Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublisher.com/sjams/

OPEN ACCESS

Urology

Role of DJ Stent in Management of Upper Ureteric Stone Treated with Extracorporeal Shock wave Lithotripsy

Prashant Gupta, Pramod Kumar Sharma*, Bandhan Bahal, Sudipta Kumar Singh, Anshuman Aashu, Soumendranath Mandal

Department of Urology, Calcutta National Medical College & Hospital, Kolkata India

***Corresponding author:** Pramod Kumar Sharma
| **Received:** 20.04.2019 | **Accepted:** 26.04.2019 | **Published:** 30.04.2019
DOI: 10.21276/sjams.2019.7.4.48

Abstract **Original Research Article**

Extracorporeal shockwave lithotripsy (ESWL) is one of the most frequently performed procedures in patients with urolithiasis. For large ureteric stones, ESWL is often preceded by a double J stent insertion. However, fear of complications, including sepsis and stent related symptoms, is often expressed. The following study assessed the impact of stent insertion on the results of ESWL in patients with upper ureteric stones and complications. Medical records of 492 patients with upper ureteric stone size upto 1.5cm were analysed from January 2017 to December 2018 into stented (groupA) and non-stented group (group B). Stone free rate, rate of complications (minor and major complications) and irritative LUTS (Lower urinary tract symptoms) were recorded and analysed. The success rate of the stented group was not significantly different in both groups (p> 0.775), however, there was high incidence of LUTS in the stented population. We did not find any advantage of double J stenting in patients receiving ESWL for upper ureteric stones. In view of the greater likelihood of having stent related symptoms, this approach should be reserved for selected cases.

Key words: Extracorporeal shock wave lithotripsy; Lower urinary tract symptoms; ureteric stone.

INTRODUCTION

Kidney stone is a very common disease. There are various modes of treatment for kidney stone ranging from open surgery to minimally invasive types depending upon size, location and availability of resources. Commonly used modalities of treatment include ESWL, retrograde intrarenal surgery (RIRS) and percutaneous nephrolithotomy PCNL [1]. Optimal treatment depends upon the size, composition, equipment availability and surgeon capability [1]. ESWL was used in 1980 for the treatment of stone disease in kidney. It is an effective means of treatment with the success rate of over 80 % for renal and ureteric stone. Management of kidney and ureteric stone have changed with the introduction of newer technique and advancement [1,2]. And recent technical development in lithotriptor with shorter focal length and narrow focal width help to reduce the pain and avoid the need of anaestheia and hospital admission [1,2]. European Urology Association guidelines recommend ESWL and URSL as the first line treatment for proximal ureteric stones because both these procedure have less invasiveness and lower morbidity with low complication rates and both these procedures are well tolerated by the patient [1,3]. The wide use of ESWL is due to its higher efficacy in selected cases, making it the first treatment in many cases today, despite the advent of newer and less invasive alternative technique that are available [4]. Various studies investigate the success of ESWL in patients with nephrolithiasis and ureterolithiasis but none of the studies recommend the clear cut guideline regarding the uses of double J stent in upper ureteric stone treated with ESWL.

MATERIALS AND METHODS

The aim of the study was to evaluate the role of double J stent in patients with upper ureteric stone in terms of success of stone clearance rate, complications and side effects. This is a randomized control, prospective study of 492 conducted in department of urology in Calcutta national medical college and hospital from January 2017 to December 2018. Patients' characteristics (age, sex, BMI) and stone characteristics (size, dexterity, and Hounsfield unit) were noted (Table 1). All patients were treated with Dornier Compact Sigma Lithotriptor. Routine investigations were done (complete blood count, renal function test, coagulation profile, urine analysis). All patients also had X-ray KUB, ultrasonography of abdomen and contrast enchanced computeriszed

tomography of KUB region. Post treatment NCCT KUB was used for evaluation and assessment. Patient with urinary tract infection were treated with the appropriate antibiotics depending upon the culture reports prior to ESWL. Patients with uncontrolled infection, coagulopathy, pregnancy and anatomical abnormality of kidney were considered contraindication for ESWL.

The study population included patients with single, upper ureteric calculus with size ≤1.5 cm with HU= +700 to +1100 who had not receive prior ESWL or stone surgery. Patients who had previous history ESWL or other stone surgery and patients with percutaneous nephrostomy in situ were excluded. The stone size and hounsfield unit were calculated by CT scan. To avoid statistical difference, study population was divided into 2 groups. Group A included the stented population and group B non-stented population with 1:1 randomization (Table 2). Average number of ESWL cycles received by patients was 3 and each cycle of ESWL included 2000 shocks with escalating protocol on outdoor basis. Each cycle of ESWL was overseen by medical staff. The treatment was conducted under fluoroscopic control in supine position. Local analgesic ointment was applied at flank before procedure in all patients. The time period between the insertion of DJ and 1st session of ESWL ranged between 2 weeks to 4 weeks. The effectiveness of treatment was evaluated radiologically after 1 and all subsequent procedures. Treatment was described as successful if stone was completely eliminated from urinary tract or if a residual asymptomatic stone measure <4 mm. The asymptomatic stone was defined as, one neither causing symptoms nor hydronephrosis on scan. When criteria of success had been achieved, stent was removed. The procedure was stopped when complete fragmentation of the stones was achieved on fluoroscopy or 2000 shocks were completed. Procedure was considered unsuccessful in cases where fragmentation was not achieved at the end of the fifth session. Patients were given hydration, analgesic and antispasmodic treatments during and after each sessions and the first post-treatment week after each session. After final treatment each patient underwent NCCT KUB before double J stent removal. Complications were classified into minor and major. Minor complications included pain, fever, dysuria, while major complications included stent related complication (stent migration, stent breakage, and encrustation) and pyelonephritis.

Table-1: Characteristics of patients, stone and treatment

(A) Patients characteristics	
Total no. Of patients	492
mean age (in yrs)	44.65
Gender • Male • Female	 330 162
BMI (kg/m^2) • < 25 • > 25	 414/492 (85.15%) 78/492 (15.85%)
(B) Stone characteristics	
Site • Right • Left	 261 231
Size • < 10 mm • > 10 mm	 258 234
Hounsefield units	+800 to +1100

The collected data was analyzed using Statistical Package for the Social Sciences (IBM SPSS® statistics version 25) computer program. Statistical analyses were performed using Chi-square test, Fisher exact test for nominal data and Mann-Whitney U test, Kruskal-Wallis H test for ordinal data. P value of less than 0.05 was considered significant.

RESULTS

Total study population was 492, which included 330 (67.07%) male patients and 162 (32.93%) female patients, with mean age of 44.65 years (range: 15 to 65 years). Patients with BMI ≤ 25 kg/m^2 comprised 84.15% and BMI >25kg/m^2 comprised 15.85% population (Table 3). All patients included in the study had upper ureteric calculi with the size upto 1.5 cm in maximum dimension. Patients were classified to assess the impact of stone burden on the outcome of stone clearance into 2 categories – stone size ≤ 10 mm and > 10 mm. The total population of patient with stone size ≤ 10 mm was 53.43% and >10mm was 47.56%. Right sided stone comprised 53.43% and left sided stone comprised 46.56% of population. There was no statistically significant difference in both the groups in gender (p- 0.480) and BMI (p- 0.364). The dexterity of stone was noted separately in each group. We did not

find any significant difference in dexterity (p- 0.824). While 48.78% patients had stone ≤10 mm in size and 51.21% patient had stone >10 mm in size in group A and 56.09% patient had stone size ≤ 10 mm and 43.90% patients had stone size > 10 mm in group B. The overall success rate was 81.70%. While success rate in group A was 82.9% and in group B was 80.48 %. These results were not statistically significant (p- 0.775). The stone clearance rate was 90% and 86.9% in group A and group B in patients with stone size less than 10 mm (p =0.756) and clearance rate were 76.19% and 72.2% in group A and group B with stone size more than 10 mm (p= 0.777). Complications of ESWL (steinstrasse, stent related complication and various minor and major complications) were studied in both the groups. Rate of steinstrasse was 7.3% and 12.19% in group A and group B (p- 0.456). LUTS in group A was 30.89% and group B was 12.20 (p- <0.05). Rate of minor complications after ESWL was 42.27% in group A and 33.73% in group B. Average number of sessions was found to be higher among the patients with stent placement. Proportion of stone-free patients was similar across patients with and without stent. None of the major complications, such as stent migration, infection, and pyelonephritis or stent breakage were observed in any group.

Table-2: Comparison of characteristics in groups

(A) Patients characteristics			
	Group A (%)	Group B (%)	p value
No. Of patients	246	246	
Gender • Male • female	 176/246 (70.7%) 72/246 (29.3%)	 156/246 (63.4%) 90/246 (36.6%)	0.480
BMI (kg/m^2) • < 25 • >25	 198/246 (80.49%) 48/246 (19.51%)	 216/246 (87.80%) 30/246 (12.20%)	0.364
(B) Stone characteristics			
Site • Right • left	 132/246 (53.65%) 114/246 (46.34%)	 126/246 (51.21%) 120/246 (48.78%)	0.824
Size ≤10 mm >10 mm	 120/246 (48.78%) 126/246 (51.21%)	 138/246 (56.09%) 108/246 (43.90%)	0.510

Table-3: Stone clearance and complications

Variables	Group A	Group B	p value
Stone clearance			
Overall clearance	204/246 (82.9%)	198/246 (80.48%)	0.775
• ≤ 10 mm calculi	108/120 (90%)	120/138 (86.9%)	0.756
• >10 mm calculi	96/126 (76.19%)	78/108 (72.2%)	0.777
Steinstrasse	18/246 (7.3%)	30/246 (12.19%)	0.456
Stent related symptoms (LUTS*)	76/246 (30.89%)	30/246 (12.20%)	< 0.05
Complications			
• Minor	108/246 (43.90 %)	84/246 (34.14%)	0.365
*- Lower urinary tract symptoms			

DISCUSSION

Ureteric stents are mostly used for drainage in the presence of obstruction either due to stone or stricture. In ureter, stones can cause severe pain, acute kidney dysfunction and other serious complications, like significant kidney damage, sepsis etc. There is an increased risk of complications associated with the application of double J stenting before ESWL. Several authors have shown that this approach can relieve obstructions and increase the percentage of fragmentation by improving the stone-fluid interface [3, 5]. Rate of steinstrasse is found to be insignificant in both the groups [4]. Stent causes spasm and constriction of ureter, resulting in reduced stone clearance [3, 6]. Joshi HB and associates [6] found that Lower urinary tract symptoms were significant in stented population. Singh and associates [7], found that stents interfere with shock wave propagation. We found similar stone clearance rates in both the groups, and comparable results were found by kumar *et al*. [8] and Pettenati *et al*. [9]. Pettenali *et al*. in a retrospective study found that stent use was associated with reduced ESWL success in cases of proximal ureteric stones that were larger than 8 mm [9]. The fragments of stones broken down have a risk of causing obstruction in the ureter following ESWL. The probability of obstruction is higher with larger stones [10]. Ureteric stents do not

protect from steinstrasse formation or infectious complications and does not increase the stone free rate [11-13]. Low *et al*. retrospectively analyzed 179 patients, and found that there was no difference between the stone-free rates of patients with or without stent placement in their 1-month and 3-months follow up [14]. Preminger *et al*. also failed to detect a difference between patients with and without stent placement in terms of stone-free rates, independent of the stone load and shock strength [15]. Mustafa *et al*. also reported that the placement of a ureteral stent for the purpose of improving stone free rates or enhancing the passage of fragments during ESWL is unnecessary in renal stones with diameters less than 2.5 cm [16]. Though medical literature specifies that stents generally do not affect ESWL results or at least do not have a negative effect on stone-free rates, we state in our series that ureteral stents were observed to have a no effect on the stone-free rates. There have been reports of stent migration, stent breakage, encrustation, infection, pyelonephritis, and stone formation with the usage of stent [17, 18]. But these complications were not reported in our study. Joshi et al. reported that 60% of the patients had stent-related irritative bladder symptoms such as increased frequency of urine, urgency with or without urge urinary incontinence [18]. We found lower urinary tract symptoms to be significantly higher in patients with stent. The American and European urology guidelines do not recommend routine use of stenting as a part of ESWL, as it might cause additional symptoms in patients with a ureteric stent and financial burden to the patients.

Our study had few limitations. We did not report the effect of stenting in patients undergoing ESWL for renal, mid and lower ureteric stones. We did not use a validated questionnaire for ureteric stent symptoms assessment. Also the average time to clearance and efficacy quotient had not been mentioned in this study.

CONCLUSION

Our data confirms that stenting do not increase the stone free rates in patient receiving ESWL for upper ureteric stones. Moreover stented patients had significantly higher lower urinary tract symptoms. Potential complications associated with double J stent placement suggest that this procedure should be limited to selected cases.

REFERENCES

1. Aboutaleb H, Omar M, Salem S, Elshazly M. Management of upper ureteral stones exceeding 15 mm in diameter: shock wave lithotripsy versus semirigid ureteroscopy with holmium: yttrium–aluminum–garnet laser lithotripsy. SAGE open medicine. 2016 Dec 20;4:2050312116685180.
2. Chaussy CH, Brendel W, Schmiedt E. Extracorporeally induced destruction of kidney stones by shock waves. The Lancet. 1980 Dec 13;316(8207):1265-8.
3. Farsi HM, Mosli HA, Alzimaity M, Bahnassy AA, Ibrahim MA. In situ extracorporeal shock wave lithotripsy for primary ureteric calculi. Urology. 1994 Jun 1;43(6):776-81.
4. Ozkan B, Dogan C, Can GE, Tansu N, Erozencı A, Onal B. Does ureteral stenting matter for stone size? A retrospectıve analyses of 1361 extracorporeal shock wave lithotripsy patients. Central European journal of urology. 2015;68(3):358.
5. Morgentaler A, Bridge SS, Dretler SP. Management of the impacted ureteral calculus. The Journal of urology. 1990 Feb;143(2):263-6.
6. Joshi HB, Stainthorpe A, MacDonagh RP, Keeley FX, Timoney AG. Indwelling ureteral stents: evaluation of symptoms, quality of life and utility. The Journal of urology. 2003 Mar;169(3):1065-9.
7. Singh I, Gupta NP, Hemal AK, Dogra PN, Ansari MS, Seth A, Aron M. Impact of power index, hydroureteronephrosis, stone size, and composition on the efficacy of in situ boosted ESWL for primary proximal ureteral calculi. Urology. 2001 Jul 1;58(1):16-22.
8. Kumar V, Dhabalia JV. Extracorporeal shock wave lithotripsy in impacted upper ureteral stones: Comparison between stented and non-stented technique. Indian Journal of Urology. 2011 Jan 1;27(1):151.
9. Pettenati C, El Fegoun AB, Hupertan V, Dominique S, Ravery V. Double J stent reduces the efficacy of extracorporeal shock wave lithotripsy in the treatment of lumbar ureteral stones. Central European journal of urology. 2013;66(3):309.
10. Drach GW, Coordinator S, Dretler S, Fair W, Finlayson B, Gillenwater J, Griffith D, Lingeman J, Newman D, Group S. Report of the United States cooperative study of extracorporeal shock wave lithotripsy. The Journal of urology. 1986 Jun;135(6):1127-33.
11. Musa AA. Use of double-J stents prior to extracorporeal shock wave lithotripsy is not beneficial: results of a prospective randomized study. International urology and nephrology. 2008 Mar 1;40(1):19-22.
12. Graff J, Diederichs W, Schulze H. Long term follow-up in 1003 extracorporeal shock wave lithotripsy patients. J Urol. 1988; 140: 479-483.
13. Mohayuddin N, Malik HA, Hussain M, Tipu SA, Shehzad A, Hashmi A, Naqvi SA, Rizvi SA. The outcome of extracorporeal shockwave lithotripsy for renal pelvic stone with and without JJ stent--a comparative study. J Pak Med Assoc. 2009 Mar;59(3):143-6.
14. Low RK, Stoller ML, Irby P, Keeler L, Elhilali M. Outcome assessment of double-J stents during extracorporeal shockwave lithotripsy of small solitary renal calculi. Journal of endourology. 1996 Aug;10(4):341-3.

15. Preminger GM, Kettelhut MC, Elkins SL, Seger J, Fetner CD. Ureteral stenting during extracorporeal shock wave lithotripsy: help or hindrance?. The Journal of urology. 1989 Jul;142(1):32-6.
16. Mustafa M, Ali-El-Dein B. Stenting in extracorporeal shockwave lithotripsy; may enhance the passage of the fragments. J Pak Med Assoc. 2009 Mar;59(3):141-3.
17. El-Faqih SR, Shamsuddin AB, Chakrabarti A, Atassi R, Kardar AH, Osman MK, Husain I. Polyurethane internal ureteral stents in treatment of stone patients: morbidity related to indwelling times. The Journal of urology. 1991 Dec;146(6):1487-91.
18. Joshi HB, Okeke A, Newns N, Keeley Jr FX, Timoney AG. Characterization of urinary symptoms in patients with ureteral stents. Urology. 2002 Apr 1;59(4):511-6.