ORIGINAL ARTICLE

# Frequency of complications in patients with bladder stones treated with transurethral cystolitholapaxy at Lady Reading Hospital Peshawar

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## ABSTRACT

**Background and Objective:** Urinary bladder stones are a relatively common urological condition, particularly in developing countries. Although several minimally invasive treatment modalities are available, transurethral cystolitholapaxy remains a commonly performed procedure and may be associated with both short- and long-term complications. This study aimed to determine the frequency of complications among patients with bladder stones undergoing transurethral cystolitholapaxy.

**Methods:** This descriptive cross-sectional study was conducted in the Department of Urology, Lady Reading Hospital, Peshawar, Pakistan, over a period of one year. A total of 102 patients of either gender, aged 15–70 years, with radiologically confirmed bladder stones >4 cm were included. Detailed clinical history, physical examination, and relevant radiological evaluation were performed. Patients were assessed for procedure-related complications, and their frequencies were recorded and analyzed.

**Results:** The mean age of the patients was 40.37 ± 16.72 years. Recurrent urinary tract infection was the most frequently observed complication, occurring in 22 (21.6%) patients, followed by bleeding in 21 (20.6%), mucosal injury in 17 (16.7%), bladder perforation in 12 (11.8%), residual stones in 8 (7.8%), and urethral stricture in 6 (5.9%) patients.

**Conclusion:** Transurethral cystolitholapaxy is an effective minimally invasive treatment for bladder stones; however, procedure-related complications may occur. Recurrent urinary tract infection and bleeding were the most frequently observed complications, emphasizing the importance of appropriate patient selection, meticulous technique, and postoperative surveillance.

**Keywords:** Bladder calculi, cystolitholapaxy, complications, urinary tract infection.

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## Introduction

Calculi of urinary tract being the most common condition and has affected mankind since ancient times.[1] The relative occurrence of this disease varies throughout the topographies. Incidence of this disease depends on different demographic factors including gender, age, geographic residential place, sexual category etc. This disease is relatively more common in dry and hot areas.[2] Asia exhibits wide range variations in the incidence of this disease as per the literature the frequency estimates from 5–19.1%. This variation is due to difference in geographies.[3] The frequency of bladder stone was estimated to be around 5% in developed countries.[4] Stagnation of urine in urinary bladder is the main culprit for stone formation (25% of the cases being reported). The reason for this incomplete emptying may be any one of the following such as enlarge prostate, neurogenic bladder, stricture, stenosis of urethra etc.[5]

Despite various modalities of bladder stone management, transurethral cystolitholapaxy remains the standard for stone less than 4 cm. Extracorporeal shockwave lithotripsy (ESWL), percutaneous cystolitholapaxy (PCCL) are still being performed in some cases.[6,7]

Although transurethral cystolitholapaxy remains the primary therapeutic choice for bladder calculi, the procedure presents notable operational constraints and can be labor-intensive [8]. A major limitation of the lithopunch instrument is its inability to retrieve an intact calculus in a single pass. Consequently, the stone must be fragmented, requiring

repeated insertions and withdrawals of the instrument from the urinary bladder to remove individual fragments. These frequent re-entries increase the likelihood of mucosal trauma and subsequent urethral stricture formation [9]. Despite achieving an overall efficacy rate of approximately 95.17%, this minimally invasive endoscopic approach carries inherent surgical risks. Published literature documents short-term adverse outcomes such as mucosal injury (18.5%), hemorrhage (22%), and urinary tract infections (22%), along with long-term sequelae including urethral stricture development in 7.14% of cases [10].

In Pakistan, where vesical calculus disease exhibits a high prevalence, effective clinical management is of vital concern. Therefore, this study aimed to evaluate the frequency and distribution of complications associated with transurethral cystolitholapaxy in patients undergoing treatment for vesical stones.

## Methods

This descriptive cross-sectional study was conducted in the Urology Department of Lady Reading Hospital, Medical Teaching Institute, Peshawar, Pakistan. Time span of this study was one year (February 21, 2023 to February 21, 2024).

Ethical approval for the study was obtained from the Ethics Committee of Lady Reading Hospital, Peshawar. Informed written consent was obtained from all participants prior to inclusion in the study.

A total of 102 patients aged ≥15 years with radiologically confirmed bladder stones on ultrasonography, X-ray kidney–ureter–bladder (KUB), or computed tomography (CT-KUB), and a stone size ≤4 cm suitable for transurethral cystolitholapaxy were included. All patients underwent the procedure at the study center and provided informed consent.

Patients with associated pathologies such as urethral stricture, bladder tumor, or severe benign prostatic hyperplasia requiring surgery, as well as those with neurogenic bladder, previous bladder surgery, active uncontrolled urinary tract infection, or bleeding disorders were excluded. Informed consent was taken every patient being enrolled and clarified that this study is purely for publication and their confidentiality was maintained. The patients were evaluated by detailed history, clinical examination, radiography (Ultrasonography, X-ray KUB, and CT KUB), routine urine examination and urine culture and sensitivity test. All the findings were documented clearly. All cases were performed by Consultant Urologist with more than five years' experience of endourological procedures. Per-operative and post-operative complications were recorded on a predesigned proforma.

### *Statistical analysis*

Statistical Package for Social Sciences (SPSS) version 25 was used for data analysis. Age as being a quantitative variable was presented as mean ± standard deviation. Qualitative variables including gender and complications (mucosal injury, bleeding, perforation, residual stones, infection, and urethral stricture) were expressed as frequency and percentages. For comparison of complications with age groups and gender, the Chi-square test was applied. A p-value ≤0.05 was considered statistically significant.

## Results

A total of 102 patients were enrolled in this study. The mean age of the patients was 40.37 ± 16.72 years. Age and gender distribution of the patients is given in Table-1. In our study, mucosal injury was observed in 17 patients (16.7%), while bleeding occurred in 21 patients (20.6%). Bladder perforation was noted in 12 patients (11.8%), and residual stones were detected in 8 patients (7.8%). Postoperative infection was reported in 22 patients (21.6%), whereas urethral stricture developed in 6 patients (5.9%). Stratification of complications with age and gender are given in Table-2.

## Discussion

In pediatric populations, the bladder is the primary site of stone formation. In Pakistan, bladder stones remain a major public health issue, particularly among low-income group of children and adolescents. Historically, lithotomy, the sole therapeutic option for renal stones, was associated with significant morbidity and mortality. Management strategies are dictated by available resources and expertise, ranging from open vesicolithotomy to endoscopic cystolitholapaxy or cystolithoclasty, with extracorporeal shock wave lithotripsy (ESWL) representing the first-line modality in pediatric cases.

Up to 5% cases being reported as bladder calculi out of all urinary stone diseases. Treatment option has greatly varied due to invention of modern practices for bladder calculi in the form of ESWL and other fibro optical techniques.[4,7] Which of these is better is still a matter of great debate. Percutaneous cystolitholapaxy is considered as a best practice for multiple bladder calculi or big calculi as it uses nephroscope with fluoroscopic guidance for removal of stones. Although prevalence of primary bladder calculi is low, it is continuously encountered in clinical practices.[11]

Workup to rule out the bladder outflow obstruction as a possible cause of vesical stone growth is undertaken. As in pediatric age group the urethral caliber is small so transurethral cystolitholapaxy is not being offered in majority of urological setups despite being recent advances in endourology in this century. Such procedure results in considerably more complications and is not recommended. [12]

Transurethral cystolitholapaxy being offered to majority of young patients with bladder calculi which involves breaking stone with lithopunch and retrieving small fragments through urethra. Despite the fact that it is treatment option of choice in major cases but is associated with potential complications like any other medical procedure. This discussion aims to provide deep incite for its complications associated with transurethral cystolitholapaxy.[13]

Urinary tract infections as being the most common complication encountered during the procedure as bacteria being introduced with instruments into the bladder. Prophylactic antibiotic therapy aims to reduce these infections but at the cost of rising resistance. Such procedure should be avoided in patients having active UTI as it leads to its exacerbation. [14]

It is primarily attributed to mechanical trauma to the bladder mucosa and the application of energy sources during lithotripsy, which may result in mucosal injury and subsequent bleeding. While most cases are mild and self-limiting, severe hematuria may necessitate further therapeutic intervention. Urethral stricture formation is a recognized complication associated with transurethral cystolitholapaxy, often resulting from prolonged instrumentation or iatrogenic urethral trauma during the procedure .[15]

Clinically, strictures may present with obstructive lower urinary tract symptoms, impaired urinary flow, and recurrent urinary tract infections. Comprehensive preoperative evaluation and meticulous intraoperative technique are essential to mitigate this risk. Bladder perforation, although relatively rare, represents a serious complication of transurethral cystolitholapaxy.[16]

It may occur during stone fragmentation or extraction of stone debris. Predisposing factors include excessive instrumental force and the presence of large or adherent calculi. Early recognition and prompt surgical management are critical to prevent adverse outcomes, including peritonitis and sepsis. Despite advancements in endourological techniques, complete stone clearance may not be achievable in a single session of transurethral cystolitholapaxy .[17]

Residual stone fragments may act as a nidus for recurrence and can necessitate repeat interventions. Therefore, appropriate preoperative imaging and meticulous attention to complete stone fragmentation are imperative to optimize outcomes. Postoperative pain, particularly dysuria, is commonly observed and is largely attributable to bladder mucosal irritation and procedural trauma .[18]

***Table 1.*** *Demographic data of enrolled patients*

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Age Groups** | 15–35 years | 50 | 49.0 |
| | 36–55 years | 27 | 26.5 |
| | >55 years | 25 | 24.5 |
| **Gender** | Male | 58 | 56.9 |
| | Female | 44 | 43.1 |

***Table 2.*** *Distribution of complications with age and gender*

| Complication | Outcome | 15–35 Years n (%) | 36–55 Years n (%) | >55 Years n (%) | Male n (%) | Female n (%) | P-value (Age) | P-value (Gender) |
|---|---|---|---|---|---|---|---|---|
| **Mucosal Injury** | Yes | 6 (35.3%) | 6 (35.3%) | 5 (29.4%) | 7 (41.2%) | 10 (58.8%) | 0.45 | 0.15 |
| | No | 44 (51.8%) | 21 (24.7%) | 20 (23.5%) | 51 (60.0%) | 34 (40.0%) | | |
| **Bleeding** | Yes | 12 (57.1%) | 4 (19.0%) | 5 (23.8%) | 10 (47.6%) | 11 (52.4%) | 0.63 | 0.33 |
| | No | 38 (46.9%) | 23 (28.4%) | 20 (24.7%) | 48 (59.3%) | 33 (40.7%) | | |
| **Perforation** | Yes | 7 (58.3%) | 1 (8.3%) | 4 (33.3%) | 6 (50.0%) | 6 (50.0%) | 0.30 | 0.60 |
| | No | 43 (47.8%) | 26 (28.9%) | 21 (23.3%) | 52 (57.8%) | 38 (42.2%) | | |
| **Residual stones** | Yes | 4 (50.0%) | 3 (37.5%) | 1 (12.5%) | 5 (62.5%) | 3 (37.5%) | 0.63 | 0.73 |
| | No | 46 (48.9%) | 24 (25.5%) | 24 (25.5%) | 53 (56.4%) | 41 (43.6%) | | |
| **Infection** | Yes | 11 (50.0%) | 5 (22.7%) | 6 (27.3%) | 14 (63.6%) | 8 (36.4%) | 0.88 | 0.46 |
| | No | 39 (48.8%) | 22 (27.5%) | 19 (23.8%) | 44 (55.0%) | 36 (45.0%) | | |
| **Urethral stricture** | Yes | 5 (83.3%) | 0 (0.0%) | 1 (16.7%) | 6 (100.0%) | 0 (0.0%) | 0.18 | **0.02** |
| | No | 45 (46.9%) | 27 (28.1%) | 24 (25.0%) | 52 (54.2%) | 44 (45.8%) | | |

Stratification of complications by age and gender showed no statistically significant association between age groups and any of the assessed complications (all $p > 0.05$). Similarly, most complications were not significantly associated with gender. However, urethral stricture showed a significant association with gender ($p = 0.02$), with all six cases (100%) occurring in male patients. Although urethral stricture was more frequent in the younger age group (83.3%), the association with age was not statistically significant ($p = 0.18$).

Karami et al. from Iran evaluated transurethral cystolithotripsy in 48 adult patients with bladder stones >2 cm and reported a high stone-clearance rate of 98.5%, with no major perioperative complications. During a mean follow-up of 22.4 months, no stone recurrence or urethral stricture was observed. These findings support the safety and efficacy of the transurethral approach for bladder stone management, although complication rates may vary depending on patient characteristics, stone burden, operative technique, and duration of follow-up.[19]

A study from Kerala evaluating different treatment modalities for urinary stone disease reported favorable outcomes with minimally invasive procedures, although procedure-related complications such as urinary tract infection, stone migration, incomplete clearance, and the need for additional interventions were encountered. While open surgery achieved the highest stone-clearance rate, minimally invasive approaches were associated with reduced postoperative morbidity and shorter hospital stay. These findings support the benefits of minimally invasive stone management but, similar to our study, emphasize that procedure-related complications remain clinically relevant and should be considered when selecting the most appropriate treatment approach.[20]

Singh and Kaur compared three endoscopic approaches for bladder stone removal in 67 patients and achieved complete stone clearance in all groups. Transurethral removal using a nephroscope had the shortest operative time (32.1 ± 8.5 minutes) and was considered safe and effective without increased morbidity, although it required more urethral entries. These findings support the overall efficacy of transurethral treatment, while highlighting that procedural factors may influence the risk of urethral complications.[21]

Transurethral cystolitholapaxy remains an effective and minimally invasive treatment option for vesical calculi, with acceptable complication rates. Appropriate patient selection, careful procedural technique, and adequate preoperative counselling are essential to minimize potential complications and optimize outcomes. Further studies are warranted to refine treatment strategies and explore safer, less invasive approaches for bladder stone management.

### *Limitations of the study*

This study has certain limitations, including its single-center design, absence of a comparison group undergoing alternative treatment modalities, and limited follow-up for assessing long-term complications. In addition, procedure-related outcomes may have been influenced by operator experience, potentially limiting the generalizability of the findings.

## Conclusion

Transurethral cystolitholapaxy is an effective minimally invasive treatment for bladder stones; however, procedure-related complications may occur. Recurrent urinary tract infection and bleeding were the most frequently observed complications, emphasizing the importance of appropriate patient selection, meticulous technique, and postoperative surveillance. Moreover, further studies are needed for better lineation of treatment modality of choice with large data sets and multicenter studies.

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### List of Abbreviations

TUCL (Transurethral Cystolitholapaxy)
PCCL (Percutaneous Cystolitholapaxy)
ESWL (Extracorporeal Shock Wave Lithotripsy)
UTI (Urinary Tract Infection)

### Conflict of interest

None to declare.

### Grant support and financial disclosure

None to disclose.

### Ethical approval

Ethical approval was obtained from the Ethics Committee of Lady Reading Hospital, Peshawar (Approval No: 477/LRH/MTI Dated: September 1, 2022).

### Author's contributions

**TJ, MA, MSK:** Conception and design, data collection and analysis, critical intellectual input, manuscript drafting.
**ALL AUTHROS:** Approval and responsibility of the final version of the manuscript to be published.

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