The Efficacy of Extracorporeal Lithotripsy in Patients with Lithiasis on Solitary Kidney

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Abstract

Introduction and Objectives. Extracorporeal shock wave lithotripsy (ESWL), a non-invasive treatment used in the treatment of renal-ureteral lithiasis, was introduced in medical practice in 1980 in Germany. It can be successfully practiced even in case of patients with single kidney lithiasis.

Matherials and Methods. We performed a prospective / retrospective study of all patients with lithiasis on a solitary kidney, treated and followed-up in Urology Clinic in Târgu Mureş from 23 July 1991 until 31 December 2015. All single kidney lithiasis patients who met the following criteria were included in the research: functional kidney without stasis and calculus ≤ 20 mm. A total of 203 patients were enrolled in the study.

Results. The number of patients assigned by gender is approximately similar: 101 males (49.75%) and 102 (50.25%) females. In terms of age, the mean age was 56.75 +/- 13 years. Most calculi were found in inferior calves (34.49%), pelvic (20.91%) and lumbar ureter (16.72%). There have also been renal units with multiple lithiasis. Some patients required autostatic ureteral stenting or percutaneous nephrostomy prior to ESWL sessions either due to septic conditions or obstructive anuria. In 185 patients (91.13%), total calculus disintegration was obtained after one or more lithotripsy sessions. A total of 173 patients (85.22%) returned to the regular control at 3 months or later, showing a rate of stone free of 86.75%.

Conclusions. Although the discussion regarding the optimal treatment modality in renal ureteric lithiasis in case of single kidney is still open and new treatment options are becoming numerous, given good efficacy, low incidence of complications, and high rate of stone-free (86.75 %), we consider ESWL to be the appropriate therapy in these patients if the indication is properly established and is performed by a urologist with extensive experience in this field.

Key-words: ESWL, lithiasis, single kidney, stone-free

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Introduction And Objectives

ESWL (Extracorporeal Shock Wave Lithotripsy), a non-invasive treatment used in the treatment of renal-ureteral lithiasis, was introduced in medical practice about 40 years ago, in 1980 in Germany (Extrakorporale Stoss Wellen Lithotripsy). Over time, ESWL has become the treatment of choice in the case of renal and ureteral calculi [1].

Extracorporeal shockwave lithotripsy (ESWL) is currently the therapeutic method of choice, for its minimal aggressiveness and time proven effectiveness that can be successfully practiced even in patients with single kidney lithiasis. [2] As such, ESWL is and can be applied to these patients, although disputes over PCNL (Percutaneous Nephrolithotomy)/ URS (Retrograde Ureteroscopy) versus ESWL exist. An autostatic stent inserted before performing extracorporeal lithotripsy is more commonly used in these situations because of the risk of anuria due to obstruction by calculus. The rate of stone free is lower (70-75%) and residual fragments having a much higher incidence (20%) [1,3].

Flexible URS with laser lithotripsy, emerging from technological advances, may become an alternative in well-selected cases for treating renal and ureteral lithiasis. ESWL remains, however, an agreed method by the patient and physician due to its non-invasiveness [4,5]

Materials And Methods

We performed a prospective / retrospective study of all patients with single kidney (congenital, functional or surgical) lithiasis, treated and followed in Urology Clinic in Târgu Mureş from 23 July 1991, when extracorporeal lithotripsy was started in this clinic until 31 December 2015. All single kidney lithiasis patients who met the following criteria were included in the research: functional kidney without stasis and calculus ≤ 20 mm. We excluded patients with calculus > 20 mm, patients with urinary infections, as well as patients for whom another therapeutic decision was made. In all cases, the diagnosis was confirmed by computed tomography (CT), intravenous urography or ultrasonography. Prior to treatment, all patients were evaluated in terms of medical history, urinary tract abnormalities, physical examination, urine summary and urine culture, renal function, coagulation tests.

A total of 203 patients were enrolled in the study.

Lithotripsies were performed with Siemens Lithostar - System C (1991-2011) and then with Siemens Lithoscope (November 2011-2015), all procedures being performed under fluoroscopic control. Both devices use the electromagnetic shock wave generation.

The indication for ESWL in single kidney patients involves a careful selection of cases in order to achieve the best results, reduced rate of complications and an improved quality of life. [6]

All patients were hospitalized in order to follow, post procedural, their evolution and to detect and treat possible complications.

Post ESWL follow up consisted of urinary ultrasound and simple renal and bladder X-ray usually performed one day after treatment.

Patients were considered free of calculi if no residual fragments were found at the 3-month follow-up.

Data was collected and processed using Microsoft Office Excel 2013 and Graphpad InStant.

Results

The number of patients assigned by gender is approximately similar: 101 males (49.75%) and 102 (50.25%) females.

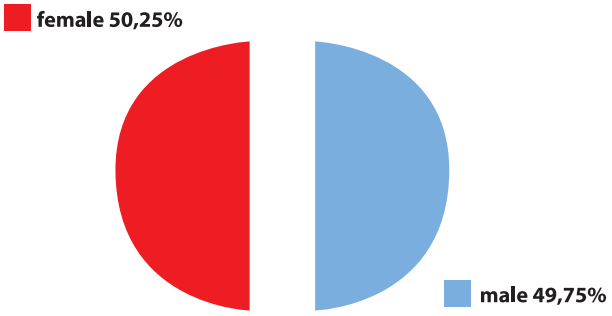

Fig 1. Male/female percentage

In terms of age, the mean age was 56.75 +/- 13 years.

Of the total number of patients, 47% had a history of lithiasis. A total of 98 patients experienced one or more comorbidities: high blood pressure was present in 60 cases, diabetes mellitus in 17 cases, and obesity was highlighted in 80 patients.

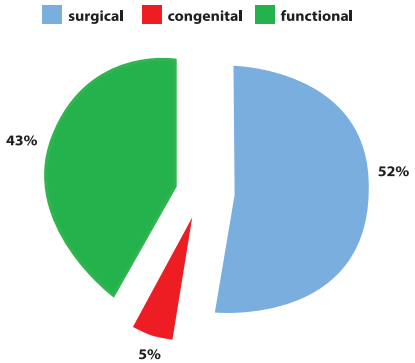

Fig. 2. Types of single kidney

Most calculi were found in inferior calves (34.49%), pelvic (20.91%) and lumbar ureter (16.72%). There have also been renal units with multiple lithiasis.

Calculus localization		No. of calculi	%
Renal	Superior calyx	7	2,44
	Middle calyx	18	6,27
	Inferior calyx	99	34,49
	Pelvis	25	8,71
	Ureteropelvic junction	13	4,53
Uretheral	Lumbar	48	16,72
	Iliac	17	5,92
	Pelvic	60	20,91

Table 1 – Calculus localisation

Some patients required autostatic stenting or percutaneous nephrostomy prior to ESWL sessions either due to septic conditions or obstructive anuria.

Procedure	No. of patients	%
Autostatic stent	31	46,97
Percutaneous nephrostomy	35	53,03
Total	66	100

Table 2 – Necessity of procedures prior to ESWL

ESWL was performed for single or multiple lithiasis, with calculi located both in the kidneys and in the ureter.

In 185 patients (91.13%), total calculus disintegration was achieved after one or more lithotripsy sessions. The efficacy of calculi fragments elimination was significantly increased by using the double J stent ($p = 0.04$).

A total of 173 patients (85.22%) returned to the regular control at 3 months or later, showing a rate of stone free of 86.75%. Post-treatment complications were generally minor, with a low incidence (6.31%), the most common being obstruction due to the migration of calculi fragments, gross hematuria and pyelonephritis. No patient experienced renal hematoma or changes in renal function after ESWL.

Discussions

Although in our study, the success rate was very high, with low rate of complications, discussions on the right therapeutic option for single kidney lithiasis remain open.

Shockwave lithotripsy is considered to be the safest method, but we should not forget less stone-free rates for the unique kidney, as well as rare but serious complications such as renal hematoma or steinstrasse (with Acute Renal Failure).

Percutaneous nephrolithotomy in the single kidney patient group has been extensively explored. It is well known that, due to compensatory hypertrophy, the risk of parenchymal lesions and bleeding may be higher. In the CROES PNL study, there were higher transfusion rates in the renal impairment group (189 patients out of a total of 5745), and the stone-free rate was significantly lower compared to the group without renal impairment [7]. Adanur et al. claimed that PCNL can not be considered as a minimally invasive operation in solitary kidneys because of the possible risk of complications. In their opinion, retrograde endoscopic surgery should be the procedure of choice [8].

Regarding ureteroscopy, only four studies have been identified in the literature which considered that it is the procedure of choice in case of sole kidney [9]. However, their findings have confirmed that single kidney lithiasis can be effectively and safely managed with ureteroscopy. In a recent study, Kuroda and colleagues found that this procedure for calculus <2 cm in single kidney patients is as safe as in patients with bilateral kidneys [10].

In a paper published in 2012, Ahmed R. El-Nahas and co., shows that the stone-free rate for the lower part of the kidney calculi is net in favor of flexible ureteroscopy with laser lithotripsy (86.5%) than extracorporeal lithotripsy (67.7%), but with an insignificantly higher incidence of complications [5]. Some drawbacks are represented by the fragility of the instrument used and the high repair costs. [11]

In a meta-analysis involving 1205 patients, comparing the rate of free stone and complications in ESWL versus flexible ureteroscopy with laser lithotripsy, was concluded that flexible ureteroscopy results in a higher free stone rate but with a higher complication rate and longer hospitalization. [12]

In cases with unique kidney, the risk / benefit ratio decides the therapeutic approach because there is much more to lose than in the group of patients with bilateral kidneys. In case of a serious complication, we

can not rely on the contralateral compensatory kidney. As usual, in ambiguous clinical cases, more dedicated clinical trials are needed to find evidence-based guidance. Clinical expertise remains the key factor in providing the best therapeutic option.

Conclusions

Although the discussion regarding the optimal treatment in renal ureteric lithiasis on the single kidney is still open and new treatment options are becoming numerous, given good efficacy, low incidence of complications, and high rate of stone-free (86.75 %), we consider ESWL to be the appropriate therapy in these patients if the indication is properly established and is performed by a urologist with extensive experience in this field.

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