

**Original article:**

## **Nephrostomy tube' VS 'tube less PCNL': a comparative study**

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### **ABSTRACT**

**Aim:** To assess the efficacy, safety, and morbidity of tubeless percutaneous nephrolithotomy (PCNL) and compare it with conventional PCNL.

**Materials and Methods:** This is a comparative study carried out at NIMS, Jaipur. 102 patients underwent PCNL in two groups between 2016 and 2017. One group of 54 patients underwent PCNL with nephrostomy placement (standard PCNL) while the second group of 48 patients underwent PCNL without nephrostomy tube and D-J stent (TUBELESS PCNL).

**Results:** 54 patients who underwent conventional PCNL with nephrostomy tube & DJ stent had mean age of 31.4 years and mean stone size of 3.1 cm. The mean operative time was 40 mins with mean hospital stay was 3.2 days and mean analgesic requirement is 150 mg of diclofenac. 48 patients who underwent tubeless PCNL had mean age of 33.9 yrs and mean stone size of 2.8 cm. The mean operative time was 31 mins with mean hospital stay of 2.8 days. Mean analgesic requirement was 85 mg of diclofenac. Decrease in haemoglobin was, however, almost same in both the groups.

**Conclusions:** This study demonstrates that percutaneous nephrolithotomy without nephrostomy is a safe and well tolerated procedure in selected patients. We believe that tubeless percutaneous nephrolithotomy may be considered as the accepted standard of care for selected cases and it is possible to reserve placement of a nephrostomy tube for specific indications.

**Keywords:** conventional PCNL, Tubeless PCNL, nephrostomy, DJ Stent

### **INTRODUCTION**

The incidence and characteristics of nephrolithiasis reflects a wide geographic variation and stones occur at all ages without clear gender predominance. Despite disparity between hemispheres, nephrolithiasis is increasingly occurring globally mainly due to westernized lifestyle and dietary changes which includes higher salt intake with processed foods and decreased water consumption. Nephrolithiasis continues to be a major problem in India. It is more prevalent in northern states than in southern states of India.

PCNL (Percutaneous Nephrolithotomy) is an established procedure used primarily to treat patients with complex renal calculi and various other endourological indications. It is a safe and less invasive approach than open surgery in patients with complete or partial staghorn calculi.<sup>1</sup> Moreover it has advantages of lower Morbidity, shorter operative time, shorter hospital stay and earlier return to Work.

Since the first description of percutaneous nephrolithotomy, it has become an integral part of renal stone management<sup>2</sup>. The placement of percutaneous tube after the completion of the procedure has been considered standard practice to aid in hemostasis, to ensure proper drainage<sup>3</sup> of urine and to facilitate easy access in case repeat PCNL is required. Despite these apparent advantages, nephrostomy tube has been implicated in post operative discomfort and morbidity. To reduce discomfort and tube related morbidity, modifications have been made like the

use of smaller nephrostomy tube or avoiding it completely after an uncomplicated procedure with complete stone clearance and placing double-J stent as “tubeless PCNL”.<sup>4,5</sup>

A plain KUB (kidney, ureter, bladder) film is obtained postoperatively in all cases of percutaneous nephrolithotomy to assess the size and location of residual stones. Helical CT is the most accurate method to determine residual calculi. Management of residual stones after primary percutaneous nephrolithotomy continues to be controversial. Many authors advocate the use of repeated percutaneous nephrolithotomy to obtain a stone free renal unit.

One approach relies on secondary extracorporeal shockwave lithotripsy as an out-patient treatment for retained fragments, which minimizes the number of tracts and reduces the operative time and risk of perforation, as well as the extravasation and bleeding, that are associated with multiple tracts. This combined approach has the advantages of a shorter-hospital stay and hence lower cost.<sup>6</sup>

#### **MATERIALS & METHODS**

A standard technique of percutaneous nephrolithotomy was used to evaluate 102 patients between 2016 and 2017. Of 102 patients 2 patients were presented with acute renal failure secondary to obstructive uropathy, an initial D.J. stenting was done for improvement of renal function and PCNL was subsequently performed.

#### **INCLUSION CRITERIA**

1. All cases of renal calculi who underwent Percutaneous Nephrolithotomy.
2. Renal calculi include calyceal calculi, pelvic calculi, upper ureteric calculi or any of the combination of above.

#### **EXCLUSION CRITERIA**

1. Patients who needed more than two percutaneous tracts; or
2. Patients who had a residual stone after the procedure
3. Patients who had a solitary kidney were excluded from the study
4. Patients with Congenital anomalies- Horse shoe kidney, Mal rotated Kidney, Duplex moiety& Ectopic kidney.
5. Patients with bilateral renal calculi, Staghorn calculi.
6. Patients with pelvis injury& extravasation during surgery
7. Patients undergone Re-look PCNL for residual stones

All procedures were performed with the patients under general anesthesia in prone position. After retrograde ureteral catheterisation, initial percutaneous access was obtained after injecting air with contrast retrograde. The tract was dilated under fluoroscopic control using sequential metal dilators, and an amplatz sheath of 24 to 26 Fr was placed depending on degree of dilation of selected calyx and the bulk of stone to be retrieved. Stone disintegration was done using a pneumatic lithotripter (swiss lithoclast).

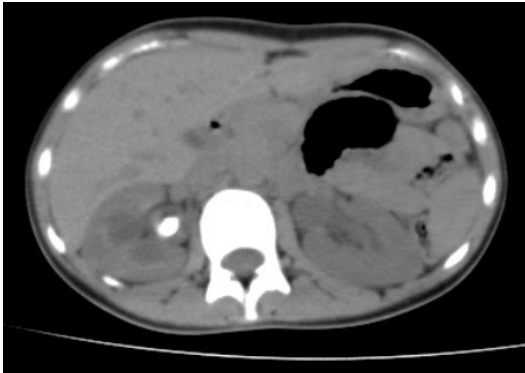


Fig1 : pre operative plain CT scan abdomen showing single, 1.5 cm calculus in right renal pelvis with hydronephrosis

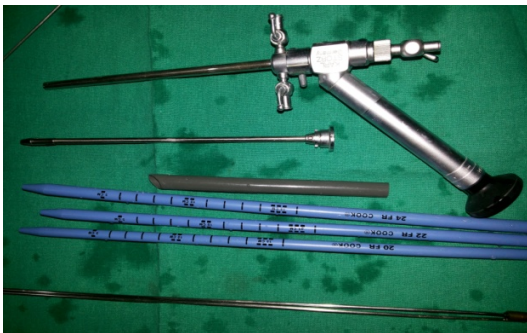


Fig 2: PCNL equipment used in our study, from top to down: nephroscope, obturator, Amplatz sheath, Amplatz dilators, lithotripsy probes



Fig 3: Surgery site in immediate post-op period in a patient who underwent TUBELESS PCNL (there is no nephrostomy tube)



Fig 4: Post-Operative X ray KUB showing right DJ stent in situ in a patient who undergone right TUBELESS PCNL. (No nephrostomy tube)

After completion of the procedure D.J. stent was placed over the guide wire across the ureteropelvic junction. Once it was ensured that tract bleeding was not alarming, in Group 1 patients a 20 or 24 number Abdominal Drain is placed in pelvicalyceal system through the amplatz sheath under fluoroscopic guidance as nephrostomy drainage and amplatz sheath is removed. In group 2 patients after completion of the procedure amplatz sheath is removed and the skin incision was closed with single 2-0 silk mattress suture. The D.J. stent was removed as an outpatient procedure after 4-6 wks from surgery.

**RESULTS**

Pre-operative characteristics and Post operative outcomes are analyzed between two groups of patients.

**Table 1**

**Age of Patients**

| Age group | Group 1 | Group 2 | Total |
|-----------|---------|---------|-------|
| 0-14      | 10      | 7       | 17    |
| 15 +      | 44      | 41      | 85    |
| Total     | 54      | 48      | 102   |

**Table 2**

**Sex of Patients**

| Sex group | Group 1 | Group 2 | Total |
|-----------|---------|---------|-------|
| Male      | 32      | 28      | 60    |
| Female    | 22      | 20      | 42    |
| Total     | 54      | 48      | 102   |

**Table 3**

**Laterality of stones**

| Laterality | Group 1 | Group 2 | Total |
|------------|---------|---------|-------|
| Right      | 34      | 30      | 64    |
| Left       | 20      | 18      | 38    |
| Total      | 54      | 48      | 102   |

**Table 4**

**Type of stones**

| Stone types          | Group 1 | Group 2 | Total |
|----------------------|---------|---------|-------|
| Small stone (< 2cm)  | 12      | 20      | 32    |
| Large Stone (> 2 cm) | 42      | 28      | 70    |
| Total                | 54      | 48      | 102   |

**Table 5**

**Site of stones**

| site            | Group 1 | Group 2 | Total |
|-----------------|---------|---------|-------|
| Calyceal        | 17      | 16      | 33    |
| Pelvic          | 30      | 28      | 58    |
| Pelvic+calyceal | 7       | 0       | 7     |
| Upper ureter    | 0       | 4       | 4     |
| Total           | 54      | 48      | 102   |

**Table 6**

**Statistical analysis between group 1 and group 2 patients (operative and post operative outcome)**

|   | Group 1  | Group 2  |
|---|----------|----------|
| Mean operative time                           | 40 mins  | 31 mins  |
| Mean days hospital stay                       | 3.2 days | 2.8 days |
| Mean analgesic requirement (diclofenac in mg) | 150 mg   | 85 mg    |
| Decrease in haemoglobin                       | 0.6      | 0.5      |

X-Ray KUB & Ultra Sound KUB Region done in all the patients to assess the stone clearance before removing the nephrostomy. All cases in this study are single stage PCNL

**Table 7**

**Post Operative Complications In Our Study**

| Complications        | No. of patients |         |
|----------------------|-----------------|---------|
|                      | Group 1         | Group 2 |
| Fever                | 2               | 3       |
| Hematuria            | 3               | 6       |
| Blood Transfusion    | 1               | 2       |
| Perinephric hematoma | 0               | 2       |
| Ileus                | 1               | 0       |
| Sepsis               | 0               | 0       |

In our study total number of operated patients is 102. 54 patients who underwent conventional PCNL with nephrostomy tube & DJ stent had mean age of 31.4 years and mean stone size of 3.1 cm. The mean operative time was 40 minutes with mean hospital stay was 3.2 days and mean analgesic requirement is 150 mg of diclofenac. 48 patients who underwent tubeless PCNL had mean age of 33.9 yrs and mean stone size of 2.8 cm. The mean operative time was 31 minutes with mean hospital stay of 2.8 days. Mean analgesic requirement was 85 mg of diclofenac. Decrease in haemoglobin was, however, almost same in both the groups.

**DISCUSSION**

Since the first description of percutaneous nephrolithotomy, it has become an integral part of renal stone management. To reduce discomfort and tube related morbidity, modifications have been made like the use of smaller nephrostomy tube or avoiding it completely after an uncomplicated procedure with complete stone clearance with double-J stent as tubless PCNL. Because there is still apprehension without using a DJ stent, few have tried a totally tubeless PCNL.<sup>7</sup>

Advances in surgical instruments, radiological imaging, and urologist's skills have made PCNL surgery easier, safer, and more effective in the management of renal stones. Clayman *et al.* reported that there was no significant difference in the size of the resultant renal scar when comparing renal parenchymal damage associated with 24 F and 36 F nephrostomy tracts. Traxer *et al.* found that renal parenchymal damage resulting from the creation of a nephrostomy tract is small compared to overall renal volume regardless of the size of the nephrostomy tract, and there is no advantage to using a small-access sheath based on renal scarring alone.

Shah *et al.*<sup>8</sup> compared the outcome of tubeless PCNL with small-bore nephrostomy drainage after PCNL. In this study, patients who underwent tubeless PCNL experienced significantly less post-operative pain, needed less analgesia, and were discharged 9 hours earlier than patients in the other group. However, 39.4% of patients with Nephrostomy tube had bothersome stent-related symptoms, of which 61.5% needed analgesics and/or antispasmodic agents.

Limb and Bellman (2002)<sup>9</sup> described 112 patients who underwent tubeless PCNL; strict criteria were used to select these patients, who had a mean stone burden of 3.30 cm<sup>2</sup>. They reported a 93% stone-free rate and a mean length of hospitalization of 1.56 days; 7% required subsequent SWL ancillary treatments. These findings have recently been

reproduced in similar, albeit smaller, studies (Aghamir et al, 2004; Karami and Gholamrezaie, 2004; Patel and Abubacker, 2004).

Feng and associates (2001)<sup>11</sup> performed a randomized controlled study comparing standard PCNL, mini-PNL, and tubeless PCNL. They found no advantage for the mini-PCNL over the standard PCNL and also found that the tubeless cohort experienced the least morbidity.

Early tube removal after PCNL results in an equivalent analgesic requirement, decrease in haemoglobin and hospital stay as tubeless PCNL. It has a significantly lower incidence of early haematuria, better clearance rates and preserves the option of check nephroscopy. It can be considered as an accepted standard of care, with the preserved advantages of tubeless PCNL.

Wahib Isac, Emad et al<sup>12</sup> compared the outcome of tubeless pcnl for expanded indications .A retrospective review of the charts of patients who underwent PCNL at their institute was performed. Patients were assigned to one endourologist who routinely performed tubeless PCNL and to a second endourologist who routinely left a small-bore pigtail nephrostomy. Preoperative demographics operative and postoperative outcomes were compared.

According to Yew and Bellman<sup>13</sup>, a tubeless approach to any renal surgery should only be attempted in select uncomplicated cases. The exclusion criteria should include operative times longer than 2 hours, three or more percutaneous accesses, significant perforations or disruptions of the collecting system, significant residual stone burden, and significant bleeding. In these instances, and when second-look nephroscopy is desired, traditional external nephrostomy tube drainage should be used. In their select cases, in lieu of the standard double-J stent, we place a 7F/3F tail-stent with the string attached exiting the urethral meatus. Care is taken in correct placement to avoid having the tail of the stent exiting the meatus. In their initial 4 patients, tail-stents were successfully placed. The pain scores were low and stent symptoms appeared minimal. All stents were easily removed without the use of cystoscopy. Fluoroscopic visualization of the 3F tail is poor, and positioning of the tail can be difficult. Nevertheless, this modification appears feasible and safe with excellent patient satisfaction.

According to Meta analysis conducted by Wang, Zhao.et al<sup>14</sup> a review of the English language literature on studies involving randomized controlled trials for PCNL was done. The studies chosen to be included in our review compared tubeless PCNL with standard PCNL and described the advantages of each in the outcomes. Two reviewers independently screened the studies for eligibility, evaluated their quality and extracted the data from the eligible studies, with confirmation by cross-checking. Data were processed using RevMan 5.0.

When study at our center was compared with study of MS Agarwal, Desai, Feng and Singh; 56 patients treated in tubeless manner are considerably higher in our group, mean stone size is comparable, diathermy was not used in our study, mean hospital stay 2.8 days in our study is slightly higher than others, stone clearance of 100% is comparable to other studies. When compared to Bellman, Delnay, Limb and Bellman, Goh and Wolf, number of patients treated in tubeless manner are considerably higher in our group, mean stone size is comparable and mean hospital stay of 4.1days in our study is slightly higher than others; stone clearance of 100% is comparable to other studies.<sup>15</sup>

Since we could clear almost the stones with the PCNL alone, we did not find any necessity for sandwich therapy using ESWL technique. Our stone clearance rates almost similar to all other series. Slightly higher post-op duration

in our study was found probably due to initial experience, not using additional hemostasis procedures like diathermy, small sample size when compared to some studies.

## CONCLUSIONS

The present prospective study shows that “tubeless PCNL” is a safe, effective and feasible procedure independent of patient and stone factors. It decreases the length of hospital stay, the pain experienced and the need for morphine-based analgesia; we feel it should be the standard of care for patients undergoing a PCNL.

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