Extracorporeal shock wave lithotripsy treatment of renal and ureteral stones Maltepe University Hospital experience

Böbrek ve üreter taşlarının vücut dışı şok dalgaları (ESWL) ile tedavisi Maltepe Üniversitesi Hastanesi deneyimi

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ÖZET

Amaç: Vücut dışı şok dalgaları ile taş tedavisi (ESWL) ürolitiyazis tedavisinde kullanılan invazif olmayan bir yöntemdir. Bu çalışmanın amacı ürolitiyaziste kullanılan ESWL tedavisinin sonuçlarını ve uygun endikasyonlarını ortaya koymaktır.

Yöntem: Temmuz 2009-Temmuz 2011 arasında üriner sistemde soliter taş nedeniyle ESWL tedavisine alınan 51 hasta çalışmaya alındı. ESWL seanslarını takibeden 3 ay içinde taşsızlık durumu ve komplikasyonlar gözlenip değerlendirildi.

Bulgular: Ellibir hastanın 38'i (% 74.5) erkek 13'ü kadındı (% 25.5). Hastaların yaşları 20-73 arası değişmekteydi (ort. 41.7 yıl). Kırkdört hastada (% 86) üç ay sonunda taştan tam arınma gerçekleşti. Otuzüç böbrek ve 18 üreter taşının sırasıyla 29'unda (88 %) ve 13'ünde (72%) arınma sağlandı. ESWL yapılan 7 hastada başarı sağlanamadı, Üreterorenoskopik litotripsi ve perkütan nefrolitotomi gibi invazif girişimler uygulandı.

Sonuç: ESWL özellikle ürolitiyazis tedavisinde son derece etkin ve invazif olmayan bir tedavi yöntemidir. Bu çalışmada böbrek ve üreter taşlarında başarı şansı sırasıyla %88 ve %72 bulunmuştur. Ayrıca taş üriner sistemde ne kadar distalde ise başarı şansı o kadar düşmektedir.

Anahtar kelimeler: vücut dışı şok dalgaları, nefrolitiyazis

ABSTRACT

Objective: Extracorporeal Shock Wave Lithotripsy (ESWL) is an effective noninvasive method to treat urolithiasis. This study aims to evaluate the outcome and the appropriate indication of ESWL for urolithiasis.

Material and methods: The data of 51 patients undergoing ESWL for the management of solitary urolithiasis during a period of 2 years (July 2009-July 2011) were reviewed. Stone-free status and complications were observed and evaluated within a period of three months following the last ESWL treatment session.

Results: Out of these 51 patients, 38 were male (74.5%) 13 were female (25.5%). Ages varied from 20 to 73 (mean 41.7 years). Forty-four patients (86%) had complete clearance of stone by the end of 3 months. Out of 33 renal and 18 ureteral stones 29 (88%) and 13 (72%) were succesfuly cleared. ESWL was unsuccessful in 7 patients that required adjunct invasive intervention including ureterorenoscopic lithotripsy and percutaneous nephrolithotomy.

Conclusions: ESWL is a highly effective noninvasive modality in the management of urolithiasis. The success rates in this study for kidney and ureteral stones were found to be 88% and 72% respectively. Furthermore the more distal the stone's position is, the less success ESWL has.

Key words: extracorporeal shock wave lithotripsy, nephrolithiasis

INTRODUCTION

Before Chaussy used extracorporeal shock wave lithotripsy (ESWL) in 1980, invasive methods have been used in the treatment of urinary stones (1). Since then, (ESWL) has been the treatment of choice for renal stones of ≤ 2 cm maximal length located in the calices or the renal pelvis (2). Considering its high efficacy, low rate of morbidity and complication, 3rd generation lithotriptors used in outpatient clinics became the major treatment option in urolithiasis. The higher trend to treat patients with ESWL can also be explained with no requirement of anesthesia. Although the definite time and criteria to evaluate stone-free status of a patient after ESWL treatment remained controversial for many years, it is now certain that clearance of disintegrates by three months is necessary to say that ESWL is succesful (3). The disintegration depends on stone volume (4), stone composition and localization, and type of lithotripter, applied shock wave number and energy (5). Clearance of disintegrates depends on their localization and is worse for those in the lower calyces than for those in the middle or upper calyces.

In this study we report the early outcomes of 51 patients treated with electrohydrolic Lithoshock ESWL device with fluoroscopic stone focusing.

MATERIALS AND METHODS

The data of 51 patients with diagnosis of urolithiasis undergoing endoscopic shock wave lithotripsy between July 2009 and July 2011 were reviewed. The diagnosis of urolithiasis was done either with Kidney Ureter Bladder film (KUB) plus ultrasound (US) or with computed tomography (CT). The calculi were focussed with C-Arm Fluoroscopy. Patients having pain, hydronephrosis due to stone obstruction, and stone size 5 ≥ mm were treated with ESWL. The patients with ureteropelvic junction obstruction, renal failure and urinary obstruction were excluded. Asymptomatic patients with stone size < 5 mm and no obstruction were followed up for spontaneous passage. If they are not stone-free during this period, ESWL or percutaneous nephrolithotomy for kidney stones and ureterorenoscopic lithotripsy for ureteral stones were carried out. Complete blood count, blood urea analysis, coagulation parameters were done before the procedure.

Double-J catheters were inserted to 9 patients (%17) before ESWL sessions.

Parenteral diclofenac or fentanyl was used in order to ensure analgesia. Electrohydrolic (Ultralith) ESWL device with fluoroscopic C-arm focussing was used. One to 5 ESWL sessions (mean 3) were performed. 500 to 3500 shock waves (Mean 2567) were applied for each session. Shock wave intensity varied from 10 to 22 kv (mean 18 kv). On 10th, 30th and 90th days following the last ESWL session, patients were checked with KUB films and/or ultrasound, stone free status were defined with evidence of disintegration and spontaneous passage of disintegrates.

RESULTS

Of these 51 patients, 38 were male (74.5 %) 13 were female (25.5 %). Ages varied from 20 to 73 (mean 41.7 years). Three had (5.9%) upper calyceal, 9 had (%17.6) mid calyceal, 12 had lower calyceal (23.5%), 9 had renal pelvis (17.6%) and, 18 had ureteral(35.3%) stones. Stone sizes varied from 5-30 mm (mean 10.5). After 3 months follow up 44 patients became stone free (86%.) Out of 33 renal and 18 ureteral stones 29 (88%) and 13 (72%) were succesfuly cleared. Table 1 shows the success rate of ESWL with respect to stone localization. Two patients required ureterorenoscopic lithotripsy due to the complication of distal ureteral obstruction by abundant stone fragments which is also called as "Steinstrasse" phenomenon. Table 2 gives the status of complete stone disintegration and clearance as well as treatment failure in details. Five patients underwent invasive intervention modalities including ureterorenoscopic lithotripsy and percutaneous nephrolithotomy due to ESWL failure. Complications such as renal hematoma, hypertension, renal failure or infection were not seen in any patients after ESWL treatment. Petechiae, ecchymosis, and macroscopic hematuria shorter than 24 hours were seen in all cases. The success rates for

Stone localization	Stone Free	Success Rate
Upper Calyx	2/3	67%
Mid Calyx	9/9	100%
Lower Calyx	11/12	92%
Renal Pelvis	7/9	78%
Proximal Ureter	12/13	92%
Mid Ureter	1/3	33%
Distal Ureter	0/2	0%

Table 1. Success rates according to stone localization

Stone status	# Patients	Percentage
*Stone free	44	87 %
**Non Stone free	5	16 %
***Steinstrasse	2	3 %
Total	51	100 %

Table 2. Overall success and failure rates after ESWL treatment *Complete disintegration and passage of disintegrates, **Incomplete disintegration or failure to pass disintegrates ***Persistent ureteral obstruction due to impacted disintegrates requiring immediate endoscopic intervention

the kidney stones and ureteral stones were found to be 88% and 68% respectively.

DISCUSSION

Follow-up, ESWL, ureterorenoscopic lithotripsy, percutaneous lithotripsy and open surgery are the treatment options for urolitihiasis. The management of urolithiasis depends on the factors such as stone size, localization, presence of obstruction and renal function. Since its introduction in 1980, ESWL became the preferred treatment option for the majority of renal calculi because of its non-invasive nature and low potential of complications (6).

The overall success of ESWL in this study was 88 % and 68 % for kidney and ureteral stones, respectively. The success rate of ESWL in proximal ureteral stones reported to be 89-95.5 % in the literature and is in accordance with our findings. As to the mid ureteral stones, either ESWL or ureterorenoscopic lithotripsy can be prefered. Although the overall ESWL success for mid ureteral stones in previous reports was about % 65, this rate was much lower in our study. Furthermore, ESWL was unsuccesful in lower ureteral stones in contrast to previous reports (6).

The surprising fact is ESWL success rate in this study (%92) for lower calyceal stones was higher than the cumulative stone free rate of 41-73% for lower pole stones in many reports (7). This high rate can be due to some facts; First the stone burden in lower calyces was low in our patients, second we recommended vibratory massage in hand stand position as suggested a previous report with stone-free rate of % 62.5 in patients with massage and up side down position following ESWL sessions in contrast to 35.4 % stone free rate in patients with ESWL alone (8). The stone-free rate for upper calyceal stones is reported to be high in the literature, however the number of patients undergoing ESWL for upper calyceal stones was very small in our series making the comparison with the results of these series impossible.

We evaluated the stone free status with KUB films and/or urinary ultrasound by 3 months. These imaging modalities seem to have lower sensitivity and specifity in detection of small disintegrates and calculi. The question here is whether it is necessary to evaluate stone-free rate using the more sensitive tools such as computed tomography with more radiation exposure, if these clinically insignificant residual fragments (CIRF) have no therapeutic consequences. Some authors reported that 78% of CIRF pass spontaneously, and only around 20% of patients with CIRF had recurrent stones requiring treatment (9). It remains unclear whether these patients would not have stone recurrences when they had been completely stone free. More aggressive and invasive treatment of lower pole calculi with percutenous nephrolithotomy (PCNL) instead of ESWL is not justified if the only advantage is a better clearance of CIRF, also it cannot be shown that PCNL has a significantly lower long-term recurrence rate due to fewer CIRF (10).

In conclusion, urolithiasis management with Lithoshock ESWL device was found to be effective. According to the location, the procedure seems more succesful in kidney stones than in ureteral stones, and not succesful in lower ureteral stones which requires mostly invasive endoscopic procedures.

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