

## Research Article

# Prospective study comparing the safety and efficacy of totally tubeless percutaneous nephrolithotomy vs standard percutaneous nephrolithotomy

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## ABSTRACT

**Background:** To evaluate the feasibility and safety of totally tubeless percutaneous nephrolithotomy (PCNL) Vs standard PCNL.

**Methods:** From August 2014 to January 2016, 66 patients underwent PCNL in our institute. Of this group, 35 patients underwent traditional nephrostomy drainage following PCNL. A tubeless procedure was performed in the remaining 31 patients. These groups were compared with respect to age, stone burden, intraoperative events, postoperative pain, analgesic requirements, soakage, postoperative change in hemoglobin, hospitalization time and complication rates.

**Results:** Two groups were comparable with respect to age, stone burden (2.03 cm Vs. 2.12 cm) and intraoperative events. The mean pain score (day2 - 4.95 vs. 2.95) (day3 - 4.33 vs. 1.44) and analgesic requirement (mg diclofenac) (day2 - 140.22 vs. 65.31) (day3 - 124.44 vs. 43.89) was significantly less for group 2 on day 2 and 3. There was significant problem of soakage from nephrostomy tract in group 1. Patients in group 2 returned faster to normal activities but there was no difference found in drop in hemoglobin, complication rates even in subset of patients with large stone burden. No patient required readmission in the follow-up for pain, obstruction or infection in group 2. One patient developed urinoma which resolved conservatively

**Conclusions:** In selected cases totally tubeless PCNL is feasible and safe.

**Keywords:** Tubeless, Nephrostomy, PCNL

## INTRODUCTION

With the improvement of instrumentation and experience of PCNL, several modifications to the procedure have taken place in order to reduce the morbidity & early return to normal lifestyle. Percutaneous nephrolithotomy (PCNL) is currently the procedure of choice for removing large and complex renal calculi. Placing a nephrostomy tube is the last step after completing PCNL. Nephrostomy tube following PCNL is thought to provide hemostasis along the tract, avoid urinary extravasation, maintain

drainage of kidney and, if required relook but it causes significant discomfort and increased hospital stay.<sup>1,2</sup>

In attempt to reduce morbidity from nephrostomy tubes, tubeless PCNL emerged, which initially involved using ureteral stents for renal drainage in place of nephrostomy tubes. These initial studies showed that tubeless PCNL was safe and effective.<sup>2-4</sup> But stents have their problems like stent dysuria and the need for a second procedure to remove stents. Then came the concept that the best available drainage of the kidney is the normal peristaltic ureter and this resulted in totally tubeless PCNL, which

questions the need for any type of drainage following PCNL.<sup>3-7</sup> But it is still considered by many as adventurous and risky. Hence, in a prospective study, we tried to assess the efficacy, safety & morbidity of totally tubeless PCNL and compare with tubeless and standard PCNL.

## METHODS

This study was done as a prospective study Patients presenting with renal calculus, planned for PCNL and who gave informed written consent were included in the study. Patients were divided into standard and totally tubeless groups. Patients were divided into two groups standard PCNL (with a nephrostomy tube) and totally tubeless PCNL (no ureter stents or ureteric catheters). Inclusion criteria for totally tubeless were : no serious bleeding or perforation in the collecting system during the operation, stone free or CIRF (4 mm) at the end of the procedure, no major arterial bleeding and, two or less number of tracts. Patients who were excluded from totally tubeless group were patients with solitary kidney, or kidneys with congenital anomalies, patients with compromised renal function and those who had undergone bilateral simultaneous PCNL.

In patients with supracostal access tract, chest fluoroscopy was performed to confirm the integrity of the costophrenic angle and to rule out significant pneumothorax. In totally tubeless, on completion of the procedure, the Amplatz sheath was removed and the wound was stitched with a mattress suture.

Hemoglobin levels was checked in all patients on post-operative day 1 and ultrasonography was performed on post-operative day 1 to look for any significant per nephric collection. Post-operative pain scores were assessed by patient according to Visual analogue scale and numeric rating scale These groups were compared with respect to age, stone burden, intraoperative events, ,postoperative pain , analgesic requirements , soakage , postoperative change in hemoglobin , hospitalization time and complication rates. No routine imaging was used to detect urinoma or haematoma when the recovery was uneventful.

Differences in percentages (qualitative variables) were analyzed by use of the  $\chi^2$  test. Differences between means were evaluated with Student's t test and the Mann-Whitney U test. Statistical analysis was performed using SPSS 17.0. A P value of <0.05 was considered statistically significant.

## RESULTS

From August 2014 to January 2016, 66 patients underwent PCNL in our institute. Of this group, 35 patients underwent traditional nephrostomy drainage following PCNL. A tubeless procedure was performed in the remaining 31 patients. In all, 72 tracts were required

in 66 renal units; six patients needed two tracts in a renal unit during the procedure. Of the 72 tracts, 15 were supracostal. 6 supracostal tracts were kept tubeless. Two groups were comparable with respect to age, stone burden (2.03 cm Vs. 2.12 cm) and intraoperative events. The mean operative time in group 1 was 45 mins and in tubeless group it was 44.2 mins. The mean pain score (day 2 - 4.95 vs. 2.95) (day 3 - 4.33 vs. 1.44) and analgesic requirement (mg diclofenac) (day 2 - 140.22 vs. 65.31) (day 3 - 124.44 vs. 43.89) was significantly less for group 2 on day 2 and 3. There was significant problem of soakage from nephrostomy tract in group 1. 6 patients in first group developed nephrostomy tract leakage and 5 out of them required DJ stent insertion. One patient was managed conservatively, but his hospital stay was increased. 4 patients in tubeless group required blood transfusion and 3 patients with tube required blood transfusion. The average drop in hemoglobin in group 1 was 0.9 g/dl where as it was 1.1 g/dl in group 2.

**Table 1: Mean pain scores in two groups.**

Mean pain score	Group 1	Group 2	P value
Day 1	6.01	6.13	Not significant
Day 2	4.95	2.95	P < 0.03
Day 3	4.33	1.44	P<0.01

**Table 2: Average requirement of analgesics.**

Analgesic Requirement	Group 1 (mg diclofenac)	Group 2 (mg diclofenac)	P value
Day 1	140.12	138.1	Not significant
Day 2	140.22	65.31	P < 0.01
Day 3	124.44	43.89	P<0.001

There were 3 cases of postoperative UTIs seen in the totally tubeless group. Fever was seen in 4 patients with nephrostomy drainage.

Patients in group 2 returned faster to normal activities but there was no difference found in drop in hemoglobin, complication rates even in subset of patients with large stone burden. The average hospital stay was 4.5 days in group 1 and 2 days in group 2 which was statistically significant. Tubeless group patients took 5 to 7 days for complete convalescence whereas standard PCNL patients recovered in 9 to 10 days.

No patient required readmission in the follow-up for pain, obstruction or infection in group 2. One patient developed an urinoma in group 2 which resolved conservatively.

## DISCUSSION

In 1984, Wickham et al.<sup>8</sup> reported their experience with percutaneous stone extraction and stated that in selected cases it is not unreasonable to avoid leaving a nephrostomy tube. However, in 1986, Winfield et al.<sup>9</sup> reported prolonged hospitalization and pain in two patients after percutaneous stone removal when nephrostomy tubes were not left in place. Thereafter, placing a nephrostomy tube at the end of a percutaneous procedure became standard. Since then, with improvements in technique, the morbidity of percutaneous procedures has decreased dramatically.

In 1997, Bellman et al.<sup>1</sup> presented tubeless percutaneous approach involving placement of an internal ureteral stent for drainage in place of NT. In their study, the hospitalization time, analgesia requirements, time to return to normal activity, and cost were significantly less with this new technique.

Likewise, Bdesha et al.<sup>11</sup> reported that hospitalization was curtailed in 40 patients on whom PNT placements were not performed. Crook randomly performed standard PNL and totally.

tubeless PNL on 50 patients with renal stones and reported that there were no significant intergroup differences in hemorrhage, infection, blood transfusion, or clinical values, but that the hospitalization time was shorter in the totally tubeless PNL group than in the standard PNL group.<sup>12</sup>

Several studies since then have demonstrated that tubeless and totally tubeless PCNL have equivalent outcomes in the properly selected patient group when compared to PCNL performed with the presence of a nephrostomy tube (with/without stent).<sup>2,3,5,6,10,11</sup>

Our study also demonstrated that totally tubeless PCNL have equivalent outcomes in the properly selected patients. In our study perioperative blood loss, transfusion, and the complication rate in the totally tubeless group were comparable to the standard group. Meanwhile, the length of hospitalization and analgesic requirements were significantly decreased in the totally tubeless group.

Few authors have avoided tubeless PCNL in patients with a supracostal access tract<sup>5,8,12,13</sup> or upper calyceal puncture.<sup>7,8,15,16</sup> In our experience, avoiding a nephrostomy tube is feasible in patients with upper calyceal or supracostal access, without increasing pulmonary morbidity. None of our patients who underwent totally tubeless PCNL with supracostal access developed any pulmonary complications.

One of the most common complaints after urologic procedure is urine leakage and pain/discomfort associated with drainage tubes.<sup>3,9,17,18</sup> Minimizing drainage tubes

inserted at the conclusion of these procedures can decrease pain profile associated with these procedures. Ultimately, there is potential to reduce patient hospital stay due to decreased analgesic requirements. Furthermore, this may springboard the potential for performing percutaneous renal surgery to the outpatient setting. This would follow the trends seen in the medical community and could potentially translate into healthcare savings.

The most common complications of PCNL are bleeding and urinary extravasation.<sup>2,9,18-20</sup> Nephrostomy tube placement, at the end of the standard PCNL procedure, is thought to prevent these complications. A concern of many urologists with the tubeless technique is the lack of a tamponade effect in the nephrostomy tract. Despite this, tubeless PCNL retains its role in selected patients with renal stones who are undergoing uncomplicated PCNL.<sup>3,6,21-23</sup> However, a nephrostomy tube should be placed if serious disruption or significant laceration of the collecting system is noted. Also, if significant intrarenal bleeding is found and endoscopic visualization is impossible, a nephrostomy tube should be inserted. The tube is then clamped, allowing the pelvicaliceal system to be tamponaded.<sup>6,8,24,25</sup>

## CONCLUSION

Total Tubeless PCNL can be used with a favorable outcome in selected patients (stone burden <3 cm, single tract access, no significant residual stones, no significant perforation, minimal bleeding, and no requirement for a secondary procedure), with the potential advantages of decreased postoperative pain, analgesia requirement, and hospital stay.

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