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A novel percutaneous nephrolithotomy (PCNL) set: The 'Economical One-shot PCNL Set' (Ecoset)

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KEYWORDS

Percutaneous nephrolithotomy;
Amplatz dilator;
Cost;
One-shot;
Ecoset, **Ec**onomical **O**ne-shot PCNL **Set**

ABBREVIATIONS

PCNL, percutaneous nephrolithotomy

Abstract ***Objectives:*** To suggest a novel disposable percutaneous nephrolithotomy (PCNL) set that we named the '**Ec**onomical **O**ne-shot PCNL **Set**' (Ecoset), which consists of a single 30-F dilator, 30-F sheath, and 8-F polyurethane dilator, as use of a 'one-shot' dilatation technique during PCNL is becoming widespread.

Patient and methods: The medical records of 42 patients with kidney stones who had undergone 'one-shot' PCNL from February 2014 to June 2016 were retrospectively reviewed and analysed. Demographic data, as well as the stone size, radiation exposure time, operation time, hospitalisation duration, rate of treatment success and complications, were recorded.

Results: The mean (SD, range) age of the patients was 44.43 (16.54, 11–72) years. The mean (SD) stone size was 35.12 (17.53) mm. The mean (SD) operation time was 54.58 (22.24) min. The mean (SD) fluoroscopic screening time was limited to 154.72 (117.48) s. Treatment success was achieved in 32 (76%) patients. The mean (SD) hospital stay was 3.09 (0.75) days. None of the patients had any major complications. Bleeding requiring blood transfusion was required in three patients. The cost of a disposable dilatation set for a single PCNL operation with a balloon set, a standard Amplatz set, or an Ecoset is ~$137, $120, or $27 (American dollars), respectively.

Conclusions: The one-shot dilatation technique using the Ecoset for PCNL can be feasibly, safely, and effectively performed in almost every adult patient. The

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Amplatz dilator set and balloon dilator set have the disadvantage of relatively high cost, whereas the Ecoset is the cheapest 'disposable set' that can be used during PCNL surgery.

Introduction

Percutaneous nephrolithotomy (PCNL) is the 'gold standard' procedure for managing particularly large renal stones. The stages of this operation are: obtaining access to the collecting system (guided by ultrasonography or fluoroscopy), dilatation of the tract, placement of the sheath, fragmentation of the calculus, and placement of the nephrostomy catheter. Dilatation of the percutaneous access tract can be achieved by three standard techniques: semi-rigid Amplatz dilatation, metal telescopic dilatation of the Alken type, and balloon dilatation. The novel tract dilatation method 'one-shot' was first introduced by Frattini et al. [1]. In this method, the tract is dilatated by a single 30-F Amplatz dilator. After this first study; many studies have been published showing the advantages of this dilatation method [2–8].

No commercial Amplatz dilator set is designed for the 'one-shot' dilatation technique. Therefore; in the present study, we suggest some modifications to the Amplatz dilator set design and present our experience in the use of a novel Amplatz dilator set that we named the '**Ec**onomıcal **O**ne-shot PCNL **Set**' (Ecoset).

Patients and methods

Ethics approval for the study was obtained from the local ethics committee of our institution. All patients signed the written informed consent before surgery. The medical records and files of 42 patients with renal stones who had undergone one-shot PCNL from February 2014 to June 2016 were retrospectively reviewed and analysed. These PCNL operations were performed using the novel Ecoset. This set consists of an 8-F polyurethane dilator, a 30-F Amplatz dilator, and a 30-F sheath. All operations were performed in a single centre by surgeons who had similar experience with PCNL surgery. Demographic data, as well as the stone size (largest diameter), radiation exposure time, number of access tracts, operation time, postoperative length of stay, treatment success and complication rates, were recorded.

Treatment success was defined as the absence of any residual stones or the presence of clinically insignificant residual fragments. Radiation exposure time was defined as the number of seconds of radiation exposure that had elapsed, based on the dose summary of the fluoroscopy machine at the end of each procedure. Operation time was defined as the time spent on surgery from the moment the nephrostomy needle punctured the pyelocalyceal system to the moment when the nephrostomy site was closed or the nephrostomy tube was secured [9]. Complications were classified using the Clavien–Dindo classification score system standardised for PCNL [10]. Haemoglobin drop was defined as the change in haemoglobin from before the surgical procedure to 6–24 h after surgery. Stone size was defined as the largest diameter of the stone on ultrasonography or radiography.

In this technique, after administration of general anaesthesia, a 6-F ureteric catheter was advanced to the renal pelvis, under direct vision with the cystoscope, in the lithotomy position. The ureteric catheter was fixed to the transurethral Foley catheter, the patient was repositioned to the prone position, and the renal collecting system anatomy was outlined by retrograde injection of diluted contrast via the ureteric catheter. The targeted calyx was then punctured with an 18-G access needle under fluoroscopic guidance. After a guidewire was passed into the calyx, the 8-F polyurethane dilator was advanced over the guidewire. Tract dilatation was then performed in our patients by directly advancing a single 30-F Amplatz dilator over the 8-F polyurethane dilator and a 30-F sheath was placed in the collecting system. In this way, the tract is created in a single step. This tract dilatation and sheath placement were performed under fluoroscopic guidance in all patients (Fig. 1).

Patient enrolment had no specific exclusion criteria, so all patients who underwent one-shot standard PCNL with a 30-F tract size for kidney stone indications during the study period were eligible for inclusion. Patients whose PCNL tract size was < 30 F were excluded from the study.

Results

The one-shot dilatation technique using the Ecoset was successfully applied in 45 patients, and the tract was dilatated in 42 patients. The mean (SD, range) age of the patients was 44.43 (16.54, 11–72) years. The mean (SD, range) stone size was calculated as 35.12 (17.53, 17–65) mm. In all, 12 patients had staghorn renal stones. The mean (SD, range) operation time was 54.58 (22.24, 20–10) min. The mean (SD, range) fluoroscopic screening time was limited to 154.72 (117.48, 30–420) s. For all patients a second tract was not required. Treatment success was achieved in 32 (76%) patients. The mean