

## Comparison of Ureteroscopic Lithotripsy and Extracorporeal Shock-Wave in The Treatment of Ureteral Calculi

### Üreter Taşlarının Tedavisinde Üreteroskopik Litotripsi ve Ekstrakorporeal Şok Dalga Litotripsi'nin Karşılaştırılması

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**ÖZET: Amaç:** Üreter taşlarının tedavisinde kullanılan yöntemlerden extracorporeal shock-wave lithotripsy (ESWL) ve üreteroskopik lithotripsy (URS) nin etkinlik ve komplikasyonlarını karşılaştırmak.

**Gereç ve Yöntem:** Mart 2001 ile Temmuz 2004 tarihleri arasında semptomatik üreter taşı 124 hasta URS, 91 hasta ESWL yöntemi ile tedavi edildi. ESWL grubunda PCK firmasının ürettiği Stonelith Smart Lithotripter markalı cihazı, URS grubunda ise Wolf marka 8 – 9.8 F rijid üreteroskop ve PCK Calculith Lithotripter marka pnömomatik litotriptör kullanıldı. Taştan arınma oranları, yeniden tedavi gereksinimi oranları, ve komplikasyon oranları karşılaştırıldı.

**Sonuç:** Taştan arınma oranı URS grubunda %93.54 iken ESWL grubunda %81.31 idi. Komplikasyon oranları üreteral perforasyon dışında her iki grupta da benzerdi. URS grubunda 3 hastada (%2.4) ve ESWL grubunda 9 hastada (%9.8) yeniden tedavi gerekti. ESWL ve URS yöntemlerinden her ikisi de etkin olmakla birlikte biz, üreter taşlarının tedavisinde başarı oranı daha yüksek olan URS yönteminin önerilebilir olduğu sonucuna vardık.

**Anahtar Kelimeler:** Üreter taşları, ekstrakorporeal şok dalga litotripsi (ESWL), Üreteroskopik cerrahi

**ABSTRACT: Purpose:** To compare the efficacy and the complications of extracorporeal shock-wave lithotripsy (ESWL)\* and pneumatic ureteroscopic lithotripsy (URS) in the treatment of ureteral stones.

**Methods:** Between March 2001 and July 2003, 124 patients with symptomatic ureteral calculi treated with URS and the other 91 with ESWL. In the ESWL group, PCK stonelith smart lithotripter and in the URS group 8 – 9.8 Fr Wolf rigid ureteroscope and pneumatic lithotripter (PCK Calculith Lithotripter) were used. Stone clearance, re-treatment and complication rates were assessed in this study.

**Results:** The stone clearance rate of URS and ESWL groups were measured as 93.54% and 81.31% respectively. Complication rates were similar for both groups except ureteral perforation. In the URS group, 3 patients (2.4%) and in the ESWL group 9 patients (9.8%) required re-treatment.

**Conclusion:** We concluded that, both ESWL and URS treatments are effective tools in the management of ureteral calculi, but we recommend URS as the optimal treatment for ureteral calculi cases because of the success rates are better than ESWL.

**Key Words:** Ureterolithiasis, extracorporeal shock-wave lithotripsy (ESWL), Ureteroscopic Surgery

## INTRODUCTION

Ureteral stones were managed by open ureterolithotomy for a long time (1). After the extracorporeal shock-wave lithotripsy (ESWL) and ureteroscopic (URS) lithotripsy techniques have been developed, ESWL has revolutionized the treatment of urinary stones and also has dramatically changed the management of urinary stones (2). ESWL is a safe and effective treatment option for ureteral

stones. High success rates for ESWL of mid and lower ureteral calculi have been reported (3, 4). On the other hand, URS often yields higher rate of stone clearance (5). URS allows reaching of urinary stones into the ureteral channel. Ureteroscopic treatment of ureter stones is a safe method particularly in the presence of calculous obstruction or non-opaque stones (6,7). Currently ESWL and URS techniques are used to manage ureteral stones. In this study, we report our experience of ESWL and URS.

## MATERIALS AND METHODS

Between March 2001 and July 2004, 124 patients with symptomatic ureteral calculi were treated with URS and 91 patients were treated with ESWL at our urology department. The ESWL group consisted 51 males and 40 females patients, aged 18-69

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(median age 37). Forty-two patients (46.15%) had upper ureteric, 30 patients (32.96%) had middle ureteric and 19 patients (20.87%) had distal ureteric stones in ESWL group. The URS group consisted of 72 males and 52 females patients, aged between 20 and 73 (median age 36). Nine patients (7.25%) had upper ureteric, 34 patients (27.41%) had middle ureteric and 81 patients (65.32%) had distal ureteric stones in URS group. General physical examination, blood pressure, blood and urine routine examinations, liver and kidney function tests, ultrasonic scanning and X-ray examination (plain film, IVU and nonenhanced spiral computed tomography in some patients) of the urinary system were performed before the treatment of ureteral calculi. All of the patients had partial or total obstruction and not another pathological finding. The same examinations performed after the treatment, on the days 10 and 30. In the ESWL group the stone size was measured as 6-33 mm. (median  $11.31 \pm 6.21$  mm) and in the URS group the stone size was 4-13 mm (median  $9.64 \pm 2.31$  mm). For the ESWL group, Stonelith Smart Lithotripter (belonging to PCK firm) was applied. Before the ESWL treatment, intramuscular pethidine was administered to all patients for analgesia. The mean number of shocks given per treatment was  $1215.64 \pm 91.22$  (range 1000 – 1500) with the voltage range being 14 – 22 KV. The treatment session number varied among 1-5. In the URS group, procedure was performed by using 7-9.8 Fr Wolf rigid ureteroscope. Stones were removed either mechanically by forceps or by using pneumatic lithotripter (PCK Calculith Lithotripter). All ureteroscopies were performed under general anaesthesia. Ureteroscope was inserted into the bladder and then guided upward the affected ureter. Guide-wire stent

and Dj stent were used in all of the patients who treated with URS. Dj stent was removed after 24 hours. We used Chi-Square test for to compare of radiologically stone free rate with ESWL and URS.

## RESULTS

A total of 91 patients were treated with ESWL. 46 patients (50.54%) had left ureteral calculi, 35 patients (38.46%) had right ureteral calculi and 10 patients (10.98%) had bilateral ureteral calculi in the ESWL group (Table-1). After the ESWL treatment, on day 30, stone clearance was determined in 74 patients. This procedure resulted in a success rate of 81.31%. The stone clearance rate with one ESWL session was 25.27% (23 patients) and, 45.15% with 3 ESWL sessions. Only 9 patients (9.89%) had five ESWL sessions. In the ESWL group, postoperative infection in 2 patients (2.19%), and ureteral stricture were determined in 3 patients (3.29%). 9 patients (9.89%) required re-treatment. No patient had ureteral perforation as a complication in the ESWL group. (Table-2)

A total of 124 patients were treated with URS. 69 patients (55.64%) had left ureteral calculi, 52 patients (41.93%) had right ureteral calculi and 3 patients (2.41%) had bilateral ureteral calculi in the URS group (Table-1). On the day 30 after URS treatment, stone clearance was determined in 116 patients. Success rate after URS treatment was 93.54%. In the URS group, postoperative infection was determined in 2 patients (1.61%), ureteral stricture was determined in 2 patients (1.61%). Five patients (4.03%) had a surgical operation due to ureteral perforation. Three patients (2.41%) required re-treatment. (Table 2)

**Table 1.** Characteristics and success rates of the groups

Group	Male	Female	Median Age	Unilateral Stone	Bilateral Stone	Stone Size (mm.) Median±SD	Success Rates* (%)
ESWL	51	40	37	81	10	$11.31 \pm 6.21$	81.31
URS	72	52	36	121	3	$9.64 \pm 2.31$	93.54

\*P<0.05

**Table 2.** Complications

Complications	Postoperative infections	Ureteral perforation	Ureteral constricture	Re-treatment
ESWL (91)	2 (%2,1)	0	3 (%3,2)	9 (%9,8)
URS (124)	2 (1,6%)	5 (4.0%)	2 (1,6%)	3 (2,4%)

## DISCUSSION

Percutaneous and ureteroscopic approaches to remove of urinary stones have decreased the frequency of open surgery (7). ESWL has been used extensively in the treatment of ureteral calculi for the last 20 years as an effective and non-invasive procedure. With the ESWL treatment, patients can be treated easily. ESWL provides a non-invasive, simple and safe option for the treatment of ureteral calculi (7-10). However, in this study stone clearance success rate was higher with URS than with ESWL. URS with pneumatic lithotripsy developed in 1990s, was reported to be the most effective. But URS requires anaesthesia and hospitalization (6,7). Although more effective than ESWL. URS-associated morbidity and the need for anaesthesia, encourages the opinions which do not recommend performing URS as a primary option in the treatment of ureteral stones (7,8).

The complications observed with URS, depend on the urologist's training and experience. All patients want anaesthesia-free, out-patient treatment and also the treatment to be successful and free of complications. It is clear that, the results of URS are better than those of ESWL. (7,8,11)

Residual stones after ESWL treatment can be the cause of obstruction, hydronephrosis and urosepsis (11,12). After URS treatment, most patients have become stone free with a single URS procedure. However, the success of URS depends on the urologist's skill (7,11,12). After URS treatment, we have observed high success rate, and low complication rate. Only 5 patients had a surgical operation due to ureteral perforation. Insignificant postoperative infection and ureteral constricture rate was observed after URS treatment. For this reason, URS should be the procedure choice for ureteral stones especially for lower ureteral stones. The criteria for primary ESWL versus URS should be determined by the physician in charge of the patient care.

Especially in the hands of inexperienced, after URS treatment potential complications can be serious. But URS is also effective in certain cases when ESWL fails. If the patient has urinary tract infection, antibiotics should be administered before the treatment. In this study, the advantage of ureteroscopic lithotripsy in the treatment of ureteral calculi was showed which is the higher rate of stone clearance compared with ESWL ( $P<0.05$ ).

Prolonged stones can cause ureteral adhesions which impede the clearance of calculus. It is very difficult to eliminate this problem with ESWL, but this problem can be solved effectively with URS. Also URS can clear the stone streets which formed after ESWL treatment (7,11,12). Currently it is believed that the placement of double J stent prevents postoperative infection and helps the drainage of urine after operation (5-7).

We conclude that both ESWL and URS are the effective tools in management of ureteral calculi however we recommend URS as being the optimal treatment for ureteral calculi.

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