

Ureteroscopic and Extracorporeal Shock Wave Lithotripsy for Rather Large Renal Pelvis Calculi

Kamyar Tavakkoli Tabasi, Mehri Baghban Haghighi

Introduction: The aim of this study was to compare the results and complications of extracorporeal shock wave lithotripsy (SWL) plus retrograde ureteroscopic lithotripsy using laser and pneumatic lithotriptors with SWL monotherapy for renal pelvic calculi between 2 cm and 3 cm.

Materials and Methods: A total of 55 patients with 2- to 3-cm pelvic calculi were assigned into groups 1 and 2, including 22 and 33 patients, respectively. Patients in group 1 first underwent laser or pneumatic lithotripsy and insertion of a double-J ureteral catheter and then underwent SWL 2 to 4 weeks thereafter. In group 2, the patients underwent SWL after double-J ureteral catheter insertion. The stone-free rate, complications, and cost effectiveness were evaluated 3 months postoperatively.

Results: Five patients (22.7%) in group 1, had their calculi completely fragmented after ureteroscopy and retrograde lithotripsy without any need for further SWL. In 9 patients (40.9%), after a single session of SWL, and in 3 (13.6%), after 2 sessions, fragmentation was completed. In group 2, successful treatment was achieved after 1 and 2 SWL sessions in 6 (18.2%) and 8 (24.2%) patients, respectively. The stone-free rate was significantly higher in the patients of group 1 than those in group 2 (77.3% versus 42.4%, respectively; $P = .01$). The period of anesthesia was 23.1 minutes (during ureteroscopy) in group 1 and 13.2 minutes in group 2 (during cystoscopy or ureteroscopy and insertion of ureteral catheter). No significant complication was reported in neither of the groups. The mean costs of the treatment were US \$ 400 and US \$ 370 in groups 1 and 2, respectively.

Conclusion: Ureteroscopic lithotripsy before SWL is a rational method for the treatment of the rather large renal pelvic calculi with fairly acceptable costs.

Keywords: urinary calculi, lithotripsy, ureteroscopy

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INTRODUCTION

Kidney calculi with pain, infection, or urinary outflow obstruction usually need complete calculus removal.

However, many calculi without any of these problems are nowadays treated thanks to the availability of minimally invasive methods and instruments.⁽¹⁾

Kidney calculi are commonly treated by extracorporeal shock wave lithotripsy (SWL) or percutaneous nephrolithotomy (PCNL).⁽¹⁻⁴⁾ Size, location, and composition of the

calculi are of the critical factors affecting the method of treatment.⁽¹⁾ Although most authors prefer PCNL for the calculi greater than 2 cm, SWL is another accepted method for these calculi subject to insertion of a ureteral catheter.^(5,6)

Another optional method is ureteroscopic lithotripsy using a rigid or flexible ureteroscope. The energy for lithotripsy in this case may be supplied by ultrasound,

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pneumatic or laser sources. However, ureteroscopic lithotripsy is not as common as the previously mentioned methods.⁽⁷⁾ Using a combination of this method with SWL has already been suggested by some authors as an alternative for PCNL with encouraging results.^(8,9) The aim of our study was to compare ureteroscopic lithotripsy plus SWL with SWL monotherapy for the treatment of the 2- to 3-cm pelvic calculi.

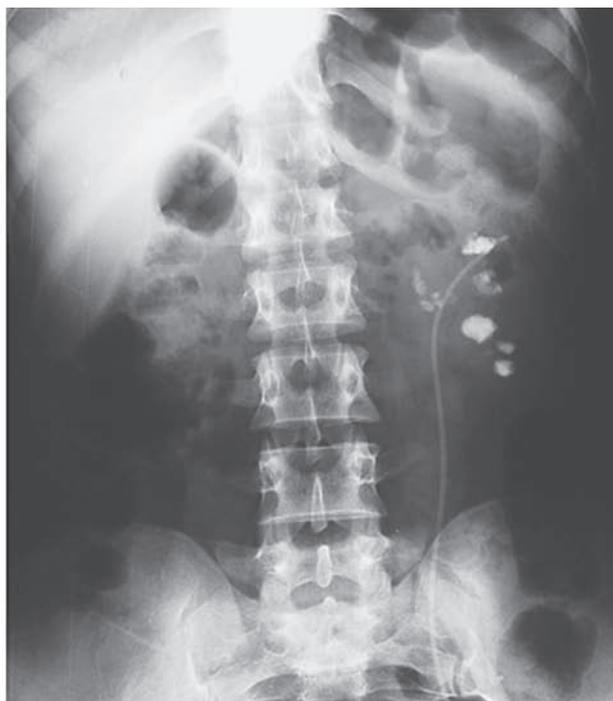
MATERIAS AND METHODS

In a clinical trial carried out between September 2003 and September 2005, we evaluated 124 patients referred to our center with 2- to 3-cm renal pelvic calculi. Patients who were not willing to or could not undergo PCNL due to their preferences or medical contraindications were selected to enroll in the study. Medical limitations for performing PCNL included cardiovascular or respiratory problems which did not let a prone position or prolonged general anesthesia. Kidney calculus was diagnosed by ultrasonography, plain abdominal radiography, and intravenous urography. Also, urinalysis, urine culture, and renal function tests were performed before the procedure. Patients with a surgical history or a history of a previous SWL, active urinary infection, anatomic

abnormalities such as horseshoe kidney or duplicate renal system, and previous metabolic problems were excluded. Finally, 66 patients entered the study and provided written consent.

The patients were assigned into groups 1 (31 patients) and 2 (35 patients) based on their preferences. In group 1, the patients underwent general anesthesia with propofol after 8 hours of fasting. In the lithotomy position, a 5-F semirigid or flexible ureteroscope (Henke-Sass Wolf GmbH, Tuttlingen, Germany) was passed into the ureter and after visualizing the pelvic calculus, pneumatic or laser lithotripsy (EMS, Dallas, USA and Deka, Italy; respectively) was used to fragment the calculus (Figure). Then, a ureteral catheter was inserted and SWL (MPL 9000, Dornier, Munich, Germany) was performed if there were residual calculi greater than 7 mm. In group 2, a ureteral catheter was inserted under general anesthesia, while the patient was secured in the lithotomy position. Two weeks later, SWL was performed once for these patients.

Both groups were followed up 2 to 4 weeks postoperatively using ultrasonography and plain abdominal radiography. The procedures were considered to be completely successful if there were no calculi or calculi smaller than 5 mm. Otherwise,



Left, A 3-mm calculus is shown in the pelvis. **Right,** The calculus is shown in the pelvis after ureteroscopy and 1 session of shock wave lithotripsy.

SWL was repeated for the patients of both groups and follow-up by ultrasonography and abdominal radiography was done 2 to 4 weeks thereafter. The costs of the procedures were calculated and compared between the two groups.

RESULTS

Of the 66 patients, 9 in group 1 and 2 in group 2 were lost to follow-up. Overall, records of 22 and 33 patients in groups 1 and 2 were analyzed, respectively. The mean ages of the patients in groups 1 and 2 were 28.7 ± 12.9 years (range, 14 to 59 years) and 29.4 ± 9.1 years (range, 17 to 60 years), respectively. The mean size of the calculi was 2.73 cm (range, 2.53 cm to 2.98 cm) and 2.76 cm (range, 2.54 cm to 2.99 cm) in the patients of groups 1 and 2, respectively. No significant difference was noted between the patients' ages.

In group 1, entering the pelvis and visualizing the calculus by ureteroscope was unsuccessful in 2 patients (9.1%). In 5 patients (22.7%), the calculi were completely fragmented after ureteroscopy and retrograde lithotripsy without any need for further SWL. In 9 patients (40.9%), after a single session of SWL, and in 3 (13.6%), after 2 sessions, fragmentation was completed. In the remainder, even after 2 SWL sessions, large residues were still left. The total success rate of the procedure was 77.3% (17 of 22 patients). Three patients experienced allergy to the anesthetic drugs, severe flank pain, and fever and chills (suspicion of sepsis) and were hospitalized for 1 night after the procedure.

In group 2, successful treatment was achieved after 1 and 2 SWL sessions in 6 (18.2%) and 8 (24.2%) patients, respectively, and in the other patients, residues remained even after 2 sessions of SWL. The total success rate was 42.4% (14 of 33 patients). Consequently, the stone-free rate was significantly higher in the patients of group 1 than those in group 2 ($P = .01$).

The period of anesthesia was 23.1 minutes (during ureteroscopy) in group 1 and 13.2 minutes in group 2 (during cystoscopy or ureteroscopy and insertion of ureteral catheter). No significant complication was observed in neither of the groups. The mean costs of the treatment were US \$ 400 and US \$ 370 in groups 1 and 2, respectively.

DISCUSSION

Invention of SWL and other technologic advances in endourology have made us able to treat most of the kidney calculi with the least complications.⁽¹⁾ Nowadays, most kidney calculi are treated by SWL.^(10,11) However, the problem of this technique is its less success rate in larger calculi. Percutaneous nephrolithotomy is an effective technique for the treatment of such large kidney calculi and it is preferred to open surgery because of low complications and favorable outcomes.^(12,13) However, there is still controversy in the treatment of the pelvic and kidney calculi between 2 cm to 3 cm. Lingeman and colleagues believe that calculi sized 2 cm to 3 cm require more surgical approaches after SWL when compared with calculi sized 1 cm to 2 cm. Also, the stone-free rate is only 34% after SWL, while this rate has been reported to be 90% after PCNL.⁽¹⁴⁾ In another study by Psihramis and associates, the complete success rate of SWL for the kidney calculi larger than 2 cm was only 33%.⁽¹⁵⁾ In their study, SWL was just used once and the location of the calculus was variable including the inferior calyx. In our study, the success rate for SWL per se was 42.4% for the 2- to 3-cm calculi, which is a bit higher than those in the previous studies. It should be mentioned that in most of our patients, SWL was performed twice and all the calculi were located in the pelvis.

Regarding the need for extra treatment in most of the cases and low rate of successful removal of the calculi after SWL, in the National Institutes of Health Consensus Development Conference in 1988, it was recommended that PCNL be used as the first choice for removal of the kidney calculi larger than 2 cm.⁽⁵⁾ However, some authors still consider SWL for the treatment of these calculi. They believe that it is necessary to insert ureteral catheter before SWL in these patients to reduce the need for unwanted surgical interventions.⁽⁶⁾ We, therefore, inserted a double-J catheter before the procedure for all patients.

For the treatment of kidney calculi, retrograde intrarenal surgery has also been considered by some authors. Grasso and Bagley reported the results of this method in 22 patients. In one-third of these patients, ureteroscopy was again needed and the total success rate was 91% after 2 sessions of flexible ureteroscopy and laser lithotripsy.⁽⁷⁾ The problem

with this technique is the long period of the surgery and frequent failures in long-term stone-free rates. A combination of outpatient ureteroscopic lithotripsy with SWL has been considered as an alternative for PCNL. In a recent study by Hafron and colleagues, 14 patients with a mean calculus size of 847 mm² were treated by a combination of flexible ureterorenoscopy with holmium laser lithotripsy and SWL.⁽⁸⁾ Thirteen patients (93%) were successfully treated; 2 of them remained stone-free with the first intervention and 10 needed a second intervention (ureterorenoscopy in 7, ureterorenoscopy and SWL in 1, SWL in 1, and alkalinizing medications in 1) to become stone-free. One patient died due to an irrelevant disease. Two patients needed a third session of SWL, of whom 1 underwent PCNL due to urosepsis. The success rate was 84.6% (residues smaller than 4 mm). Thus, in comparison with the conventional PCNL method, this technique could have the same treatment results and less morbidity.

Retrograde intrarenal surgery has been considered a great substitute for SWL monotherapy.⁽⁹⁾ The indications for endourological SWL include the presence of coagulopathies, intrarenal strictures, concurrent calculus of the kidney and ureters, kidney anomalies, and SWL failure.^(8,9) In our study, the use of ureteroscopy and SWL resulted in a success rate of 77% which is less than the mentioned outcome reported by Hafron and colleagues,⁽⁸⁾ but higher than that of SWL monotherapy. In our study, the number of the patients was more and in contrast with the previous studies which had used flexible ureteroscope, rigid ureteroscope was used, too. Therefore, due to the more difficult access to all calculi, the success rate seems to be less with this method. Concerning the costs, although our proposed technique is slightly more expensive, it is worth due to the higher success rate.

Our study had some limitations; the number of patients who did not return for follow-up was relatively high, and therefore, we could not evaluate them. Another factor which could make a bias in the procedure was performance of SWL by 2 surgeons. However, the considerably higher success rate in one group can allow us to make our preliminary conclusion that ureteroscopy with lithotripsy prior to SWL would provide a higher chance of successful treatment.

CONCLUSION

Since in some patients, PCNL is not possible due to medical problems or lack of facilities in some regions, it is rational to consider alternative methods for PCNL. Furthermore, some of the urologists do not have enough acquaintance with PCNL and prefer other choices. In our experience, ureteroscopic lithotripsy plus SWL was a safe method for the treatment of rather large calculi in the renal pelvis. Notwithstanding that the authors still believe that PCNL is the treatment of choice in these cases, a combination of endourological approaches and SWL can always be a favorable alternative since it eliminates the skin tracts and its complications. Besides, this approach does not need a prone position which could be troublesome in some patients.

CONFLICT OF INTEREST

None declared.

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