

A Novel Irrigation System in Percutaneous Renal Surgery

Mohammad Mehdi Hosseini, Mohammad Amin Afrasiabi, Eskandar Negahdari, Alireza Aminsharifi, Saeed Shakeri, Alireza Tadayon, Ejaz Ahmad, Farhad Manaheji

**Abstract of the preliminary study was presented as a video presentation in 25th WCE, Cancun, Mexico, 2007.*

Nephrology-Urology Research
Center, Shiraz University of
Medical Sciences, Shiraz, Iran

Corresponding Author:

Mohammad Mehdi Hosseini,
MD
Nephrology-Urology Research
Center, Shahid Faghihi
Hospital, Shiraz University of
Medical Sciences, Shiraz, Iran

Tel: +98 711 233 1006
Fax: +98 711 233 0724
E-mail: mmhosseini@sums.
ac.ir

Received December 2011
Accepted January 2012

Keywords: percutaneous nephrolithotomy, kidney, treatment outcome, lithotripsy

INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is known as an alternative for open surgery and a minimally-invasive modality for management of large or complex renal stones.⁽¹⁾ In this procedure, stone is fragmented with pneumatic, ultrasonic, or electrohydrolic devices and its particles are removed with irrigation.⁽²⁾ In traditional method, free uncontrolled outflow of irrigation from the open end of the Amplatz sheath causes wetness of the operating field that may also result in contamination if the stone is infected (Figure 1). We designed, manufactured, and used a closed system to overcome this problem during percutaneous renal surgeries, such as PCNL.

CASE REPORT

Between September 2005 and September 2012, 1137 adult patients, including 674 men and 463 women, with a mean age of 38.2 years (range, 19 to 67 years) and mean stone size of 25.5 mm (range, 15 to 50 mm) underwent PCNL in our referral training center.

Of 1137 patients, 516 had right-sided and 621 had left-sided stones. Most of the patients (64%) were first episode stone formers and 36% had recurrent diseases. Comorbidities included single kidney, diabetes mellitus, hypertension, heart diseases, renal insufficiency, and obesity (Table 1). All the patients were evaluated by our team, including a urologist, an anesthesiologist, and a cardiologist if needed.

Stone was diagnosed with ultrasonography and confirmed with plain abdominal x-ray (kidney, ureters, and bladder x-ray), intravenous urography, or computed tomography scan. Complete blood count, renal function test, coagulation profile, and urine analysis and culture were

Table 1. Demographic characteristics of the patients who underwent percutaneous nephrolithotomy with closed irrigation system.

Male/Female	678/459
Mean age (range), y	38.2 (19 to 67)
Mean stone size (range), mm	25.5 (15 to 50)
Right/left side	516/621
Comorbidities	
Solitary kidney	47 (4.1%)
Diabetes mellitus	44 (3.8%)
Hypertension	113 (9.9%)
Heart diseases	74 (6.5%)
Renal insufficiency	22 (2.0%)
Morbid obesity	27 (2.4%)

checked.

Patients with staghorn calculi or positive culture received oral antibiotic 7 to 10 days prior to the operation. They were admitted 6 to 12 hours before the operation, and received par-enteral fluid and antibiotic.

TECHNIQUE

We designed and manufactured a closed system that can be connected to the external, free end of the Amplatz sheath to collect the outflow of irrigation in percutaneous renal surgery. This device is composed of a simple plastic 3-way tube 28 or 30F with or without two lock-washers for watertight connections (Figure 2). The distal way of the device is attached to the open end of the Amplatz sheath by a piece of a matched connection tube. The proximal way has a 10 mm seal cap for nephroscope passage. The oblique way is connected to a matched tube to evacuate the outflow irrigation (Figure 3). When this device is connected to the Amplatz sheath, the length of the sheath will be increased about 3.5 cm. Therefore, before this connection, the Amplatz sheath should be shortened to match with the length of the nephroscope. During the operation, the irrigation outflow goes through the draining port into the collection bottle passively with little spillage. This mechanism also gives an estimation of the fluid volume used for irrigation during the surgery.

In all (1137 patients) but 27 cases, the procedure was done with little spillage of irrigation fluid during the operation. In 27 morbid obese patients, the standard Amplatz sheath was found too short to reach the collecting system. Therefore, we were unable to mount the 3-way connector in this setting. The outcomes of PCNL using the closed irrigation system are shown in Table 2.



Figure 1. Conventional irrigation system in percutaneous renal surgery.

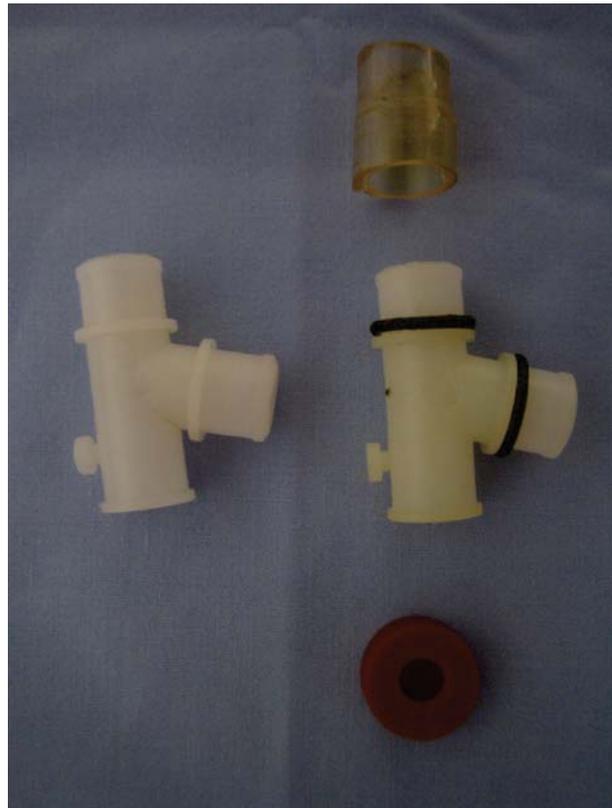


Figure 2. Elements of the connector used for closed irrigation system.

DISCUSSION

In the present study, we showed the feasibility of our home-made system to minimize the spillage of the irrigation fluid during PCNL. This inexpensive device could also be help-



Figure 3. Closed irrigation system during percutaneous nephrolithotomy using our novel device.

Table 2. Results and complications of novel irrigation system.

Stone-free rate, n (%)	1029 (90.5%)
Mean operative time (range), min	75 (40 to 115)
Mean irrigation volume (range), L	11.5 (6 to 18)
Complications (Clavien classification)	
Grade I: Fever (T: 38.3°), bleeding, PCS perforation	44 (23,18,11)
Grade II: Transfusion, ileus, pneumonia	23 (12,7,4)
Grade III: Redo PCNL, URS, late hematuria	7 (3, 2, 2)
Grade IV: Myocardial infarction, sepsis	5 (4,1)
Grade V: Death	2

PCS indicates pelviciceal system; PCNL, percutaneous nephrolithotomy; and URS, ureteroscopy.

ful to measure the volume of the irrigation used for procedure. Despite these potential benefits, the surgeon should be aware that this system converts an open irrigation system to a closed one. Any obstruction in the draining port (eg, stone fragments) may lead to an increased intrarenal pressure. Although we did not encounter any major complication with the closed irrigation system, a comparative study would be helpful to observe if this system affects the outcome of PCNL.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Basiri A, Ziaee SA, Nasseh H, et al. Totally ultrasonography-guided percutaneous nephrolithotomy in the flank position. *J Endourol.* 2008;22:1453-7.
2. Peterson GN, Krieger JN, Glauber DT. Anaesthetic experience with percutaneous lithotripsy. A review of potential and actual complications. *Anaesthesia.* 1985;40:460-4.