## **Original Research Article**

DOI: http://dx.doi.org/10.18203/2349-2902.isj20164403

# Tubeless per cutaneous nephrolithotomy: is it the present standard of care?

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**Received:** 03 November 2016 Accepted: 25 November 2016

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## **ABSTRACT**

Background: Since the time standard per cutaneous nephrolithotomy (PCNL) was introduced in 1976, it has undergone changes in techniques, instrumentation and post-operative management for better patient care. Standard PCNL involves placement of nephrostomy tube and DJ stent/ureteric catheter after stone retrieval. Now the trend is towards tubeless PCNL and totally tubeless PCNL as to minimize pain, infection and hospital stay. Our objective was to compare the outcome of standard PCNL with tubeless PCNL.

Methods: This was a randomized study of patients who underwent standard PCNL and tubeless PCNL in our institute from August 2013 to August 2015 for renal calculi >2 cms. Patients with residual calculi needing further ancillary treatment and patients who had major collecting system tear were excluded from the study. A total of 257 patients who had undergone PCNL during the study period for renal calculi >2 cm were included in the study. 27 patients were excluded due to presence of residual calculi or major collecting system tear. Of these 115 underwent standard PCNL and remaining 115 tubeless PCNL. Post-operative visual analog pain score, need for analgesics, infection rate, post-operative hospital stay were analyzed.

Results: No significant differences were noted in patient demographics, age, sex, stone size and stone burden. There were no significant complications seen in tubeless group as compared to standard PCNL group. Post-operative pain and hospital stay was significantly reduced in tubeless PCNL group.

Conclusions: Tubeless PCNL is a relatively safe and effective modification of standard PCNL. It increases patient compliance of PCNL by reducing post-operative pain and early recovery.

Keywords: PCNL, Renal calculi, Standard PCNL, Tubeless PCNL

## INTRODUCTION

Renal calculi are the most common cause for pain in patients with urological problems and their recurrence rate is also very high to the tune of 70%. Various options are available for their treatment ranging from open surgery to extracorporeal shock wave lithotripsy (ESWL). For large stone burden, per cutaneous nephrolithotomy (PCNL) is the standard of care.<sup>2,3</sup> Per cutaneous nephrolithotomy was first introduced by Fernstrom and Johansson and rapidly gained acceptance

as the standard of care for removal of large and complex renal calculi.<sup>4</sup> Since then a lot of modifications have been introduced in the techniques and instrumentation of PCNL.

In a standard PCNL, a 30Fr Amplatz sheath is placed after dilatation of the tract and calculi are retrieved after fragmentation. Either a double J (DJ) stent is placed or Ureteric catheter is retained. A nephrostomy tube is placed post procedure for haemostatic tamponade effect and to access the system in case of significant residual fragments. Routinely 20-24 Fr tube nephrostomy drainage is advocated after PCNL.<sup>5</sup> This standard procedure is adapted by most urologists for stone burden of >2 cms.

With the advent of mini perc and micro perc nephroscope, small renal calculi are removed using laser lithotripsy and nephrostomy tube is usually not placed. In miniperc <18 Fr amplatz sheath is used and in micro perc 4.85 Fr sheath is used. All these modifications are good enough only for calculi <2 cm in size. <sup>6-8</sup>

The disadvantage of placing a nephrostomy tube is the pain associated with it and also the chances of infection and prolonged hospital stay. As a result newer modifications were introduced in the technique of placing nephrostomy tubes. Small nephrostomy tube placement reduced pain. Tubeless PCNL was introduced where no nephrostomy tube was placed post procedure. In a totally tubeless procedure not even a DJ stent or Ureteric catheter is placed. In both these techniques hospital stay and post-operative pain is reduced.

## **METHODS**

Patients with renal calculi >2 cm in size who were candidates for PCNL were randomized alternatively to standard PCNL and tubeless PCNL only if there were no residual calculi following PCNL and there was no major collecting system tear. Residual calculi were defined as stone fragment more than 5mm visible on fluoroscopy. Patients with altered renal function test, solitary kidney, bleeding disorders, unfit for general anaesthesia and bilateral renal calculi were excluded from the study. A total of 257 eligible patients underwent PCNL during the period of August 2013 to August 2015. Of these 27 patients were not included in the study since they had residual stones visible on fluoroscopy that couldn't be cleared due to various reasons and patients who had major collecting system tear.

All patients in the study were thoroughly investigated. CT urogram was done to evaluate stone burden and location of stone. Out of 230 patients, a 14 Fr nephrostomy tube was placed in 115 patients and secured with 1-0 polypropylene. In the remaining 115 patients who were assigned for tubeless PCNL, nephrostomy tube was not placed and skin sutured with 1-0 polypropylene. In both the groups a DJ stent was always placed.

## Procedure

All patients were given intravenous antibiotics prior to surgery. All procedures were done under general anaesthesia. Cystoscopy is done in lithotomy position and 5 Fr ureteral catheters placed on the stone side. Patients are then placed in prone position. Dye is injected through the ureteric catheter and calyx punctured under fluoroscopic guidance using an 18G initial puncture needle. Tract is dilated over a 0.035" terumo guide wire

using Alkens dilator set. A 30 Fr Amplatz sheath is placed. Calculi are visualised using 24 Fr nephroscope and fragmented using pneumatic lithoclast and fragments retrieved. If there are residual fragments which cannot be retrieved due to poor vision or inaccessibility or if there was a major collecting system tear, such patients were not included in the study. DJ stent is placed under guidance. Nephrostomy tube is placed depending on which group the patient is allocated. Nephrostomy tube is kept open and removed at bedside on post-operative day one. DJ stents were removed 6 weeks post operatively.

## **RESULTS**

There were no significant differences observed in age, gender, stone side and stone size in both the groups (Table 1). Mean operative time was higher in standard PCNL compared to tubeless PCNL group. Haemoglobin drop was noted more in standard group even though blood transfusion was not required in both the groups. Two patients had PCNL site infection in nephrostomy group compared to none in tubeless group.

**Table 1: Patient demographics.** 

	Standard	Tubeless
	PCNL	PCNL
No. of patients	115	115
Age (years)	38.5 (25-62)	37.8 (27-64)
Sex		
Male	73	70
Female	42	45
Stone side		
Right	56	54
Left	59	61
Largest stone size (cm)	2.12±1.4	2.04±1.38
Total stone burden (cm)	3.89±1.57	3.75±1.49

Table 2: Peri-operative outcome.

	Standard PCNL	Tubeless PCNL
Operative time (min)	54.8 (30-83)	51.2 (26-77)
Punctures	1.3 (1-3)	1.28 (1-3)
Haemoglobin drop (g%)	$0.85\pm0.29$	0.73±0.31
Blood transfusion	Nil	Nil
PCNL site infection	2	Nil
Fever	3	1
UTI	2	1
Haematoma	Nil	1
Visual pain analog score (0-10)	4.8±1.3	2.5±0.9
Need for analgesia (mg)	128±33	68±32
Hospital stay (days)	$3.4\pm 1.2$	$2.1 \pm 0.56$

Three patients had fever in post-operative period in standard group and only one patient had fever in tubeless group. Two developed UTI in standard group compared to one in tubeless group.

There was haematoma formation in one patient in tubeless group at the punctured site. According to visual analog score, the highest average pain recorded on first post-operative day was 4.8 in the standard group and only 2.5 in tubeless group.

All patients were given injectable diclofenac sodium 50 mg whenever they complained of pain. Tubeless group patients were more comfortable with less pain. Standard group required average of 128 mg of diclofenac sodium compared to only 68mg in tubeless group. Hospital stay in standard group was average 3.4 days compared to only 2.1 days in tubeless group.

#### DISCUSSION

With advances in instrumentation and techniques, PCNL has become a safe procedure to perform with decreased post-operative complications, reduced pain and decreased hospital stay. As a standard of care nephrostomy tube is placed post operatively in all patients undergoing PCNL. But since it was the cause for increased post-operative pain and advanced hospital stay we decided to get away with nephrostomy tube. Our objective was to compare standard PCNL with tubeless PCNL in terms of post-operative complications, post-operative pain and hospital stay.

There were no significant differences in patient's demographics between the two groups. Age, sex, stone side, stone burden were all comparable between the two groups. Post-operative haemoglobin drop was not much and comparable in both the groups.

Study used diclofenac sodium intramuscular injection for analgesic requirement of the patient. If pain was not relieved we used pethidine. Other studies have use morphine, pethidine and diclofenac. Patients were evaluated by visual analog scoring system. Standard PCNL patients had more pain compared to tubeless PCNL patients. Our analgesic requirements were comparable to Garolalo et al and Aghamir et al. 12,13

One patient in tubeless group developed slight haematoma at the puncture site which resolved without any complication. Post-operative fever was seen in three patients of standard PCNL compared to only one in tubeless PCNL. This was comparable to series of Aghamir et al.<sup>13</sup>

Post-operative stay was significantly more in standard PCNL as compared to tubeless PCNL. It was comparable to other studies by Garofalo et al. and Choi et al. <sup>12,16</sup>

### **CONCLUSION**

On the basis of our results it is reasonable to conclude that tubeless PCNL is safe and effective modification of standard procedure irrespective of stone size and number of puncture. It reduces post-operative pain and hospital stay significantly. Whenever significant residual stones are present it is safe to place nephrostomy tube for a second look PCNL through the existing tract.

Funding: No funding sources Conflict of interest: None declared Ethical approval: Not required

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Cite this article as: Khan A, Rahiman M, Verma A, Bhargava R. Tubeless per cutaneous nephrolithotomy: is it the present standard of care? Int Surg J 2017;4:117-20.