Supine Transgluteal vs Prone Position in Extracorporeal Shock Wave Lithotripsy of Distal Ureteric Stones

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OBJECTIVE To evaluate of efficacy of transgluteal (supine) approach for shock wave lithotripsy (SWL) in treatment of distal ureteric stones.

PATIENTS AND METHODS This prospective, randomized, comparative study was conducted on 98 patients. Patients were randomly assigned into 2 groups: group A (n = 49; prone position) and group B (n = 49; supine position, transgluteal). Inclusion criteria included patients with radiopaque lower ureteric stones ≤10 mm. Exclusion criteria included radiolucent stones, stones >10 mm, the need for any auxiliary procedure, and any contraindication for SWL. Post-SWL evaluation included plain x-ray of kidney, ureter, and bladder at 2 weeks after treatment and then at monthly intervals after treatment for 3 months. Stone-free status was defined as no residual stone fragments visible on plain x-ray. Treatment failure was defined as persistence of stone fragments at 3 months or the need for ureteroscopy.

RESULTS Stone-free rate after 1 treatment session was achieved in 44.9% and 75.5% for prone and supine positions, respectively. Proceeding to ureteroscopy, after failure of the second SWL session to clear the stones, was done in 34.7% and 8.2% for prone and supine positions, respectively. The overall success rate for SWL treatment in prone and supine groups was 65.3% and 91.8%, respectively ($P < .001$).

CONCLUSION Transgluteal SWL while patient in supine position proved efficacy for treatment of distal ureteric stones. Larger group studies comparing the results of SWL in supine position with those of prone position and also with those of ureteroscopy may enrich our data to reach a consensus for the ideal management of distal ureteric stones. UROLOGY 85: 51–54, 2015.

The discovery of the effect of shock waves took place in the late 70s of the 20th century. Soon after, it was introduced to the medical field in the early 1980s in the form of extracorporeal shock wave lithotripsy (SWL), which appeared to be a revolution in the management of urinary stones.[1,2] SWL provided through early machines was essentially not effective for treatment of distal ureteral stones. The third-generation lithotripters with the advanced design and continuous in-line control give accurate localization and in situ treatment for distal ureteral stones. Moreover, the size of the distal ureteric stones, being usually smaller than the focus of shock wave makes these stones amenable to treatment.[3,4]

Today, around 80% of urinary tract stones are managed with SWL.[5]

The optimal management of distal ureteral stones is not established, yet,[6] both the American Urological Association and European Association of Urology guidelines state that SWL and ureteroscopy are acceptable primary approaches for the treatment of distal ureteral stones.[3,7-9]

SWL is a safe method with excellent outcomes in the treatment of distal ureteral stones.[10,11] It is noninvasive, easy, with short hospital stay, rapid recovery, and low complication rate.[2,12]

Shock waves should have a pathway through the body to reach the stone. In case of distal ureteral stones, the bony pelvis may block shock waves. Therefore, a variety of patient positions were tested to improve efficacy.[9]

The most common position which was found to be safe and effective is the prone position with the source of shock wave in contact with anterior abdominal wall.[5,12] Its drawbacks lie in increased intra-abdominal pressure with decreased lung capacity, large skin-to-stone distance,

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and the possibility of attenuation of the shock wave by bowel gases.[5,11]

Ackaert et al[13] reported a success rate of 89% among 110 patients with distal ureteric stones in the "straddle" (horse riding) position, which is specific to the Dornier HM-3 lithotripter (Dornier MedTech GmbH, Germany).

Using the same principle of transgluteal pathway of shock waves, the supine position was adopted to treat distal ureteral stones through the obturator foramen with complete stone disintegration and a success rate of 95%.[14]

Supine position with shock wave delivery via gluteus maximus muscle through greater sciatic notch also was applied.[5,12]

In this study, our objective was to evaluate the efficacy and safety of transgluteal approach in treating distal ureteral stones.

PATIENTS AND METHODS

After approval of our ethics research committee and an informed written patient consent, this prospective, randomized, comparative study was conducted in the Department of Urology, Zagazig University Hospitals, from July 2010 to June 2013. Ninety-eight patients (59 men, 39 women; mean age, 45.8 years; and mean body mass index, 28.7 kg/m^2) with lower ureteric stones were included. The sample size of patients was estimated to be 98 at 95% confidence interval and the power of the test to be 80% and by assuming the relative risk as 3. Selection of patients was by systematic random sampling as the average annual total number of patients attending outpatients' clinics with ureteric stones $\leq$10 mm was 1029, and the sample size was calculated to be 98. So, the K constant interval was 10.

Patients were randomly assigned into 2 groups (1 patient was allocated to 1 treatment arm and the next to the other): group A (n = 49; prone position), group B (n = 49; supine position, transgluteal; Fig. 1). The preoperative evaluation included medical history taking, physical examination, laboratory investigations, that is, urine analysis, urine culture and/or sensitivity, complete blood count, coagulation profile, blood urea nitrogen and serum creatinine levels, and radiologic investigations (intravenous pyelography or computed tomography [CT] plain x-ray of kidney, ureter, and bladder [KUB]). Stone size was measured mainly by CT and by KUB in patients who did not have CT results. Inclusion criteria included patients with radiopaque lower ureteric stones. Exclusion criteria included radiolucent stones, stones >10 mm, the need for any auxiliary procedure, and any contraindication for SWL.

Operative Technique

Urine cultures were done for all patients, and those with positive culture results were treated with antibiotics for at least 2 days before SWL. The lithotripter used in the study was an electromagnetic Dornier Lithotripter S (Dornier MedTech GmbH, Germany). Patients received sedoanalgesia. The calculi were fragmented under fluoroscopic guidance. In each treatment session, shock wave power was increased gradually to reach 100%. The maximum number of shock waves was limited to 4000 shocks per session. All patients were treated by the same team. Group A patients were treated in prone position with flexion of the ipsilateral leg and their chest raised by pillows for comfort. Group B patients were treated in supine position with the therapy head against the patient's buttock, and their head and legs were raised by pillows for comfort. Post-SWL evaluation included KUB film at 2 weeks after treatment and then at monthly intervals after treatment, if required. A second session of lithotripsy was used if no fragmentation was evident after initial treatment as assessed at the 2-week post-treatment KUB. Stone-free status (treatment success) was defined as no residual stone fragments visible on plain x-ray. α-Blockers were not used after treatment. Treatment failure was defined as persistence of stone fragments beyond 3 months or the need for ureteroscopy. The primary end point of our study was the stone-free status at follow-up visits up to 3 months or the need for ureteroscopy in cases failed to clear the stones.

Figure 1. Supine (transgluteal) position for extracorporeal shock wave lithotripsy. (Color version available online.)

Statistical Analysis

Data were checked and analyzed using SPSS software (SPSS, Chicago, IL). Quantitative data were expressed as mean $\pm$ standard deviation, whereas qualitative data were number or ratio. The paired and nonpaired t tests, the chi-square test, and the Wilcoxon tests were applied when appropriate. P <.05 was considered significant.

RESULTS

The study included 98 patients with stone in lower ureter that is indicated for SWL, all fulfilled the inclusion and exclusion criteria; 7 patients (7.1%) had a history of ipsilateral ureteroscopy and 13 patients (13.2%) had a history of SWL ipsilateral renal stone. Urine analysis was done in all patients; pyuria was present in 3 patients, for whom urine culture or sensitivity was assessed, and antibiotics were accordingly described for 1 week. Urine cultures were repeated to document sterile urine. The preinterventional laboratory investigations were within normal limits for all patients.

A total of 98 patients satisfied the inclusion criteria for the study, of which 49 patients were treated in the prone position (group A) and 49 in the supine position (group B, transgluteal). There was no significant difference in