

ORIGINAL ARTICLE

Extracorporeal Shock Wave Lithotripsy Versus Ureteroscopy For Management Of Stone Upper Ureter 10-15 mm : A Prospective Comparative Study

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ABSTRACT

Keywords:

Extracorporeal Shock Wave Lithotripsy, Ureteroscopy, stone, ureter.

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Introduction: Different treatment modalities have been utilized in the management of urinary tract stones including minimally invasive techniques. **Purpose:** To evaluate the efficacy, outcome and complications of extracorporeal shock wave lithotripsy (ESWL) versus semi-rigid ureteroscopy (URS) in the management of proximal ureteral stones 10-15 mm. **Materials & Methods:** This is prospective comparative study of 40 patients with symptomatic upper ureteric stone 10-15mm. At the outpatient clinic of urology department, Aswan University hospital, within the time of December 2018 to March 2020. Patients were classified into two groups: **URS (Group A)** and **SWL (Group B)**. Inclusion criteria were single stone ureter, radio-opaque stone and size ranged from 10-15mm. **Results:** Stone-Free rates in URS group 85% vs 70% in ESWL group (P Value 0.002). There is no significant difference in complication rate between ESWL and URS. As regarding the need for auxiliary procedures, 2 cases (10%) needed URS after ESWL & 3 cases (15%) needed ESWL after URS (P value 0.015). **Conclusion:** Both ESWL and URS are effective treatment modalities for upper ureteral stones between 10-15 mm with minimal patient morbidity.

INTRODUCTION

Urolithiasis is considered one of the leading causes of morbidity of the urinary tract system in the world. In the last few decades, the treatment of urinary tract stones has been developed due to the introduction of minimally invasive techniques [1]

Few decades back, Ureteral stones were managed by open surgery. With the development of semi-rigid ureteroscope, shock wave lithotripsy (SWL) machines, laparoscopic procedure and flexible ureteroscopies (URS) there were enormous changes in the management of ureteral stones

and each of these methods has high efficacy when used for the appropriate indication [2]

The European Association of Urology guidelines recommend SWL or ureteroscopic laser lithotripsy (URSL) as the first-line treatment for proximal ureteral stones [3]

For managing proximal ureteral stones, SWL is a minimally invasive procedure and can be done as an outpatient procedure, however it has disadvantages as less clearance rate, longer time of treatment and poor patient compliance [3]

The advantage of the endoscopic option is the adequate and immediate decompression of the obstruction in one session with significantly higher stone-free rates in comparison to SWL concerning the complications. Traditionally, ureteroscopic procedures have been associated with higher complication rates than SWL [4]. However, there is a lack of definite evidence-based modalities for managing large proximal ureteral stones [5]. The aim of this study is to compare the use of SWL versus URS for management of stone upper ureter 10-15 mm in diameter.

MATERIALS AND METHODS

This was a prospective comparative study included patients presented with symptomatic upper ureteric stone 10-15mm at the outpatient clinic of urology department, Aswan University hospital, in the period between December 2018 and March 2020.

All patients included in this study had single radiopaque stone and size ranged from 10-15 mm in diameter.

Patients with radiolucent stones, Elevated serum creatinine (≥ 1.5 mg/Dl), single kidney, urinary tract abnormalities and recurrent stones were excluded from this study.

Eligible patients were classified into two groups; URS (Group A) and SWL (Group B) each group included 20 patients.

Patients included in this study preoperative evaluation as regard history, clinical examination, urine analysis, urine culture

underwent and preoperative radiographs as U/S, Plain KUB film and MSCT-KUB. Patients were followed 2nd and 4th weeks by KUB, U/S, +/- non-contrast MSCT. Statistical analysis of the collected data was done using (SPSS 25). *Student T* Test was used to assess the statistical significance of the difference between two study groups means. *Chi-Square test* was used to examine the relationship between two qualitative variables.

Results

Demographic data and stone characteristics

Mean age in group A was 37.55 ± 11.55 (22-60 years) while in group B was 37.95 ± 13.38 (21-62 years) (P value >0.05). Group A included 12 males & 8 females while groups B included 13 males & 7 females.

In group A, mean size of stone 12.15 ± 1.5 mm while 11.45 ± 1.28 mm (P value >0.05) in group B. In group A, mean stone density 1030 ± 103.1 HU while 992.5 ± 97.7 HU (P value >0.05) in group B. In group A, stone was in right side in 10 cases and 10 cases in left side while in ESWL group was found to be in right side in 12 cases compared to 8 cases in left side. In group A, one case presented without hydronephrosis compared to 19 cases presented with variable degrees of hydronephrosis (8 mild, 8 moderate and 3 marked) while in group B; 4 cases presented without hydronephrosis while 16 cases presented with variable degrees of hydronephrosis (14 mild and 2 moderate).

Table (1) Demographic data and stone characteristics.

		Group A (n=20)	Group B (n=20)	P value
Age	Mean ± SD	37.55 ± 11.55	37.95 ± 13.38	0.46
Sex	Male	12/20(60%)	13/20(65%)	0.256
	Female	8/20(40%)	7/20(35%)	
:Stone characteristics				
Size(mm)		12.15 ± 1.5	11.45 ± 1.28	0.06
Density(HU)		1030 ± 103.1	992.5 ± 97.7	0.12
Side				
Right		10(50%)	12(60%)	0.34
Left		10(50%)	8(40%)	0.325
Degree of hydronephrosis:				
NO		1(5%)	4(20%)	0.069
Mild		8(40%)	14(70%)	0.002
Moderate		8(40%)	2(10%)	0.003
Marked		3(15%)	0(0%)	0.06

Intraoperative data:

In group A mean number of sessions 1.15 ± 0.37 while in group B 2.1 ± 0.79 (P value 0.06). Stone migrated in 3 cases in group A. There was no significant difference in time needed for complete stone clearance between group A & B (78.16±27.60 min vs 50.55±8.65 min respectively) (P value0.09).

Table (2) Operative data

Table (2) summarizes the intra operative data in both study groups.

	Group A (n=20)	Group B (n=20)	P value
Number of sessions	1.15 ± 0.37	2.1 ± 0.79	0.06
Time needed for complete stone clearance (min)	78.16±27.60	50.55±8.65	0.09
Stone migration	3/20(15%)	0(0%)	0.002
Intraoperative complications			
1- false passage	2/20(10%)	0(0%)	0.005
2- bleeding	3/20(15%)	0(0%)	0.003
4-Allergic reaction to antibiotics	1/20(5%)	1/20(5%)	0.36
5-Complications of anesthesia	3/20(15%)	0(0%)	0.005
6-Renal colic	0(0%)	10/20(50%)	0.002
7-skin bruises	0(0%)	2/20(10%)	0.006
8- perinephric hematoma	0(0%)	1/20(5%)	0.02

Postoperative data:

In group A, 3 cases needed auxiliary procedures(JJ and ESWL for the migrated stones) and in group B, 2 cases needed auxiliary procedure(URS and JJ) . Stone clearance rate after 1st session was

significantly higher in group A than group B (85% & 25% respectively) P value 0.002. Table (3) summarizes post-operative stone clearance rate and complications in both study groups.

Table (3) Postoperative data.

auxiliary procedure	3/20(15%)	2/20(10%)	0.015
stone clearance rate			
after one session	17/20(85%)	5/20(25%)	0.002
after 2 sessions	3/20(15%)	8/20(40%)	0.004
after 3 sessions	0(0%)	7/20(35%)	0.002
Postoperative complications			
UTI	2/20(10%)	1/20(5%)	0.006
Pain	6/20(30%)	10/20(50%)	0.002
Fever	7/20(35%)	1/20(5%)	0.001
Hematuria	2/20(10%)	2/20(10%)	0.564
Steinstrass	0(0%)	4/20(20%)	0.003

Discussion

The goal of treating ureteral stones is to achieve complete stone clearance with minimal patient morbidity. Our study aimed to investigate and compare the treatment success of ESWL and URS for symptomatic ureteral stones ranged from 10–15mm.

Our study which included 40 patients, 20 cases underwent ESWL and 20 cases underwent URS.

We found that both ESWL and URS are effective treatment modalities for upper ureteral stones between 10-15 mm .We found that ESWL is associated with lower stone-Free rates than that with URS (70% and 85% respectively). Stone clearance rate after 1st session was found to be significantly higher in URS group than ESWL group (85% and 25% respectively). More than one session needed for ESWL to achieve adequate stone clearance rate while only one session of URS is capable of achieving adequate stone clearance. However, we found that there is no significant difference in time needed for complete stone clearance between URS and

ESWL groups (78.16±27.60 min and 50.55±8.65 min respectively).

Similar results reported by Fankhauser,et al; in his large retrospective study which included 1282 patients of whom 999 (78%) underwent ESWL and 283 (22%) had URS that ESWL showed significantly lower stone-free rates [ESWL (71%) versus URS (84%) and fewer patients with freedom from re-intervention than URS [ESWL (55%) versus URS (79%)]. [6]

Also, Mostafa MM et al 2018, reported in his prospective study which included 60 cases of whom 30 cases underwent ESWL and 30 cases had URS that URS associated with higher stone free rate than that with ESWL (80% and 66.7% respectively). [8]

In addition, Lee et al 2006, suggested that ESWL is not a good option for upper ureteral stones larger than 15 mm confirming that URS is the best option for such patients. [7]

In our study we found that there is no significant difference in complication rate

between ESWL and URS (35% and 30% respectively).

In URS group, false passage has occurred in 2 cases (10%), 2 cases (10%) came with UTI which treated according to culture, and 2 cases (10%) came with mild to moderate hematuria which managed conservatively by adequate hydration and anti-hemorrhagic measures. avulsion of the ureter or any serious complication was not reported due to high experience of endoscopy in our department and good equipment.

In ESWL group 10 cases (50%) suffering from renal colic during the session and controlled by NSAIDs or nalubuphine, 1 case (5%) came with UTI which treated according to culture of urine, 2 cases (10%) came with mild hematuria managed conservatively by adequate hydration and anti-hemorrhagic measures and no case in both groups needed blood transfusion and 4 (20%) cases developed steinstrass postoperatively which treated conservatively by good hydration and alpha blockers.

Similar results reported by Mostafa MM et al 2018, who reported that patients who underwent URS are associated with higher complication rate than those who underwent ESWL (36.7% and 30% respectively). Only one case (3.3%) in ESWL group developed UTI while 2 cases (6.7%) developed UTI in URS group.[8]

In addition, Our results are similar to Iqbal et al 2018, who found that the complication rate between ESWL and URS were comparable with no significant difference.[2]

In addition, Fankhauser et al reported in his large cohort study a similarly low perioperative morbidity with very few relevant complications (Clavien Grade IIIa or IIIb complications) in both intervention groups. His study confirmed that both interventions (ESWL and URS) are safe procedures. [6]

Also, Fankhauser reported that the most common complication in his study was UTIs (2.2% among ESWL group while 6.4% among URS group. [6]

As regarding need for auxiliary procedures after ESWL or URS, **in our study** 2 cases (10%) needed URS after ESWL while 3 cases (15%) needed ESWL after URS due to stone migration. Similar results were reported by Hussein H et al 2019, who reported in his study which included 40 cases that 15.8% of cases needed URS after ESWL while 10.5% of his cases needed ESWL after URS due to stricture or edema of ureter.[9]

Our study has an advantage that it is a comparative study but the small sample size is considered a limitation in our study.

Conclusion

Both ESWL and URS are effective treatment modalities for upper ureteral stones between 10-15 mm with minimal patient morbidity.

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