

## A PROSPECTIVE STUDY ON MANAGEMENT OF URETERIC CALCULI

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### Abstract

**Background:** Urolithiasis/ Urinary tract calculi is the third most common condition of the urinary system requiring frequent attention and intervention. They can be managed either conservatively or intervened with treatments such as medical expulsive therapy, shockwave lithotripsy (SWL), ureteroscopy (URS) and pyelolithotomy. This study focuses on determining the appropriate management and factors influencing it. The aim is to identify the optimal mode of management for ureteric calculi and factors influencing the outcome. **Materials and Methods:** This prospective observational study involves 100 patients with ureteric calculus seen in Govt. medical college hospital, Namakkal, in 1 year (2021-2022). Inclusion Criteria:  $\geq 12$  years old patients admitted in Govt. Medical College Hospital, Namakkal with ureteric calculi. Exclusion Criteria: Patients with renal Calculus other than ureteric calculi. Patients having anomalies like stricture urethra, benign prostatic hyperplasia, neurogenic bladder, etc. **Result:** The peak incidence was found in 21-40yrs age group (60%), Incidence: lower ureter (66%) > Upper ureter (34%), Most common calculi size was 6-10mm (58%) in both upper and lower ureter, 60% Calculi  $\leq 10$  mm can be managed conservatively for spontaneous expulsion or with medical expulsion therapy, 40% of  $\leq 10$  mm calculi and all  $> 10$ mm ureteric calculi needed active intervention with ESWL or URS, 15% patients had positive urine culture in which E.coli was most common accounting for 53% and was sensitive to all third generation cephalosporins. **Conclusion:** Ureteric stones less than 6 mm in size with no associated complications have  $> 70\%$  chance of spontaneous passage irrespective of site and hence can be managed conservatively. All other ureteric stones needed active interventions in the form of medical expulsive therapy, ESWL and pyelolithotomy or ureterolithotomy.

## INTRODUCTION

Ureteric calculus develops as a result of various metabolic disorders<sup>1</sup> which affect various elements in the system especially calcium<sup>2</sup>. Following urinary tract infections and prostatic diseases, ureteric calculi form the third most common condition of the urinary system. Obstruction of the urinary tract by ureteric calculi is a surgical emergency which needs active intervention. 55% of ureteric calculi recur in 5-10 years and 78% of ureteric calculi recur in 20 years<sup>3</sup>. Calculi occurring above pelvic brim constitutes upper ureteric calculi and those occurring below pelvic brim constitutes lower ureteric calculi<sup>4</sup>.

The factors influencing the treatment modalities<sup>5,6</sup> is: clinically- severity of symptoms, urinary tract infection, coagulation abnormality, obesity and systemic hypertension; stone – size, composition,

location, duration of obstruction if present; anatomic considerations like pelviureteric junction obstruction, horseshoe kidney, solitary kidney and ectopic kidney; and technical factors including availability of equipment and cost factors. In case if intervention is needed, the above factors need to be considered to select the treatment from available options for achieving a disease-free state with less morbidity. In many cases, more than one treatment modalities will be suitable. In such cases, patients' preferences are considered in making a decision balancing the morbidity and invasiveness of the procedure with technical difficulty and chance of having a disease-free state.<sup>6</sup>

## MATERIALS AND METHODS

**Methods:** This prospective observational study involves 100 patients with ureteric calculus seen in

Govt. Medical College Hospital, Namakkal, in 1 year (2021-2022).

**Inclusion Criteria**

≥12 years old patients admitted in Govt. Medical College Hospital, Namakkal with ureteric calculi.

**Exclusion Criteria**

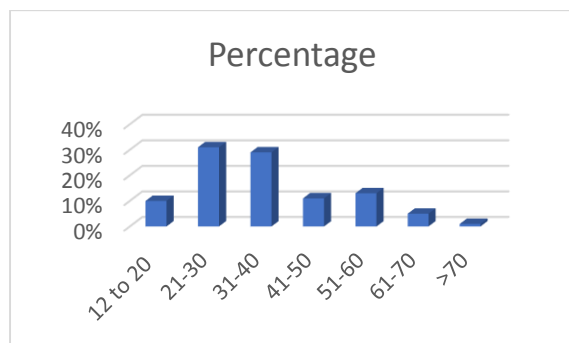
Patients with renal Calculus other than ureteric calculi. Patients having anomalies like stricture urethra, benign prostatic hyperplasia, neurogenic bladder, etc.

**Methodology**

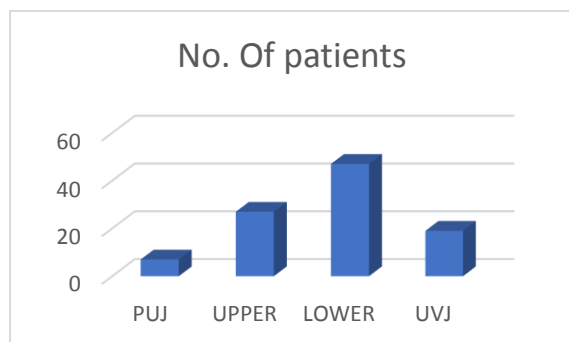
All patients were subjected to a detailed clinico epidemiological work up<sup>7</sup>. Complete hemogram, urine analysis, urine culture, serum biochemistry including urea, creatinine was performed in all patients. Calcium, phosphorus, uric acid, 24hrs urine study for urinary excretion of calcium, phosphorus and uric acid<sup>8</sup> were performed in selected patients. Radiological investigations included plain x-ray, CT abdomen and pelvis, KUB, IVU series, Retrograde urethrogram, Voiding Cystourethrogram and Retrograde ureterogram depending upon the clinical situation. Ultrasonogram was performed in all patients with ureteric calculus and repeated after therapeutic endoscopic procedures. Patients were asked to come for follow up 1 month and 6 months after therapeutic procedures. Ultrasonogram of KUB was done during follow up period, and treated accordingly.

**RESULTS**

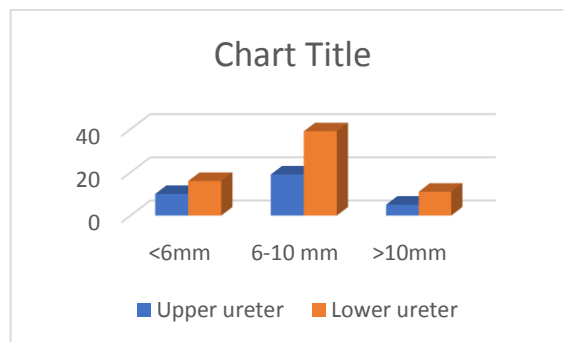
The peak incidence was found in 21-40yrs age group (60%)



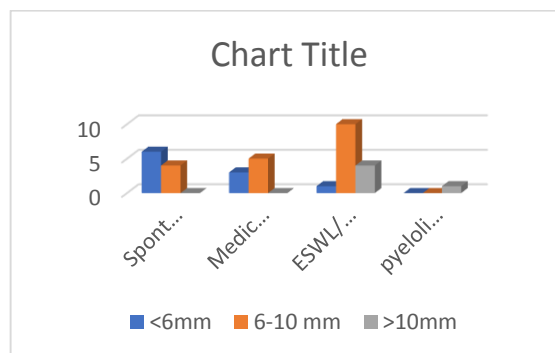
**Figure 1: Age Distribution**



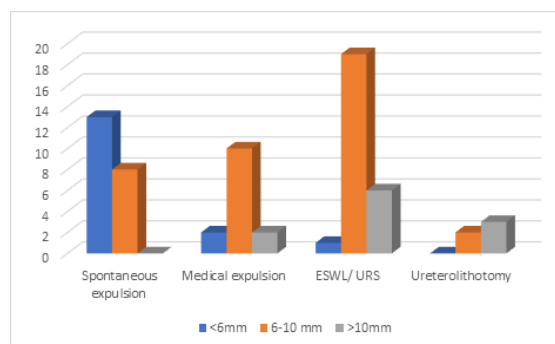
**Figure 2: Site Distribution**



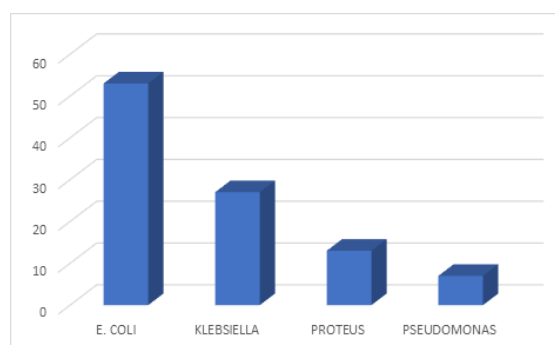
**Figure 3: Stone Distribution According To Size**



**Figure 4: Management Of Upper Ureteric Calculi**



**Figure 5: Management of Lower Ureteric Calculi**



**Figure 6: Urine Culture Growth**

**Table 1: Distribution**

Serial no	Age group	Number of patients	Percentage
1	12-20	24	10%
2	21-30	27	31%
3	31-40	33	29%
4	41-50	17	11%
5	51-60	13	13%
6	61-70	5	5%
7	>70	1	1%

Upper ureteric calculi occurred in 34% and lower ureteric calculi occurred in 66% indicating increased incidence of lower ureteric calculi

**Table 2: Frequency of patients with Site of ureteric stone**

Serial number	Site	No. Of patients
1	PUJ	7
2	UPPER	27
3	LOWER	47
4	UVJ	19
	TOTAL	100

In 34% of upper ureteric stones 29% were <6mm, 56% were 6-10 mm, 15% were >10mm

In 66% of lower ureteric stones 24% were <6mm, 59% were 6-10 mm, 17% were >10mm

**Table 3: Distribution of stones according to stone size**

	Upper ureter	Lower ureter	Total
<6mm	10	16	26
6-10 mm	19	39	58
>10mm	5	11	16
	34	66	100

**Management of upper ureteric calculi (34%)**

- Spontaneous expulsion with Conservative management was done for 29% in which <6mm were 60%, 6-10 mm were 40%
- medical expulsive therapy done for 24 % patients in which <6mm were 37%, 6-10 mm were 63%.
- None of the >10mm calculi expelled either spontaneously or with medical expulsion therapy

**All >10mm upper ureteric calculi needed active intervention**

- 44% patients needed intervention with either shockwave lithotripsy (SWL) or ureteroscopy (URS) in which <6mm were 7%, 6-10 mm were 66%, >10mm were 27%
- One patient (3%) needed pyelolithotomy for >10 mm calculi in upper ureter

**Table 4: Management of upper ureteric calculi**

	Spontaneous expulsion	Medical expulsion	ESWL/ URS	Pyelolithotomy
<6mm	6	3	1	0
6-10 mm	4	5	10	0
>10 mm	0	0	4	1
	10	8	15	1

**Management of lower ureteric calculi (66%)**

- Spontaneous expulsion with Conservative management was done for 32% in which <6mm were 62 %, 6-10 mm were 38 %
- Medical expulsive therapy done for 21% patients in which <6mm were 14%, 6-10 mm were 72 % and >10mm were 14%
- none of the >10mm calculi in lower ureter expelled either spontaneously or with medical expulsive therapy. They needed active management
- 39% patients needed intervention with either shockwave lithotripsy (SWL) or ureteroscopy (URS) in which <6mm were 4%, 6-10 mm were 73%, >10 mm were 23%
- 8% patients were treated with ureterolithotomy in which 6-10 mm were 40%, >10mm were 60%

**Table 5: Management of lower ureteric calculi**

	Spontaneous expulsion	Medical expulsion	ESWL/ URS	Ureterolithotomy
<6mm	13	2	1	0
6-10 mm	8	10	19	2
>10mm	0	2	6	3
	21	14	26	5

15% patients had positive urine culture in which E. coli was most common accounting for 53% and sensitive to all third generation cephalosporins antibiotics.

**Table 6: Urine Culture**

Organism	No.	%
E. COLI	8	53
KLEBSIELLA	4	27
PROTEUS	2	13
PSEUDOMONAS	1	7
Total	15	100

## DISCUSSION

The treatment of ureteric calculi is based on the size of the stone and their location. Also, the accessibility and availability of resources with apt technologies are also taken into consideration<sup>9</sup>.

Conservative Management allowing spontaneous stone passage is preferred provided that passage of calculus is within acceptable time limits, manageable patient symptoms and a low complication risk. The axial diameter /width of the stone on plain computed tomography scan is closely related with stone passage rate.<sup>10</sup>

Ureteric stones less than 6 mm size have more chance (73%) of passing spontaneously and can be managed conservatively in the absence of- urinary tract infections / increased patient symptoms/ derangement of renal function or impending renal failure.

### Medical Expulsive Therapy

Alpha blockers are used in treating ureteric calculi less than 10 mm due to less adverse effects

These drugs potentially increase the likelihood of spontaneous stone passage and shorten the duration of stone passage<sup>11</sup>.

### Active Intervention

The indications include: (I) persistent obstruction; (ii) failure of progression of passage of stone; and (iii) persisting colicky pain.

SWL (Shock wave lithotripsy)<sup>12</sup> and URS(Ureterorenoscopy) are the two main modalities of active surgical intervention available and used to treat ureteric calculi with minimal morbidity and increased success rate of achieving stone free state.

Other than location, additional stone-related factors, including composition, skin-to-stone distance on CT and density of the stone may influence the treatment.

### Stone density

Ureteric calculi are less likely to be fragmented successfully with SWL if there is increased stone density with a threshold limit of 1000 HU and the same was supported by two studies.<sup>13</sup>

### Skin-to-stone distance (SSD)

CT scans also allow measurement of SSD in addition to measuring stone size and density. Reduced success rates of SWL are seen in patients with a higher SSD and increased stone density. A large Canadian retrospective study on ureteric calculi, concluded that SSD >11 cm and stone density >900 HU were used as important predictors

of success rate of SWL. Another retrospective review study of more than 1000 SWL treatments also showed that patients with SSD >10 cm had lower success rates with reduced stone-free rates.

Ureteral stents provide drainage and also passively dilate the ureter<sup>14</sup>. In fact, they actually impede the passage of fragments affecting the success rate of stone passage. They should be used prior to Shock wave Lithotripsy<sup>15</sup> to treat obstruction, intolerable pain, acute renal injury, sepsis, and in patients with a solitary kidney. If sepsis develops, antibiotics course should be administered prior to lithotripsy and at the time of treatment patient should be relieved of symptoms of sepsis.

In cases, where ureter is narrow and insertion of a ureteroscope is predicted to be difficult, pre-stenting will be effective in passively dilating the ureter and re-attempting URS at a later stage. Pre-stenting is recommended to improve the rate of ureteral access and reduce the procedural complications. URS and balloon dilation are effective and safe if done at a single sitting. In case of failure, pre-stenting and URS after passive dilatation at a later stage is necessary.

## CONCLUSION

Major advancements have been made in the past decades in ureteric calculi management. Shock Wave Lithotripsy, Ureterorenoscopy, and PCNL have made open surgery for ureteric calculi obsolete. Factors such as fragility of stone, obesity, and unfavourable location of calculi poses a challenge to the surgeon in treating ureteric calculi. These can be managed with newer instruments like ureteroscopes with smaller calibre and laser fibres which allows a greater number of calculi to be managed with higher success rate and reduced morbidity to the patient allowing them to achieve a good quality of life. This study concludes that the decision of optimal mode of management should be individualized for each patient with an intention to achieve higher chance of stone free status with less complications.

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