



## General Surgery

## A PROSPECTIVE STUDY ON THE MANAGEMENT OF UPPER URETERIC CALCULI AT A TERTIARY CARE CENTRE

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**ABSTRACT** **Background:** Various options are available for the management of ureteric colic, including conservative management, medical expulsion therapy, and surgical intervention. Primary management of ureteric stones is dependent on various factors, including patient presentation, clinical assessment, and stone characteristics. In the present study, we evaluated and managed all the upper ureteric calculi with respect to feasibility of various procedures, clearance of the stones and their complications. **Methods:** A cross-sectional study was conducted among 70 patients > 12 years of age with upper ureteric calculi attending Hassan institute of medical sciences, Hassan. All Procedure related complications & side effects during admission & follow-up were documented. **Results:** 33 (42.9%) patients underwent URSL(Pneumatic) and 33(42.9%) underwent Laser URSL. During guidewire insertion under fluoroscopic guidance using cystoscope, the stones were dislodged and migrated in 7 patients and among them 5(6.5%) in ICL (Pneumatic with ureteroscopy) and 2(2.6%) in Laser ureteroscopy procedure. The migrated stone treated with PCNL/RIRS depending upon the size of stones. Stone fragments were migrated in 2 patients who underwent Pneumatic ICL lithotripsy and 1(1.3%) in patients who underwent Laser lithotripsy and it is confirmed by fluoroscopy. In 4 (5.2%) of our patient's stones were impacted and large (>20mm) and guidewire could not be negotiated across the stone and hence Ureterolithotomy (Open /Lap) performed and other 2 (2.6%) of our patients did not accept invasive procedures and hence underwent ESWL and 5 (6.5%) were treated medically. In medical treatment, all the patients advised to take Tamsulosin 0.4 mg HS & NSAID'S for 4 weeks and advised to drink water >3.5 litre orally so as to achieve 2.5 litre of urine output. 2(2.6%) patients could not complete the course because of intermittent pain, so they advise URSL, remaining 2 patients completed the course but there was no clearance of the stone, NCCT KUB done and advised for definitive treatment. **Conclusion:** Stone clearance was higher in LAP/OPEN ureterolithotomy, Laser Lithotripsy. However, the difference in stone clearance rate between various procedures was not significant. It can be stated that non-invasive procedures are as effective as open surgeries. However, selection of treatment should be based upon the factors such as size, location, Hounsefield units and others which can optimize the outcome for patients who have upper ureteral calculi.

**KEYWORDS :** Ureteric calculi, lithotripsy, ureteroscopy, MET, ESWL, Ureterolithotomy

### INTRODUCTION

Ureteric calculi or stones lie within the ureter, at any point from the ureteropelvic junction (UPJ) to the vesicoureteric junction (VUJ). These are the definitive obstructive cause of colicky type of abdominal pain. Most patients with renal colic are discharged home from the ED, making it one of the 10 most frequent ED discharge diagnosis [1].

The ureter has three sites of narrowing where stones become lodged. First narrowing occurs at the level of the ureteropelvic junction (UPJ). Next narrowing occurs where the ureter crosses anterior to the iliac vessels to enter the true pelvis at the level of the pelvic brim. Final site of narrowing occurs at the ureterovesical junction (UVJ) where the ureter courses through the bladder wall to the ureteric orifice [2].

Various options are available for the management of ureteric colic, including conservative or expectant management, medical expulsion therapy, and surgical intervention. Primary management is dependent on various factors, including patient presentation, clinical assessment, and stone characteristics. If appropriate, attempting to allow a stone to pass spontaneously negates the risks and costs associated with surgical interventions. If a stone does not pass following a trial of conservative management, this may lead to infection, deteriorating kidney function, or readmissions due to uncontrolled pain.

The surgical management of kidney and ureteral stones is based on the stone location, size, the patient's preference and the institutional capacity. Over past decades, there has been a paradigm shift from open surgery to endourology in the management of upper tract urolithiasis. To date, the available modalities in the management of urolithiasis include External/Extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL), ureterorenoscopy (URS) including semirigid and flexible ureteroscopy [3].

Based on the prior studies, the spontaneous passage rate of stone size was 98% for stones upto 2 mm in diameter; 98% for stones of 3mm;

81% in 4mm, 65% for stones 5mm 33% for stones of 6 mm and 9% for stones larger than 6.5mm. Left-sided ureteral stones seem to pass significantly more often than right-sided in some analyses. S foungristos et al. suggested that the reason might be that the right ureter is typically adherent to the peritoneum, in contrast to the left ureter, providing a better peristalsis in the left ureter. In this study lower stones causing moderate to massive hydronephrosis passed significantly more often within 4 weeks than stones causing no or only mild hydronephrosis. In the long-term there was no significant difference between the grades of hydronephrosis [4]. In the present study, we evaluated and managed all the upper ureteric calculi with respect to feasibility of various procedures, clearance of the stones and their complications.

### METHODOLOGY

- **Study Design:** Cross sectional study
- **Study Duration:** 18 months (January 2021 - June 2022)
- **Study Area:** Hassan Institute of Medical Sciences, Hassan.
- **Study Participants:** Patients with upper ureteric calculi attending Hassan institute of Medical sciences, Hassan.

### Inclusion Criteria

1. All patients aged > 12 years with upper ureteric calculi

### Exclusion Criteria

Upper ureteric calculi associated with

1. Congenital anomalies
2. Neurogenic bladder
3. Stricture ureter
4. Coagulation abnormalities
5. Pregnancy.

### Estimation Of Sample Size

Based on a study done by Hamby Abuotaled Mohammed omar, the stone free rate of Lithotripsy given is 59% (positive outcome).  
 $n = z^2 pq / d^2$

Z=1.96,

p= prevalence of stone free rate for upper ureteric calculi=59%=0.59

q=1-p=0.41

d=20% of p=0.118

$n = (1.96)^2 \times 0.59 \times 0.41 / (0.118)^2 = 67$  subjects

Therefore, after approximating, the sample size of the study participants was fixed at 70.

#### Method Of Collection Of Data

All patients > 12 years with upper ureteric calculi attending Hassan institute of medical sciences, Hassan were included in the study. Clearance from the institutional ethical committee was taken before starting the study. Study participants were included in the study by Purposive Sampling technique.

The study participants > 12 years with upper ureteric calculi were included in the study, till the sample size was reached. Written informed consent was taken from the study participants before collecting the data. A pre-tested, semi-structured questionnaire was used to collect information on clinical history, past history, family history and personal history by interview method. Systemic examination and relevant laboratory and radiological investigations were done. All the patients underwent selected standard treatment options depending on the size of upper ureteric calculi. During follow-up, Plain X-ray KUB/USG or NCCT KUB was done 2 weeks after the procedure to know the radiological clearance of stones. All Procedure related complications & side effects during admission & follow-up were observed /documented.

#### Statistical Analysis

The data was collected and compiled in MS Excel. Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 26.0) was used. Significance level was fixed as 5% ( $\alpha = 0.05$ ). Qualitative variables are expressed as frequency and percentages and Quantitative variables are expressed as Mean and Standard Deviation. To compare the proportion between groups chi-square test was applied.

#### RESULTS

Among 77 subjects, 26 (33.8%) belonged to 41-50 years age group, 18 (23.4%) belonged to 31-40 years age group with 57(74%) males. The most common complaint by the subjects was loin pain which was present in all 77(100%) of the subjects, followed by 15 (13%) complained of fever, 9 (11.7%) complained of vomiting, 1(1.3%) complained of LUTS. Majority i.e., 34 (44.2%) had past history of urolithiasis, 15(19.5%) had diabetes mellitus, 13(16.9%) had hypertension, 3 (3.9%) had cholelithiasis, 2 (2.6%) had loin pain, 2 had hypothyroidism, 1 (1.3%) had COPD, 1 (1.3%) had liver abscess, 1(1.3%) had CAD. Among 77, 7 (9.1%) had family history of renal calculi. 21 (27.3%) had history of smoking. 38 (49.4%) had history of alcohol.

Majority i.e., 40 (51.9%) had right sided renal calculi, 35 (45.5%) had left sided renal calculi and 2 (2.6%) had bilateral renal calculi. 31 (40.3%) had <10 mm calculi, 35(45.5%) had 10-15mm calculi, 3 (3.9%) had 16-20mm calculi, 6(7.8%) had 21-25mm calculi, 1(1.3%) had 26- 30mm calculi, 1(1.3%) had >30mm calculi. 8 (10.4%) had calculi <500 HU, 51(66.3%) had calculi 500-1000 HU, 18(23.4%) had >1000 HU. 15 (19.3%) had No HUN, 33 (42.9%) had Mild HUN, 25 (32.5%) had Moderate HUN, 4 (5.2%) had Severe HUN.

33 (42.9%) patients underwent URSL(Pneumatic) and 33(42.9%) underwent Laser URSL. During guidewire insertion under fluoroscopic guidance using cystoscope, the stones were dislodged and migrated in 7 patients and among them 5(6.5%) in ICL (Pneumatic with ureteroscopy) and 2(2.6%) in Laser ureteroscopy procedure. The migrated stone treated with PCNL/RIRS depending upon the size of stones. Stone fragments were migrated in 2 patients who underwent Pneumatic ICL lithotripsy and 1(1.3%) in patients who underwent Laser lithotripsy and it is confirmed by fluoroscopy. In 4 (5.2%) of our patient's stones were impacted and large (>20mm) and guidewire could not be negotiated across the stone and hence Ureterolithotomy i.e. Open-02 & Laparoscopic (LAP)-02 performed and other 2 (2.6%) of our patients did not accept invasive procedures and hence underwent ESWL+DJ Stenting and 5 (6.5%) were treated medically. majority i.e., 69 (89.7%) had stone clearance. Incomplete clearance in 4 (5.2%) patients in medical treatment, 2(2.6%) patients with Pneumatic lithotripsy, 1(1.3%) patients with laser lithotripsy and 1(1.3%) with ESWL. All those patients for whom failed stone

clearance were advised to undergo definitive treatment. 9 (11.7%) showed symptoms during follow up. majority i.e., 3 (3.9) had loin pain, 1 (1.3%) had stone fragments passed into urine, 3 (3.9) had LUTS, 2 (2.6) had fever.

#### DISCUSSION

The Upper ureter is the most common site of stone distribution 6 and there are several modes of treatment available nowadays including medical therapy, ESWL, ureterolithotomy, URSL& PCNL and this study is to know the procedure which yields high stone clearance with less/no complications in our Hospital.

In our study, 26 (33.8%) belonged to 41-50 years age group, 18 (23.4%) belonged to 31-40 years age group with 57(74%) males. In a study by Jeevaraman et al [5], Ureteric calculi was seen 60% in the age group 21 to 49 years and 62% were males. Several authors have reported 30 to 50 years age as the period of maximum incidence of urinary calculi and male predominance, which was consistent with this study.

In our study, the most common complaint by the subjects was loin pain which was present in all (100%) of the subjects, followed by 15 (13%) complains of fever, 9 (11.7%) complained of vomiting, 3 (3.9%) complained of burning micturition, 1 (1.3%) complained of AUR, 1(1.3%) complained of LUTS, 1(1.3%) complained of dyspnea, 1 (1.3%) complained of easy fatigability, 1 (1.3%) complained of loose stools. In a study by Jeevaraman et al [5], The most common complaint was colicky abdominal pain, reported by 98% of the patients and 3.66% of patients had associated fever which was similar to this study.

In our study, (51.9%) had right-sided ureteric calculi, 35 (45.5%) had left-sided ureteric calculi and 2 (2.6%) had bilateral ureteric calculi. In a study by Jeevaraman et al [5], Equal distribution of calculi was there between right and left sides of the ureter. Drash et al [6] have noted a 55% preponderance to the left.

In our study, 30 (39%) underwent URSL, 27(35.1%) underwent Laser URSL, 7 (9.1%) were treated medically, 4 (5.2%) underwent RIRS, 3 (3.9%) underwent PCNL, 2 (2.6%) underwent open ureterolithotomy, 2 (2.6%) underwent LAP ureterolithotomy, 1 (1.3%) underwent DJ stenting, 1 (1.3%) underwent ESWL. In a study by Jeevaraman et al [5], 41% had undergone retrograde ureteroscopy, 21% had undergone open surgeries, and 39% had undergone medical management, whereas in this study majority underwent URSL, which was contrary to the previous one.

In our study, 72 (93.6%) had stone clearance. 5 (6.5%) had stone passed into the urine. This was similar to a study by Jeevaraman et al [5] in which 3 (3%) stones spontaneously passed into urine.

In our study, 9 (11.7%) showed symptoms during follow-up i.e., 2 (2.6%) showed symptoms of fever, 5 (6.5%) had LUTS, 2 (2.6%) had loin pain. URSL (pneumatic) stone clearance rate at discharge was 100%, for laparoscopic ureterolithotomy it was 100% and for percutaneous nephrolithotripsy, it was 100%. In a study by Basiri et al [7], The clearance rates for these surgeries were 56%, 88% and 64%, respectively, which were comparable with the present study. In a study by Wang et al [8], The stone clearance rate for URSL was 72%, which was similar to this study, and for PCNL, it was 96% which was more compared to this study.

In a study by Nikoubakhth et al [9], transureteral lithotripsy was compared to extracorporeal shock wave lithotripsy in the management of upper ureteral calculi, stone-free rates were 76.9% in the patients of the TUL group and 68.8% in the patients of the SWL group with TUL being more effective than ESWL. In contrast, in this study it was 100% by lithotripsy and EWL failed in stone clearance which was similar to the previous one. Whereas in a study by Lingeman et al [10] on upper ureteric calculi management by ESWL, it was observed that the success rate of stone clearance and recurrence rate of stone removal significantly increased when the stone was manipulated into the kidney before ESWL and hence it was stated that ESWL could be treatment of choice for upper ureteric calculi because of its less morbidity than open surgeries.

In another study by Lotan et al [11], It was reported that ureteroscopy was more cost-effective than ESWL regardless of success rate. In the present study, ureteroscopy showed 100% stone clearance compared

to ESWL, which failed in stone clearance. Whereas in another study by Segura et al [12], It was reported that ESWL should be preferred over Ureteroscopy for proximal ureteric calculi of size < 1 cm. In this study, all the types of treatment performed were not significantly associated with stone clearance, outcome symptoms and follow-up symptoms except for medical treatment, which showed significant association with outcome symptoms. (P<0.05).

**Table 1: Clinical Epidemiology**

Clinical Epidemiology		Frequency	Percent
AGE	12-20 YEARS	2	2.6
	21-30 YEARS	15	19.5
	31-40 YEARS	18	23.4
	41-50 YEARS	26	33.8
	51-60 YEARS	9	11.7
	61-70 YEARS	6	7.8
GENDER	MALE	57	74.0
	FEMALE	20	26.0
PRESENTING COMPLAINTS	LOIN PAIN	77	100.0
	FEVER	15	13.0
	LUTS (Lower urinary tract symptoms)	1	1.3
	VOMITING	9	11.7
PAST HISTORY	CORONARY ARTERY DISEASE (CAD)	1	1.3
	CHOLELITHIASIS	3	3.9
	COPD	1	1.3
	LIVER ABSCESS	1	1.3
	LOIN PAIN	2	2.6
	HYPOTHYROIDISM	2	2.6
	UROLITHIASIS	34	44.2
	DIABETES MELLITUS	15	19.5
	HYPERTENSION	13	16.9
	PERSONAL HISTORY	FAMILY HISTORY	7
SMOKING		21	27.3
ALCOHOL		38	49.4

**Table 2: Stone Characteristics**

STONE CHARACTERISTICS		Frequency	Percent
LATERALITY	BILATERAL	2	2.6
	LEFT	35	45.5
	RIGHT	40	51.9
STONE SIZE	<10 MM	31	40.3
	10-15 MM	35	45.5
	16-20 MM	3	3.9
	21-25 MM	6	7.8
	26-30 MM	1	1.3
HOUNSFIELD UNIT [H.U] OF THE CALCULI	<500 HU	8	10.4
	500-1000HU	51	66.3
	>1000 HU	18	23.4
DEGREE OF HYDROURETERONEPHROSIS (HUN)	NO	15	19.3
	MILD	33	42.9
	MODERATE	25	32.5
	SEVERE	4	5.2

**Table 3: Treatment And Outcomes**

TREATMENT AND OUTCOMES		Frequency	Percent
TREATMENT	URSL (PNEUMATIC)	33	42.9
	LASER URSL	33	42.9
	MEDICAL	5	6.5
	RIRS	4	5.2
	PCNL	3	3.9
	URETERO-LITHOTOMY (OPEN/ LAPAROSCOPIC)	4	5.2
	ESWL	2	2.6
STONE CLEARANCE	YES	69	89.7
	NO	08	10.4
INCOMPLETE STONE	MEDICAL	4	5.2

CLEARANCE	PNEUMATIC LITHOTRIPSY	2	2.6
	ESWL	1	1.3
	LASER LITHOTRIPSY	1	1.3
FOLLOW-UP SYMPTOMS	YES	9	11.7
	NO	68	88.4

**CONCLUSION**

It was observed that stone clearance was slightly more in URSL(Pneumatic), LAP/OPEN ureterolithotomy, PCNL compared to other procedures like Medical expulsive therapy, ESWL and LASER URSL. However, the difference in stone clearance rate between various procedures was not significant. It can be stated that non-invasive procedures are as effective as open surgeries. However, selection of treatment should be based upon the factors such as size, location, and others which can optimize the outcome for patients who have ureteral calculi.

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