



A DESCRIPTIVE STUDY OF MORBIDITY PROFILE AFTER ESWL FOR UROLITHIASIS

General Surgery

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ABSTRACT

Background: Urinarolithiasis is a common disease of urinary tract after urinary tract infection (UTI) and prostate diseases and its incidence is increasing. Treatment of urolithiasis includes ureteroscopic endoluminal extraction of stones (URS), extracorporeal shockwave lithotripsy (ESWL) and percutaneous nephrolithotripsy (PCNL). ESWL may sound appealing because of it's a non invasive procedure but it is not bereft of renal and extrarenal complications. All the studies on complications following ESWL are not on Indian population and the data on this subgroup of population who are at maximum risk of urolithiasis is missing. Thus, this study aims to provide data on the subject on Indian population.

Method: This is a descriptive observational study carried out between July 2017 and July 2019, on 180 consecutive patients who underwent ESWL.

Result: Out of 180 patients 161 (89.44%) patients were male and 19(10.56%) patients were female. Male to female ratio was 8.47: 1. Mean age of the patients of this study group was 34.79 yrs. Out of 180 patients, 171 (95%) had pain of various grades. Only 9 patients (5%) did not complain of pain. The second most common presenting complain was hematuria 17(9.44%). There was no statistical significance between presenting symptom of hematuria and the size of stone with P value of 0.566. microscopic hematuria was present in 17 patients (5.56%). The mean size of the stone was 11.09mm and majority of patients had stones in size range of 09 mm to 12 mm. Out of 180 patients 64 patients (35.55%) had stones in upper pole of the kidney followed by 41 patients (22.78%) upper ureter and 35 patients (19.44%) lower pole. The most common complication was Graveluria in 93 patients. 96(53.33%) patients who underwent ESWL had successful clearance of stone at first session. 84(46.66%) patients had to undergo 2nd and 3rd sessions of ESWL.

Conclusion: Stone free rate is 77.22 % after completion of ESWL. Failure rate was seen in 12.22 % of patients. Graveluria, Loin pain, hematuria, and Steinstrasse are the complications following. Nil effect was seen in 21 patients corresponding to 11.67% of the patients. ESWL is safe and effective for renal and upper ureteric stones. Stone size was directly proportional to the number of ESWL sittings.

KEYWORDS

ESWL, RIRS, SFR, PCNL

INTRODUCTION

10.6% of men and 7.1% of women are affected with urinary tract stone disease in the United States (1). In Indian population, about 12% of them are expected to have urinary stones and out of which 50% may end up with loss of kidney functions (2). ESWL shows excellent stone-free rates (SFR) for stones up to 2cm in size except the lower pole stones(6). ESWL may sound appealing because of it's a non invasive procedure but it is not bereft of renal and extrarenal complications. Reversible Changes renal changes such as mild tubular necrosis, cast and red blood cells in tubular lumen, vascular changes of tubular lumen, mild interstitial edema and hemorrhagic are seen. Irreversible changes which results in loss of Renal Tissue, disruption of nephrons, extensive interstitial edema, large hematomas of cortex and medulla, rupture and occlusion of veins and arteries, fracture of glomerular and peritubular capillaries occurs when the large stone fragments get stuck in the distal ureter. (3–7%) (8), (9). ESWL induces acute injury in extrarenal tissues (Evan et al, 1991, 1998) such as liver and skeletal muscle. Other extrarenal injuries such as perforation of the colon, hepatic hematoma, splenic rupture, pancreatitis, and abdominal wall abscess, rupture of the hepatic artery, rupture of the abdominal aorta, and iliac vein thrombosis (5). Fortunately, these events are all exceedingly rare, and have generally been presented as isolated incidents. UTI due to ESWL which is shown is low (0.7–5.8%) (6) and urosepsis is very low (0.2–1%) (7)

MATERIAL AND METHODS

This study is a descriptive observational study conducted between July 2017 to July 2019 at a tertiary care centre. 180 consecutive patients who presented with urolithiasis and who underwent ESWL were included in the study. All the patients included in the study were subjected to the basic routine investigations for urolithiasis after detailed clinical history and examination. They were then subjected to ESWL on OPD basis. A single dose of Amikacin 500 mg IV stat was given as a prophylactic antibiotic within 30 minutes before starting the procedure. All patients were made to lie supine and the stone was localized with the help of C arm and fragmented with 3000 Shocks at the energy level 1-2 depending on the tolerance level of the patient. Post procedure the patient was advised to take plenty of oral fluids and analgesics (Tab Paracetamol 1gm SOS). Patients were advised to pass the urine through a strainer to collect gravels passed through urine. They were followed up in the OPD after 1 week, 1 month and 3 months and were asked about any symptoms such as pain fever hematuria and

other symptoms. At this review a repeat X Ray KUB and USG Abdomen was done to reassess the stone fragmentation, to plan for second sitting if required and to look for any renal hematoma, paranephric collection and residual stone fragments. A max of 3 sittings were given to patients and residual calculus if any after the third sitting was tackled with minimally invasive surgery (RIRS/PCNL/URSL). ESWL was considered successful if no residual fragmentation of ESWL or <4mm of stone seen after ESWL on subsequent follow up.

RESULTS

This study included 180 patients diagnosed with Urolithiasis who came to the Department of Urology of our Tertiary Care Teaching Hospital from Aug 2017 to Aug 2019.

Demographic Data of the patients:

Table 1: Gender representation

	N=Total patients	Percentage
Total number of patients	180	
Total number of male patients	161	89.44%
Total number of female patients	19	10.56%
Ratio of Males: Females	8.47:1	

Out of 180 patients 161 (89.44%) patients were male and 19(10.56%) patients were female. Male to female ratio was 8.47: 1

Table 2: Age of patients

AGE	Mean age	Standard deviation
Mean age of all subjects	34.7944	12.2057
Mean age of female subjects	40.2105	12.0627
Mean age of male patients	34.1553	12.0999

Table 3: Age distribution of the patients

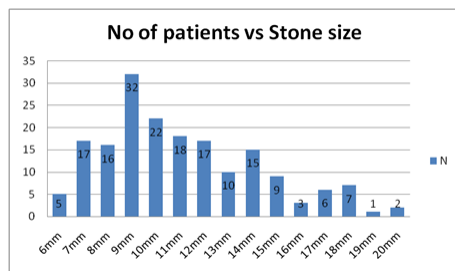
Age in years	Frequency	Percentage
18-25	46	25.55%
26-35	68	37.78%
36-45	33	18.33%
46-55	17	9.44%
56-65	13	7.22%
66-75	03	1.67%

Mean age of the patients of this study group was 34.79 yrs. The maximum number of patients were in in age group between 26 – 35 yrs (37.78%) Table 2 & 3.

Table 4: comorbidities in the patients

Comorbidities	Total number of patients (N)	Percentage (%)
Type II Diabetes mellitus	22	12.22%
Hypertension	18	10%
Gout	3	1.67%
BPH	1	0.56%
Past/recurrent UTI	7	3.89%
Past Urolithiasis	8	4.44%

Out of 180 patients 22 (12.22%) had Diabetes mellitus, 18(10%) patients had hypertension, 3 (1.67%) had Gout, 1 (0.56%) had BPH, 7 (3.89%) had H/O past or recurrent UTI, 8 (4.44%) had past H/O Urolithiasis. 121(67%) patients were free of comorbidities



Size of stone

Figure 1: Graphical representation of stone size

The mean size of the stone was 11.09mm and majority of patients had stones in size range of 09 mm to 12 mm (Table 8, Fig 1).

Table 5: Anatomical site of stone

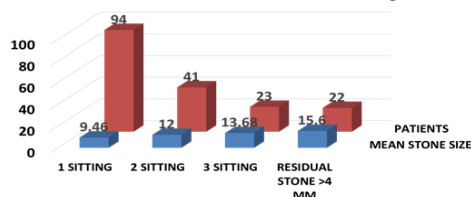
Site	Frequency	Percentage
Renal pelvis	32	17.77%
Upper pole	64	35.55%
Mid pole	3	1.67%
Lower pole	35	19.44%
Upper ureter	41	22.78%
Mid ureter	5	2.78%
Total	180	100%

Out of 180 patients 64 patients (35.55%) had stones in upper pole of the kidney followed by 41 patients (22.78%) upper ureter and 35 patients (19.44%) lower pole.

Table 6 Total number of ESWL sessions

Total ESWL session	N (No of patients)	Percentage
1	94	52.22%
2	41	22.78%
3	23	12.77%
Residual stone	22	12.22%

94 Patients underwent ESWL only 1 session of ESWL, 41 Patients achieved during stone clearance after 2nd session of ESWL, 23 patients after 3rd session and residual stone was observed in 22 patients



The stone size and the number of sittings were directly proportional

Figure 2 : Relationship between number of session and stone size

Note All patients received total number of 3000 shocks/ Energy 3 per session.

Table 7: Size of stone in context of number of ESWL session

Total ESWL session	Size of stone	Std Dev
4		

1	9.46	1.998
2	12	3.26
3	13.68	3.396
Residual	15.6	3.86

Note: Stone sizes were significantly larger in patients receiving 2 and 3 cycles of ESWL when compared to single session (P <0.0001)

Table 8 Relationship between size of the stone and presence of Post ESWL UTI

UTI	Frequency	Size	St Dev	P value
Present	6	12.2	3.11	0.2785 (Non significant)
Absent	174	11.035	3.254	

There was no statistically significant association between the stone size and Post ESWL UTI (P value 0.2785).

Table 9 Significant complications/ findings subsequent to ESWL

Complications	No of patients	Percentage
Fever	11	6.11%
Pain	74	41.11%
Hematuria	49	27.22%
Patients with no fragmentation	21	11.67%
Gravelluria	93	51.67%
Streintasse	3	1.67%
Culture positive (insignificant growth 6 patients additionally)	1	0.555%

The most common complication was Graveluria in 93 patients followed by pain in 73 patients and hematuria in 49 patients.

Table 10 Post ESWL UTI

Infection	Total number of patients	Percentage
Culture positive (E Coli)	1	0.55%
Insignificant growth on culture	6	3.33%
Note:	3 patients had history of recurrent UTI	

Positive culture (E Coli) UTI was seen in 1 patient and 6 patients had insignificant growth in urine culture, out of which 3 had recurrent H/O UTI.

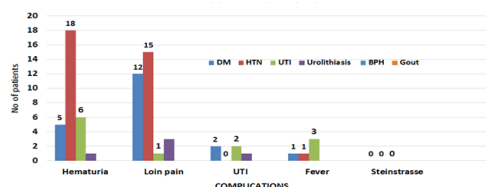


Figure 3 Relationship between the com morbidities and complications

Hematuria and was seen more in hypertensive patients. UTI and fever were seen more in patients with recurrent history of UTI.

Table 12: Auxillary procedures

Auxillary procedure	No of patients	Percentage
Repeat ESWL (2 nd and 3 rd session)	84	47.77%
DJ stent insertion	1	0.55%
PCNL	7	3.89%
URSL	2	1.11%

96(53.33%) patients who underwent ESWL had successful clearance of stone at first session. 84(46.66%) patients had to undergo 2nd and 3rd sessions of ESWL. 22 patients had residual stones more than 4 mm. DJ stent was inserted in 1 (0.56%) patient with Steinstrasse. 3.89% patients with renal stones underwent PCNL and 2 patients (1.11%) with ureteric stones underwent URSL. 12 patients lost follow up.

DISCUSSION

Our study evaluated morbidity profile in 180 patients who presented with urolithiasis and underwent ESWL in our tertiary care hospital. Of these 19 (10.56%) patients were females and rest 161(89.44%) were male patients. The ratio of Males: Females was 8.47:1. In a study by Al-Marhoon MS et al. [8] male subject inclusion was 68.5% whereas for females 31.5%. This more or less corresponds with our study with a higher male preponderance. The mean age of study participants was

34.7944 $\pm$ 12.2057 years. There was no statistically significant difference between the pre ESWL and post ESWL renal function test in terms of Serum Urea and Serum creatinine levels. Pre and post ESWL mean urea levels were 19.316mg/dL and 19.18.13 mg/dL respectively whereas creatinine was 0.910mg/dL and 9.06 mg/dL respectively with no statistical significance with a P value of 0.547 and 0.898. Marchini GS et al. (9) noted that patients with silent ureteral stones present with significant impairment of ipsilateral renal function and hydronephrosis at diagnosis. It is to be noted that Mean size of stones in our study was 11.09 mm with STDEV of 3.24 mm. Sahin C et al. (10) noted that stone size could help to predict the possible impact of extracorporeal shockwave lithotripsy on the quality of life. Lower stone size of 10 mm or less is associated with 73.3% of stone free outcome in patients whereas with stone size higher of 20-25 mm size may be associated with only 53% stone free outcome subsequent to ESWL. Similar results were seen in our study where the no of ESWL session was directly proportional to the stone size ie more no of ESWL sessions were required for bigger stone size. Stone sizes were significantly larger in patients receiving 2 and 3 cycles of ESWL when compared to single session (P <0.0001). The mean size of stone in patients undergoing single session of ESWL was 9.46 $\pm$ 1.998 mm, in patients undergoing 2 sessions of ESWL it was 12 $\pm$ 3.26 mm and in patients undergoing 3 sessions of ESWL it was 13.688 $\pm$ 3.396 mm. 11 patients corresponding to 6.11% of study population had fever subsequent to the study. Clinical symptoms (lower urinary tract symptoms, hematuria, fever, etc) and positive bacterial examinations (bacteriuria and/or positive urinary culture) were 2 essential parts of the definition of UTI. Lu Y et al. (11) concluded that antibiotics as prophylaxis could not improve symptoms and decreased neither the rate of fever and positive urine culture, nor the incidence of urinary tract infection after shock wave lithotripsy. There were 6 patients with urinary tract infections. Of these, E.Coli was grown in urine culture of 1 patient which was sensitive to Nitrofurantoin. All patients had however received a dose of Inj Amikacin pre ESWL which was adjusted as per age, renal function and weight of the patients. It is interesting to note that of the 7 patients who developed urinary tract infection subsequent to ESWL, 3 had prior history of recurrent urinary tract infections and 1 patient had h/o Urolithiasis and 1 patient was diabetic. There were 6 patients with insignificant growth upon culture. Hence, the overall post ESWL infection rate was 3.88 % in 180 patients including the ones with insignificant growth. In a study by Honey RJ et al. (12) the use of targeted antibiotic prophylaxis in preventing urinary tract infections in patients undergoing shock wave lithotripsy was evaluated. 0.36% patients of 389 developed UTI whereas asymptomatic bacteriuria was present in 11 patients corresponding to 2.8% of the evaluated patients. Our study closely corresponded with this study. Graveluria was present in 93 patients corresponding to 51.67% of the study subjects. Of these 93 patient Streintrasse was present in 3 patients corresponding to 1.67% of the study population. Madbouly K et al. (13) had concluded that 1-4% of the patients undergoing ESWL can develop Streintrasse which closely corresponded with our study. In a similar study by Al-Marhoon MS et al. (8) the streintrasse formation was 3.6%. Pain and hematuria were the most common issues subsequent to ESWL. In a study by Al-Marhoon MS et al. loin pain was experienced by 16.7% with renal stones and 21% with ureteric stones. Severe renal colic mandating admission occurred in 2% of patients with renal stones and 6% of patients with ureteric stones. Patients who had UTI were 7 in number with mean stone size of 12.2 $\pm$ 3.11 mm whereas in patients without UTI it was 11.035 $\pm$ 3.254 mm. The P value was non significant at 0.2785. Nil effect was seen in 21 patients corresponding to 11.67% of the patients. These patients had no stone fragmentation subsequent to ESWL. Chiang BJ et al. (14) suggested that age, history of ipsilateral renal or ureteral calculi episodes, stone burden and radiopaque stone were significant predictors of ESWL failure in all patients. They suggested that for treating symptomatic ureteral stones, those with lesser size, radiolucency and without a history of ipsilateral renal or ureteral calculi could be considered for first-line therapy with ESWL. Of all the patients, 158 (87.77%) patients did not require any further intervention. Either the procedure was successful or the stone size was very less (<4mm) and conservative management would suffice which corresponded to 63.33%. Some patients had to undergo repeat ESWL (84 patients). 7 patients corresponding to 3.89 % of the study subjects had to undergo PCNL. 1 patient required DJ stenting and 2 underwent URSL while 12 patients lost to follow up.

CONCLUSION

Stone free rate is 77.22 % after completion of ESWL. Failure rate was seen in 12.22 % of cases who subsequently underwent auxillary

procedures (5.56%) and 12 patients lost to follow up. Graveluria, Loin pain, hematuria, and Steinstrasse are the complications following ESWL in order of descending frequency. The incidence of UTI can be low due to the pre ESWL prophylactic antibiotics that was given to all the patients. Hematuria was seen more in patients with hypertension and UTI is common in patients with past history of UTI. Nil effect was seen in 21 patients corresponding to 11.67% of the patients. These patients had no stone fragmentation subsequent to ESWL. 63.34% did not require any surgical intervention. Either the procedure was successful or the stone size was very less and conservative management would suffice. This corresponds to high success rate of the procedure. ESWL is safe and effective for renal and upper ureteric stones. Stone size was directly proportional to the number of ESWL sittings

Conflicts of interest: The author declare no conflicts of interest

Disclosures and funding: None

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