

A Study on Ureteric Calculi

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ABSTRACT

Introduction: Disease of Ureteric calculi is on increase specially in the developed countries and present with various pattern, presentation, treatment and outcome. The aim of the study is to evaluate all in-patients with calculus disease of ureter with special reference to clinical epidemiology and To evaluate treatment selection and outcome, to compare the results with similar published studies.

Material and methods: 100 patients were evaluated in this study in thanjavur medical college. Based on the epidemiological factors and symptoms, signs, radiological workup, and patients clinical presentation, treatment selection made either for medical management or surgical management.

Results: A total of 100 patients were included in this study. Of these the maximum incidence of ureteric calculi appeared in the age group of 21 to 49 years age group (60%). The largest stone in our series measured 13 mm. 39 in-patients (39%) were managed medically. 18 patients had stone size of 5 mm or less. 41% of patients had undergone retrograde ureteroscopy, of them 40 patients had successful retrieval of stones. 21 patients (21%) underwent open surgical management in the form of ureterolithotomy and pyelolithotomy.

Conclusion: In this study we have evaluated the various factor contributing to calculus disease of ureter, various presentation and treatment modalities and outcome of patients of various age groups. This will be helpful for the surgeon in future regarding plan and management of ureteric calculi.

Keywords: ureteric calculi, stones, site, ureterolithotomy, pyelolithotomy, medical treatment.

INTRODUCTION

Ancient Greek and Roman physicians recorded the symptoms and treatment of urologic stone disease but little attention was directed to localization of the stone or to the cause of formation. In the decade since then, there have been major changes in the management of ureteral calculi. Most notably, medical therapy to facilitate passage of ureteral stones has been popularized and there have been tremendous advances in ureteroscopic technology. These developments have improved the outcome of ureteral stones management for large number of patients. In the 20th century, advances in technology and microscopic techniques have led to a better understanding of structural characteristics of calculi, their chemical composition and the various components of urine. Many theories have been proposed to explain the cause and development of urologic calculi but none have been able to answer fully the questions concerning stone formation.¹ This is a study of 100 patients with calculus disease of ureter seen in the period of six months from November 2015 to April 2016 with particular reference to clinical epidemiology.² The aim of the study was to evaluate all in-patients with calculus disease of ureter with special reference to clinical epidemiology including age and sex incidence, distribution of calculi within the ureter, clinical presentation, laterality, alteration in urine culture, to

evaluate treatment selection and outcome, and to compare the results with similar published studies.

MATERIAL AND METHODS

All patients were subjected to a detailed clinico-epidemiological work up for six months 2015-2016. 100 patients were evaluated. Complete hemogram, urine analysis, urine culture, serum biochemistry including urea, creatinine were performed in all patients. Calcium, phosphorus, uric acid, 24 hours urine study for urinary excretion of calcium, phosphorus and uric acid were performed in selected patients. Institutional ethical committee clearance was obtained and informed, written valid consent was obtained from all the patients.

Inclusion criteria

All in-patients admitted in Department of General surgery aged 12 years or more presented with ureteric calculi.

Exclusion criteria

1. Ureteric calculi patients treated as out patients in General surgery OPD
2. Patients with Calculus involving other than ureter.
3. Incidentally detected ureteric calculi.
4. Ureteric calculi associated with other anomalies like neurogenic bladder, stricture urethra

Study design

This was an observational study conducted in our institution Thanjavur Medical college Hospital during the period 2015 to 2016. Radiological investigations included plain x-ray 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.

Cystoscopic stent removal was done who were intervened by ureteroscopy or open surgery.

Patients were asked to come for follow up 1 month and 6 month after therapeutic procedures. Ultrasonogram of KUB was done during follow up period, and treated accordingly.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for making tables and statistical analysis. Descriptive statistics like mean and percentages were used to interpret the results.

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RESULTS

In Frequency of patients with their stone size, most study patients had the ureteric stone size of 6mm to 7mm. 86 % stones were less than 1 cm² (table 1). In age groups, 84 % of patients were below 40 years (table 2). Most of calculi site were found to be lower ureter and UV junction, 46% of patients had their stone at lower ureter and UV junction. 37% of patients had their stones in upper ureter (table 3). Clinically, 70% of patients had hematuria. Most patients had hydronephrosis. Only 15% of patients had positive urine culture (table 4). 41 patients were managed medically, of those 16 patients with lower ureteric stones, 7 patients with middle ureteric stone and 16 patients with upper ureteric stones were managed medically. Maximum size of the stone passed spontaneously was 10 mm (table 5). Ureteroscopic management were done for 41 patients, in which 26 patients with lower ureteric stone, 4 patients with middle ureteric stone, 11 patients with upper ureteric stone were managed endoscopically. Maximum size of the stone removed endoscopically was 12 mm (table 6). Surgical management was done in 21 patients, of which 2 patients only underwent ureterolithotomy for lower ureteric calculi. 6 patients underwent surgery for middle ureteric calculi. 13 patients underwent surgery for upper ureteric calculi (table 7).

Most common organism cultured in patient with ureteric calculi was E.coli which accounts for 53%. E. coli was sensitive to all third generation cephalosporins like *cefotaxime*.

The peak age incidence of ureteric calculi was found in the age group of 21-49 years and the male to female ratio was 1.7:1. There was no specific laterality noted in this study. Right and left side of ureter had equal number of distribution. 54% of patients had ureteric stones above pelvic brim. 86% of stones were less than 1 cm size. 15% of patients had positive urine culture mainly E.coli as causative organism. Colicky abdominal pain, hematuria and fever were the main presenting problems. Most patients with ureteric calculi had normal renal function tests. USG was the main investigation for diagnosing ureteric calculi. Lower ureteric stone of size 5mm or less passed spontaneously with stone passage rate of 72.4%. It is concluded that symptomatic management with observation is preferred in lower ureteric calculi with stone size of 5mm or less. Ureteroscopic stone removal is the preferred line of management in patients with lower ureteric calculi of size more than 5mm. Ureterolithotomy or pyelolithotomy was the line of management in patients with large stone size (greater than 1 cm), difficult location and correction of associated problems.

DISCUSSION

A total of 100 patients were included in this study. Of these the maximum incidence of ureteric calculi appeared in the age

group of 21 to 49 years age group (60%). Several authors have reported 30 to 50 years age as the period of maximum incidence of urinary calculi.¹ Of the 100 patients, 38 patients (38%) were females. The sex incidence ratio was 1.7:1. Several authors have reported sex incidence from 1:1 to 3:1. 98% patients presented with colicky abdominal pain², which is the commonest symptom in ureteric calculi. 70% of patients presented with microscopic or macroscopic hematuria.³ 66% of patients had associated

Serial no	Stone size	Number	Percentage
1	4 mm	10	10%
2	5 mm	12	12%
3	6 mm	21	21%
4	7 mm	16	16%
5	8 mm	14	14%
6	9 mm	7	7%
7	10 mm	6	6%
8	11 mm	8	8%
9	12 mm	5	5%
10	13 mm	1	1%
Total		100	

Table-1: Frequency of patients with their stone size

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

Table-2: Age distribution

Serial number	Site	No. of patients
1	PUJ	7
2	Upper	30
3	Middle	17
4	Lower	27
5	UVJ	19
Total		100

Table-3: Frequency of patients with Site of ureteric stone

Observation	No of patients	Percentage
Gross hematuria	45	45%
Micro. Hematuria	25	25%
Fever	66	66%
Positive urine culture	15	15%
Hydronephrosis	86	86%

Table-4: Clinical presentation

Location of stone		Stone size(mm)								Total
Lower	Size(mm)	4	5	6	7	8	9	10	11	16
	No.	2	6	3	3	1	0	1	0	
Middle	Size(mm)	4	5	6	7	8	9	10	11	7
	No.	1	2	1	1	1	1	0	0	
Upper	Size(mm)	4	5	6	7	8	9	10	11	16
	no.	6	1	3	2	2	2	0	0	
Total										39

Table-5: Medical management

Location of stone		Stone size (mm)									Total
Lower	Size (mm)	4	5	6	7	8	9	10	11	12	26
	No.	1	2	7	6	3	2	4	2	0	
Middle	Size (mm)	4	5	6	7	8	9	10	11	12	4
	No.	0	0	1	0	2	0	0	0	1	
Upper	Size (mm)	4	5	6	7	8	9	10	11	12	11
	No	0	1	3	2	4	0	0	1		
Total											41

Table-6: Ureteroscopic management

Location of stone		Stone size(mm)									Total
Lower	Size (mm)	5	6	7	8	9	10	11	12	13	2
	No.	0	0	0	1	0	1	0	0	0	
Middle	Size (mm)	5	6	7	8	9	10	11	12	13	6
	No.	0	0	1	0	2	0	2	1	0	
Upper	Size (mm)	5	6	7	8	9	10	11	12	13	13
	No.	0	2	2	1	1	0	3	3	1	
Total											21

Table-7: Uretero lithotomy/ pyelolithotomy

Organism	No.	%
E. Coli	8	53
Klebsiella	4	27
Proteus	2	13
Pseudomonas	1	7
Total	15	100

Table-8: Positive urine culture micro organisms

fever.

37 patients (37%) had calculi in the upper ureter including pelviureteric junction which is explained by its narrowest part of ureter. 54% patients had ureteric stones above pelvic brim. In carstensen's series, it was 68%.⁴ Majority of the stones were less than 1 cm in size (86%) while 14% of stones were between 1 to 2 cm. This relatively low incidence of larger stones may probably be due to patients seeking medical attention immediately once they developed pain.

The largest stone in our series measured 13 mm. There is no specific laterality noted in this study population. Equal distribution was there between right and left sides of the ureter. Drash and Segura have noted a 55% preponderance to the left.⁵ In Higgins series, it was 53%. 86% of patients presented with hydronephrosis.⁶ Of these, only 5 patients had palpable mass. 15 % of individuals had positive urine culture, mainly E.coli as causative organism, which was sensitive to third generation cephalosporins like cefotaxime. Remaining organisms includes Proteus, Klebsiella and pseudomonas. E-coli formed the major organism in various studies.⁶

Renal function tests namely blood urea and serum creatinine were done in all patients. 15 patients had marginal elevation in renal parameters. 2 patients had renal failure associated with urosepsis for which emergency surgical intervention were done. A plain X –ray of abdomen and pelvis is the simplest test to obtain; however, radiolucent stones, such as uric acid stones and cystine stones, may not be visualized⁷, and stool in the colon may make it difficult to identify smaller stones in the ureter. The test of choice at our institution for diagnosing an acute stone is ultra sonogram, which identifies site, size, and associated hydronephrosis.

Three stones were passed spontaneously after a variable observation of one to seven days.⁸ Of them, 18 patients had stone size of 5mm or less. Subsequent scan showed disappearance of stones hydronephrosis and relief of symptoms. 41% of patients had undergone retrograde ureteroscopy, of them 40 patients had successful retrieval of stones. Selection of ureteroscopy depends on the size and location of stones. With the wide usage of ureteroscope, all ureteric stones were tried to remove by endoscopy.⁹ 21 patients (21%) were underwent open surgical management in the form of ureterolithotomy and pyelolithotomy.¹⁰ Post operative periods were uneventful. Among the medically managed 39 patients, lower ureteric calculi were found in 16 patients. Upper ureteric calculi were found in 16 patients. Middle ureteric calculi were found in 7 patients. 8 out of 11 patients who had the stone size of 5mm or less in lower ureter were passed spontaneously. 8 out of 33 patients who had the stone size of more than 5mm in lower ureter were passed spontaneously. The maximum size of the stone that passed spontaneously from lower ureter was 10mm.¹¹ The maximum size of stone that passed spontaneously from upper ureter was 9mm. 16 out of 40 patients who had stones in the upper ureter were passed spontaneously, with a passage rate of 40%. 7 out of 14 patients who had stones in the middle ureter were passed spontaneously. The maximum size of stone that passed is 9 mm.¹² Among the 41 patients who underwent ureteroscopic stone removal, 26 patients were from lower ureteric region, 4 patients from middle ureteric region, 11 patients from upper ureteric region. The maximum size of the stone that was removed by ureteroscopy was 12mm in size. 50% (13 out of 26) of stones removed from lower ureter was 6mm or 7mm in size. Ureteroscopic removal of stone for lower ureteric calculi is preferred line of treatment than open surgical procedures.

Among the 21 patients who underwent ureterolithotomy or pyelolithotomy, 13 patients [62%] had their stones in the upper ureter. Upper ureteric stones were removed commonly by open surgery when its size was more than 10mm. The maximum size of the stone that was removed by open surgery was 13mm in our study.

All patients were stayed for an average period of 7 to 10 days as compared to 3 to 5 days after endoscopic stone removal. Few patients were discharged the next day of endoscopy. No one reported pain after endoscopy. Morbidity related to endoscopic procedure was minimal¹³ hence this should be the first line of management even in patients with upper ureteric calculi. Only one patient with upper ureteric calculus of size 8mm was not removed by ureteroscopy, which was removed by open surgery.¹⁴ All patients who underwent open surgery were followed in post-operative period 1 month, and after 6 month period. They were undergone follow up Ultra sonogram of KUB. Only 2 patients had non obstructive renal calculi which were managed conservatively.¹⁵ Ureteric stents were removed by cystoscopy.

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CONCLUSION

The past several decades have seen profound advancements in the management of upper urinary tract urolithiasis. SWL, URS, and PCNL have rendered open stone surgery virtually obsolete. Although factors such as obesity, stone fragility, and unfavorable stone location present challenges to the urologist, new instruments such as smaller caliber ureteroscopes and laser fibers allow increasing numbers of stones to be managed with high success rates and minimal patient morbidity. It is imperative for surgeons to keep apprised of new technology and techniques to provide individualized treatments for each patient with greatest chance of success.

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