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### Stones and Endourology

Original article

# Role of Extracorporeal Shock Wave Lithotripsy in Management of Upper Ureteric Stones

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#### KEYWORDS

Extracorporeal shock wave lithotripsy;  
Ureterorenoscopy;  
Upper ureteric calculus

#### Abstract

**Introduction:** The treatment options for upper ureteric stones range from open surgeries to minimally invasive and non invasive techniques. Presently the two most frequently used options for upper ureteric calculi that require intervention are extracorporeal shock wave lithotripsy (ESWL) and ureterorenoscopy (URS) with contact lithotripsy applied by attaining endoscopic access to the calculi.

**Objective:** The objective of this study is meant to evaluate ESWL in the treatment of upper ureteric stones  $\leq 2$  cm in terms of stone free rates, complications and procedure time.

**Patients and method:** Seventy six patients were subjected to ESWL as primary modality for treatment of upper ureteric stone. ESWL group had mean stone size of 10.58 mm. The stone free rate was 93.4% for ESWL. The sample size was adequate as it was determined by statistician by applying pertinent formulas.

**Results:** It was observed that the stone free rate in ESWL group was higher (97.7%) when the stone size was  $\leq 10$  mm and when the duration of symptoms was  $< 1$  month. ESWL was advantageous in terms of procedural time with no requirement of anaesthesia. The complications in ESWL were minor in nature and were not statistically significant.

**Conclusion:** In conclusion, this study shows that ESWL is an important modality in treating upper ureteric calculi  $\leq 2$  cm in size and we strongly recommend ESWL as the first choice of procedure in solitary upper ureteric calculi  $\leq 10$  mm size.

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#### Introduction

Although the present day urologists' armamentarium is so replete with tools to treat urolithiasis, management options are by no means less controversial today to what it were nearly a decade back.

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Each individual stone, presents the physician and the patient with a dilemma in the era in which a myriad of management options are available. Evolution of technology in the last two decades has revolutionized the treatment of ureteric calculi. In 1882 ureterolithotomy by dorsal lumbarotomy was first described. In 1885 and 1889 transperitoneal and extraperitoneal ureterolithotomy were reported respectively [1]. With the advent of lithotripsy in 1982, management of urolithiasis has taken a quantum leap. Now with high safety and comparable efficacy profile, lithotripsy has also become a leading modality in the treatment of ureteric stones. A guideline panel by the AUA society to review the treatment outcomes for upper ureteric stones have also recommended ESWL as first line treatment for patients with uncomplicated proximal ureteral stones of 1 cm or less [2]. They also concluded that the stone free rate after one year of treatment approaches 85%. Other more important factors in favour of ESWL are cost reduction, ease of monitoring, lack of exposure to ionising radiations in ultrasound monitoring, decreased morbidity and more patient acceptability [3]. Presently the two most frequently used options for ureteric calculi that require intervention are SWL and URS with contact lithotripsy applied by attaining endoscopic access to the calculi. In the present study we would present data from our institution on the usefulness of SWL in the treatment of upper ureteric stones less than 2 cm in size.

## Patients and methods

The prior permission from Institute Ethics committee was taken and all the patients were told about study and their role in study. The consent from patients were also taken. The study was a prospective study conducted from July 2012 to April 2014. A total of 76 patients were included in the study with their proper consent.

The study is a prospective study meant to evaluate ESWL in the treatment of upper ureteric stones. The upper ureter was defined as the segment between the ureteropelvic junction and the superior margin of the sacroiliac joint.

The patients with having stones  $\leq 2$  cm, solitary stones, radio opaque stones, and having upper ureteric stones were included. Whereas those subjects where stones are greater than 2 cm in size, radiolucent stones, stones at any other position other than upper ureter, stones in an abnormal ureter like congenital ureteric abnormality or ureteral reimplantation, patients having renal insufficiency, uncorrected coagulaopathy and morbidly obese patients and acute infection in an obstructed kidney were excluded.

Patient's history was taken and clinical examination done. Investigations in the form of radiography (X ray KUB) and ultrasonography (Abdomen and Pelvis), IVP along with laboratory parameters were assessed. The stone size was noted as per X-ray KUB dimension and the maximum diameter was defined as the stone size. The laboratory investigations done were as follows: Hemogram, Renal function tests, blood sugar level, coagulation profile, urinalysis, urine culture and sensitivity. Appropriate antibiotics were given preoperatively in cases where the urine culture showed evidence of infection. The findings were recorded in the standard Proforma. The form of treatment was explained to the patients and the written informed consent was taken.

All cases were treated as day care procedures, without any anaesthesia. Dornier Sigma (third generation), an electromagnetic shock

wave lithotripter was used. Patients were given supine position on lithotripsy table and the calculus was localised by using both X-ray and USG. All sessions were performed by a single technician under the supervision of a consultant. Shock waves were delivered at the rate of 60–80 per minute with a maximum of 2500 shocks per one session of treatment. We started with low energy waves and increased energy as per tolerability of the patient. Maximum of 3 sittings spaced two weeks apart were given. All patients were asked to drink lots of fluids and maintain active lifestyle and skipping exercises if possible. Prior to every sitting an X-ray KUB was obtained to see for the state of clearance of stone. Study end points included stone free status which was defined as either no visible fragments or fragments less than 3 mm, which were considered as clinically insignificant residual fragments as determined by X-ray KUB and USG KUB for maximum of three months following the last sitting. Patients not responding after 3 sittings of ESWL were deemed failures and other modalities of treatment were explained to them. Number of sessions of ESWL and complications if any were noted. In cases of failures ancillary procedure done was also noted.

## Statistical analysis

The distribution of incidence of various qualitative characteristics will be shown as n (% of cases), while the distribution of various quantitative characteristics will be shown using Mean  $\pm$  Standard deviation across two intervention groups. The statistical comparison of continuous variables across two study groups was done using independent sample 't' test after confirming the underlying normality assumption. The significance of difference of categorical variables across two groups will be tested using Fisher's exact probability test. The entire statistical analysis will be performed using Statistical Package for Social Sciences (SPSS version 12.0; Chicago, IL) for MS Windows and GraphPad's software. Categorical and qualitative data between the groups was analyzed by Fisher's exact test from a  $2 \times 2$  contingency table. Level of significance was expressed as probability value (P-value). P-value of  $<0.05$  was considered statistically significant.

## Results

The majority of the patients undergoing ESWL were in the age group of 31–60 years being 59.2% of cases followed by patients who were less than 30 years of age. Males accounted 76.3% (58/76) whereas females accounted for 23.7% (18/76). Pain was the most common symptom affecting 81.6% (62/76) patients followed by hematuria which was in 10.5% (8/76) patients undergoing ESWL. Only 7.9% (6/76) patients reported incidental detection of stones. The duration of symptoms was  $\leq 1$  month in 92.1% (70/76) of patients. 57.9% (44/76) patients had stones of  $\leq 10$  mm in size while 42.1% (32/76) patients had stones between 10.1–20 mm in size. 76.3% (58/76) underwent a single sitting of ESWL and 14.5% (11/76) underwent two sittings of ESWL. In only 9.2% (7/76) of patients three sittings of ESWL had to be given. Of the 76 patients subjected to ESWL 93.4% (71/76) of patients were stone free whereas in only 6.6% (5/76) of patients ESWL proved to be a failure. Hence the average stone free rate was 93.4%.

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