

Outcome of Extracorporeal Shockwave Lithotripsy as Monotherapy in Upper Urinary Tract Lithiasis

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ABSTRACT

Introduction: Due to its non-invasive nature, extracorporeal shockwave lithotripsy (ESWL) is preferred treatment modality for uncomplicated renal and ureteral stone < 20 mm in diameter. The success rate of it ranges from 46% to 91% depending on various factors.

Objective: To assess outcome of ESWL as a monotherapy in uncomplicated solitary renal and upper ureteric calculus ranging from 10mm to 20mm.

Methods: In this retrospective study, the records of 34 patients who underwent Extracorporeal shockwave lithotripsy ESWL in Birat Medical College – Teaching Hospital over a period of one and a half year were reviewed to assess the outcome in terms of stone free rate and complication rate.

Results: Mean age of the patients was 30.57±8.44 years and mean calculus size was 14.47±2.68 mm (range 10-20mm). Male and female ratio was 2:1. The success rate was higher for pelvic (83.33%) and upper calyceal (75%) and upper ureteric calculi (75%) compared to other calyces. Clinically significant residual fragment (CSRF) was the most common problem after ESWL (23.33%) at three months after the procedure.

Conclusions: The outcome of ESWL as monotherapy for upper urinary tract calculi is acceptable in selected cases three months after the procedure.

Keywords: Extracorporeal shockwave lithotripsy; outcome; upper urinary tract calculi.

INTRODUCTION

Urolithiasis is a common condition which affects about 10% of general population and its incidence and prevalence is increasing all over the world.¹ It is the third most common urological condition after urinary tract infection and prostate related conditions. Moreover, even after successful treatment, about 70% of the patients of urolithiasis experience recurrence over a period of years.¹ There are various treatment modalities available for the

treatment of upper urinary tract stones. They include: extracorporeal shockwave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL), retrograde intrarenal surgery (RIRS), laparoscopic or robotic surgery and open surgery.

Extracorporeal shockwave lithotripsy was introduced by Chaussy and colleagues in 1980.² Due to its non-invasive nature and being daycare procedure, it gained popularity shortly. It became the preferred treatment modality for uncomplicated renal and ureteral stone < 20 mm in diameter.^{3, 4} The treatment of renal calculi is based on factors like size, location, composition of stones, patients' body habitus and renal anatomy.⁵ This study aimed at assessing the outcome of ESWL as a monotherapy in uncomplicated solitary renal and upper ureteric calculus ranging from 10mm to 20mm.

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METHODS

This is a retrospective study. The records of patients who underwent ESWL between January 2016 to June 2017 in Birat Medical College - Teaching Hospital were reviewed. The inclusion criteria were adult patients with solitary radio-opaque stone larger than 10mm measured in plain KUB (kidney-ureter-bladder) x-ray. Patients with coagulopathy, active urinary infection, previous renal surgery, obstructive nephropathy, ESWL as a secondary procedure and pregnant women were excluded. All patients had undergone pre-procedure evaluation as per institutional protocol including intravenous urography. Patients received shockwaves at the energy ranging from 12 to 16 KV and frequency of 60 to 90/min from Allengers UROLITH+ under intravenous analgesia. After the procedure patients were advised to take plenty of fluids, Diclofenac sodium 50mg tablets on demand basis and report to hospital if any complication occurs. Post-procedure stone clearance evaluation was done at 1-week, 1-month and 3-month using KUB x-ray/ultrasonography. Treatment success was defined as no fragment left or CIRF (clinically insignificant residual fragment) 4mm or less.⁷ Unsuccessful treatment was defined as no stone fragmentation or clinically significant residual fragments at three month post-procedure. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) 20.0 version and statistical averages (Mean, Median and Range) were calculated. The study was approved by the hospital administration as Institutional Review Committee was not established at that time.

RESULTS

Thirty four patients had undergone ESWL during the period. Four patients were excluded as two patients lost to follow up at three month post procedure and in two ESWL were done as a secondary procedure. Mean age of the patients was 30.57 ± 8.44 years and mean calculus size was 14.47 ± 2.68 mm (range 10-20mm). Male and female ratio was 2:1. The location of calculus, treatment success rate and complication/s are as mentioned in table 1.

The mean number of shockwaves was 3786.67 ± 849.63 and it was delivered in 1-3 sessions depending on the fragmentation status. The overall success rate of ESWL was 73.33% for upper tract urinary calculi. According to the gender, the success rate for males was 75% (16/20) and 70% (7/10) for the females.

The most common complication was clinically significant residual fragment CSRF (23.33%) which did not pass after fragmentation at the three month follow up. One patient developed steinstrasse requiring ureteroscopic fragments removal and double J stenting and another patient required another modality (PCNL) for calculus treatment as it was not fragmented.

DISCUSSION

Extracorporeal shockwave lithotripsy is a preferred treatment modality for uncomplicated renal and ureteral stone < 20 mm in diameter due to its non-invasive nature.^{3,4} The success rate of ESWL ranges from 46% to 91%.⁶

Table 1: Calculus location and treatment outcome after ESWL

| Calculus location | Number of cases | Success Rate | Complication/s |
|-------------------|-----------------|---------------|------------------------------------|
| Pelvis | 12 | 83.33%(10/12) | CSRF-2 |
| Upper calyx | 8 | 75%(6/8) | Steinstrasse-1, No Fragmentation-1 |
| Mid calyx | 3 | 66.66%(2/3) | CSRF-2 |
| Lower calyx | 3 | 33.33%(1/3) | CSRF-2 |
| Upper ureter | 4 | 75%(3/4) | CSRF-1 |

Abe and colleagues in assessing the outcome of 2844 patients who underwent ESWL in their institute reported that the outcome of ESWL is poor for patients aged 40 or older in treating upper urinary tract calculi. Abdel-Khalek and team with 2954 patients also reported the same.^{8, 9} In this study, most of the patients were young adults (30.57 years) so age cannot be considered as predictor of the poor outcome here. Similarly, the outcome was comparable with respect to the gender (75% for males and 70% for females). This is similar to the other studies showing that gender is not a significant predictor of ESWL outcome.¹⁰⁻¹¹

The current study showed the success rate of ESWL 73.33% for stones 10-20 mm. This is consistent with the results of Al –Ansari and team who reported overall success rate of ESWL to be 78% in 427 patients studied over a period of three years.¹² Similarly, in another study with 51 patients having calculus more than 10mm, 68.6% success rate was reported by Choi and his colleagues.¹³

The mean of shockwaves was 3786 to fragment calculus in this study whereas mean of 8301 shocks required to fragment calculus >10mm in the study of Shinde et al.⁶ But 3732 was the mean number of shocks in another study including 55 patients for fragmenting calculus of 21-28mm.⁷ This difference in the mean number of shockwaves delivered can be due to different generations of lithotripter used in each study.

The outcome of ESWL depends on location of the calculus also. Calyceal stone have poor outcome than pelvic and upper ureteric stone and lower calyceal stone having further poor outcome.^{6,12,14} The success rate of lower calyceal stone was 33% only compared to > 65% for other locations in this study.

The role of pre-stenting in ESWL is controversial. It has been observed that stenting prior to ESWL does not improve stone clearance or prevent steinstrasse.¹⁵⁻¹⁶ In the current study, the success rate of ESWL was 73.33% and only single (3.33%) patient developed steinstasse even without stenting. No major complications related to the procedure were observed till three month follow up.

The study is limited by its retrospective nature. The treatment was planned based on plain KUB x-ray and IVU. Post-procedure stone clearance was also assessed by KUB x-ray/ultrasonography. Use of computed tomography scan could further characterize stone, renal anatomy and guide proper patient selection improving success rate of ESWL.

CONCLUSIONS

The outcome of Extracorporeal shockwave lithotripsy ESWL as monotherapy for upper urinary tract calculi is acceptable in selected cases with added advantage of its non-invasive nature, minimal morbidity and out- patient procedure. I recommend further studies with CT based selection criteria to improve success rate of ESWL.

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Conflict of Interest: None

NJHS

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