



# IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH  
An official Publication of Human Journals

ISSN 2349-7203



Human Journals

Research Article

February 2018 Vol.:11, Issue:3

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## Shock Wave Lithotripsy for Bladder Stones



**IJPPR**  
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH  
An official Publication of Human Journals

ISSN 2349-7203



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**Submission:** 21 January 2018  
**Accepted:** 27 January 2018  
**Published:** 28 February 2018



HUMAN JOURNALS

[www.ijppr.humanjournals.com](http://www.ijppr.humanjournals.com)

**Keywords:** Shock Wave Lithotripsy, Bladder Stones

### ABSTRACT

**Introduction:** This study determines the safety and efficacy of extracorporeal shock wave lithotripsy (ESWL) in the treatment of vesical stones. **Methods:** Study design was Retrospective survey. The study included all patients from Imam AL Hussein Medical City who were treated by extracorporeal shock wave lithotripsy (ESWL) at the outpatient unit during 2009 – 2017. The working team at the unit depend on the guideline of the European Association of Urology for treating the patients. **Results:** Ninety-three patients, male and female, 2 to 90 years old (average age 46 years) with bladder stone were treated with the HM-3 lithotripter (Storz type). 50 patients had chronic diseases and 43 of them without. Bleeding 57 patients and Dysuria 54 patients considered a common side effect for the procedure that treated as an outpatient, while retention of urine and fever is an uncommon side effect that requires hospitalization and intervention. **Discussion:** In our series, ESWL monotherapy proved to be a successful treatment with a success rate of 66 percent. The main advantages of ESWL are the minute fragmentation that allows for uncomplicated evacuation even in the presence of infravesical obstruction, no need for anesthesia and hospitalization, no need for an indwelling catheter and finally the rapid evacuation of the fragments. Most of the cured patients were stone free one week after the treatment. **Conclusion:** ESWL is an effective, safe, noninvasive method of treatment for bladder stones that can be performed without the use of anesthesia and on an outpatient basis even in the presence of lower urinary tract pathology (prostatic hyperplasia or neurogenic bladder).

## INTRODUCTION

Bladder stones are calcified materials that are present in the bladder. Bladder stones are commonly associated with underlying urological disorders, including infection, infravesical outlet obstruction (benign prostatic hyperplasia, contracture of bladder neck, urethral stricture) and neurogenic bladder dysfunction.[1]. Urinary bladder calculi represent 5% of urolithiasis [2]. most commonly solitary although multiple stones are found in 25% of cases [3]. The management options for vesical lithiasis have changed dramatically with the development of endourological fibre-optic instruments and extracorporeal shockwave lithotripsy (SWL)[4]. Various techniques have been used for the management of bladder calculi, such as open cystolithotomy, transurethral cystolitholapaxy (TUCL), SWL, and percutaneous cystolitholapaxy (PCCL) [5].Introduction of SWL in the early 1980s dramatically change the management of urinary tract stones. More than 90% of stoes in adults might be suitable for SWL treatment. [6]. It require energy source to create the shock wave, a coupling mechanism to transfer the energy from outside to iside the body, and either fluoroscope or ultrasound or both to identify and position the calculi at a focus of converging shock waves.However, the ideal treatment option for bladder stones remains controversial [7].

This study determines the safety and efficacy of extracorporeal shock wave lithotripsy (ESWL) in the treatment of vesical stones.

## METHODS:

Study design was Retrospective survey. The study included all patients from Imam AL Hussein Medical City who were treated by extracorporeal shock wave lithotripsy (ESWL) at the outpatient unit during 2009 – 2017.

The working team at the unit depending on the guideline of the European Association of Urology for treating the patients. Basic descriptive statistics were used for describing characteristics. Simple and Multiple regression analysis was performed to test the association between the main variables while controlling the potential confounding and interactions.

**RESULTS:**

Ninety-three patients, male and female, 2 to 90 years old (average age 46 years) with bladder stones were treated with the HM-3 lithotripter (Storz type).

**Table 1 , Gender distribution:**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	88	94.6	94.6	94.6
	Female	5	5.4	5.4	100.0
	Total	93	100.0	100.0	

50 patients had chronic diseases and 43 of them without.

**Table 2. Chronic diseases:**

Chronic Disease	Number	Percentage
Hypertension	43	46.2 %
Diabetes	19	20.4 %
Ischemic heart dis.	5	5.4 %
Stroke	7	7.5 %

The symptoms experienced by the patients varying between haematuria, dysuria, urinary retention and pyuria.

The aetiology of the stone disease was diverse. 52 patients showed symptomatic and clinical prostatic hyperplasia. In 27 infravesical obstruction (urethral stricture) was present. 9 patients had a neurogenic bladder, 5 patient with silent migration of stone from the upper urinary tract.

Regarding number and type of the stones; 82 patits with single stone and 11 patients with multiple. 54 patients had luscent, 39 patients opaque stones.

**Table 3, Number of stones treated by SWL:**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	82	88.2	88.2	88.2
	Multiple	11	11.8	11.8	100.0
	Total	93	100.0	100.0	

**Table 4, Type of stones treated by SWL:**

		Frequency	Percent	Valid Percent	Cumulative Percent
<b>Valid</b>	<b>Opaque</b>	<b>54</b>	<b>58.1</b>	<b>58.1</b>	<b>58.1</b>
	<b>Lucent</b>	<b>39</b>	<b>41.9</b>	<b>41.9</b>	<b>100.0</b>
	<b>Total</b>	<b>93</b>	<b>100.0</b>	<b>100.0</b>	

All the ESWL treatments were done without anesthesia and the patients were managed on an outpatient basis. No morbidity was encountered during or after ESWL.

Preoperatively, a full physical examination was performed in all patients. Routine blood results, electrocardiography, plain abdominal films, ultrasound and excretory urography were obtained to evaluate the complete lower urinary tract. To focus on the bladder stone, the patient was placed in the prone position on the lithotripter unit while we started the procedure, Duration of treatment ranged from 30 to 65 minutes (average 42 min). The number of shock waves per session ranged from 2000 to 4500 (average 3250). Treatments were performed without the use of anesthesia, while we provided the patients with analgesics or sedatives during the procedure when they had pain. To check stone disintegration and evacuation plain abdominal films (KUB) and ultrasonography were used just after the procedure and one week after ESWL. Results Dimensions of the stone were approximated by measuring the greatest diameters ranging from 8 mm to 42 mm (mean 20.8 mm). After one ESWL treatment 54 of the 93 patients (58.1%) had complete disintegration and evacuation of the stones, 11 patients (11.8%) lost and not back for follow up, while the remaining 28 patients (30.1%) had no disintegration (not complete evacuation), so they underwent an endoscopic procedure.

**Table 5, Results of SWL:**

		Frequency	Percent	Valid Percent	Cumulative Percent
<b>Valid</b>	<b>Erosion</b>	<b>21</b>	<b>22.6</b>	<b>22.6</b>	<b>22.6</b>
	<b>Shuttering</b>	<b>47</b>	<b>50.5</b>	<b>50.5</b>	<b>73.1</b>
	<b>No chang</b>	<b>25</b>	<b>26.9</b>	<b>26.9</b>	<b>100.0</b>
	<b>Total</b>	<b>93</b>	<b>100.0</b>	<b>100.0</b>	

Bleeding happened in 57 patients and Dysuria in 54 patients which considered a common side effect for the procedure that treated as outpatient, while retention of urine and fever is uncommon side effect that requires hospitalization and intervention.

**Table 6, side effects of SWL:**

	Frequency	Percent
<b>Bleeding</b>	<b>57</b>	<b>61.3 %</b>
<b>Dysuria</b>	<b>54</b>	<b>58.1 %</b>
<b>Retention</b>	<b>7</b>	<b>7.5 %</b>
<b>Fever</b>	<b>5</b>	<b>5.4 %</b>

**DISCUSSION:**

Standard treatments for bladder stones consist of either an open operation or endoscopic transurethral disintegration and extraction [8]. The advantage of these treatments is the ability of simultaneous treatment of some underlying diseases which predispose to stone formation, such as benign prostatic hyperplasia and urethral strictures.

The disadvantages of these treatments are the need for hospitalization since postoperative recovery requires specific medical assistance; the need for anesthesia; the risk of harmful influence on the bladder mucosa [9] and the risk of urethral strictures from the prolonged use of endoscopic tools or the postoperative use of indwelling catheters.

**Table 7: fate of bladder stones treated by SWL:**

		Frequency	Percent	Valid Percent	Cumulative Percent
<b>Valid</b>	<b>Cured</b>	<b>54</b>	<b>58.1</b>	<b>58.1</b>	<b>58.1</b>
	<b>Operated</b>	<b>28</b>	<b>30.1</b>	<b>30.1</b>	<b>88.2</b>
	<b>Lost in follow up</b>	<b>11</b>	<b>11.8</b>	<b>11.8</b>	<b>100.0</b>
	<b>Total</b>	<b>93</b>	<b>100.0</b>	<b>100.0</b>	

The reported complications as well as the risk of recurrence of bladder stones initiated the search for a noninvasive treatment. ESWL appears to be an attractive, alternative treatment for bladder stones providing good therapeutical results according to previous reports [10]

In our series, ESWL monotherapy proved to be a successful treatment with a success rate of 70 percent. The main advantages of ESWL are the minute fragmentation that allows for uncomplicated evacuation even in the presence of infravesical obstruction, no need for anesthesia and hospitalization, no need for an indwelling catheter and finally the rapid evacuation of the fragments. Most of the cured patients were stone free one week after the treatment.

**Table 8: comparison with other studies:**

	Cured	operated
This study 2017 82 patients ( SM / HM3 lithotripter )	54 p. ( 65.8 % )	28 p. ( 34.1 % )
Hotiana MZ 1993 29 patients ( MPL 9000 lithotripter )	22 p. ( 75.8 % )	7 p. ( 24.1 % )
Garcia Cardoso 2003 45 patients ( SM /SL 10 lithotripter )	35 p. ( 77.7 % )	10 p. ( 22.2 % )

## CONCLUSION:

ESWL is an effective, safe, noninvasive method of treatment for bladder stones that can be performed without the use of anesthesia and on an outpatient basis even in the presence of lower urinary tract pathology (prostatic hyperplasia or neurogenic bladder).

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