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UPPER RENAL STONE MANAGEMENT BY EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY

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ABSTRACT

Background: For upper ureteric and renal stones smaller than 2 cm, extracorporeal shock wave lithotripsy, or ESWL, is a good option since it is non-invasive and has fewer side effects than other therapy options.

Aim: This study set out to assess the efficacy of extracorporeal shock wave lithotripsy, or ESWL, as a treatment for stones in the upper ureters.

Methods: This study included 120 people of both genders who had upper ureteric stones and used extracorporeal shock wave lithotripsy (ESWL). Data were collected from the previous medical records of all individuals, including laboratory testing, diagnostic imaging, and clinical information. Every person had a straightforward X-ray KUB two weeks after ESWL in order to assess stone fragmentation. Treatment success was also considered for stones less than 5 mm that did not exhibit symptoms or infection. Every person was followed up with at two weeks, one month, two months, and three months using USG KUB and X-ray KUB.

Results: Of the research subjects, twenty-eight (28) or 23.3% had a stone attenuation value of less than 1000 HU (Hounsfield Unit). While 27.5% of research participants (n = 33) had a stone attenuation value of 1200–1500 Hounsfield units, the majority of participants (49.16%, n = 59) had a value of 1000–1200 Hu. The study participants reported experiencing post-procedural discomfort, hematuria, UTI, and Stein Stresse as consequences following extracorporeal shock-wave lithotripsy (ESWL). According to 44.16% (n=53) of the patients, post-procedural discomfort after ESWL was the most common complication seen in the study subjects, followed by hematuria in 22 cases. Urinary tract infection (UTI) was recorded in 9.16% (n=11) study participants, Stein Strasse was reported in 5.83% (n=7) study subjects, and 5% (n=27) study subjects after ESWL.

Conclusion: ESWL is a viable treatment option for people with upper ureteric stones, and it has the added advantages of being chairside, affordable, and non-invasive. ESWL can be carried out without anesthesia when treating upper ureteric stones, which are frequently treated invasively. Moreover, ESWL is associated with better acceptance, less issues, and a speedier recovery.

Keywords: Lithotripsy caused by extracorporeal shock wave, Upper Ureteric Stone, and Genitourinary Urothithiasis.

INTRODUCTION

Among the most frequently reported urological problems are genitourinary stones, with a prevalence of 2% to 3% and a lifetime recurrence rate of about 50%. The majority of urological practice in India is devoted to treating urinary stones. Ultrasonography (USG) and CT are two recent advances in radiographic modalities that have increased the probability of detecting urinary stones in both symptomatic and asymptomatic patients.1, 2

A number of factors influence the choice of treatment for urinary stones, including the size, location, and expected composition of the stone, the availability of technique expertise, anatomical features, and contraindications, patient-related factors like comorbidity and age, and symptoms like pain, hematuria, and urinary tract infections.3. Recent years have seen a dramatic shift in the management of kidney stones, from open surgery to the more advanced and cutting-edge ESWL (extracorporeal shock-wave lithotripsy) and minimally invasive surgical methods such ureterorenoscopy procedures and percutaneous therapies.4,5

Extracorporeal shock-wave lithotripsy, or ESWL, has been the main therapeutic option for patients with renal and/or ureteral calculi since it was introduced to the medical community in the 1980s. However, the value of ESWL has altered dramatically with the introduction of endourology and minimally invasive procedures, both of which have good success rates. Since then, careful subject selection and optimal technical settings have been crucial in urological practice to enable ESWL to yield the best and most acceptable results.6 Under 2 cm, extracorporeal shock-wave lithotripsy (ESWL) is a frequently utilized therapeutic modality for kidney and upper ureteric stones. It has several advantages over open surgical techniques, including a lower risk of complications and non-invasiveness. The results of endoscopic surgery are influenced by potential predictor factors relating to renal structure anatomy, stone characteristics, and patient-associated factors. Previous literature research has revealed success rates of 60 to 90 percent using ESWL in the management of renal and upper ureteric stones.7. Evaluating the effectiveness of extracorporeal shock wave lithotripsy, or ESWL, in the treatment of upper ureteric stones was the aim of the current clinical study.

MATERIALS AND METHODS

Evaluating the effectiveness of extracorporeal shock wave lithotripsy, or ESWL, in the treatment of upper ureteric stones was the aim of the current prospective clinical trial. The study population consisted of the participants in the Institute's Urology Department who were managed with ESWL.

This study included a total of 120 participants, both male and female, who had upper ureteric stones that measured between 0 and 2 cm. The inclusion criteria were met by subjects with upper ureteric stones who were getting ESWL treatment at the institute and were prepared to complete the trial. Pregnant women, people with uncontrolled coagulopathy, people with urosepsis, and people with stones bigger than 2 cm were all excluded from the trial.

After being properly informed about the study's design, every participant provided their informed consent. Following final inclusion, urine microscopy, sensitivity, and culture were carried out for every participant along with serum creatinine, BUN (blood urea nitrogen), PT/INR (prothrombin time/international normalized ratio), RBS (random blood sugar), and complete hemogram. Furthermore, imaging was done with CT (computed tomography), USG KUB (ultrasonography-Kidney, ureter, bladder), and X-ray KUB. An expert in the field used the same machine to teach a single topic to ESWL students. Neither sedation nor anaesthesia was used during ESWL procedures. For every ESWL session, all participants received between 2500 and 3000 shocks, starting at 10 kV and going up to 500 initial shocks at 24 kV.

Throughout the procedure, fluoroscopy was employed to continuously monitor the target location. After the procedure, all patients were put on an antibiotic regimen for seven to 10 days. Every two weeks after each ESWL appointment, a simple X-ray KUB was done to assess the stone fragmentation. Patients whose stone was either unbroken or whose residual stone measured more than five cm received another ESWL session. The end-point was evaluated utilizing an X-ray and a USG KUB three months following the last ESWL session in order to ascertain the success rates. The cases were considered failed for ESWL when three ESWL sessions were finished with no apparent stone fragmentation or when the remaining stone measured more than five cm. These individuals underwent observation, ureterorenoscopy (URS), or retrograde intrarenal surgery (RIRS). Those with less than 5 mm or uninfected, asymptomatic stones were considered to have succeeded in ESWL. All patients were observed for two weeks, one month, and three months after ESWL. At the follow-up, an X-ray and a USG KUB were conducted on each participant.

RESULTS

Evaluating the effectiveness of extracorporeal shock wave lithotripsy, or ESWL, in the treatment of upper ureteric stones was the aim of the current prospective clinical trial. This study included a total of 120 participants, both male and female, who had upper ureteric stones that measured between 0 and 2 cm. A list of the study participants' demographic information is provided in Table 1. The study sample was predominantly composed of people in the age range of 21 to 40, making up 46.6% (n = 56) of the sample. Then came those in the age range of 41 to 60, 35.83% (n = 43) of the sample, 10% (n = 12) of the sample under 20, and 7.5% (n = 9) of the population over 60. 30.83% (n=37) of the participants in the current study were female, and 69.16%

Of the study participants, 61.6% (n=74) had stones between 11 and 20 mm, whereas 38.3% (n=46) had stones smaller than 10 mm. Among the subjects, 20% (n=24) had altered serum creatinine levels, whereas 80% (n=96) had normal values. Flab pain was the most common clinical presentation among the study participants, affecting 72.5% (n=87). Table 1 shows that among the patients, hematuria (12.5%, n = 15), burning micturition (28.3%, n = 34), nausea (40 %, n = 48), and accidental diagnosis (20 %, n = 24) were the other common clinical manifestations.

Upon analyzing the stone attenuation value of the participants, it was discovered that 23.3% (n=28) of the study subjects had a value below 1000 HU (Hounsfield Unit). Table 2 shows that whereas 27.5% of research participants (n = 33) had a stone attenuation value of 1200–1500 Hounsfield units, the majority of subjects (49.16%, n = 59) had a value of 1000–1200 Hu.

The study participants reported the following problems following extracorporeal shock-wave lithotripsy (ESWL): UTI, hematuria, post-procedural pain, and Stein Strasse.

According to Table 3, the most frequent complications that the study subjects experienced were post-procedural pain (n = 53), which was reported by 44.16% of the subjects, hematuria (n = 22.5% of the subjects) following ESWL, urinary tract infection (UTI) (n = 9.16% of the subjects), and Stein Strasse (n = 5.83% of the subjects) following ESWL.

Table 4 presents the stone clearance rate according to the size of the study subjects' stones. Of the study subjects, 97.82% (n = 45) had complete stone clearance for stones weighing between 0.5 and 1 cm, and 90.54% (n = 67) had complete stone clearance for stones weighing between 1-2 cm.

DISCUSSION

To treat upper ureteric stones, extero corporeal shock wave lithotripsy, or ESWL, was employed. The purpose of this prospective clinical study was to assess its effectiveness. In this study, 120 individuals of both sexes had upper ureteric stones measuring two to three centimeters. Ten percent (n=12) of the research participants were under twenty, seven percent (n=9) were over sixty, and 46.6% (n=56) were in the forty–six–six age range. There were 30.83% (n=37) females and 69.16% (n=83) males in the current study. Of the study participants, 61.6% (n=74) had stones between 11 and 20 mm, whereas 38.3% (n=46) had stones smaller than 10 mm.

Among the subjects, 20% (n=24) had altered serum creatinine levels, whereas 80% (n=96) had normal values. Of the clinical presentations made by study participants, 72.5% (n=87) involved flank discomfort; the remaining 40% (n=48) included nausea, 28.3% (n=34) included burning micturition, 12.5% (n=15) included hematuria, and 20% (n=24) involved accidental diagnosis. This investigation's results were similar to those of Wazir BG et al. (2008) and Al-Mahroon AS et al. (2013), whose researchers used similar demographic data to assess participants. The study's conclusions show that when the stone attenuation value was determined, 23.3% of the study participants (n=28) had a value that was less than 1000 HU (Hounsfield Unit).

While 27.5% of research participants (n = 33) had a stone attenuation value of 1200–1500 Hounsfield units, the majority of participants (49.16%, n = 59) had a value of 1000–1200 Hu. These results were consistent with the findings of El-Nahas AR et al. (2007) and Wang LJ et al. (2005), whose studies similarly revealed similar amounts of stone attenuation.

It was noted that during extracorporeal shock-wave lithotripsy (ESWL), the study participants reported post-procedural discomfort, hematuria, urinary tract infection (UTI), and Stein Strasse. Among the study individuals, post-procedural emesis (n = 53) was the most frequently reported problem. Of the study participants, 22.5% (n = 27) reported hematuria (post-ESWL), 9.16% (n = 11) reported urinary tract infections (UTI), and 5.83% (n = 7) reported Stein Strasse (post-ESWL).

These results supported the conclusions of Gupta NP et al. (2005) and Joseph P et al. (2002), whose research participants had similar issues to those in question.

Referring to the study subjects' stone clearance rate by size, it was found that 46 (n = 45) study subjects had full stone clearance for stones between 0.5 and 1 cm, and 74 (n = 67) study subjects had full stone clearance for stones between 1-2 cm.

These findings were in line with research conducted by Perks AE et al. (2008) and Wiesenthal JD et al. (2010), whose authors found that the current study's stone removal rates were similar to their own.

CONCLUSION

Within its limitations, the present study concludes that subjects with upper ureteric stones can be effectively managed with ESWL compared to invasive techniques like PCNL selectively with the added advantages of it being a chairside procedure, cost-effective, and non-invasive procedure. ESWL can be done without anesthesia for upper ureteric stones which are usually managed invasively. ESWL is also associated with better acceptance, fast convalescence, and fewer complications. The present study had a few limitations including a small sample size, shorter monitoring period, and geographical area biases. Hence, more longitudinal studies with larger sample sizes and longer monitoring periods will help reach a definitive conclusion.

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TABLES

S. No	Characteristics	Percentage (%)	Number (n)
1.	**Age range (years)**		
a)	<20	10	12
b)	21-40	46.6	56
c)	41-60	35.83	43
d)	>60	7.5	9
2.	**Gender**		
a)	Males	69.16	83
b)	Females	30.83	37
3.	**Stone size (mm)**		
a)	<10	38.3	46
b)	11-20	61.6	74
4.	**Clinical Picture**		
a)	Flank pain	72.5	87
b)	Nausea	40	48
c)	Burning micturition	28.3	34
d)	Hematuria	12.5	15
e)	Accidental finding	20	24
5.	**Serum creatinine**		
a)	Normal	80	96
b)	Altered	20	24

Table 1: Demographic and disease characteristics of the study subjects

S. No	Stone attenuation value	Percentage (%)	Number (n)
1.	**<1000 HU**	23.3	28
2.	**1000-1200 HU**	49.16	59
3.	**1200-1500 HU**	27.5	33

Table 2: Distribution of the study subjects based on stone attenuation values

S. No	ESWL complications	Percentage (%)	Number (n)
1.	**Stein Strasse**	5.83	7
2.	**Post-procedural pain**	44.16	53
3.	**Hematuria**	22.5	27
4.	**Urinary tract infection (UTI)**	9.16	11

Table 3: Complications in the study subjects following ESWL procedure

S. No	Size of the stone	Clearance (%)	Complete clearance (n)
1.	**0.5-1 cm (46)**	97.82	45
2.	**1-2 (74)**	90.54	67

Table 4: Stone clearance based on the stone size in the study subjects