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Complications of ESWL with and without JJ Stent in Upper Ureteric Stones

Dr. Jalal Ahmed Choudhury[1*], Prof (Dr.) Promode Ranjan Singh[2], Dr. Abul Kalam Azad[3], Dr. Ahmed Nasim Hassan[4], Dr. Choudhury Gulshan Ara Kamal[5], Dr. Salma Akter[6]

[1]Assistant Professor, Department of Surgery, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh
[2]Prof & HOD(Ex), Department of Urology, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh
[3]Associate Professor, Department of Surgery, Sylhet MAG Osmani Medical College (SOMC), Sylhet, Bangladesh
[4]Assistant Professor, Department of Surgery, Sylhet MAG Osmani Medical College (SOMC), Sylhet, Bangladesh
[5]Junior Consultant (Cardiology), Goainghat Upazila Health Complex, Sylhet, Bangladesh
[6]Junior Consultant (Obs & Gynae), Bishwanath Upazila Health Complex, Sylhet, Bangladesh

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***Corresponding author:** Dr. Jalal Ahmed Choudhury
Assistant Professor, Department of Surgery, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh

Abstract

***Background*:** Although ESWL is considered safe for upper ureteric stones, the use of JJ stents may influence complication rates and patient morbidity. ***Objective*:** To assess the outcome of ESWL for upper ureteric stones with or without Double-J stent. ***Methods*:** In this prospective comparative study, 62 patients with upper ureteric stones were randomly allocated into stented (n=31) and non-stented (n=31) groups. Post-procedural complications including ureteric colic, steinstrasse, fever, suprapubic pain, and LUTS were recorded and analyzed. ***Results*:** Ureteric colic was significantly lower in the stented group compared to the non-stented group (12.9% vs 35.5%; $p<0.05$). However, suprapubic pain was significantly higher in the stented group (41.9% vs 16.1%; $p<0.05$). The incidence of steinstrasse and fever did not differ significantly between groups ($p>0.05$). Lower urinary tract symptoms were significantly more common in the stented group, including urinary frequency (48.4% vs 9.7%; $p<0.01$), urgency (54.8% vs 16.1%; $p<0.01$), and dysuria (61.3% vs 19.4%; $p<0.01$). Gross haematuria did not differ significantly between groups. ***Conclusion*:** Although JJ stenting reduces ureteric colic after ESWL, it is associated with significantly higher lower urinary tract symptoms and patient discomfort. Routine pre-ESWL stenting is therefore not recommended in uncomplicated upper ureteric stones ≤2 cm.

Keywords: Extracorporeal shock wave lithotripsy (ESWL); JJ ureteric stent; Upper ureteric stones; Post-ESWL complications; Lower urinary tract symptoms (LUTS).

INTRODUCTION

Urolithiasis is a significant global health problem with increasing prevalence [1-2]. In Bangladesh, renal stone disease is common due to climatic conditions, dietary patterns, and socioeconomic factors [3]. Extracorporeal shock wave lithotripsy (ESWL), introduced in the 1980s, transformed the management of urinary calculi by providing a non-invasive treatment option [4].

Although ESWL is generally safe and effective [2], complications may occur due to obstruction by stone fragments, including ureteric colic, hydronephrosis, infection, renal impairment, and steinstrasse [5-6]. To prevent such complications, ureteric stents are often placed prior to ESWL. The European Association of Urology recommends stenting in selected cases to reduce obstructive and infective complications [2-7].

However, ureteric stenting itself is associated with considerable morbidity. Stent-related symptoms have been reported in 10% to 85% of patients [9]. Common adverse effects include bladder irritation, hematuria, flank pain, and suprapubic discomfort [8-10-11]. These symptoms may result from vesicoureteric reflux, infection, encrustation, or stent migration.

Furthermore, indwelling ureteric stents significantly affect patient quality of life. Joshi *et al.* reported reduced functional capacity and decreased quality of life in up to 80% of patients with ureteric stents

[2-13]. Several studies have demonstrated that routine JJ stenting does not improve ESWL outcomes but increases patient discomfort [12].

Therefore, the routine use of pre-ESWL stenting remains controversial. This study was undertaken to compare complications and lower urinary tract symptoms following ESWL with and without JJ stent placement in patients with upper ureteric stones.

Objective

General Objective

To assess the outcome of ESWL for upper ureteric stones with or without Double-J stent.

Specific Objectives

- To record post-ESWL complications including ureteric colic, steinstrasse, suprapubic pain, fever, and gross hematuria in both groups.
- To assess and compare lower urinary tract symptoms (frequency, urgency, dysuria) between stented and non-stented groups.
- To determine whether pre-ESWL stenting reduces obstructive complications.

METHODOLOGY

This quasi-experimental comparative study was conducted in the Department of Urology at Sylhet MAG Osmani Medical College Hospital, Sylhet, from January 2011 to June 2012, and included a total of 62 patients with unilateral upper ureteric stones who met the eligibility criteria. The patients were randomly allocated into two equal groups: Group A (n=31), who underwent extracorporeal shock wave lithotripsy (ESWL) with prior JJ stent placement, and Group B (n=31), who underwent ESWL without JJ stenting. All patients underwent detailed pre-procedural evaluation including comprehensive history and clinical examination, complete blood count, serum urea and creatinine, urine culture and sensitivity, intravenous urography (IVU), ultrasonography, plain X-ray KUB, and bleeding profile; patients with urinary tract infection were treated appropriately before intervention. In Group A, a 5 Fr JJ stent was inserted under regional anesthesia prior to ESWL. Both groups received ESWL using a Siemens Lithoskop machine with 3500 shock waves per session. Patients were monitored for post-procedural complications including ureteric colic, steinstrasse, suprapubic pain, fever, gross hematuria, urinary frequency, urgency, and dysuria. Follow-up assessments were conducted at 1 week and then monthly up to 3 months. Data were analyzed using SPSS version 16, with frequencies and percentages calculated for categorical variables and comparisons made using the Chi-square test; a p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 62 patients were included, with 31 in Group A and 31 in Group B, and the majority of patients were in the 31–40 years age group (20 patients, 32.3%), followed by 41–50 years (17 patients, 27.4%) and 21–30 years (13 patients, 21.0%). In Group A, the highest proportion was also in 31–40 years (10 patients, 32.3%), whereas in Group B the same age group accounted for 10 patients (32.3%), with comparable distributions across other age categories. The mean age was 36.9 ± 11.0 years in Group A and 35.4 ± 11.3 years in Group B (overall 36.1 ± 11.1 years), and there was no statistically significant difference between the groups ($p > 0.05$).

Table-1 Age distribution of the patients

Age	Study group			p value
	Group-A (n=31)	Group-B (n=31)	Total (n=62)	
18-20 years	2 (6.5)	3 (9.7)	5 (8.1)	*p>0.05
21-30 years	6 (19.4)	7 (22.6)	13 (21.0)	
31-40 years	10 (32.3)	10 (32.3)	20 (32.3)	
41-50 years	8 (25.8)	9 (29.0)	17 (27.4)	
51-60 years	5 (16.1)	2 (6.5)	7 (11.3)	
Mean (± SD)	36.9 (±11.0)	35.4 (±11.3)	36.1 (±11.1)	†p>0.05

***Chi-Square (χ^2) Test and †'Z' test were applied to analyze the data. SD: Standard deviation. Figure in the parenthesis indicates corresponding percentage.**

Out of 62 patients, 46 (74.2%) were male and 16 (25.8%) were female. In Group A (n=31), 24 patients (77.4%) were male and 7 (22.6%) were female, while in Group B (n=31), 22 patients (71.0%) were male and 9 (29.0%) were female. The difference in sex distribution between the two groups was not statistically significant (p>0.05).

Table-2: Distribution of the patients according to sex

Sex	Study group			p value
	Group-A (n=31)	Group-B (n=31)	Total (n=62)	
Male	24 (77.4)	22 (71.0)	46 (74.2)	p>0.05
Female	7 (22.6)	9 (29.0)	16 (25.8)	
Total	31 (100.0)	31 (100.0)	62 (100.0)	

*** Chi-square (χ^2) test was applied to test the level of significance.**
Figure in the parenthesis indicates corresponding percentage.

Table-3: Distribution of the patients by complications

Complications	Study group		*p value
	Group-A (n=31)	Group-B (n=31)	
Ureteric colic	4 (12.9)	11 (35.5)	p<0.05
Steinstrasse	3 (9.7)	5 (16.1)	p>0.05
Fever	5 (16.1)	2 (6.5)	p>0.05
Surapubic pain	13 (41.9)	5 (16.1)	p<0.05

***Chi-Square (χ^2) Test was applied to analyze the data.**
Figure in the parenthesis indicates corresponding percentage.

Table-4 showed distribution of the patients by lower urinary tract symptoms. Urinary frequency [15 (48.4%) vs 3 (9.7%); χ^2=11.273; p<0.01]; urgency [17 (54.8%) vs 5 (16.1%); χ^2=10.145; p<0.01] and dysuria [19 (61.3%) vs 6 (19.4%); χ^2=11.328; p<0.01] were significantly more in group-A than that of group-B; but gross haematuria [21 (67.7%) vs 15 (48.4%); χ^2=2.385; p>0.05] did not differ statistically significant between groups.

Table-4: Distribution of the patients by lower urinary tract symptoms (LUTS)

Lower urinary tract symptoms	Study group		*p value
	Group-A (n=31)	Group-B (n=31)	
Urinary frequency	15 (48.4)	3 (9.7)	p<0.01
Urgency	17 (54.8)	5 (16.1)	p<0.01
Dysuria	19 (61.3)	6 (19.4)	p<0.01
Gross haematuria	21 (67.7)	15 (48.4)	p>0.05

***Chi-Square (χ^2) Test was applied to analyze the data.**
Figure in the parenthesis indicates corresponding percentage.

DISCUSSION

Urinary obstruction due to an impacted upper ureteric stone is a potentially serious condition that may lead to progressive renal impairment, pyonephrosis, and sepsis if not treated promptly. Extracorporeal shock wave lithotripsy (ESWL) has become an established, minimally invasive treatment modality for upper ureteric stones ≤2 cm since its introduction into clinical practice [14]. Although ESWL is widely accepted as effective, the routine placement of a double-J (JJ) stent before the procedure remains controversial. Proponents suggest that stenting relieves obstruction and improves fragmentation by creating a favorable stone–fluid interface, while others argue that outcomes are similar without stenting and that stent-related morbidity may outweigh potential benefits [15-16].

The present quasi-experimental study evaluated complications of ESWL with and without JJ stenting in 62 patients with upper ureteric stones. Baseline demographic characteristics were comparable between the two groups. The mean age of patients was 36.1 ± 11.1 years, with no significant difference between the stented and non-stented groups. Similar age distributions have been reported in previous studies, where ureteric stones predominantly affect individuals in the third and fourth decades of life [17-19].

A marked male predominance was observed in this study (male-to-female ratio 2.76:1), which is consistent with earlier reports [17-18]. The higher prevalence of stone disease among males may be related to dietary habits, occupational exposure, metabolic differences, and hormonal influences [20]. The side of stone involvement was nearly equally distributed between right and left ureters, and no significant difference was found between the groups, which aligns with findings from prior studies indicating that laterality does not influence ESWL outcome [18-21].

The number of ESWL sessions required did not differ significantly between groups. Most patients in both arms required more than one session. These findings are consistent with previous randomized studies showing comparable retreatment rates in stented and non-stented patients [16]. This suggests that routine JJ stenting does not reduce the need for repeated ESWL sessions.

Stone clearance rates were also comparable between groups (74.2% in the stented group vs 80.6% in the non-stented group), with no statistically significant difference. These findings support earlier studies demonstrating that pre-ESWL stenting does not significantly improve stone fragmentation or overall stone-free rates [16-22-23]. The effectiveness of ESWL appears to be more closely related to stone size and composition rather than the presence of a stent [24].

Ureteric colic, a common post-ESWL complication caused by passage of stone fragments, was significantly less frequent in the stented group. Similar findings have been reported previously, suggesting that stents may facilitate fragment drainage and reduce acute obstruction-related pain [22]. However, while stenting may reduce colic, it introduces other complications that may negatively affect patient comfort.

In this study, suprapubic pain was significantly more common in the stented group. Comparable findings were reported by Ghoneim *et al*. [16], who attributed this discomfort to bladder irritation caused by the distal coil of the stent. The stent acts as a foreign body within the bladder and trigone, leading to persistent discomfort and reduced quality of life.

Steinstrasse occurred in both groups without a statistically significant difference. Previous research has shown that steinstrasse can develop regardless of stent placement [16-25]. Although some studies suggested a protective effect of stenting, others demonstrated that stone size is a more important determinant of steinstrasse formation than the presence of a stent [25-26]. Therefore, routine prophylactic stenting solely to prevent steinstrasse may not be justified in uncomplicated cases.

Fever was observed in both groups without significant difference. Earlier studies have similarly reported comparable rates of post-ESWL fever between stented and non-stented patients [16-22]. However, it has been suggested that stents may serve as a nidus for bacterial colonization, particularly with prolonged indwelling time [27]. The slightly higher frequency of febrile episodes in stented patients reported in some studies may be attributed to additional instrumentation and foreign body placement [23].

A major finding of the present study was the significantly higher incidence of lower urinary tract symptoms (LUTS) in the stented group. Urinary frequency, urgency, and dysuria were markedly more common among patients with JJ stents. These findings are consistent with several prior reports demonstrating increased stent-related morbidity [22-23-28]. The mechanism is believed to involve irritation of the bladder trigone and bladder neck by the distal end of the stent. Although gross haematuria was more frequent in the stented group, the difference was not statistically significant, which is in agreement with earlier findings [16].

Overall, the results of this study indicate that while JJ stenting may reduce ureteric colic following ESWL, it is associated with significantly increased rates of suprapubic pain and lower urinary tract symptoms. Importantly, stenting did not improve stone clearance rates or reduce the number of ESWL sessions required. These findings suggest that routine pre-ESWL JJ stenting may not be necessary in uncomplicated upper ureteric stones ≤2 cm. Instead, stent placement should be individualized based on specific clinical indications such as solitary kidney, severe hydronephrosis, or impaired renal function. Careful patient counseling regarding potential stent-related morbidity is essential to optimize treatment outcomes and patient satisfaction.

CONCLUSION

ESWL is an effective treatment modality for upper ureteric stones ≤2 cm, with comparable stone clearance rates in stented and non-stented patients. Routine JJ stenting before ESWL does not improve treatment success or reduce the need for multiple sessions. Although stenting decreases the incidence of ureteric colic, it significantly increases suprapubic pain and lower urinary tract symptoms. The overall complication profile suggests greater morbidity in the stented group. Therefore, JJ stenting should not be performed routinely and should be reserved for selected clinical indications.

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