

Outcomes of Percutaneous Nephrolithotripsy With or Without Nephrostomy Tube: A Comparative Study

Shrestha NM

ABSTRACT

Introduction: Percutaneous Nephrolithotripsy (PCNL) is one of the most accepted surgical modality for removal of renal stone. Placement of a nephrostomy tube at the end of PCNL is a standard procedure for PCNL, however many reports have showed the safety and efficacy of tubeless PCNL for the removal of renal stone. **Aim:** The present study aimed to report the outcomes of PCNL with or without nephrostomy tube. **Methods:** It is Prospective Hospital Study conducted from June 2017 to April 2020 in the Department of Urology Nepalgunj Medical College. Total 153 patients under inclusion criteria were divided into two groups. Group 1 (75 patients) was allocated to patients who were being treated under standard PCNL procedure while Group 2 (78 patients) was allocated for patients who were being treated under Tubeless PCNL procedure. The two groups were compared for operation time (minutes), hospital stay (days), post operative dose of analgesic (mg), post operative complications such as, leakage (%), bleeding (%) and infection (%). Data were analyzed from SPSS and p-value less than 0.5 was considered as significant. **Results:** In Group II the mean hospital stay, analgesic dose and rate of leakage was significantly lesser than Group I ($p < 0.05$) whereas, the mean operation time, rate of infection and bleeding were not significantly different between two groups ($p > 0.05$). **Conclusion:** Tubeless PCNL procedure causes more rapid recovery and earlier discharge from the hospital, reduction in postoperative pain and no leakage when compared to standard tubless PCNL.

Keywords: Nephrotomy, Percutaneous Nephrolithotripsy (PCNL), Standard Percutaneous Nephrolithotripsy, Tubeless Percutaneous Nephrolithotripsy

Author:

Dr. Naresh Man Shrestha

Address for Correspondence:

Dr. Naresh Man Shrestha
Associate Professor
Department of Urology
Nepalgunj Medical College and Teaching Hospital
Kohalpur, Banke, Nepal
Email: drnms1973@gmail.com

INTRODUCTION

Kidney stones is a common disease that affects at least 10% of people. Renal stone is a major public

health problem with a significant percentage of patients who needs surgical treatment.¹ Over the period of time there have been dramatic changes in the surgical treatment of renal stone. Various non-invasive, minimally invasive, and invasive methods have been reported as a treatment for kidney stones, which comprises: medicinal treatment, open renal surgery, extracorporeal shock wave lithotripsy (ESWL) and percutaneous nephrolithotomy (PCNL). In the past 30 years, PCNL is proved to be minimally invasive method which is an effective treatment for large stones located in the kidney and upper ureter. PCNL is a more effective treatment for stones <2 cm compared with the ESWL method.² PCNL includes four steps: access to the kidney, dilatation of the tract (access site), nephroscopy and fragmentation of stones, and finally insert a nephrostomy tube. Until 1997, the standard PCNL method

used a nephrostomy tube which is placed at the end of PCNL. Nephrostomy tube is a thin plastic tube that is placed in the kidney from the back through the skin where tract is made. A nephrostomy tube is placed to provide adequate urinary drainage, hemostatic tamponade of the percutaneous renal tract and conserves renal access for a possible second – look PCNL.³

However, the need for placing a nephrostomy tube has been questioned by several authors since 1997. Many reports have confirmed the safety and efficacy of tubeless PCNL, and verified the benefits of a lower analgesic administration and earlier hospital discharge with no increase in morbidity. Therefore, this modification in technique allows earlier discharge from the hospital, reduction in postoperative pain, and more rapid recovery.⁴ Nephrostomy tube which is used in conventional standard PCNL has its own advantage to protect the kidney. However, there are numerous studies claiming the benefit of Tubeless PCNL over standard PCNL on the basis of

efficiency and. Safety. However findings from Hamzalchaoui et al⁵ had not significantly benefited to tubeless PCNL group when compared to standard PCNL group. Moreover post operative infection was significantly higher in tubeless PCNL than standard PCNL. Moreover, study of Ahmed Sebaey¹ had found that operation time, hospital stay and leakage were not significantly different between PCNL and tubeless PCNL groups. Therefore, further studies is still needed to establish that tubeless PCNL or standard PCNL procedures to be conducted for safe and effective treatment of renal stone through PCNL.

Till now there is no any study comparing between Tubeless PCNL and standard PCNL in this Mid- Western region of Nepal. Therefore, this study aims to compare between tubeless PCNL and standard PCNL procedures for treating renal stone in Urology Department of Nepalgunj Medical College, Kohalpur, Banke, Nepal.

METHODS

This is a Prospective Hospital based study. Data of patient who underwent standard PCNL and tubeless PCNL were collected from Nepalgunj Medical College, Department of Urology, Kohalpur from June 2017 to April 2020. Information about patients regarding hospital stay, postoperative pain, operation time, leakage, fever, bleeding and urinary infection in patient were being collected.

Preoperative evaluation:

Patient with a single renal pelvis stone of size greater than 20 mm × 10 mm with any age and sex were included in this study. Patient with uncorrected coagulopathy, active untreated UTI, pregnancy, and multiple stone were excluded in the study. Ultrasonography of abdomen and pelvis, kidney-ureter-bladder (KUB) X-ray and intravenous urogram (IVU) and urine examinations were performed.

Grouping and treatment total 153 patients under inclusion criteria were divided into two groups. In group 1 there were 75 patients and in group 2 there were 78 patients. Group1 was allocated to patients who were being treated under standard PCNL procedure while Group 2 was allocated for patients who were being treated under Tubeless PCNL procedure.^{5,6}

Operative techniques:

PCNL: A standard PCNL was performed in prone position under spinal anesthesia. Retrograde pyelography (RGP) with 76 % urograffin was performed to opacify the renal collecting system after inserting ureteric catheter 6 french (fr) in lithotomy position then patient turned to prone position. Lower or mid calyceal puncture was made with needle 17.5 g under c-arm fluoroscopy at 30°angle. Guide wire placed, over which tract was dilated with Teflon fascial and metal sequential dilators up to 28 fr and 30 fr Amplatz sheath placed. After visualizing stone through

nephroscope, stone fragmented with pneumatic lithotripter and took it out. Stone clearance checked by fluoroscopy. At the end of procedure double j stent placed inside the urinary system along with 28 fr nephrostomy tube in Group I. But In Group II, procedure completed only by placing D.J. stent and suturing the skin without placing Nephrostomy tube.

Post operative treatment:

On the first day following surgery, Injection ketorolac 30 mg IV TDS was introduced for both group and then switched over to oral analgesic tablet Mefanemic acid from next day till pain subsides.

The primary end point of this study are post operative analgesia requirements, length of hospitalization, operation time and post-operative complications (fever, leakage and infection). These indicators were compared between the two groups.

Operation time was considered as duration (in minutes) taken for actual procedure to remove pelvis renal stone: starting from kidney puncture to removal of nephroscope.

Hospitalization duration is defined as the period which started from the first postoperative day to the day that patients got discharged from the hospital.

Post-operative complications were considered as the occurrence of wound infection, leakage of urine after removal of nephrostomy tube and fever.

Statistical analysis

Data analysis is performed with the program statistical package for social sciences (SPSS version 17.0). Quantitative variables such as age, operation time, length of hospitalization, dose of analgesic, were expressed as mean ± Standard deviation whereas the qualitative variables such as sex, operative complications were presented as frequency and percentage. For the parametric test of two independent group data, Independent t-test is use, whereas, for non-parametric test for two independent group data, Mann-Whitney U test was used. A p-value less than 0.05 was considered statistically significant.⁷

RESULTS

Baseline characteristics of two categorized groups of patients with respect to sex, age and average stone size were statistically same as shown in Table I (P>0.05).

Variables	Group I	Group II	p-value
Sex (Male: Female)	45:30	43:35	0.545
Age (years)	47.42±10.54	48.708±10.09	0.614
Stone (mm)	51.07±13.25	54.21 ±16.80	0.894

Table I : Baseline characteristics of the patients in Group I (standard PCNL) and Group II (tubeless PCNL)

A p-value less than 0.05 was considered statistically significant

There were no statistically significant differences between the Standard PCNL and Tubeless PCNL groups for mean operative time. The mean (SD) dose of postoperative analgesia was significantly higher in the Standard PCNL group compared with the Tubeless PCNL group, at 2981.33±572 versus 889.13±172 mg, respectively. The Hospital stay (days) was 100.68±17.38 in the STD PCNL group versus 34.64±6.9 in Tubeless PCNL group, this difference was statistically significant. There was statistically significant differences between the Standard PCNL and Tubeless PCNL groups for leakage but no statistically significant differences between infection and bleeding between the groups.

S.no	Variables	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p- value
1	Operation time (min)	60.84±4.28	56.769±4.77	0.1
2	Post operative analgesic (mg)	2981.33±572	889.13±172	<0.001
3	Hospital stay (days)	100.68±17.38	34.64±6.9	<0.001

Table II : Comparison of operation time, post operative analgesic, hospital stay between Group I (standard PCNL) and Group II (tubeless PCNL)

A p-value less than 0.05 was considered statistically significant.

S.no	Variables	Group 1 n (%)	Group 2 n (%)	p-value
1	Leakage	29 (38.60)	Absent	<0.001
2	Infection	14 (18)	11 (14)	0.449
3	Bleeding	5 (6.6)	4 (5.1)	0.689

Table III : Comparison of the rate of post-operative complications (leakage, infection, bleeding) between Group I (standard PCNL) and Group II (tubeless PCNL)

DISCUSSION

Since 1980s, PCNL has been applied in the management of large renal stones due to its lower morbidity and hospital stay in comparison to open surgery. The placement of a nephrostomy tube is considered to be standard option in PCNL to draining the kidney, avoiding urine extravasation, plugging the access, and facilitating a secondary nephrostomy procedure required. However, the tube can prolong hospitalization period, cause discomfort and pain to patient. Therefore a urologist needs to improve this procedure.⁴ This study aimed to compare tubeless PCNL and standard PCNL in patients with kidney stones. Efficacy (hospital stay time, operative time) and safety (postoperative pain and analgesia requirement, postoperative fever, infection, urine leakage) were being explored.

The present study has revealed operation time was not significantly lower in the tubeless PCNL group compared with the standard PCNL group. This findings has been supported by the study of the study of Wahibisc.⁶ However, the finding of

this study is not supported by the study of H.Yuan et al⁸ and A Tyagi et al.⁹ The mean hospitalization time in the tubeless PCNL group was significantly lower compared with the standard PCNL group. Similarly previous studies reported that the mean hospitalization time was significantly lower in the tubeless PCNL group in comparison with standard and tubeless PCNL technique.^{6,8-12} The outcome was due to decreased pain, irritation and avoiding insertion of a nephrostomy and ureteral catheter. However the study of Hamzalchot et al.⁵ does not support the finding of our study.

The mean analgesia requirements for Group I was significantly more compared with Group II. The finding is persistent with the study of Suresh Bhat et al.¹¹, Agrawal MS et al.¹², Zhong-Jun¹³ and Mustafa Okan Istanbul luoglu et al.¹⁴ However the study of Hamzalchaoui⁵ does not support the outcome of our study.

The incidence of urinary leakage from the nephrostomy site was significantly less for the tubeless group compared with the standard PCNL. This findings has been supported by the study of the study of Yuan. H⁸, Agrawal MS(2008)¹³, Agrawal MS (2014)¹¹, Zhong-Jun Chen.¹² However the finding of this study was not supported by the study of Ahmed Sebaey¹, Suresh B et al.¹⁰ The difference in urinary infection between two groups was no statistically significant and this result is further supported by study of Agrawal MS(2008).¹³ However according to study performed by Hamzalchaoui⁵ post operative infection was significantly higher in tubeless PCNL than standard PCNL.⁵ Furthermore, the difference in fever in two groups was also not statistically significantly different and this result of this study is further supported by study of Yuan. H⁸, Suresh B et al¹⁰, and Zhong-Jun Chen.¹² Likewise, the difference in bleeding in two groups was also not statistically significant and this result is further supported by study of Agrawal MS(2008)¹³, Suresh B et al¹⁰, A Tyagi et al.⁹

LIMITATION

Major limitation of this study is, that it is non randomized and non-blinded study, which may have led to many biases. One of that is selection bias. Another limitation is the requirement of rescue analgesics is not analyzed in the post-operative period.

CONCLUSION

Our study showed that Tubeless PCNL reduces postoperative urinary leakage, local pain related to the nephrostomy tube, hospital stay and dose of analgesic. Therefore PCNL can be substituted by tubeless PCNL for the removal of kidney stone for more safe and efficient treatment of renal stone. It would be better if randomized blinded study could be carried out in the future to avoid the biases in the results.

REFERENCES

1. Nalbant I, Ozturk U, Sener NC, Dede O, Bayraktar AM, Imamoglu MA. The comparison of standard and tubeless percutaneous nephrolithotomy procedures. *Int. Braz. J Urol* 2012; 38:795-800.
2. Sebaey A, Khalil M M, Soliman T, Mohey A, Elshaer W, Kandil W, Omar R. Standard versus tubeless mini-percutaneous nephrolithotomy: A randomized controlled trial. *Arab Journal of Urology* 2016; 14: 18-23.
3. Desai M.R, Kukreja R.A, Desai M.M, *et al.* A prospective randomized comparison of type of nephrostomy drainage following percutaneous nephrostolithotomy: large bore versus small bore versus tubeless J. *Urol* 2004; 172:565-567.
4. Zhong-J C, You-Ji Y, Jia-JieZ. Comparison of tubeless percutaneous nephrolithotomy and standard percutaneous nephrolithotomy for kidney stones: A meta-analysis of randomized trials. *Asian Journal of Surgery* 2020;43: 60-68.
5. I. Hamza, S Ahmed, Hadjalouane HB et al. PCNL standard technique verses tubless-125 procedures. *Cureus* 11 (3):e4251. Doi10.7759/cureus.425.
6. I. Wahib, R. Emad, L. Xiaobo. Tubless percutaneous nephrolithotomy: Outcome with expanded indications. *IntBraz J Urol*.2014;40:204-11.
7. Marusteri M, Bacarea V. Comparing groups for statistical differences: how to choose the right statistical test? *BiochemiaMedica*. 2010 ; 20(1) : 15-32.
8. H. Yuan, S. Zheng, L. Liu, P. Han, J. Wang, Q. Wei The efficacy and safety of tubeless percutaneous nephrolithotomy: a systematic review and meta-analysis. *Urol Res* 2011; 39:401-410
9. A Tyagi, D Ramesh, B Ramana et al. A prospective study on outcomes of tubeless percutaneous nephrolithotomy : our experience in SVIMS. *International Journal of Contemporary Medical Research* 2016;3 (9):2608-11.
10. B Suresh, L Jithin and P Fredrick. A randomized controlled study comparing the standard, tubless and totally tubless percutaneous nephrolithotomy procedures for renal stones from a tertiary care hospital. *Indian J Urol*. 2017 Oct-Dec; 33(4): 310–314.
11. S Ni, C Qiyin, W Tao. Tubeless percutaneous nephrolithotomy is associated with less pain and shorter hospitalization compared with standard or small bore drainage: A meta-analysis of randomized, controlled trials *Urology* 2011; 77(6):1293-98.
12. Chen ZJ, Yan YJ, Zhou JJ. Comparison of tubeless percutaneous nephrolithotomy and standard percutaneous nephrolithotomy for kidney stones: A meta-analysis of randomized trials. *Asian Journal of Surgery* 2016; 43(1):60-68
13. 4-Agrawal M.S., GuptaA, BansalS, YadavA, Goyal J.A randomized comparison of tubeless and standard percutaneous nephrolithotomy. *Journal of Endourology* 2008;22(3): 439-42.
14. M.O. Istanbuluoglu, T. Cicek, B. Ozturk, M. Gonen, H. Ozkardes. Percutaneous nephrolithotomy: nephrostomy or tubeless or totally tubeless? *Urology* 2010;75: **1043-48**.