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Clinical Study and Management of Ureterolithiasis

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Abstract

Background: The management of ureteral calculi is constantly evolving, and advances in technology, new medications and the application of pharmacotherapy continue to alter our approach to ureterolithiasis. The optimal clinical management of patient with ureterlithiasis requires knowledge of the diagnostic procedures, the rational treatment of acute stone colic, stone expulsive treatment and the modern principles of stone removal. The aim of this study was to explore the clinical characteristics and management of ureterolithiasis. ***Methods:*** This cross-sectional descriptive study was conducted in the Department of Surgery and Urology, Sylhet MAG Osmani Medical College Hospital, Sylhet during the period from December 2013 to May 2014. Fifty eight patients with ureterolithiasis fulfilling the inclusion and exclusion criteria were selected. ***Results:*** The mean age of the patients was 36.0 ± 13.2 years, with the majority aged 31–40 years. All patients presented with abdominal pain, and 84.2% reported radiation of pain to the groin or genitalia. Other symptoms included nausea/vomiting (39.6%), hematuria (36.2%), and burning micturition (27.6%). Most stones (89.7%) measured between 1–2 cm. Treatments included ESWL (36.2%), ICPL (22.4%), open ureterolithotomy (31.0%), and expectant management (10.3%). Postoperative urinary tract infection occurred in 17.2% of cases; wound infection occurred in 11.1% of open surgery cases. Overall stone clearance was 86.2%, with the highest clearance in open ureterolithotomy (100%). ***Conclusion:*** With the availability of better facilities like Extracorporeal Shockwave Lithotripsy, the requirement for open surgery and interventional procedures may decrease.

Keywords: Ureterolithiasis, ureteric stones, stone clearance, ESWL, open ureterolithotomy, clinical presentation.

INTRODUCTION

Urinary stones are the third most common affliction of the urinary tract, exceeded only by urinary tract infections and pathologic conditions of the prostate (Benign prostatic hyperplasia and prostate cancer). Stone disease has been a major problem afflicting human population ever since the antiquity. [1]

Urolithiasis is one of the most prevalent urological disorders, [2] and the prevalence of urinary stones has increased in most countries. The formation of stones in the urinary tract affects 5–10% of the population, [3,4] with an estimated lifetime risk of 12% for white males, [5] and 5–6% for white females.[6] In the United Kingdom at least 1 renal stone will form in approximately 8% of male and 4% of female population and in the United States the male lifetime prevalence has increased to 15%. [7] An even higher frequency has been reported from other parts of world and there are only a few geographical areas in which stone disease is rare, e.g. in Greenland and in the coastal areas of Japan. [8] The life time recurrence rate is approximately 50%. [9]

In developing nations, bladder stones are more prevalent than upper urinary tract stones, whereas the reverse pattern is typically observed in developed

countries. These differences are largely attributed to dietary habits.[10] In Bangladesh, renal stone disease is commonly encountered, influenced by factors such as geography, dietary practices, economic conditions, chronic dehydration, heat exposure, and possibly genetic predisposition. [11] Urinary stones are most frequently seen in individuals between 20 and 49 years of age, with the highest incidence reported in the 35–45 age group. However, urolithiasis can occur at any age. In children, the condition is relatively rare, with approximately 5 to 10 cases annually in the United States among those aged 10 months to 16 years.[10] Among men, the peak age for stone formation is around 30 years, while women tend to have two peaks—at 35 and again at 55 years.[1] Additionally, seasonal variation has been noted, with increased urinary calcium oxalate saturation observed in men during the summer months and in women during early winter.[12]

A stone in the ureter usually comes from the kidney and ureteric stones (ureterolithiasis) Most are single small stones that are passed spontaneously. Deficiency of vitamin A, altered urinary solutes and colloids due to dehydration, decreased urinary citrate, renal infection, inadequate urinary drainage and urinary stasis, prolonged immobilization and hyperparathyroidism predispose urinary stone.[13]

The presentation of the typical patient with ureteral colic is well recognized as the stone progresses to the lower ureter, the waves of agonising loin pain are typically referred more to the groin, external genitalia and the anterior surface of the thigh. [13] The traditional diagnostic tools of KUB radiograph and intravenous urography remain the most useful methods of evaluation. Ultrasound combined with a KUB is usually diagnostic. [14]

OBJECTIVE

The objective of this study was to explore the clinical presentations and management of ureterolithiasis.

METHODOLOGY & MATERIALS

This cross-sectional descriptive study was conducted at the Department of Surgery and the Department of Urology, Sylhet M.A.G. Osmani Medical College Hospital, Sylhet, from 1st December 2013 to 31st May 2014. The study included patients admitted for surgical management of ureterolithiasis who fulfilled the inclusion criteria: age above 12 years and diagnosis of ureteric stone. Patients with associated renal or bladder stones, those below 12 years of age, or those with significant comorbidities rendering them unfit for surgery were excluded. A total of 58 patients were enrolled using a consecutive convenient sampling technique. The sample size was calculated using the Fruchter and Guilford formula, considering a 5% level of significance and a 3.96% prevalence of urolithiasis. Data were collected through a pre-validated, structured data sheet by the researcher himself. Each patient underwent a detailed clinical assessment and relevant investigations, including hemoglobin, serum creatinine, urine analysis, urine culture and sensitivity, ultrasonography, KUB radiograph, and intravenous urography. Eligible patients were treated either by open ureter lithotomy or endourological procedures such as ureteroscopy stone removal with DJ stenting, depending on clinical indication and stone characteristics. Procedures were performed under general or spinal anesthesia. Postoperative care included close monitoring of vital signs, fluid intake/output, and administration of analgesics, antibiotics, and sedatives as required. Catheters and drains were removed between the 6th and 8th postoperative days, and patients were discharged accordingly—typically on the 3rd day for endoscopic procedures and the 8th day for open surgeries. Follow-up was conducted two weeks post-discharge, with patients assessed for symptoms such as pain, hematuria, or urinary tract infections. All findings were documented systematically for analysis.

RESULTS

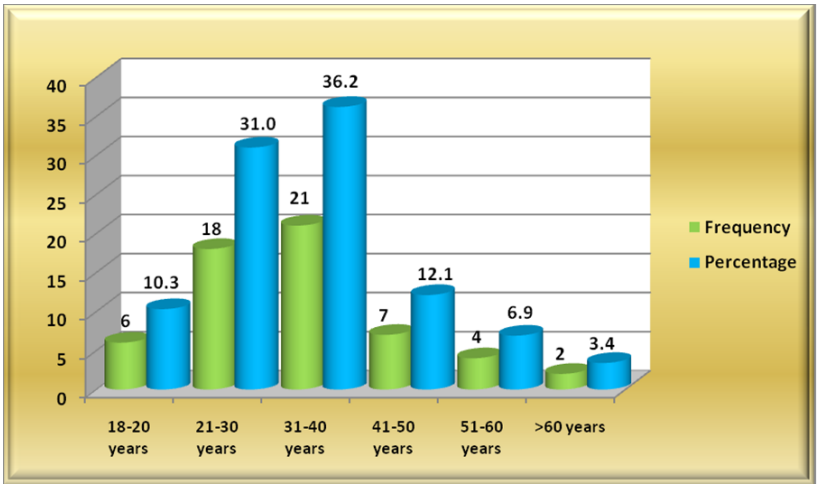

Figure 1: Age distribution of the patients (n=58)

The age of the patients ranged from 18 to 80 years with the mean age of 36.0 (SD ±13.2) years. Age distribution of the patients is shown in figure 1. Among the total 58 patients 21 (36.2%) patients were between 31 to 40 years, 18 (31.0%) patients were between 21 to 30 years, 7 (12.1%) patients were between 41-50 years, 6 (10.3%) patients were between 18-20 years, 4 (6.9%) patients were between 51-60 years and 2 (3.4%) patients were above 60 years.

Table 1: Mode of presentation (n=58)

Mode of presentation	Frequency	Percentage
Abdominal pain	58	100.0
Radiation pain	49	84.5
Haematuria	21	36.2
Burning micturition	16	27.6
Nausea/ Vomiting	25	39.6
Fever	13	22.4

In the present study all the patients presented with pain abdominal pain. 84.2% of the patients had radiation of pain from loin to the groin, genitalia or to the thigh. Other common clinical presentations were haematuria (36.2%), burning micturition (27.6%), nausea/ vomiting (39.6%) and fever (22.4%). Mode of presentation was shown in table 1.

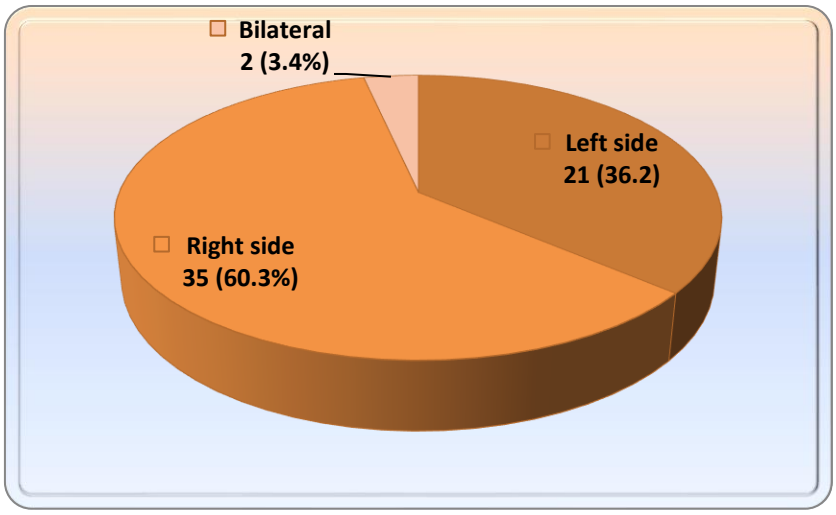

Figure 2: Distribution of the patients by side of involvement (n=58)

Figure 2 showed the distribution of the patients by side of involvement. Among the total 62 patients right side involved in 35 (60.3%) patients, left side involved in 21 (36.2%) patients and bilateral involvement was in 2 (3.4%) patients.

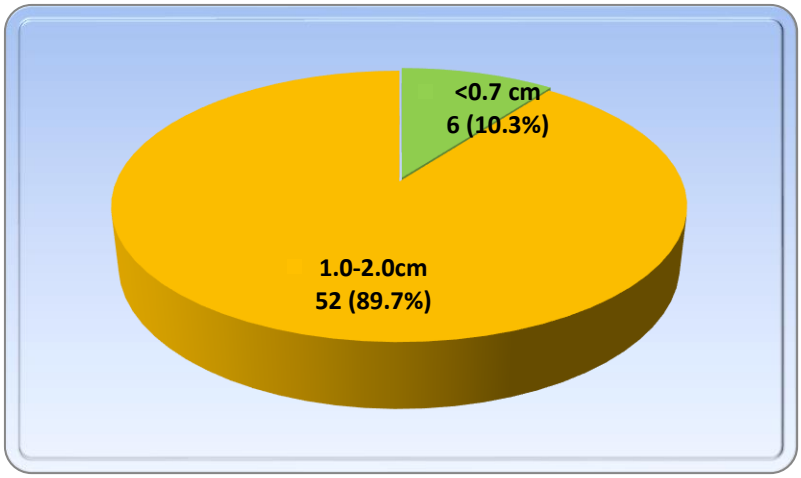

Figure 3: Distribution of patients by size of the stone (n=58)

Size of the stone ranged from 0.5 to 2 cm with the mean of 1.72 (SD ± 0.46) cm. Most of the ureteric stones were between 1-2 cm (89.7%) and 10.3% stones were less than 1.0 cm. Figure 3 showed the distribution of patients by size of the stone.

Table 2: Distribution of the patients by treatment options of ureterolithiasis (n=58)

Treatment options	Frequency	Percentage
ESWL	21	36.2
Ureterolithotomy	18	31.0
Expectant	6	10.3
ICPL	13	22.4

ESWL: Extracorporeal shock wave lithotripsy; ICPL: Intracorporeal pneumotic lithotripsy

Table 2 showed the distribution of the patients by treatment. Treatment were expectant management (medical therapy) in 6 (10.3%) cases, extracorporeal shock wave lithotripsy (ESWL) in 21 (36.2%), intracorporeal pneumotic lithotripsy (ICPL) in 13 (22.4%) and open ureterolithotomy in 18 (31.0%).

Table 3: Distribution of the patients by postoperative complications

Postoperative complications	Frequency	Percentage
Urinary tract infection	10	17.2
Wound infection	2	11.1

Table 3 showed the distribution of the patients by postoperative complications. Among the patients underwent intervention (both endo and open surgery) treatment (n=52) urinary tract infection developed in 10 (17.2%) patients; while among the patients underwent open ureterolithotomy (n=18) wound infection developed in 2 (11.1%) patients.

Table 4: Distribution of the patients by short term outcome of treatment of ureterolithiasis (n=58)

Treatment options	Clearance of stone	
	Frequency	Percentage
Expectant (n=6)	5	83.3
ESWL (n=21)	17	80.9
ICPL (n=13)	10	76.9
Ureterolithotomy (n=18)	18	100.0

ESWL: Extracorporeal shock wave lithotripsy; ICPL: Intracorporeal pneumotic lithotripsy

Table 4 showed the distribution of the patients by short term outcome of treatment of ureterolithiasis. Clearance of stone by extracorporeal shock wave lithotripsy (ESWL) was 80.9%, by open ureterolithotomy was 100.0%, by intracorporeal pneumotic lithotripsy was 76.9% and by expectant management was 83.3% of cases. Total clearance of stone was 86.2% of cases.

DISCUSSION

This cross-sectional descriptive study was carried out in the Department of Urology, in collaboration with the Department of Surgery, at Sylhet M.A.G. Osmani Medical College Hospital, Sylhet, from December 2013 to May 2014, with the aim of evaluating the clinical presentation and treatment outcomes of ureterolithiasis using various management approaches. For this purpose, 58 patients with ureteric stones fulfilling the inclusion and exclusion criteria were selected. The outcome of the study is discussed below:

In this study the age of the patients ranged from 18 to 80 years with the mean age of 36.0 (SD ±13.2) years. This result correlates with the study of Mohayuddin *et al.,*[15] where the mean age of the patient was 34.3 ± 11.35 years. Wazir *et al.,*[16] reported the mean age was 40.15 years in urinary stone disease. Demirbas *et al.,*[17] found that the mean age of the urteric stone was 40.6 ± 12.5 years. Ghoneim *et al.,*[18] found the mean age of the patients with ureteric stone was 41.9 (± 11.05 years). This study also showed the maximum patients that 21 (36.2%) were between 31 to 40 years, 18 (31.0%) patients were between 21 to 30 years, 7 (12.1%) patients were between 41-50 years, 6 (10.3%) patients were between 18-20 years, 4 (6.9%) patients were between 51-60 years and 2 (3.4%) patients were above 60 years. This result is supported by Wazir *et al.,* [16] where 33.6 % of patients of urinary stone disease were between 31 to 40 years, 25.3% patients were between 41 to 50 years, 20.8% patients were between 51 to 60 years, 20.3% patients were between 20 to 30 years.

In this present study all the patients were presented with abdominal pain and 84.2% of the patients had radiation of pain from loin to the groin, genitalia or to the thigh. Other common clinical presentations were hematuria (36.2%), burning micturition (27.6%), nausea/

vomiting (39.6%) and fever (22.4%). A similar study by Morse *et al.,*[19] showed main presenting symptom was pain (87%), in addition 20% of the patients had vomiting and 3% had hematuria.

Among the total 62 patient's right ureter was involved in 35 (60.3%) patients, left ureter in 21 (36.2%) patients and bilateral involvement was in 2 (3.4%) patients. In this regards Choi *et al.,*[20] found that 51.0% of ureteric stone occurred in right side and 49.0% occurred in left side. Ghoneim *et al.,*[18] reported equal involvement of ureteric stone of left and right side.

In this study size of the stones ranged from 0.4 to 2 cm with the mean of 1.72 (SD ± 0.46) cm. Most of the ureteric stones were between 1-2 cm (89.7%) and 10.3% stones were less than 1.0 cm.

In the present study, treatment modalities included extracorporeal shock wave lithotripsy (ESWL) in 21 cases (36.2%), open ureterolithotomy in 18 cases (31.0%), intracorporeal pneumolithotripsy (ICPL) in 13 cases (22.4%), and expectant (medical) management in 6 cases (10.3%). In comparison, a study conducted by Holman *et al.,*[21] reported that 12.1% of patients underwent ureteroscopic procedures, while only 4.5% required open ureterolithotomy. Remaining patients were treated with ESWL. This study also showed that clearance of stone by extracorporeal shock wave lithotripsy (ESWL) was 80.9%, by open ureterolithotomy was 100.0%, by intracorporeal pneumotic lithotripsy was 76.9% and by expectant management was 83.3% of cases. Total clearance of stone was 86.2% of cases. In this regards Randal *et al.,*[22] showed 50% success rate for proximal, 80% for mid and 99% for distal ureteric calculi. In a recent study Turk *et al.,*[23] reported a stone free rate of 95% for ureteroscopic removal of stones in the lower third of ureter with a 5% short term complication rate and no long term sequelae. In this study, Ureterolithotomy was done in 18 (31.0%) patients with impacted stones and calculus size greater than 1.5cms. It had 100% success rate and was complicated by wound infection in 11.1% cases.

Open surgery for ureteric stones is now reserved for managing the complications of other forms of stone removal, but is rarely if ever indicated as a primary manoeuvre. [24] Mohayuddin *et al.,*[15] reported that the stone clearance rate following ESWL was 77.5% in the stented group and 87.5% in the non-stented group (p = 0.57), with a mean stone size of 19.3 ± 0.126 mm. Similarly, Musa *et al.,*[25] found a stone-free rate of 88% in the stented group compared to 91% in the unstented group, where the average stone size was 16 mm (range: 10–20 mm). Chandhoke *et al.,*[26] also observed comparable results, with an 84% stone-free rate in patients without a JJ stent and 80% in those with a stent, with a mean stone size of 13.2 ± 0.8 mm. Ghoneim *et al.,*[18] reported stone-free rates at 3 months of 90% in the stented group versus 86.7% in the non-stented group (p = 0.346). In the present study, all patients who underwent ESWL were pre-stented with a JJ stent prior to the procedure.

In this study among the patients underwent intervention (n=52), urinary tract infection developed in 10 (17.2%) patients; while among the patients underwent open ureterolithotomy (n=18) wound infection developed in 2 (11.1%) patients.

LIMITATIONS OF THE STUDY

This study had several limitations. Firstly, it was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to the broader population. Secondly, the sample size was relatively small due to the limited duration of the study period. Lastly, long-term outcomes and complications could not be assessed as the follow-up period was short, restricting the ability to evaluate the sustained effectiveness of the treatment modalities used.

RECOMMENDATIONS

The present study offers several recommendations based on the observed findings. Stones measuring less than 0.7 cm in diameter may be effectively managed with expectant (medical) therapy. Endourological procedures have proven to be valuable treatment options, particularly for calculi located in the lower ureter and in cases without complications. Open surgery remains a relevant and practiced modality, especially for larger stones and in complicated cases where minimally invasive techniques may not be suitable. Additionally, further research involving larger sample sizes and multiple centers is recommended to comprehensively evaluate the effectiveness and long-term outcomes of various treatment approaches, enabling more robust and generalizable conclusions

CONCLUSION

Ureteric calculi show a peak incidence in the 2nd and 3rd decade accounting for 36.2% and 31.0% of the cases respectively with the mean age of presentation is 36.0 (SD ±13.2) years. Abdominal pain was the main presenting symptom (100%) in all the patients with radiation of pain in most cases (84.5%). Vomiting (39.6%) and hematuria (36.2%) are other significant symptoms. Bilateral calculi were present in minority (3.4%) of the patients and right (60.3%) sided predilection was observed in the cases of unilateral stones. Endourological procedures are useful in most of the patients with calculi in ureter especially in lower ureter and in uncomplicated cases. A good percentage (83.3%) of stone less than 0.7cm size passed spontaneously with expectant therapy. Open surgery is still a practiced modality of treatment for ureteric calculi especially in large calculi and complicated cases. Post-operative complication was UTI (17.2%) in those with endourological procedures. Wound infection (11.1%) was a significant complication after open surgery. With

the availability of better facilities like Extracorporeal Shockwave Lithotripsy, the requirement for open surgery and interventional procedures may decrease.

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Conflicts of Interest: There are no conflicts of interest.

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