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Treatment Modalities and Postoperative Outcomes in Ureterolithiasis

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Abstract

Background: *Ureterolithiasis is a common urological emergency with varying management strategies, ranging from medical expulsive therapy to surgical interventions. Optimal treatment selection depends on multiple factors, including stone size, location, and the availability of healthcare resources. Despite advances in minimally invasive techniques, limited data exist from resource-constrained settings comparing outcomes across different treatment modalities. This study aimed to evaluate the treatment modalities and short-term postoperative outcomes of patients with ureterolithiasis in a tertiary care hospital.*

Methods: *A cross-sectional descriptive study was conducted at Sylhet MAG Osmani Medical College Hospital from December 2013 to May 2014. Fifty-eight patients with ureterolithiasis who underwent conservative or interventional treatment were enrolled in the study. The treatment modalities included extracorporeal shock wave lithotripsy (ESWL), intracorporeal pneumatic lithotripsy (ICPL), open ureterolithotomy, and expectant medical therapy. Data on demographic characteristics, treatment distribution, complications, and stone clearance were analyzed using SPSS (version 21).*

Results: *The majority of patients were male (62.1%) and aged 31–40 years (36.2%). ESWL was the most common treatment (36.2%), followed by open ureterolithotomy (31%) and ICPL (22.4%). Open surgery demonstrated the highest stone clearance rate (100%), followed by expectant management (83.3%), ESWL (80.9%), and ICPL (76.9%). Postoperative complications were infrequent, with urinary tract infections (17.2%) being the most common complication.*

Conclusion: *Open ureterolithotomy yielded superior clearance rates, although minimally invasive techniques remain effective and preferred where available. Individualized treatment decisions guided by clinical and logistical factors are essential for optimizing outcomes in ureterolithiasis.*

Keywords: *Ureterolithiasis, ESWL, ICPL, ureterolithotomy, stone clearance, postoperative outcomes.*

1. Introduction

Ureterolithiasis, the presence of calculi in the ureter, is a common urological condition that significantly contributes to patient morbidity due to acute flank pain, hematuria, and potential obstruction of urinary flow. The global burden of urolithiasis has been rising steadily over the past few decades, with a notable increase in both developed and developing countries [1, 2].

The lifetime prevalence of urolithiasis in the United States has been reported to be as high as 13%, and similar trends are being observed in

Asian populations, likely due to dietary shifts, dehydration, and metabolic disorders [3,4]. Ureteral stones account for approximately 20% of all urinary tract calculi, with the distal ureter being the most common site [5].

Multiple treatment modalities exist for ureterolithiasis, ranging from conservative medical therapy to minimally invasive and open surgical interventions. Medical expulsive therapy (MET), often utilizing alpha-blockers such as tamsulosin, has demonstrated varying efficacy in facilitating spontaneous passage of distal ureteral stones, especially those under 10 mm in diameter [6,7]. Despite the promise shown in some trials, large randomized controlled studies have reported mixed outcomes regarding the effectiveness of MET, making it a subject of ongoing debate [8].

Extracorporeal shock wave lithotripsy (ESWL) remains a mainstay for treating small-to-moderate-sized ureteric stones due to its non-invasive nature and acceptable clearance rates. However, its success is highly dependent on stone size, location, and composition [9]. Ureteroscopy, particularly when combined with intracorporeal pneumatic or laser lithotripsy, has emerged as a preferred modality for more complex cases, demonstrating high stone-free rates with relatively low morbidity [10,11]. Open ureterolithotomy, once the standard, is now reserved primarily for cases where endourological options fail or are contraindicated [12].

The choice of intervention is influenced by several factors including stone characteristics (size, location, composition), patient factors (comorbidities, anatomical variations), and institutional resources [13]. While minimally invasive approaches are increasingly favored, they are not devoid of complications such as postoperative urinary tract infections, bleeding, or incomplete stone clearance [14]. Furthermore, there is limited region-specific data comparing the efficacy and safety of these modalities in low-resource settings, particularly in South Asia, where delayed presentation and limited access to advanced urological equipment may necessitate alternative strategies [15].

The current study aims to address this gap by evaluating and comparing the treatment modalities and postoperative outcomes in patients with ureterolithiasis at a tertiary care hospital in Bangladesh. By analyzing demographic trends, complication rates, and short-term stone clearance outcomes across various interventions, this study seeks to provide practical insights into optimizing the management of ureteric stones, especially in resource-constrained settings.

2. Methodology & Materials

This cross-sectional descriptive study was conducted in the Department of Surgery and the Department of Urology, Sylhet MAG Osmani Medical College Hospital, Sylhet, from 1st December 2013 to 31st May 2014. A total of 58 patients diagnosed with ureterolithiasis and undergoing surgical or endourological treatment were included in the study.

3. Sample Selection

3.1. Inclusion Criteria

- Patients diagnosed with ureterolithiasis
- Aged above 12 years
- Regardless of gender

3.2. Exclusion Criteria

- Ureteric stone with concurrent renal or bladder calculi
- Children under 12 years of age
- Patients with significant comorbidities (e.g., uncontrolled diabetes, hypertension, hepatic or renal diseases) are contraindicated for surgery
- Patients were selected using a consecutive and convenient sampling technique.

The study was approved by the Institutional Ethical Committee of Sylhet MAG Osmani Medical College. Patients admitted for surgical or endoscopic management of ureterolithiasis were screened for eligibility. After a detailed history and physical examination, relevant investigations, including blood tests, urine analysis and culture, ultrasonography, KUB radiography, and intravenous urography, were conducted. Eligible patients were included after providing written informed consent.

Interventions included open ureterolithotomy or endourological procedures (ureteroscopic stone removal with DJ stent insertion) under general or spinal anesthesia. Postoperative monitoring included input-output charting, vital sign recording and infection surveillance. Discharge occurred on the 3rd postoperative day for endoscopic procedures an3d the 8th day for open surgery. A follow-up was conducted two weeks post-discharge. Data were entered and analyzed using SPSS Version 21. Confidentiality was strictly maintained throughout the study period.

4. RESULTS

Table 1. *Demographic Characteristics of the Study Population (n = 58)*

Characteristics		Total (n)	Percentage (%)
Age Group (Years)	18–20	6	10.3
	21–30	18	31.0
	31–40	21	36.2
	41–50	7	12.1
	51–60	4	6.9
	>60	2	3.4
Sex	Male	36	62.1
	Female	22	37.9

Table 1 presents the demographic characteristics of the study population in detail. The majority of patients were between 21 and 40 years of age, with 36.2% aged 31–40 and 31.0% aged 21–30. A smaller proportion fell within the age brackets of 41–50 (12.1%), 18–20 (10.3%), 51–60 (6.9%), and > 60 years (3.4%). Regarding sex distribution, males represented 62.1% (n = 36), while females accounted for 37.9% (n = 22), indicating a higher prevalence of ureterolithiasis among males in this cohort than among females.

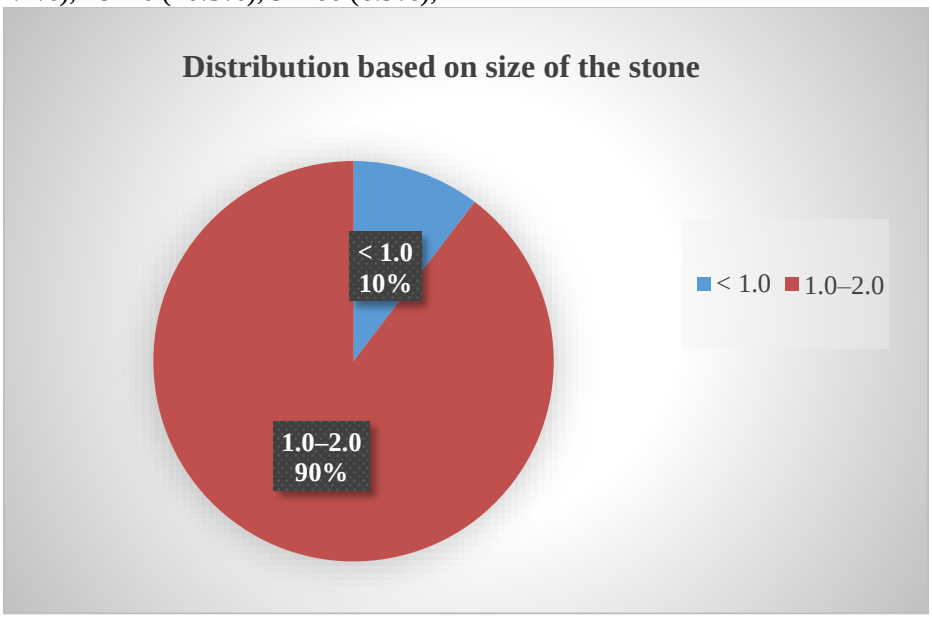

Figure 1. *Distribution of Patients by Stone Size (n = 58)*

Figure 1 illustrates the distribution of patients according to stone size. Stone sizes varied among the patient population, although the exact numerical distribution is not tabulated here. This figure complements the demographic data by providing visual insights into the variability of stone burden among patients undergoing treatment.

Table 2. *Treatment Modalities Used in the Management of Ureterolithiasis (n = 58)*

Treatment Modality	Frequency (n)	Percentage (%)
Extracorporeal Shock Wave Lithotripsy (ESWL)	21	36.2
Open Ureterolithotomy	18	31
Intracorporeal Pneumatic Lithotripsy (ICPL)	13	22.4
Expectant (Conservative Medical Therapy)	6	10.3

Table 2 describes the treatment modalities employed for the management of ureterolithiasis. Extracorporeal Shock Wave Lithotripsy (ESWL) was the most commonly used treatment, accounting for 36.2% (n = 21) of the patients. Open ureterolithotomy was performed in 31.0% (n = 18) of the patients, whereas intracorporeal pneumatic lithotripsy (ICPL) was performed in 22.4% (n = 13). A smaller group (10.3%, n = 6) received expectant (conservative) management.

Table 3. *Postoperative Complications Among Interventional Patients (n = 52)*

Complication	Frequency (n)	Percentage (%)
Urinary Tract Infection	10	17.2
Wound Infection	2	11.1

Table 3 presents the postoperative complications in patients who underwent interventional procedures. The most frequent postoperative complication was urinary tract infection (UTI), which was observed in 10 patients (17.2%). Wound infections occurred in two patients (11.1%). Notably, this table only covers interventional patients, excluding those who were managed conservatively.

Table 4. *Short-Term Stone Clearance Outcomes by Treatment (n = 58)*

Treatment Modality	n	Stone Cleared (n)	Clearance Rate (%)
Expectant Management	6	5	83.3
ESWL	21	17	80.9
ICPL	13	10	76.9
Open Ureterolithotomy	18	18	100

Table 4 outlines the short-term stone clearance outcomes by treatment modality. Open ureterolithotomy demonstrated a 100% stone clearance rate (n = 18/18). ESWL achieved an 80.9% clearance rate (n = 17/21), followed by ICPL at 76.9% (n = 10/13). Expectant management yielded an 83.3% (n = 5/6) clearance rate.

5. Discussion

This study evaluated the comparative efficacy of treatment modalities and short-term postoperative outcomes in patients with ureterolithiasis at a tertiary care center in Bangladesh. Among the 58 patients, minimally invasive procedures such as extracorporeal shock wave lithotripsy (ESWL) and intracorporeal pneumatic lithotripsy (ICPL) were preferred over open ureterolithotomy, yet the latter demonstrated superior stone clearance outcomes. These findings echo broader trends in urological practice while emphasizing the need to balance treatment efficacy, invasiveness, and resource availability.

The demographic distribution observed in this study—predominance of males (62.1%) and highest prevalence in the 31–40 age group—aligns with global epidemiological data on urolithiasis. Romero et al. and Scales et al. noted a higher incidence of urinary stones among males, particularly in their third and fourth decades of life, which is thought to be linked to dietary habits, occupational exposure, and metabolic risk factors [1, 3].

Our study found that ESWL was the most commonly used intervention (36.2%), followed by open ureterolithotomy (31.0%) and ICPL (22.4%). This preference for ESWL is consistent with global practice due to its non-invasiveness and reduced recovery time. However, its stone clearance rate (80.9%) was inferior to that of open surgery, which achieved 100% clearance. Sokouti et al. conducted a systematic review and meta-analysis that confirmed lower success rates for ESWL compared to ureteroscopic interventions, especially for impacted or proximal ureteral stones [16].

ICPL showed a moderate clearance rate of 76.9%, aligning with the findings of Aboumarzouk et al. (2012), who demonstrated that ureteroscopic lithotripsy with laser or pneumatic devices offers reliable outcomes, particularly for stones under 2 cm [17]. However, the relatively lower success rate in our study could be attributed to the unavailability of flexible ureteroscopes or advanced lithotripters in low-resource settings, a factor also highlighted by Geraghty et al. (2018) in their economic evaluation of stone treatments [10].

Interestingly, expectant (conservative) management achieved a high clearance rate (83.3%) in a limited number of patients, likely due to smaller stone sizes and favourable anatomical conditions. Although medical expulsive therapy (MET) has been debated, studies such as that by Ye et al. and Meltzer et al. suggest that tamsulosin can expedite stone passage and reduce the need for surgical intervention in selected cases [7, 18]. However, Pickard et al. cautioned that MET's effectiveness remains inconclusive when evaluated across larger, placebo-controlled trials [6].

Postoperative complications in our study were relatively infrequent. Urinary tract infections (17.2%) and wound infections (11.1%) were the most reported. These findings are in line with Chew et al., who emphasized the importance of perioperative antibiotic prophylaxis in preventing infections during ureteroscopy [14]. Blackmur et al. and Kaczmarek et al. further identified prolonged operative times, impacted stones, and preexisting infections as key risk factors for postoperative urosepsis [19, 20]. The low incidence of complications in our cohort may reflect effective perioperative protocols, though a larger sample would be required to generalize safety outcomes.

From a resource-utilization perspective, Schulz et al. demonstrated that while ESWL may offer initial cost benefits, recurrent interventions often result in increased long-term expenditures, especially when stone-free rates are suboptimal [21]. Konnopka et al. extended this analysis by highlighting the economic burden associated with repeated procedures and complications. In contrast, open ureterolithotomy—though more invasive—may be more cost-effective in specific populations due to its definitive nature [22].

Our findings underscore a critical issue in the developing world: the reliance on open surgery in cases where advanced endourological tools are unavailable or unaffordable. While global trends are shifting toward less invasive techniques, regional differences in infrastructure and training necessitate flexible treatment strategies. As noted by Yurdakul et al., even systemic issues like staffing shortages and pandemic-related resource shifts have influenced treatment availability and outcomes [23].

Furthermore, the follow-up duration in our study was limited to two weeks post-discharge. Although this provides insight into short-term clearance, it does not account for recurrence or long-term complications. Studies by Legemate et al. and Phillips et al. emphasized the importance of long-term monitoring, particularly for high-risk patients or those with residual fragments [11, 24].

In summary, this study confirms the efficacy of open ureterolithotomy in achieving complete stone clearance, while also demonstrating the clinical utility of ESWL and ICPL in selected cases. It highlights the delicate balance between adopting minimally invasive techniques and addressing the realities of local healthcare infrastructure. Future efforts should aim to expand access to advanced endourology tools, improve perioperative care, and promote individualized treatment planning based on patient-specific and system-specific factors.

6. Conclusion

This study compares the effectiveness and outcomes of treatment modalities for ureterolithiasis. Open ureterolithotomy achieved 100% stone clearance, surpassing ESWL and ICPL. However, minimally invasive approaches remained preferred due to reduced morbidity and shorter hospital stays. The low complication rates across modalities support the safety of surgical and end urological interventions. These findings underscore individualized treatment selection based on stone characteristics, resources, and patient suitability. The study provides insight into optimizing ureteric stone management in both resource-rich and resource-constrained settings.

Conflicts of Interest

There are no conflicts of interest.

Ethical Approval

The study was approved by the Institutional Ethics Committee.

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