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COMPARISON OF STENTED VERSUS NON-STENTED PATIENTS OF URETERIC CALCULI AFTER INTRACORPOREAL LITHOTRIPSY

Original Research

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ABSTRACT

Background: Urolithiasis is a prevalent urological condition resulting from crystalline deposits in the urinary tract, often manifesting as acute flank pain and lower urinary tract symptoms. Ureteral stents, commonly placed after ureteroscopic lithotripsy to ensure patency and prevent complications, may themselves cause discomfort, hematuria, and infection. Given this clinical dilemma, evaluating the necessity of routine stent placement is vital to improve postoperative recovery and patient quality of life.

Objective: To compare the postoperative outcomes in terms of pain and hematuria between stented and non-stented patients undergoing ureteroscopic intracorporeal lithotripsy for ureteric calculi.

Methods: This randomized controlled trial was conducted at the Department of Urology, Institute of Kidney Diseases, Peshawar, from August 2024 to January 2025. A total of 170 patients aged 18–65 years with confirmed unilateral ureteric calculi were enrolled and randomized into two groups. Group A (n=85) received a 6 Fr double J ureteral stent post-procedure, while Group B (n=85) did not. All patients underwent ureteroscopic intracorporeal lithotripsy using a 6 Fr ureteroscope and pneumatic lithotripter under general anesthesia. Pain was assessed using the Visual Analog Scale (VAS), and hematuria was defined as ≥3 red blood cells per high-power field in centrifuged urine. Statistical analysis was performed using SPSS v23, with p-values ≤0.05 considered significant.

Results: The mean VAS pain score in the non-stented group was significantly lower (3.2 ± 1.7) compared to the stented group (5.8 ± 2.1), $p<0.001$. Mild pain was reported in 61.2% of non-stented patients versus 22.4% in stented patients, while severe pain occurred in only 4.7% of non-stented compared to 34.1% of stented patients. Hematuria was present in 28.2% of the non-stented group versus 50.6% of the stented group ($p=0.002$).

Conclusion: Routine ureteral stenting following uncomplicated ureteroscopic lithotripsy significantly increases postoperative discomfort and hematuria. A selective, risk-based stent placement strategy may offer safer, more comfortable recovery and optimized resource utilization.

Keywords: Double J stents, hematuria, intracorporeal lithotripsy, pain, ureteral stent, ureteric calculi, ureteroscopy.

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INTRODUCTION

Urolithiasis is a prevalent urological condition characterized by the formation of crystalline deposits within the urinary tract, frequently encountered in clinical practice. Among its various forms, ureteric calculi—stones lodged in the ureter, the narrow conduit linking the kidneys to the bladder—pose significant clinical challenges. These stones, varying in size and composition, are associated with intense symptoms including acute flank pain radiating to the groin, hematuria, dysuria, and lower urinary tract irritative symptoms. More critically, they can obstruct urine flow, leading to serious complications such as infection, hydronephrosis, and renal impairment if left unmanaged (1). The underlying pathogenesis is multifactorial, involving a complex interplay of genetic predisposition, inadequate hydration, metabolic derangements, urinary stasis, and dietary factors that contribute to the supersaturation and crystallization of solutes such as calcium oxalate, calcium phosphate, and uric acid (2,3). To relieve obstruction and facilitate urinary drainage, ureteric stents—commonly referred to as Double J (DJ) or JJ stents—are widely employed in urological practice. These temporary internal devices help maintain ureteral patency, especially following interventions such as ureteroscopy or in the presence of severe inflammation or trauma to the ureter (4). Their usage is particularly justified postoperatively to counteract edema, prevent ureteral stricture formation, and manage residual fragments after stone removal. According to global data, stents are inserted in nearly 80% of patients treated for renal stones and about 60% treated for ureteric stones (5). By mitigating ureteral obstruction and ensuring unimpeded urine flow, stents are anticipated to improve surgical outcomes and reduce the risk of secondary complications (6).

Despite these advantages, the use of ureteric stents is not devoid of drawbacks. Being a foreign body, the stent can trigger discomfort including pelvic and flank pain, dysuria, frequency, urgency, and hematuria (7). Furthermore, prolonged indwelling times elevate the risk of bacterial colonization, biofilm formation, and encrustation, which may lead to stent blockage or even secondary stone formation (8). These adverse effects can significantly impair patients' quality of life and may necessitate early stent removal or further interventions. On the contrary, omitting stent placement in selected patients has been associated with enhanced postoperative comfort, reduced pain scores, and minimal hematuria, particularly following uncomplicated ureteroscopic procedures (9). Recent evidence indicates that non-stented patients report better symptom profiles post-lithotripsy and require fewer postoperative analgesics or consultations, though at the potential cost of unanticipated ureteric obstruction in some cases (10,11). Given the variability in stenting practices and the paucity of regional data comparing outcomes in patients undergoing intracorporeal lithotripsy for ureteric stones, there is a pressing need for context-specific evidence to guide clinical decision-making. Understanding the balance between the benefits and risks of postoperative stent placement is crucial for optimizing patient-centered care and minimizing unnecessary morbidity. Therefore, the objective of this study is to compare the postoperative outcomes, specifically pain and hematuria, between stented and non-stented patients with ureteric calculi treated with ureteroscopic intracorporeal lithotripsy, thereby informing evidence-based practice in urological stone management.

METHODS

This randomized controlled trial was carried out at the Department of Urology, Institute of Kidney Diseases, Peshawar, over a six-month period from August 2024 to January 2025, following ethical approval from the institutional review board (IRB). Informed written consent was obtained from all participants prior to their inclusion in the study, and confidentiality was maintained throughout in accordance with the Declaration of Helsinki. A total of 170 patients diagnosed with unilateral ureteric calculi on non-contrast CT scans were enrolled using a consecutive non-probability sampling technique. Participants of either gender, aged between 18 and 65 years, were eligible for inclusion. Patients were excluded if they had bilateral ureteric stones, a solitary functional kidney, renal insufficiency, or were pregnant, in order to minimize confounding clinical factors that could influence post-operative outcomes or ethical concerns in vulnerable populations (12). All enrolled patients underwent ureteroscopic intracorporeal lithotripsy performed under general anesthesia in the lithotomy position. Initially, a cystoscopy was performed using a 22 French sheath and a 30-degree optical lens to assess the urethra and bladder. A 0.032-inch hydrophilic guidewire was then inserted into the ipsilateral ureter, over which a 6 Fr semi-rigid ureteroscope was introduced under continuous saline irrigation. Once the stone was visualized within the ureter, pneumatic lithotripsy was performed to fragment it. Randomization was done using a blocked randomization technique to ensure balanced allocation into two groups: Group A (stented) received a 6 Fr double J stent with multi-loop ends, while Group B (non-stented) did not receive any stent

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following the procedure. Randomization sequence generation and concealment were maintained by an independent staff member not involved in the procedure.

Post-operative evaluation was conducted at 24 hours. Pain intensity was assessed using the Visual Analog Scale (VAS), ranging from 1 to 10. For analytical clarity, pain was also categorized into mild (VAS 1–3), moderate (VAS 4–6), and severe (VAS 7–10) groups. Hematuria was defined as the presence of three or more red blood cells per high-power field in centrifuged urine specimens collected within the first 24 hours post-procedure. All clinical data were recorded on a predesigned structured proforma by trained data collectors who were blinded to group allocation to reduce observer bias. Statistical analysis was performed using IBM SPSS Statistics version 23. Continuous variables, including age and VAS scores, were summarized as mean ± standard deviation. Categorical variables, such as gender, laterality (left or right ureter), pain category, and presence of hematuria, were presented as frequencies and percentages. Between-group comparisons for categorical variables were conducted using the Chi-square test or Fisher's exact test where appropriate, while continuous variables were compared using independent sample t-tests. A p-value of ≤ 0.05 was considered statistically significant for all tests.

RESULTS

The study comprised 170 patients who were evenly distributed into two groups, with 85 patients each in the stented and non-stented cohorts. The overall mean age of participants was 45.9 ± 14.0 years, with an age range spanning from 19 to 78 years. Males constituted 58.8% (n=100) of the study population, while females made up 41.2% (n=70). Both groups were comparable in gender distribution (p=0.756). In terms of laterality, procedures were equally distributed between the left and right ureters, with 50% (n=85) performed on each side (p=0.632). The mean age in the stented group was 46.7 ± 14.3 years, and 45.2 ± 13.8 years in the non-stented group (p=0.478), indicating no significant difference in baseline age. The overall mean Visual Analog Scale (VAS) pain score observed postoperatively was 4.5 ± 1.9. Pain scores were significantly lower in the non-stented group, which reported a mean VAS score of 3.2 ± 1.7 compared to 5.8 ± 2.1 in the stented group (p<0.001). Pain was also stratified into categories: 61.2% of non-stented patients experienced mild pain (VAS 1–3) versus only 22.4% in the stented group. Conversely, 34.1% of stented patients reported severe pain (VAS 7–10) compared to just 4.7% of non-stented patients, a difference that was statistically significant (p<0.001). Moderate pain (VAS 4–6) was noted in 43.5% of the stented group and 34.1% of the non-stented group.

Hematuria, defined as the presence of three or more red blood cells per high-power field within 24 hours postoperatively, was observed in 39.4% (n=67) of the overall cohort. A significantly higher incidence was recorded in the stented group (50.6%) compared to the non-stented group (28.2%) with a p-value of 0.002. Conversely, hematuria was absent in 71.8% of the non-stented patients versus 49.4% of those with stents. Subgroup analysis was conducted to evaluate the influence of stone size, anatomical location within the ureter, and operative time on the distribution of stented versus non-stented patients. In terms of stone size, a majority of patients in both groups had stones between 5–10 mm (52.9% in the stented group and 47.1% in the non-stented group), while larger stones (>10 mm) were slightly more common in the stented group. Regarding stone location, mid-ureteric stones were most frequently observed across both cohorts, although lower ureteric stones were slightly more prevalent in the stented group. Upper ureteric stones showed no marked variation between the groups. Operative time also varied, with most patients in both groups undergoing procedures lasting 20–40 minutes. Notably, a higher proportion of stented patients required longer operative times (>40 minutes), which could reflect increased complexity and possibly contribute to the elevated postoperative pain and hematuria observed in this group. These stratified findings underscore the importance of accounting for anatomical and procedural factors when interpreting post-lithotripsy outcomes.

Table 1: Basic demographics and characteristics

Variable		Stented Group (n=85)	Non-Stented Group (n=85)	p-value
Age (years) (Mean ± SD)		46.7 ± 14.3	45.2 ± 13.8	0.478
Gender (%)	Male	49 (57.6%)	51 (60.0%)	0.756
	Female	36 (42.4%)	34 (40.0%)	
Laterality (%)	Right	44 (51.8%)	41 (48.2%)	0.632
	Left	41 (48.2%)	44 51.8%)	

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Table 2: VAS Pain Score and Hematuria comparison against groups (stented vs. non-stented)

Variable		Stented Group (n=85)	Non-Stented Group (n=85)	p-value
VAS Pain Score (Mean ± SD)		5.8 ± 2.1	3.2 ± 1.7	<0.001
VAS Pain Category (%)	Mild (1-3)	19 (22.4%)	52 (61.2%)	<0.001
	Moderate (4-6)	37 (43.5%)	29 (34.1%)	
	Severe (7-10)	29 (34.1%)	4 (4.7%)	
Hematuria (%)	Present	43 (50.6%)	24 (28.2%)	0.002
	Absent	42 (49.4%)	61 (71.8%)	

Table 3: Subgroup Stratification of Stented vs Non-Stented Patients

Subgroup	Stented Group (n=85)	Non-Stented Group (n=85)
Stone Size < 5 mm	20	28
Stone Size 5–10 mm	45	40
Stone Size > 10 mm	20	17
Upper Ureter	25	27
Mid Ureter	30	32
Lower Ureter	30	26
Operative Time < 20 min	18	25
Operative Time 20–40 min	47	44
Operative Time > 40 min	20	16

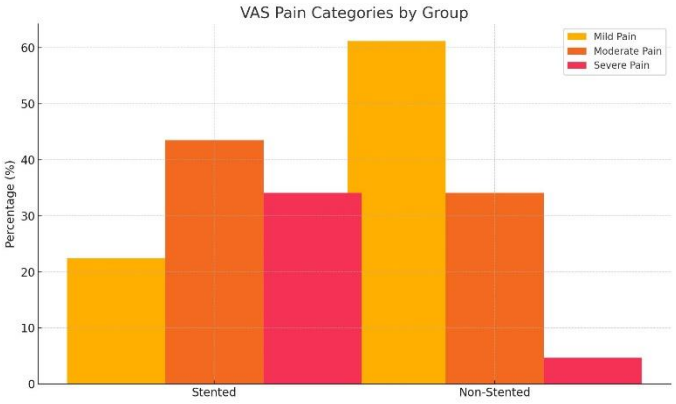


Figure 1 VAS Pain Categories by Group

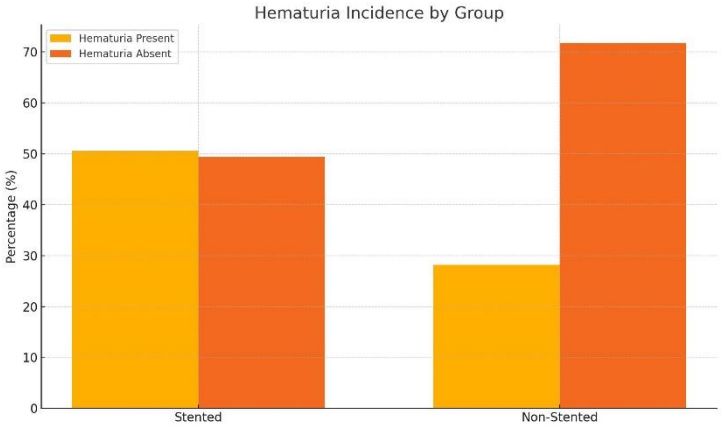
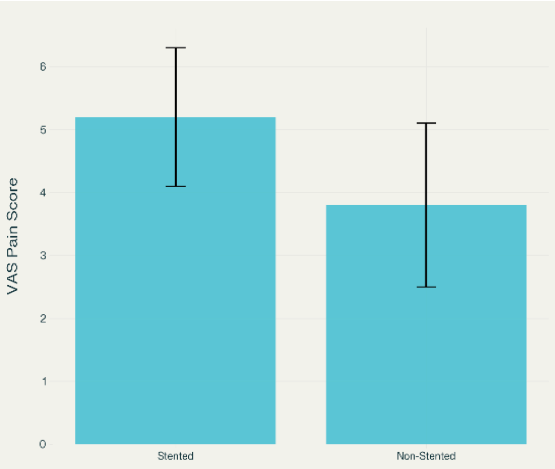


Figure 2 Hematuria Incidence by Group

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VAS pain score compared in both groups (stented vs. non-stented)

DISCUSSION

This prospective study demonstrated that non-stented patients undergoing intracorporeal lithotripsy for ureteric calculi experienced significantly better postoperative outcomes in terms of pain and hematuria compared to those who received ureteral stents. The findings revealed that the mean VAS pain score was markedly lower in the non-stented group (3.2 ± 1.7) compared to the stented group (5.8 ± 2.1), with a significantly reduced incidence of hematuria (28.2% vs 50.6%, p=0.002). The comparable baseline demographics and laterality between groups confirmed the adequacy of randomization and ensured internal validity of the comparison. These results reinforce the growing body of evidence suggesting that routine postoperative stenting may not be necessary in selected cases of uncomplicated ureteroscopic stone removal. The current findings align with previous studies from different geographical regions, which consistently reported greater discomfort, urinary symptoms, and hematuria in stented patients. One regional study observed that stented patients experienced more severe lower urinary tract symptoms and postoperative pain compared to non-stented counterparts (13,14). Another study also showed significant improvement in postoperative quality of life among patients who did not receive stents (15). In this study, only 4.7% of non-stented patients experienced severe pain, in contrast to 34.1% of stented patients, highlighting the negative impact of stents on patient comfort. The discomfort associated with stents can be attributed to mechanical irritation of the bladder trigone and ureteral mucosa, leading to ureteral spasms, inflammation, and reflux—an entity widely recognized as “stent syndrome” (16,17).

Hematuria, another frequent complication observed in stented individuals, also showed a significant intergroup difference in the present study. The stented group demonstrated a nearly twofold higher rate of hematuria, likely due to the mechanical trauma and friction exerted by the stent during physiological movement and micturition. These findings were comparable with earlier studies conducted in South Asia, where hematuria incidence was also reported significantly higher in the stented cohorts (18). While these adverse outcomes question the necessity of stents in all ureteroscopic procedures, certain clinical scenarios still mandate their placement. Stenting remains essential in cases involving ureteral injury, perforation, prolonged stone impaction, pre-existing ureteral narrowing, or significant postoperative edema, all of which risk obstruction or stricture if left unstented (19). Specific patient populations such as those with a solitary kidney or pregnancy also necessitate prophylactic stenting. Avoiding routine stenting in uncomplicated cases offers several advantages beyond symptom relief. Studies have demonstrated that non-stented protocols reduce healthcare resource utilization, including the avoidance of additional procedures for stent removal, fewer emergency visits for stent-related complications, and decreased analgesic requirements. Cost-analysis models have supported the economic feasibility of a non-stented approach in carefully selected patients, demonstrating both direct and indirect cost benefits (18,19). Additionally, patient satisfaction and postoperative quality of life were consistently reported to be higher in non-stented patients, especially in those with smaller distal ureteral stones (<1 cm) where the need for ureteral support is minimal (20).

One of the strengths of the current study lies in its prospective randomized design, balanced group allocation, and the objective assessment of pain and hematuria at a standardized time point. However, limitations must be acknowledged. The study focused solely on short-term outcomes, omitting long-term follow-up for complications such as ureteral stricture, recurrent stone formation, or delayed

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obstruction, which could potentially influence the overall safety profile of a non-stented approach. Additionally, although subgroup data on stone size, location, and operative time were reviewed, variables such as stone density, degree of hydronephrosis, and previous urological history were not assessed. These factors could influence postoperative outcomes and should be considered in future research. Overall, the findings support a selective rather than routine approach to ureteral stenting after intracorporeal lithotripsy. By identifying patients who can safely forgo stenting, clinicians can enhance postoperative comfort, reduce complications, and decrease procedural costs, thereby promoting a more patient-centered and evidence-based urological practice. Future studies should incorporate longer follow-up periods and explore broader anatomical and metabolic predictors to refine selection criteria for stent omission.

CONCLUSION

This study concludes that routine ureteral stenting following uncomplicated ureteroscopic lithotripsy for ureteric calculi is not only unnecessary but also contributes to increased patient discomfort and postoperative morbidity. The findings support a more individualized, evidence-based approach, where stent placement is reserved for specific clinical indications such as ureteral trauma, edema, or other risk factors identified intraoperatively. By adopting a "stent-when-indicated" strategy, clinicians can enhance patient recovery, reduce avoidable symptoms, and streamline postoperative care. This research reinforces the shift toward patient-centered urological practice and highlights the importance of selective stenting in improving treatment outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Issa Khan	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muzzamil Sohail	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Waqas*	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Sulaiman Shah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Idrees Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Abdus Salam	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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