

## RESULT OF ESWL IN THE MANAGEMENT OF URINARY STONES, IN THE DEPARTMENT OF UROLOGY, CHITTAGONG MEDICAL COLLEGE HOSPITAL: A STUDY OF 500 CASES.

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### Abstract

This was a prospective comparative study carried out in the Urology Department of Chittagong Medical College Hospital, Chittagong between the period of August 2007 to September 2008 to evaluate the result of ESWL in the management stones located in different parts of urinary tracts. Patients were selected from out patient department of CMCH & treated as outdoor patient under injectable NSAID. Total 500 patients were included in the study. Ages of the patients ranged from 18 to 65yrs, with a mean age of 41.5yrs. Of them 390 patient were male (78%) and 110 patient (22 %) were female. The size of the stone ranged from 7 mm to 40 mm with a mean of 23.5 mm. Of the 500 cases 400 cases were of Renal stone ( 80% ) and 100 Cases were ureteric stone ( 20% ). Of the 400 cases of renal stones 320 cases were totally fragmented( 80%) in the first session and rest of the renal stones were totally fragmented in the second session , so the success rate at is 80% in 1st session and 100% in 2nd session. Among the 100 cases of Ureteric stones 70 cases were fragmented totally in the 1st session, so the success rate is 80% in 1st session and 20% were fragmented in subsequent session. But 10% of ureteric stones failed to fragment.

**Keywords:** ESWL; Urinary stones

### Introduction

Stone diseases are as old as civilization. It was first identified in the Egyptian mummy of 4800 BC<sup>5</sup>. It is third most common affliction of the Urinary tract<sup>6</sup>. In our country though we have no statistics, in USA 2-3% of total population suffer from Urinary stone diseases. Accordingly in Bangladesh about 42-45 millions of people are suffering from Urinary stone diseases. In Bangladesh it is more common in northern part of the country affecting predominantly

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male over female with a ratio of 3:15.

Extracorporeal shock wave lithotripsy: is a technique for shattering stones such as kidney stones or gallstones with a shock wave produced outside the body<sup>1</sup>.

The first use of shock wave lithotripsy to destroy kidney stones was in 1980. Within a few years, it became the standard treatment for renal stones. Shock wave lithotripsy of gallstones began in 1985. Although it worked well in patients with a single small stone, the method did not gain wide acceptance because of difficulty in clearing the fragments and the tendency to new stone formation. Treatment of stones in the common bile duct, pancreatic duct, and salivary gland has gained general acceptance. Extracorporeal shock wave lithotripsy is also known as ESWL.

The study was carried out between the periods of August 2007 to September 2008. 500 cases were included in the study.

### Aims and objectives

1. The study was carried out to find the result of ESWL for stones located in different parts of Urinary tract.
2. To find the efficacy of ESWL for Ureteric stones in comparison to Renal stones.
3. To find out the result of ESWL for lower ureteric stones in comparison with upper ureteric stones.
4. To compare the result of Ultrasound with that of C-arm in localizing urinary stones.
5. To find out the result of ESWL in case of large stones (> 2cm ).

### Methodology

Patient attending in the Outpatient department of Urology Department, Chittagong Medical College & Hospital with urinary stones were selected for the study. After detail history and clinical examination, patients were evaluated for stone disease. Estimation of serum creatinine & Intravenous urography done as a routine in all the patient to see the gross renal function and distal obstruction. For larger stones in the majority of cases precise focus were used but for

smaller stones extended focus were used. Criteria of stone clearance is to have no distal obstruction in any form. It is assessed in this study by doing intravenous urogram & Ultrasonography of KUB & Prostate with PVR. If there was any residual stone after 2 weeks of adequate & appropriate treatment as revealed by plain X-ray KUB, second session ESWL was planned.

#### Inclusion criteria

1. Any renal and ureter stone less than 4.0 cm size having no distal obstruction and renal failure.
2. Stones at any level of the ureter without distal obstruction.

#### Exclusion Criteria

1. Any stag horn calculus.
2. Stones larger than 4 cm
3. Stones with distal obstruction
4. Stones with chronic renal failure
5. Urinary bladder stones
6. Abdominal aortic aneurysms,
7. uncontrollable bleeding disorders
8. Pregnancy
9. Patient with cardiac pacemakers should be evaluated by a cardiologist familiar with ESWL. A cardiologist may need to be present during the ESWL procedure in the event the Pacemaker needs to be overridden.

In all the patient Urinalysis and culture sensitivity were done to exclude urosepsis. All the patient were advised to take light diet at previous night of ESWL. Prophylactic antibiotic, usually 3rd generation cephalosporin are used in all the patient. Adequate analgesic in the form of Injection ketorolac is used in all these patient. Stenting were not done as a routine procedure, done only in patients with huge stone bulk. For renal stone patient was laid supine but for lower ureteric stone patient was laid prone over the ESWL table. Stones were brought into view by moving the table Up and down (300) i.e. along the Y-axis or front / back or head /foot direction (00) ie along X-axis. All these movements are controlled by Computerized digital control unit. Stones are brought into focus and targeted either by using C-arm fluoroscopy or by ultrasound. Then after bringing the stone into focus, briefing the details of shock wave shockwaves are started. Shockwaves are

started beginning from energy level 0.5 level. Which is raised gradually 0.1 levels for every 10 shockwave till 1.0 energy level. Then for every 20 shockwave 0.5 unit energy level is raised successively according to the need and tolerance of the patient. Maximum energy level used in this study was 7kv and minimum energy level used is 2kv and maximum no of shock wave used were 4500 shockwave.

#### Results

Total 500 patients were included in the study. The ages of the patient ranged from 18 to 65yrs, with a mean age of 41.5yrs. Of them 390 patient were male (78%) and 110 patient (22 %) were female. The size of the stone ranged from 7 mm to 40 mm with a mean of 23.5 mm. Of the 500 cases 400 cases were of Renal stone (80%) and 100 Cases were ureteric stone (20%). Of the 400 cases of renal stones 320 cases were totally fragmented (80%) in the first session and rest of the renal stones were totally fragmented in the second session, so the success rate at is 80% in 1st session and 100% in 2nd session. Among the 100 cases of Ureteric stones 70 cases were fragmented totally in the 1st session, so the success rate is 70% in 1st session and 20% were fragmented in subsequent session. But 10% ureteric stone were unable to break. Only the adult group of patients were included in this study.

**Table I :** Age distribution among patients of this series (n-500 )

Type of stones	No of patient	Age range	Average Age	Percentage of total pt.
Renal stone	400	18-65yrs	41.5yrs	80%
Ureteric stone	100	20-65	42.5yrs	20%
Total	500			100%

Among the 500 patient of this study 370 patients were male and 130 patients were female. The ratio is about 3: 1.

**Table II :** Sex distribution among patients of this series(n-500)

Type of stones	Male	Female	Total	Percentage
Renal stone	300	100	400	80%
Ureteric zones	70	30	100	20%
Total	370	130	500	100%

Out of 400 patients of Renal stone 320 patients that is 80 % fragmented in the 1st session. So the success rate is 80 %. Among rest 80 stones, all of them are fragmented in second session, so the success rate after 2nd session is 100 %.

**Table III :** Success rate of renal stone fragmentation (n=500)

Period of ESWL	No of cases	Totally fragmented	Success rate
1st session	400	320	80%
2nd session	80	80	100%
Total	480	400	100%

Among the 100 ureteric stones, 80 stones are fragmented in 1st session. Among rest 20 patients, 10 are fragmented in 2nd session, and rest 10 in 3rd session.

**Table IV :** Result of location of stones within kidney

Location of stone	No of stone	No of total frag.	No of cleared stone	Percentage of clearance
Upper calyx	300 cases	300 cases	300 cases	100%
Middle calyx	150 cases	150 cases	150 cases	100%
Lower calyx	50 cases	50 cases	48 cases	96%

**Table V :** Result of ESWL for Ureteric stones (n=100)

Period of ESWL	No of cases	Totally fragmented	Success rate	Failure rate
1st session	100 cases	80 cases	80 %	20 %
2nd session	20 cases	10 cases	90 %	10 %
3rd session	10 cases	10 cases	100 %	00 %
Total cases	100 cases	90 cases	90 %	10 %

Among the 100 ureteric stones, 60 were upper ureteric stone, 20 were mid ureteric and 20 were lower ureteric stone.

Among the 60 cases of upper ureteric stone 54 (90%) cases are totally fragmented, so the clearance rate is 90%. Among the 20 cases of mid ureteric stone 18 cases were totally fragmented, so the clearance rate is 90%. Among the 20 cases of lower ureteric stones, 14 cases are totally fragmented, so the clearance rate is 70%.

**Table VI :** Result of ESWL for upper and lower ureteric stone(n=100)

Site of stone	No of cases	Total fragmentation	Clearance rate
Upper Ureter	60 cases	54 cases	90 %
Mid ureter	20 cases	18 cases	90 %
Lower ureter	20 cases	14 cases	70 %

Lowest stone size of this study was 7mm and the biggest one was of 40mm. Average stone size was 23.5mm.

**Table VII :** Stone size in this study.

sl. no	size of stone	No of cases	Percentage
1	< 2cm	400 cases	80%
2	2-3cm	50 cases	10 %
3	> 3cm	50 cases	10 %
Total		500 cases	100 %

Both the C-arm and Ultrasound were used to localize the stone. C-arm was used in 400 cases(80%) and ultrasound was used for localizing 100 case(20%).

**Table VIII :** Result of C-arm versus ultrasound localization of stones (n=500)

Imaging used	No of cases	No of total fragmentation Success	rate
C-arm	400	400	100 %
Ultrasound	100	80	80 %

Patients included in this study were from different districts of Bangladesh. 400 patients had their present address at Chittagong districts, though they may not be the permanent resident of Chittagong district. 100 patients were only from three hilly districts of Chittagong. Rest 100 patients were from other districts of Bangladesh like, greater Noakhali, Comilla, B.Barria, Tangail, Kustia, Pabna, Gopalganj, etc.

**Table IX :** Territory of stone formation in this study (n=500)

Area of Bangladesh	No of cases	Percentage
Chittagong district	300 cases	60 %
Chittagong Hill tracts	100 cases	20 %
Outside Chittagong	100 cases	20 %

Single (Precise) focus is used for 400 patients (80%). Both precise and extended focus (duel) focus was used particularly in patients with smaller stones in 100 cases (20%).

**Table X :** Result of use of single focus versus duel focus

Focus used	No of cases	percentage
Single focus	400 cases	80 %
Duel focus	100 cases	20 %

Complications: All of the patients complain of some degree of pain following ESWL. Minor degree of haematuria was found in 300 (60 %) patients<sup>10</sup>. patients (2 %) developed fever with profuse requiring hospital admission and blood transfusion.

**Table XI** : Complications of ESWL reported in this study (n=500 )

Sl. no	Complications	No of cases	Percentage
1	Pain	500 cases	100 %
2	Minor haematuria	300 cases	600 %
3	Frank haematuria & fever requiring hospitalization	10 cases	2 %

In this study JJ stent were used for stones larger than 2cm, but result was beneficial.

### Discussion

The study was carried out between the period of August 2007 to September 2008. Age of the patient was between 18 to 65 years. With a median age of 41.5 years. In this study only the adult group of patients were included. But ESWL is the first-line treatment for renal and upper ureteral calculi of paediatric age group. However, larger stones which will require several ESWL sessions and consecutively increased number of shock waves are best treated with percutaneous nephrolithotomy plus ESWL. Patients with congenital anomalies necessitating surgical reconstruction are the best candidates for operation. Styrofoam boards were used to protect the lungs in children<sup>2</sup>. The male female ratio of this series was 3:1. In Bangladesh male female ratio of stone disease is 3:1<sup>5</sup>.

In this study stones up to 4cm diameter (Not stag horn) were fragmented. But for bigger stones pre-ESWL stenting were done. Though 2cm is regarded as rational limit for calculi amenable for ESWL .but larger stones could be fragmented with large dose of ESWL <sup>12,13</sup>.

ESWL is not free from complications. It may cause extensive sub capsular haematoma, parenchymal damage etc. Slowing the rate of shock wave delivery to 30 SW/ minute has a dramatic protective effect on the integrity of the kidney vasculature<sup>3</sup>. On the other hand increasing the number of SW, decreases the work time and increases the size of the cavitations. Cavitation is necessary to produce fine passable fragments<sup>4</sup>.

In this study among the 400 cases of renal stones, In 300 cases stones were in upper calyx, all of which were fragmented & cleared. 150 patients had stones in middle calyx, all of them are fragmented & cleared. But among the 50 cases of lower calyceal stones, 50 stones were fragmented but only 48

patients were cleared of the stone. so the clearance rate is 96%. Failure in rest 4% cases were due to calyectasis & poor drainage due to nondependence as located in lower calyx.

A report on Extra-corporeal shock wave lithotripsy results on 1569 patients in renal units of outpatient departmental clinic. Biosan Istanbul, Turkey showed a stone free rate of 93 %. In 3.6 % patients were those with history of surgery and / or anatomical calyceal deformities. 3.4% were due to insignificant data<sup>8</sup>.

The clearance rate of ESWL is better for renal stone than for ureteric stone. It is almost 100% for renal stones and 75% for Ureteric stone<sup>7</sup>.

People who undergo ureteroscopy for the treatment of ureteric stones achieve a higher stone-free rate, but have more complications and a longer hospital stay <sup>5</sup>.

Use of diuretics with ESWL facilitate fragmentation and clearance of ureteral stone, so diuretics seems to be the safe adjunct to ESWL treatment of ureteral stone and coincides with better result <sup>9</sup>.

In this study the size of the stone ranged from 7mm to 40 mm, with an average of 23.5mm. Bigger size of the stone at presentation was due ignorance & lack of knowledge of our people. Fragmentation of the stone depend upon the site of the stone, hardness of the stone, eg 7mm size VUJ stone required 4000 shockwave for total fragmentation, at energy level of 6, with total energy of 356 kilocalorie, on the other hand 40mm right renal stone required 3600 shock wave at energy level of 6, with a total energy of 270 kilocalorie.

In this study, no local or general anaesthesia were used, only I/V NSAID (IV Ketoralac) was used. Use of EMLA (Eutectic mixture of local anaesthetic) is not better than IV analgesic<sup>10</sup>.

In this study both C-arm and ultrasound are used to localize the stone. The perfection of localization and success rate of fragmentation is better by C-arm than by Ultrasound. this may be due due to lack of experience in ultrasound. In this study JJ stent were used for larger stones (> 2cm ). If the patient has a high probability of stricture close follow up or prophylactic pre-ESWL stenting is indicated<sup>11</sup>.

### Conclusion

ESWL is the gold standard treatment for the urinary stones smaller than 2cm. The efficacy of ESWL is better for renal stones than for ureteric stones. Among the ureter the result is better for upper

ureteric stone than for lower ureteric stone. URS and ICPL may be alternatives of ESWL for lower ureteric stone. C-arm localization is better for localization and fragmentation than ultrasound for urinary stones. EWSL for stones larger than 2cm is effective. But in that case stenting may be beneficial.

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