Arab Journal of Urology (2017) **15**, 30–35

Arab Journal of Urology
(Official Journal of the Arab Association of Urology)

www.sciencedirect.com

STONES/ENDOUROLOGY
ORIGINAL ARTICLE

Immediate versus delayed shockwave lithotripsy for inaccessible stones after uncomplicated percutaneous nephrolithotomy

Esam A.E. Desoky, Amr M. Fawzi, Ahmed Sakr, Ahmed Eliwa, Ehab R. El Sayed, Diab El Sayed, Asharf M.S. Shahin, Emad A. Salem, Hussien M. Kamel, Waleed Shabana, Mostafa Kamel *

Department of Urology, Faculty of Medicine, Zagazig University Hospital, Zagazig University, Zagazig, Egypt

Received 8 September 2016, Received in revised form 31 October 2016, Accepted 23 November 2016
Available online 28 December 2016

KEYWORDS

Immediate;
Delayed;
SWL;
Percutaneous nephrolithotomy

ABBREVIATIONS

BMI, body mass index;
CONSORT, Consolidated Standards of Reporting Trials;
HU, Hounsfield unit;
KUB, plain abdominal radiograph of the kid-

Abstract ***Objective:*** To evaluate the efficacy and safety of immediate versus delayed shockwave lithotripsy (SWL) for inaccessible stones after uncomplicated percutaneous nephrolithotomy (PCNL).

Patients and methods: Between December 2011 and June 2014, patients with residual inaccessible stones after uncomplicated PCNL were prospectively randomised into two treatment groups; Group I, immediate SWL and Group II, delayed SWL at 1 week after PCNL. Patients with residual stones of $\geqslant 1.5$ cm, a stone density of >1000 Hounsfield units and body mass index of >40 kg/m^2 were excluded from the study. The following data were reported: patients' demographics, stone characteristics after PCNL, hospital stay, perioperative complications, stent duration, and stone-free rate (SFR).

Results: In all, 84 patients (51 males and 33 females) with mean (SD) age of 39 (8.5) years were included in the study. Group I included 44 patients, whilst Group II included 40 patients. There was no statistically significant difference amongst the groups for patients' demographics, stone characteristics, and perioperative complications. The hospital stay was significantly shorter in Group I, at a mean

* Corresponding author at: Department of Urology, Faculty of Medicine, Zagazig University Hospital, Zagazig University, El Mohafza Street, Zagazig, Egypt. Fax: +20 552300150.
E-mail address: mamar1973@yahoo.com (M. Kamel).

Peer review under responsibility of Arab Association of Urology.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.aju.2016.11.002

neys, ureters and bladder;
PCNL, percutaneous nephrolithotomy;
SFR, stone-free rate;
SWL, shockwave lithotripsy;
US, ultrasonography

(SD) of 34 (3.7) vs 45 (2.9) h ($P < 0.001$). The duration of ureteric stenting was significantly lower in Group I as compared to Group II, at a mean (SD) of 12 (4.2) vs 25 (3.5) days ($P < 0.001$). The SFR was 93.2% and 95% in Groups I and II, respectively ($P = 0.9$).

Conclusions: Immediate SWL after PCNL is as effective and safe as delayed SWL with a lesser hospital stay and duration of ureteric stenting.

Introduction

The goal of stone treatment is to use the least morbid, minimally invasive and effective method of stone clearance [1]. Percutaneous nephrolithotomy (PCNL) is considered the 'gold standard' minimally invasive procedure for the treatment of large and complex renal stones [2,3].

The stone-free rate (SFR) of PCNL monotherapy ranges from 76% to 84% and residual stones may be due to the migration of fragments into an inaccessible calyx [4,5]. A certain proportion of patients that undergo PCNL treatment will require some other ancillary therapeutic strategies to improve the SFR [6].

Clinically insignificant residual stone fragments are defined as residual calculi < 0.4 cm, meanwhile the patient is asymptomatic and the stone composition is not struvite or an infection stone [7]. Residual calculi are almost inevitable postoperatively and may lead to recurrent urolithiasis or protracted UTIs.

Significant residual stones after PCNL are a challenging issue. The development of flexible nephroscopy was an important step in dealing with this issue with subsequent increases in SFRs; however, significant bleeding or difficult pelvicalyceal anatomy, such as adjacent parallel calyx containing a stone, may limit its effect [8]. For those stones that cannot be readily reached with a flexible nephroscope, a second track can be made but with caution because of the increased risk of bleeding [9].

As compared to invasive procedures, the non-invasive nature and easy retreatment with shockwave lithotripsy (SWL) have resulted in it becoming a well-recognised auxiliary treatment for residual calculi with a small stone burden [10,11]. SWL is recommended as the fist-line treatment option by the European Association of Urology (EAU) and AUA for renal calculi of < 2.0 cm [12], and it is commonly used to treat residual calculi after PCNL [11].

The aim of the present study was to evaluate the safety and efficacy of immediate vs delayed SWL for inaccessible stones after uncomplicated PCNL.

Patients and methods

Between December 2011 and June 2014, patients with residual inaccessible radio-opaque stones of > 0.7 and $\leqslant 1.5$ cm after uncomplicated PCNL (i.e. PCNL without significant bleeding or pelvicalyceal system perforation and patient haemodynamically stable for 2 h postoperatively) were prospectively randomised (using the closed envelope technique) into two treatment groups; Group I, immediate SWL and Group II, delayed SWL at 1 week after PCNL.

Approvals were obtained from our institutional ethics committee and informed written consents were taken from all patients. Patients aged < 18 years, body mass index (BMI) > 40 kg/m^2, stone density of > 1000 Hounsfield units (HU), multiple residual stones, and serum creatinine level of $\geqslant 2$ mg/dL were excluded.

As there were no previous similar studies, we conducted a pilot study including 10 patients prior to this study. Those 10 patients were submitted to immediate SWL for residual stones after PCNL. The hypothesis of the pilot study was that immediate SWL after PCNL would not result in additional morbidity for the patients. Using a study power of 80% and 95% CI, the overall complication rate detected in the pilot study was five of the 10 patients, all of which were grade I according to the modified Clavien–Dindo grading system. By reviewing our database, the overall complication rate for delayed SWL for residual stones after PCNL with similar inclusion and exclusion criteria was 19%. Using the OpenEpi, Version 2, open source calculator, the sample size was estimated to be 84. Making an allowance of 5% for possible discontinuations the total sample size was 88 patients who were randomly divided into both groups (44 each). The Consolidated Standards of Reporting Trials (CONSORT) flow diagram of the study is shown in Fig. 1.

The following data were reported: preoperative investigations including complete laboratory investigations, plain abdominal radiograph of the kidneys, ureters and bladder (KUB), pelvi-abdominal ultrasonography (US) and non-contrast CT of the urinary tract, patients' demographics, stone characteristics after PCNL,