

## Lower calyceal stone clearance using ESWL: A case series

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### Abstract

**Background:** Lower calyceal stones are difficult to clear spontaneously due to non dependent location in relation to renal pelvis in higher number of patients. Extracorporeal Shockwave Lithotripsy emerged as an important non invasive procedure in treatment of renal stones. This study was undertaken to study the efficacy of Extracorporeal Shockwave Lithotripsy in treatment of lower calyceal stones. **Material Methods:** A total 59 samples, 50 patients aged (10 to 70) with lower calyceal kidney stones were treated by using ESWL. All the patients had undergone intravenous pyelograms for the review before the procedure. Infundibular length (IL), infundibular width (IW) and infundibulopelvic angle (IPA) were measured. All procedures were performed under USG Guidance with Dornier compact Sigma ESWL MACHINE in supine position as an outpatient procedure. **Results:** Majority of the patients in this study were aged more than 15 years and Three fourth of patients were males. Right calyx was affected in 42% of the cases. The overall stone clearance in this study was 81.36%. The stone clearance was higher and significant in patients with infundibular length of less than 30 mm. The infundibulopelvic angle and infundibular width also contribute statistically in stone clearance. Colic was the common complication in the study group. **Conclusion:** The Extracorporeal Shockwave Lithotripsy was found to have efficacy in clearance of stones of less than 15 mm with fewer complications.

**Key Words:** Calyceal Stones, Renal Calculi, Extracorporeal Shockwave Lithotripsy, Success rate, Complications

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### Introduction

Renal calculus is common in urological practice. The disease affects about 12% of the world population and has become a worldwide health problem [1]. The etiology of renal calculus is multifactorial. The role of heredity has also been noted in many studies. The treatment for renal calculus can be conservative and surgical. Nowadays majority of the patients are effectively treated by using minimal invasive techniques involving lower rate complications following the procedures. It has been broadly accepted that extracorporeal shockwave lithotripsy (ESWL) is with a maximal length of 2 cms or less [2]. The efficacy ESWL has been evaluated by many studies and results of few are controversial. But the situations persist where the choice of the technique to be used in first line treatment has proven difficult [3]. This study was mainly undertaken to study effectiveness of ESWL in treatment of lower calyceal calculi.

### Material and methods

An observational study was conducted in order to establish the efficacy of ESWL in treatment of ureteric calculi. A total 59 samples, 50 patients aged (10 to 70) with lower calyceal kidney stones were treated by using Dornier compact sigma. The patients were divided into four groups based on the stone diameter. These groups included stones diameters of less than 5 mm, 6 – 10 mm, 11 – 15 mm and 16 – 20 mm. The energy, the number of shockwaves, number of treatment sessions and complications were noted. All the patients had undergone intravenous pyelograms for the review before the procedure. Infundibular length (IL), infundibular width (IW) and infundibulopelvic angle (IPA) were measured. The patients who considered to have a favourable anatomy (IPA 90°, IL 30 mm and IW

> 5 mm). Forty four cases (74.8%) were men and 25 (25.2%) were women. Before lithotripsy, all patients were evaluated routinely with renal function tests, urinalysis, urine culture, abdominal X ray and intravenous pyelogram (IVP) and/ or ultrasonography (USG). Treatment with antibiotics was administered before ESWL when the culture was positive. Patients with congenital anomalies of the urinary tract, history of previous surgery for urolithiasis, complete or partial staghorn calculi or multiple calculi and those treated by combined therapy with open surgery or percutaneous nephrolithotomy were excluded from the study. All procedures were performed under USG Guidance with Dornier compact Sigma ESWL MACHINE in supine position as an outpatient procedure. The shock wave numbers ranged between 1500 and 3500 shock wave/ session (mean 2250). All patients underwent DJ stenting before procedure, ESWL was done under SA/ Sedation. Cases were designated as stone free, clinically insignificant residual fragments that are non obstructive and non-infectious stone fragments of 4 mm or less and failure. Follow up included physical examination, urinalysis and plain abdominal film, USG. Plain abdominal film was taken on the day after ESWL and monthly in the first three months. USG KUB was done at one and 3 months post ESWL. Patients with IPA 90°, IL 30 mm and IW > 5 mm were considered to have favourable anatomy. Patients were stratified into four groups based on stone size. These groups included stone sizes of 5 mm (1), 6 – 10 (32), 11 – 15 mm (18) and 16 – 20 mm (8). The energy and shock waves and number of treatment sessions were noted. ESWL was considered as failure if residual stone fragments of size > 4 mm remained after three sittings upon retreatment.

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## Results

Table 1. Baseline characteristics of the study group

Baseline characteristics		Frequency	Percent
Age	0 - 14	3	5.1
	15 +	56	94.9
Sex	Male	44	74.6
	Female	15	25.4
Laterality	Left	20	40.0
	Right	21	42.0
	Bilateral	9	18.0

Almost 95% of the patients were aged more than 15 years in this study. Three fourth of patients were males. About 42% of the cases had stone in right calyx.

Table 2. Stone size and average number of shocks given

Stone size	Average number of shocks
≤ 5 mm	2127
6 – 10 mm	2221
11 – 15 mm	2639
16 – 20 mm	2881

The average number of shocks increased in increase in size of the stones.

Table 3. Stone clearance by size of calyceal stone

Stone size	No of samples	Non clearance	Percentage of clearance	P value
≤ 5 mm	1	Nil	100	0.059, NS
6 – 10 mm	33	2	93.93	
11 – 15 mm	18	4	87.78	
16 – 20 mm	8	5	37.5	
Total	59	11	81.36	

The overall stone clearance was 81.36% in this study. The stone clearance was 100% in stone size of less than 5 mm and 37.5% in the stones with size of 16 – 20 mm.

Table 4. Clearance of stone by anatomical characteristics in the study group

		No of samples	Percentage of clearance	P value
Infundibular length	IL ≤ 30 mm	38	89.48	0.0312, Sig
	IL > 30 mm	21	66.67	
Infundibulopelvic angle	IPA ≥ 90°	29	89.65	0.189, NS
	IPA < 90°	30	76.66	
Infundibular width	IW ≥ 4 mm	34	85.29	0.592, NS
	IW < 4 mm	25	80.0	

The stone clearance was higher and significant in patients with infundibular length of less than 30 mm. The infundibulopelvic angle and infundibular width had no statistically significant difference in stone clearance.

Table 5. Complications of the procedure

Complications	Frequency	Percent
Colic / Steinstrasse	6	12.0
UTI	2	4.0
Hematuria	2	4.0
Blood transfusion	Nil	
Perinephric hematoma	Nil	
Ileus	1	2.0
Sepsis	2	4.0

Colic / Steinstrasse was the common complication in the study group in 12% of the cases. It was followed by UTI, Hematuria, Sepsis in 4% of the cases each and ileus in 2% of the cases.

## Discussion

This study was undertaken to assess efficacy of ESWL in treatment of calyceal stones. This study had shown that, the treatment outcome of lithotripsy depends on several factors. The type of lithotripter, stone characteristics (number, size, composition and location) and renal anatomy and function are important factors for determining the treatment characteristics and outcome. The role of shockwave lithotripsy for management of lower pole nephrolithiasis has been questioned in some studies,[4] many have suggested it as the primary treatment modality for lower pole stones of less than 2 cm[5,6]. Recently, several retrospective studies have further investigated the

influence of lower pole anatomy on stone clearance. Retention of residual fragments in the lower pole calices was noted to be a major problem with ESWL not only for stones originally in the lower calices, but also when fragments of stones located elsewhere migrated there.<sup>7</sup> For this purpose this study assessed the efficiency of ESWL monotherapy for isolated lower pole nephrolithiasis with favourable anatomy and compared with regard to different stone sizes. This study had shown that, almost 95% of the patients were aged more than 15 years and majority were males. In a similar study by Kurien et al, males outnumbered females. A study by Zayd et al noted 42 years and 57% were males[2]. About 42% of the cases had stone in right lower calyx. In a study by Kurien et al, the stones higher in left side in adults and right side in children[8]. A study by Zayd et al noted that, about 49% of the cases had stones on left side[2].

The overall stone clearance was 81.36% in this study. The stone clearance was higher for stones of less than 10 mm and lower for the stones of size more than 15 mm. In a study by Kurien et al, the stone free rate was 84.09% in children and 86.48% in adults[8]. Zayd et al noted success rate of 55%[2]. The stone clearance was higher and significant in patients with infundibular length of less than 30 mm. The infundibulopelvic angle and infundibular width had no statistically significant difference in stone clearance. Colic / Steinstrasse was the common complication in the study group in 12% of the cases. It was followed by UTI, Hematuria, Sepsis in 4% of the cases each and ileus in 2% of the cases. Kurien et al had noted complication rate in 6% of the children and 4.63% of the adults[8].

#### Conclusion

The Extracorporeal Shockwave lithotripsy had higher success rate in stone size of less than 15 mm for lower calyx.s

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