients, 1cm to 2cm in 104(20.8%) patients and 2cm to 3cm in 80(16.0%) patients. Stones were approached with ureteroscope and fragmentation was done with pneumatic lithotripsy. **CONCLUSION:** Retrograde ureteroscopy and proceed for removal of ureteric calculus has become an effective way to manage stones of different sizes and levels and with a well-developed skillset, it has excellent success and low complication rates, reduced post-operative stay.

KEYWORDS: Retrograde Ureteroscopy, Ureteral calculi, Double J Stent, Complications.

INTRODUCTION: Ureteroscopy is defined as upper urinary tract endoscopy performed most commonly with an endoscope passed through the urethra, bladder, and then directly into the upper urinary tract. After the introduction of ureteroscopy, there has been a paradigm shift in management of ureteric calculus disease.

Given the familiarity of endoscopic procedures, urologists have adopted rigid, semi-rigid and flexible ureteroscopy considered an extension of cystoscopy. Young was the first to report on ureteroscopy in 1912, which was performed with a pediatric cystoscope.¹ Initial experience with rigid ureteroscopes involved a 13 French (Fr; 1 Fr: 3mm), which utilized a rod-lens system and was pioneered by Richard Wolf Medical Instruments.² A major limitation of this scope was the inability to bend the scope without distorting the visibility or damaging the optic system. In 1985, ACMI's rigiflex introduced the first semi rigid ureteroscope which was capable of navigating through the tortuous course of the ureter with better visibility.³ Candela Laser Corporation improved this by downsizing the scope and developing two independent working channels.⁴

According to European Association of Urology 2007, ureteroscopy is an effective therapeutic modality for distal ureteric calculi.⁵

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Ureteroscopy remained superior to ESWL for treatment of stones <10mm and >10mm. This commendation was centered on the outcomes of stone free status, morbidity, and retreatment rates for each respective therapy. However, costs and patient satisfaction or preference were not addressed.⁶ currently, the morbidity of ureteroscopy has been significantly reduced. The overall complication rate is 9–25%. Ureteral avulsion and strictures used to be greatly feared.⁷

Simultaneous bilateral stone fragmentation with ESWL is not advised usually but bilateral ureteric stones can be managed with URS.⁸ Whole of the ureter can be accessed easily with retrograde transurethral Ureteroscopy (URS). Stones are visualized easily with URS and through this stones can be fragmented with many types of Lithoclasts like Pneumatic, Electrohydrolic, Ultrasound and Lasers.⁹

The immediate and long term complication rate with URS varies with the expertise of the surgeon.¹⁰ Ureteric stents are used at the end of the URS if stone fragments after URS are multiple and have big stone burden. Ureteric stenting is optional in case of uncomplicated URS.^{11,12}

OBJECTIVE: To review our six year experience with ureteroscopic management of ureteric calculus and the overall analysis of the success of the technique and complications of the procedure.

PATIENTS AND METHODS: We reviewed the medical records of 500 patients (Median 46 years), admitted to the department of urology for the treatment of ureteric calculus from March 2009 to March 2015 in Mahatma Gandhi Medical College and Hospital, Jaipur.

Patients presented to the outpatient clinic with clinical features suggestive of ureteric calculus. Patients underwent ultrasonography and X-ray KUB as preliminary diagnostic modalities along with a urine routine. They were considered eligible if stones identified were larger than 7mm, irrespective of location in the ureter. Patients were subjected to an Intravenous Pyelogram before scheduling ureteroscopy and those who showed marked hydronephrosis underwent percutaneous drainage or ureteral stenting and were reviewed after 2 weeks of the procedure with a repeat plain radiograph KUB ultrasonography and planned for definitive ureteroscopy after resolution. Patients with high Creatinine clearance levels were first hydrated and managed conservatively or by decompression procedures or haemodialysis so ureteroscopy could be scheduled.

Inclusion criteria were patients from the age of 18 to 60 years, who had recurrent pain and who failed expulsion or medical treatment.

Exclusion criteria comprised of patients who had untreated urinary tract infections, stricture per urethra, abnormal anatomical hip limitations and stones larger than 3cms which may have prevented successful completion of the procedure.

The patients were subjected to a complete pre-operative work up as per protocol i.e. history taking and general physical examination to identify any anatomical disorders or congenital anomalies. Complete blood count, urine analysis, urine for culture and sensitivity, coagulation profiles, electrolyte tests and renal function tests were conducted along with X-Ray KUB, IVP or Non-enhanced CT were performed. Operative intervention included administration of an antibiotic pre-operatively and the patient sent to the operating room and placed in a lithotomy position and the procedure was commenced under spinal or general anaesthesia.

All the procedures were performed by semi rigid ureteroscope [Wolf, Germany, Size: 8/9.8 Fr] with the assistance of C-Arm fluoroscopy [Allengers], Irrigation devices, Video monitor, stone baskets and forceps.

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PROCEDURE: Cystoscopy was first performed and the urethra and bladder were visualized for any abnormalities. Bladder trabeculations, a less prominent trigone and reflux were not considered as criteria's for abandoning the procedure.

A guide wire was introduced through the ureteric orifice to the collecting system and under fluoroscopic guidance, following dilatation of the ureteric orifice an ureteroscope was introduced till the stone and the stone was fragmented with a pneumatic lithotripter. The fragmented stones were retrieved using stone removal forceps and/or basket under direct visualization, endoscopic inspection was done at the end of the procedure to rule out any residual calculi or trauma. After completing the procedure a double J stent was placed in selected patients and foleys catheterisation done for all patients.

In cases where ureteral access was not possible, insertion of a double J stent was the option followed by ureteroscopy after 14 days.

All cases were managed as inpatients and those who had an uneventful post-operative course were discharged on the first post op day and reviewed for outpatient cystoscopy along with an X-Ray KUB for DJ stent removal after two weeks or redo ureteroscopy if symptomatic calculus persisted.

Intraoperative complications like migrating or lost stone, excessive bleeding were monitored and causes of failure of the procedure were duly documented.

Endpoint of study was considered when the patients were reviewed 2 months after the procedure along with a plain radiograph KUB, who had no or insignificant residual stones. Other types of upper tract imaging were not done except when there were complications.

RESULTS: There were 500 patients with ureteric calculus disease with obstruction. Among them 437(77.2%) were males and 114(22.8%) females. Left and right ureteric stones were present in 214(42.8%), 198(39.6%) respectively and 88(17.6%) had bilateral ureteric stones. Mean age of the patients was 46 years. The size of the stone in the treated patients was in the range 7-30mm. Ureteric stones were present in the lower ureter in 225(45.0%) patients, in mid ureter 190(38.0%) and 85(17%) patients presented with upper ureteric calculus. Size of the stone was 0.7 cm to 1cm in 316(63.20%) patients, 1cm to 2cm in 104(20.8%) patients and 2cm to 3cm in 80(16.0%) patients. Stones were approached with Ureteroscope and fragmentation was done with pneumatic lithotripsy.

Table 1: Characteristics of ureteral calculi.

Site	Number of patients	Percentage
Lower Ureter	225	45
Middle Ureter	190	38
Upper Ureter	85	17

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Site	Number	Percentage
Lower Ureter	217/225	96.40%
Middle Ureter	177/190	93.10%
Upper Ureter	66/85	77.64%

Table 2: Success rate according to site

Size of Stone	No. of Patients	Success Rates	Failure Rates
<1cm	316(63.2)	310(98.1%)	6(1.26%)
1-2cms	104(20.8)	90(86.50)	14(13.46%)
2-3cms	80(16.0)	60(75.0)	20(25.0%)
Total	500(100)	460(92.0)	40(8.0%)

Table 3: Size of stone, success and failure rates

Causes	Number	Procedure Done	No. of patients
Upward stone migration	20	DJ & ESWL	All
Stone fragment failure	12	ESWL/Ureterolithotomy	All
Failed URS Insertion	7	ESWL/Ureterolithotomy	All
Ureteric Perforation	01	DJ Stenting	All

Table 4: Causes of failure of the procedure and type of secondary procedure done

	Number	Rate %
Intraoperative		
Mucosal Injury	18	3.6
Ureteral perforation	1	0.2
Significant bleeding	3	0.6
Ureteral avulsion	0	0
Early		
Fever/Urosepsis	18	3.6

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Persistent Haematuria	6	1.2
Renal colic	14	2.8
Late		
Ureteral stricture	1	0.2

Table 5: Complications among 500 URS procedures (Total – Initial + Second Look)

Studies	No. of Stone Free Patients/Total patients	Percentage
Current Study	460/500	92.0
Dasgupta P et al.	73/101	72.3
Butler MR et al.	1735 /1936	89.6
Shah OD et al.	3540/3978	89
Krambeck AE et al.	529/579	91.4
Fong YK et al.	46/51	90
Weide Z et al.	168/180	93.3
Ather MH et al.	350/437	80
Samaniego PM et al.	335/360	93.1
Bierkens AF et al.	98/105	93.3
du Fossé W et al.	263/292	90.1
Park HK et al.	185/200	93
Valente R et al.	280/298	94
Puppo P et al.	354/378	93.6
Küveli B et al.	60/66	90.9

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Cheung MC et al.	278/306	91
Silinskas V et al.	54/59	92.3
Rao MP et al.	114/124	91.9
Ilker Y et al.	195/205	95.1
Chow GK et al	172/182	94.4
Raza A et al.	53/53	100

Table 6: Comparison of current study with other ureteroscopy studies

Stones were successfully fragmented and cleared in the 217(43.4%) patients with stones in the lower ureter, in 177(35.50%) patients with stones in the mid ureter and in 66(13.2%) patients with stones in the upper part of ureter. The individual success rate of the procedure for the stone of the lower ureter, mid ureter and upper ureter was 96.4%, 93.10% and 77.64% respectively. Stones were completely removed in 460(92.0%) patients.

Stones were successfully fragmented and cleared in 460(92.0%), but failure in fragmentation were noted 12(2.4%) patients, failed URS insertion were noted in 7 cases (1.4%), upward stone migration in 20(4.0%) and ureteric perforation was noted only in 1(0.2%) patient which was successfully managed intra-operatively by a Double J stent post procedure which was successfully removed with a review ureteroscopy six weeks later. A plain radiograph was performed prior to double J stent removal to evaluate for residual stone.

DISCUSSION: The patients enrolled in our retrospective study, our protocol and experience reveals ureteroscopy to be the definitive treatment for ureteric calculus. They were followed up regularly post operatively. Fasihuddin Q and Hasan AT treated 125 patients with ureteroscopy. Among them, 73.7% were male and 26.3% were female There was technical failure to negotiate through the ureteric orifice in 8% of the patients. In 118 patients in which there was successful introduction of ureterorenoscope, there were stones in the upper ureter in 4%, in the middle ureter in 13.2% and in lower ureter in 82.6%. Stone clearance rate was 93.8%. Stricture was found in 4% patients. Stripping of mucosa occurred in 2.5% patients.¹³

Mugiya et al in 2006 treated 54 patients with ureteric stones having diameter average 15.2 mm with small diameter ureterorenoscopy. He was successful in fragmenting the ureteric stones in 87% patients by a single endoscopic procedure. No complication was recorded in any case.⁶

Makarov et al.¹⁴ proved insignificant variance in the outcome, among patients who underwent stenting and those who do not and recommended preoperative patient education for the likelihood of stenting. Saltzman B. recommended stenting in patients following ureterorenoscopic stone therapy; when stone fragments were multiple and or bigger one¹¹. We consider stenting to be invaluable for all our procedures as it support better prognosis and reduced complications rates.

Our study revealed 92.00% stone clearance rate in the ureter at all levels in the total 500 patients enrolled. It was 96.40 %clearance in the 225 lower ureteric stones, 93.10% in 190 mid ureteric and 77.64% in the 85 upper ureteric stones. The clearance rate was 98.10% in the stone size

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<1cm, 86.50% in stone size 1-2cm and 75.00% in the stone size of 2-3cm. Upward stone migration in 4 %patients was the major cause of failure of the procedure. Other complications were minor and were corrected by conservative treatment or double J insertion. Ureteric stenting were done in 376(75.20%) patients. So transurethral ureteroscopy should be the preferred method to approach and fragment the ureteric stones.

CONCLUSION: Our study for management of ureteric calculus by retrograde ureteroscopy has displayed efficient results and better outcomes and lower complication rates. URS is safe must be done carefully and in the hands of an experienced surgeon, the procedure associated with a firm peri-operative protocol with or without a double J stent placement has revealed excellent results. Thus, it can be considered as procedure of choice in the management of most ureteric calculi.

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AUTHORS:

1. H. L. Gupta
2. Manish Gupta
3. Sameer Deen

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Urology, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur.
2. Assistant Professor, Department of Urology, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur.

FINANCIAL OR OTHER

COMPETING INTERESTS: None

3. Resident Doctor, Department of Urology, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur.

NAME ADDRESS EMAIL ID OF THE

CORRESPONDING AUTHOR:

Dr. H. L. Gupta,
Department of Urology,
Mahatma Gandhi Medical College and Hospital,
Sitapura, Jaipur.

E-mail: drhotilalgupta@yahoo.com

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