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Original Research Article

A study on ureteric calculi in a rural tertiary care centre

Kailash Jagannath, Ashwin Kanakaraja Gupta*, Narayanaswamy Srinivasan

Department of General Surgery, PESIMSR, Kuppam, Chittoor, Andhra Pradesh, India

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***Correspondence:**
Dr. Ashwin Kanakaraja Gupta,
E-mail: drashwink47@gmail.com

ABSTRACT

Background: Urolithiasis is one of the most common afflictions of genito-urinary tract affecting almost 5-15% of the world population. Nearly 50% of patients affected will have recurrence within 5 years, making it a lifetime disease. This study was undertaken to know the clinical epidemiology and to evaluate different management modalities with immediate postoperative outcomes of ureteric calculi.
Methods: This was a descriptive prospective observational study done at PES Institute of Medical Sciences and Research, Kuppam for a period of 2 years. A set of inclusion and exclusion criteria were defined and followed. Initial assessment, basic investigations with specific investigations for ureteric calculi confirmation were done. Relevant operative procedure was done and patients were managed post operatively.
Results: The most common age group affected was between 31-50 years with male predominance in our study. Pain abdomen was the presenting complaints seen in all the patients. Lower 1/3rd of ureter was the commonly involved site. URSL (ureteroscopic lithotripsy) was the choice of treatment for ureteric and vesico-ureteric junction calculi and PCNL/PBPCNL (percutaneous nephrolithostomy/push back percutaneous nephrolithostomy) was the treatment of choice for calculi at pelvi-ureteric junction and upper 1/3rd of ureter with size >1 cm. The success rate of the surgical procedures done in our study was 80-100%.
Conclusions: Increasing prevalence of calculi in younger age group and in female population may be due to westernization, modern lifestyle and change in dietary habits. Having the knowledge of newer techniques will help surgeons to individualise the treatment which will improve success rate and reduce morbidity.

Keywords: Ureteric calculi, URSL, PCNL/PBPCNL

INTRODUCTION

Urolithiasis is one of the most common affliction of genito-urinary tract affecting almost 5-15% of the world population.[1] Nearly 50% of patients affected will have recurrence within 5 years, making it a lifetime disease.[2]

Since Hippocrates, the association between putrefaction and stones is known.[3] In 1817, the role of alkalinisation resulting in crystallization of urinary phosphate was pointed out.[4]

Ureteric calculi commonly presents as acute abdominal colic typically with intermittent colicky flank pain often associated with nausea and vomiting.[5] Once a stone enters ureter, lower urinary tract symptoms may occur.

There has been enormous development in the management of ureteric stones improving the outcome. Size of stone and location are given importance while considering conservative approach of management with an essential component being analgesia.[6] Open surgeries have made a way for minimal invasive procedures with tremendous advance in ureteroscopic procedures, decreasing both the patient's mortality and morbidity.

The decision making for management can be simplified by stratifying stones based on complexity (simple or complex) and location.[7]

This study was undertaken to know the clinical epidemiology and to evaluate different management modalities with immediate postoperative outcomes.

METHODS

The study done was prospective observational study conducted at PES (People's Educational Society) Institute of Medical Sciences and Research during the year 2017-2018. The hospital is located in a rural area (Kuppam) of Andhra Pradesh, South India.

The initial assessment included detailed history taking, clinical examination as per designed proforma, routine urine and blood investigations with specific investigations for confirmation of ureteric calculi.

Inclusion criteria

Inclusion criteria were all confirmed cases of ureteric calculi willing to undergo surgery.

Exclusion criteria

Exclusion criteria were pregnant women; presence of calculi other than ureter; patients not willing for surgery or investigations; associated anomalies like stricture urethra, neurogenic bladder.

Depending on the site and size of the calculus, the appropriate treatment was decided. Patients were followed for immediate postoperative period.

The ethical committee clearance of the medical college/hospital was obtained. The data was entered into MS excel sheet and SPSS software was used for statistical analysis.

RESULTS

A total of 135 cases of ureteric calculi were included in our study. The most common age group affected was between 31-50 years (51.85%) as shown in Table 1. The mean age of the study group was 43.78 years. Men were affected more commonly (57.8%) than women (42.2%) with a male to female ratio of 1.37:1.

The most common symptom was pain abdomen seen in 100% (135) patients followed by burning micturition in 61.48% (83), vomiting/nausea in 28.15%(38), fever in 24.44%(33) and haematuria in 14.07% (19) of patients as shown in Figure 1.

The ureteric calculi was found on right side in 50.37% (68), left side in 43.7% (59) and bilaterally in 5.93% (8) of patients. The commonest site of ureteric calculi was in lower 1/3rd as shown in Table 2. As few of the patients had it bilaterally, total number of calculi was 143.

Table 1: Distribution of the study cases according to age.

Age group (in years)	No of patients	Percentage (%)
15-30	25	18.52
31-40	36	26.67
41-50	34	25.19
51-60	24	17.78
>60	16	11.85
Total	135	100.0

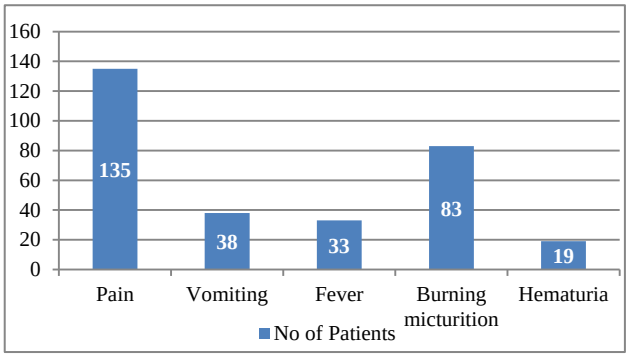

Figure 1: Symptoms among the study group.

Table 2: Various sites of ureteric calculi.

Site	No of calculi	Percentage (%)
Pelvi-ureteric junction	6	4.19
Upper 1/3 ureter	26	18.18
Middle 1/3 ureter	18	12.59
Lower 1/3 ureter	70	48.95
Vesico-ureteric junction	23	16.09
Total	143	100

The mean size of ureteric calculus was 13.56 mm. The daily average water intake was 943 ml among the study patients.

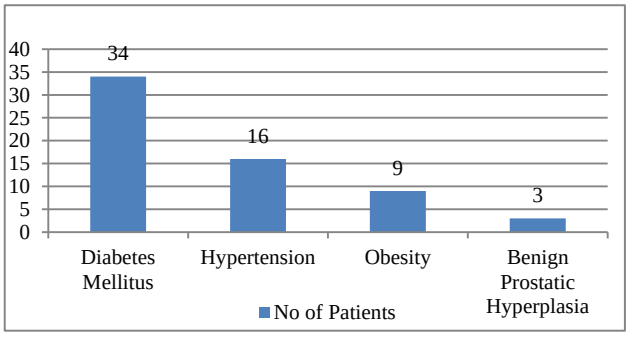

Figure 2: Common co-morbidities among study patients.

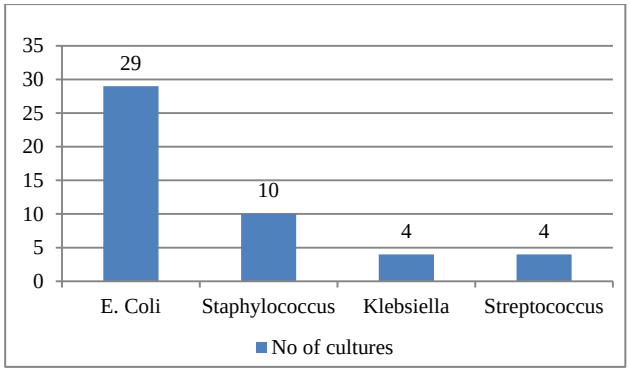

Figure 3: Distribution of various pathogens seen on urine culture.

Figure 2 shows the co-morbidities among the patients with Diabetes mellitus being the most common co morbidity.

Figure 3 shows the pathogens isolated by the urine culture with the commonest organism being *E. coli* followed by *Staphylococcus*.

Ureteroscopic lithotripsy+DJ stenting was done in 127 (88.82%) cases, percutaneous nephrolithostomy+DJ stenting in 6 (4.19%) cases and Pushback percutaneous nephrolithostomy+DJ stenting in 10 (6.99%) cases.

Table 3 shows surgeries performed according to the site of calculus. There was 100% stone clearance in all patients who underwent percutaneous nephrolithostomy +DJ stenting and Pushback percutaneous nephrolithostomy +DJ stenting procedures. The success rate of Ureteroscopic lithotripsy + DJ stenting was 82.5%.

Table 3: Surgeries performed divided according to the site of calculus.

Site of calculus	Surgeries performed			Total
	URSL+DJ#	PCNL+DJ$	PBPCNL+DJ^	
PU-junction	0	6	0	6
Upper 1/3 ureter	16	0	10	26
Middle 1/3 ureter	18	0	0	18
Lower 1/3 ureter	70	0	0	70
VU-junction	23	0	0	23
Total	127	6	10	143

#Ureteroscopic lithotripsy+Double J stenting, $ Percutaneous Nephrolithotomy+Double J stenting, ^Push back Percutaneous nephrolithotomy+Double J stenting.

Table 4: Surgical details classified based upon site of the calculi.

Anatomical site	Surgery done	No. of cases	Percentage (%)	Post operative complications			
				Pain	Fever	Burning micturition	Haematuria
Pelvi ureteric Junction	PCNL+DJ $	06	4.19	3	0	1	2
Upper 1/3 ureter (>1 cm)	PBPCNL+DJ^	10	6.99	6	1	3	4
Upper 1/3 ureter (<1 cm)	URSL+DJ#	16	11.19	55	6	20	47
Middle 1/3 ureter	URSL+DJ#	18	12.58				
Lower 1/3 ureter	URSL+DJ#	70	48.96				
Vesico ureteric junction	URSL+DJ#	23	16.09				
Total		143	100	64	7	24	53

#Ureteroscopic lithotripsy+Double J stenting, $Percutaneous Nephrolithotomy+Double J stenting, ^Push back percutaneous nephrolithotomy+Double J stenting.

Table 4 shows surgical details according to the site of the calculi and postoperative complications.

The commonest postoperative complication was pain seen in 50% of patients undergoing PCNL, 60% with PBPCNL and 46.21% with URSL procedures. This was followed by haematuria in 33.3% of patients undergoing PCNL, 40% with PBPCNL and 39.5% of patients undergoing URSL.

DISCUSSION

Since the time of Greek and Roman physicians, ureteric calculi has been recognised and documented. Over the past few decades, lifestyle and dietary habits have undergone a change in India affecting its epidemiological changes. The commonest age group affected in our study was between 31-50 years with a mean age of 43.78 years similar to a study done by Baily et al and Hiatt et al.[8,9]

The sex incidence ratio was 1.37:1. Other studies on urolithiasis had a ratio ranging from 1.15 to 2.6 as shown in Table 5 below.[3,10-15] This may be attributed to change in lifestyle of women with more working women on the rise and dietary changes in regards with the same.

The commonest presenting symptom was colicky pain abdomen in 100% of patients as comparable to studies done by Jeevaraman et al and Burkland et al.[15,16] In our study, only 14.08% of patients had hematuria which was different in comparison to other studies.[15,17]

In the present study, 50.37% of calculi were on the right side and 43.7% were on left side, unlike other studies showing predominant left sided calculi.[18-20]

The distribution of ureteric calculi in our study is comparable to studies done by David et al and Rizvi et al as shown in Table 6.[21,22]

Table 5: Sex wise ratio of ureteric calculi in various studies from different parts of the world.

Study by	Country	Male: female ratio
Knoll[10]	Germany	2.6:1
Qaader[3]	Iraq	2.5:1
Lancina Martin[11]	Worldwide	2:1
Tanthanuch[12]	Thailand	1.6:1
Lieske[13]	USA	1.3:1
Safarinejad et al[14]	Iran	1.15:1
Jeevaraman et al[15]	India	1.7:1
Present study	Kuppam, AP, India	1.37:1

Table 6: Comparison of literature: distribution of urolithiasis at various sites.

Location of Calculus	Reid Morse [18] (%)	David J et al [21](%)	Rizvi et al[22] (%)	S.Jeevaraman[15] (%)	Present study (%)
Upper ureter	17	27	31.4	37	22.37
Mid ureter	11	12	14.9	17	12.59
Lower ureter	72	61	53.7	46	65.04

Type 2 diabetes mellitus and obesity are associated with nephrolithiasis.[23] Insulin resistance, which is characteristic of metabolic syndrome and type 2 diabetes mellitus, results in lower urine pH because of impaired kidney ammoniagenesis hence promoting uric acid calculi formation. In the present study, diabetes mellitus was the most common co-morbidity among the study patients, seen in 34 (25.18%) patients.

In the present study, obesity was seen in 6.66% of patients. Obesity increases the risk of ureteric calculi formation. The intensity of the increased risk may be higher in women than in men. In particular a body mass index (BMI) of 30 or greater was associated with a greater risk of renal calculi formation. Subjects with greater BMIs excrete more urinary oxalate, uric acid, sodium, and phosphate than those with lower BMIs and this results in an inverse relation between BMI and urine pH thus more the BMI, lesser the pH (acidic) thus promoting stone formation.[24]

In the present study, the daily average fluid intake was only 943 ml, supporting studies showing that reduced water intake has a role in ureteric calculi formation.[25,26]

In our study, urine culture showed growth in 47 (34.81%) patients which is more compared to a study done by Jeevaraman et al but the most common organism was the same, *E. coli*, which was seen in 29 (21.48%) cases, followed by Staphylococcus in 10 (7.4%), *Klebsiella* species in 4 (2.9%), and *Streptococcus* in 4 (2.9%) cases. In a study by Jeevaraman et al.[15] 15% of the cases had positive urine culture, with mainly isolation of *E.coli*, followed by *Proteus*, *Klebsiella* and *Pseudomonas*.

The goal of the surgical treatment of patients suffering from ureteric calculi is to achieve complete stone clearance with minimum morbidity. The surgical procedures were based on site and size of the calculi.

URSL with DJ stenting was the common procedure done in our study. In a study by Segura et al, the stone free rates of ureteroscopy was 56% for stones smaller than 1 cm and 44% for stones larger than 1 cm. The risks of significant complications after ureteroscopy were 11%.[27] A study by Peschel et al showed ureteroscopy being better in terms of success rates and outcomes.[28]

In the study by Jeevaraman et al, out of 41 patients who underwent ureterescopy, 40 patients (97.6%) had successful retrieval of the stone.[15]

The present study differed from the study by Segura et al but had similar results when compared to the study by

Jeevaraman et al.[15,27] Among our patients of ureteric calculus, the success rate was 82.5% with URSL+DJ with some studies showing stone free rates more than 90%.[29-31] The postoperative complications were higher with URSL+DJ, in line with the world literature.

Limitations

- Lack of follow up due to poor follow up visits by the patients.
- Non availability of ESWL (extracrporeal shock wave lithotripsy) facility at our hospital.

CONCLUSION

Ureteric calculi is showing age shift, from previously middle age being affected to now seen even in younger age group. It is also being seen with increasing prevalence in females in recent times. This may be due to westernization, modern lifestyle and change in dietary habits. Pain is the most common presenting complaint of the ureteric calculi.

A variable number of predisposing factors have an influence on the formation of ureteric calculi. Dietary habits, fluid intake, and comorbidities like diabetes mellitus and obesity play a major role in its etiopathogenesis.

The invention of minimal invasive surgeries has made the ureteric calculi management much easier than earlier times with significant reduction of morbidity. Having the knowledge of newer techniques helps surgeons individualise the treatment which improves the success outcome.

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