

Original Research Article

Single institutional study on tubeless percutaneous nephrolithotomy

Arun Sengamuthu^{1*}, A. K. Sharma¹, Alap Vinay Mehendale²

¹Department of General Surgery, ²Consultant Urologist and Renal Transplant Surgeon, Jagjivan Ram Railway Hospital, Mumbai, Maharashtra, India

Received: 30 August 2022

Revised: 29 September 2022

Accepted: 03 October 2022

*Correspondence:

Dr. Arun Sengamuthu,

E-mail: arun791793@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The occurrence of renal stone is increasing which affect 10% of population with recurrence being 70% in affected patients. Tubeless PCNL is the mainstay of treatment in the management of large and complex stones. This study was conducted to evaluate the efficacy, feasibility and safety of tubeless PCNL.

Methods: This study was conducted in the department of general surgery, Jagjivan Ram Railway Hospital, Mumbai over a period of one year from March 2019-February 2020. During this period 50 patients underwent tubeless PCNL for renal stones.

Results: Among 50 patients 56% were in the age group of 46-60 years. Most common presenting complaint being flank pain (94%). About 86% of patient had complete stone clearance following tubeless PCNL. Post operative blood transfusion required in 10% of patients. The mean hospital stay was 2.12 days. Most common post operative complication were fever.

Conclusions: Tubeless PCNL is a very safe and effective treatment for renal stones.

Keywords: Percutaneous nephrolithotomy, Renal stones, Tubeless

INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is the current primary treatment of choice in patients with large kidney stone.¹ It has shown to produce stone free rates as high as 87% (85-93%). Rupel and Brown reported the removal of renal stone through an established nephrostomy tract in 1941.^{2,3} The percutaneous renal surgery dates back to 1955, during which milestone was set by Goodwin and colleagues who used a nephrostomy tube percutaneously for draining a hydronephrotic kidney.⁴ However, it was much later, in 1976, Fernstrom and Johansson performed the first percutaneous nephrolithotomy and thereafter PCNL gained its popularity.⁵

PCNL procedure have different degrees of complexity which affects stone clearance. The "Guy's stone score" proposed by Thomas and Smith et al, is a valuable tool to stratify the complexity of PCNL procedure into four

groups based on the stone burden and anatomy of both renal tract and patient.^{6,7}

In standard PCNL procedure, a nephrostomy tube and double J stent were placed at the end of the procedure. In this procedure postoperative discomfort and other complications were noticed due to nephrostomy tube placement and its removal.

Tubeless PCNL procedure, is the one that omits post-operative nephrostomy tube and it was initially proposed by Wickham and colleagues.⁸ The concept was revived by Bellman and colleagues with the addition of an internal double J stent left in place for a week or upto four weeks.

Tubeless PCNL is mainly 2 types: tubeless with ureteral stent: in which after completion of the procedure only double J stent is placed, no nephrostomy tube is placed,

and totally tubeless PCNL: in which no nephrostomy tube or double J stent is placed after the procedure.

Indications of PCNL

Stones larger than 2 centimeter. Staghorn calculus. Larger stone in the lower pole. Stones refractory to ESWL.^{9,10}

Objective

The objective was to evaluate preoperative and intraoperative findings in tubeless PCNL and to assess the intraoperative and postoperative complications developed in tubeless PCNL.

METHODS

This study was conducted in the department of general surgery, Jagjivan Ram Railway Hospital, Mumbai over a period of one year from March 2019-February 2020. During this period 50 patients underwent tubeless PCNL for renal stones. For all patients undergoing PCNL procedure, broad spectrum parenteral antibiotics given prior to surgery. Under general anesthesia, patient kept in lithotomy position cystoscopy done using 30-degree rigid cystoscope. 5 Fr ureteric catheterization done with guide wire passing beyond stone, pelvicalyceal system was opacified with urograffin dye through ureteric catheter. In prone position under fluoroscopic guidance, calyceal puncture was made and guide wire introduced through initial puncture, sequential tract dilatation done with ALKEN metal dilator. 18 Fr nephroscope passed into 26 Fr sheath over the ALKEN dilator. Stone was fragmented with pneumolithotripter and removed with forceps.

Type of study

It was a hospital based prospective study.

Statistical analysis

SPSS (Statistical Package for Social Sciences) version 23.0 was used for data analysis. Descriptive statistics was used and data were presented in tables in Microsoft Excel worksheet wherever necessary.

Ethical committee approval

The approval of Institutional Ethical Committee, Jagjivan Ram Railway hospital was taken.

Selection of subjects

Inclusion criteria

Age \geq 20 years. Male or female patients diagnosed with renal or upper ureteric calculi undergoing surgery.

Exclusion criteria

Pregnancy. Age <20 years. Patients not willing to undergo surgery. Patient with solitary kidney.

RESULTS

Table 1 shows frequency distribution of patients according to age. In this study, maximum frequency 56% of patients belonged to 46-60 years age followed by 20% of patients belonging 31-45 years age.

Table 1: Age distribution.

Age (in years)	Number of patients	Percentage
<30	5	10
31-45	10	20
46-60	28	56
>60	7	14

Table 2 shows frequency distribution of presenting complaints. In this study patients presented with flank pain (94%), burning micturition (22%), frequent micturition (14%), hematuria (12%), vomiting (10%), fever (10%) and dysuria (8%).

Table 2: Presenting complaints.

Complaints	Present	Percentage
Flank pain	47	94
Burning micturition	11	22
Frequent micturition	7	14
Hematuria	6	12
Vomiting	5	10
Fever	5	10
Dysuria	4	8

Table 3 shows frequency distribution of stone burden among patients. In our study patient presented with single stone (60%), two stones (26%), three stones (2%) and multiple stone disease (12%).

Table 3: Stone burden.

Stone burden	Number of patients	Percentage
One	30	60
Two	13	26
Three	1	2
Multiple	6	12

Table 4: Stone laterality.

Stone laterality	Number of patients	Percentage
Left	26	52
Right	23	46
Bilateral	1	2

Table 4 shows frequency distribution of patients with stone laterality. In this study patient presented with left side (52%), right side (46%) and bilateral stone disease (2%).

Table 5: Guy's stone score.

Guy's stone score	Number of patients	Percentage
Grade 1	24	48
Grade 2	12	24
Grade 3	8	16
Grade 4	6	12

Table 5 shows frequency distribution of patients with Guy's stone score. In this study patients presented with grade-1 (48%), grade-2 (24%), grade-3 (16%) and grade-4 (12%).

Table 6: Stone clearance.

Stone clearance	Number of patients	Percentage
Complete	43	86
Partial	7	14

Table 6 shows frequency distribution of stone clearance among patients. In our study 86% of patients had complete and remaining 14% of patients had partial stone clearance.

Table 7: Transfusion required.

Transfusion required	Number of patients	Percentage
Yes	5	10
No	45	90

Table 7 shows frequency distribution of transfusion required among patients. In this study 10% of patients required blood transfusion and remaining 90% of patients did not require transfusion.

Table 8: Post operative hospital stay.

Hospital stay	Number of patients	Percentage
Discharged on day-1	5	10
Discharged on day-2	34	68
Discharged on day-3	11	22

Table 8 shows post operative hospital stay of patients. In this study 68% of patients discharged on day-2, 22% of patients on day-3 and 10% of patients on day-1. The mean hospital stay was 2.12 days.

Table 9 shows post-operative complications. 10% patient had fever post operatively, 8% had perinephric collection and bleeding and 4% had sepsis.

Table 9: Post-operative complications.

Post-operative complications	Number of patients	Percentage
Fever	5	10
Perinephric collection	4	8
Sepsis	2	4
Bleeding	4	8

DISCUSSION

In our study group we had 50 patients with renal stones who underwent tubeless PCNL.

In our study, around 56% of patients belonged to 46-60 years age followed by 20% of patients in 31-45 years age group. This was similar to a study done by Manzoor et al where mean age of the study group was 43.05±14.3 years (range 2-78 years).¹¹

We evaluated the distribution of presenting complaints. In this study patients most commonly presented with flank pain (94%) followed by burning micturition (22%), Whereas frequent micturition (14%), hematuria (12%), vomiting (10%), fever (10%) and dysuria (8%) were also seen among our patients. These findings were similar to study done by Sohagaura et al.¹²

Coming to clinical findings, first we evaluated the stone burden where most of patients presented with single stone. In our study patient single stone presentation was seen in 60 percent of patients, two stones in 26%, three stones in 2% patients and multiple stone disease in 12% patients. We also analysed the stone laterality where in 52% had stone in left kidney and 46% had stone in right kidney while 2% had bilateral stones whereas Homayounieh et al showed 28% had left renal calculi, 22% had right renal calculi and 50% had bilateral calculi.¹³ These factors influence the final outcome of surgical procedure.

Next, we evaluated the Guy's stone score based on various criteria and in our study most of the patients presented with grade-1 (48%), followed by grade-2 (24%), grade-3 (16%) and grade-4 (12%) whereas a study by Thomas et al showed 87.5% in Guy's stone score grade I, 22.2% in grade II, 16.7% in grade III, 0% in grade IV.¹⁴ It has direct relation to the stone clearance, it also had influence on operative time and post operative hospital stay in PCNL patients.¹⁵ Stone clearance is one important outcome of PCNL patients and in our study 86% of patients had complete and remaining 14% of patients had partial stone clearance. Similarly, stone free rate was 87.6% in a study by Khadgi et al.¹⁶ In our study group 10% of patients required blood transfusion and remaining 90% of patients were not required transfusion whereas study by Bhat et al showed 7% of patients needed blood transfusion.¹⁷ The hospital stay in our study was in range of 1-3 days. The mean hospital stay in our

study was 2.12 days whereas Bhangu et al study showed mean hospital stay of 1.5 days.¹⁸

Most common complication in post operative period was fever (10%) which was similar to study by Lai et al which showed 10.4% with post operative fever.¹⁹ Second most common post operative complication noted was perinephric collection and bleeding which was about 8%.

The limitation in our study is that it is not a comparative study hence exploration of difference between standard and tubeless PCNL couldn't be made.

CONCLUSION

PCNL has developed to be a safer and less morbid procedure compared to an open surgery. Due to its lesser cost, shorter operative time, minimal requirement for blood transfusion and ability of the patients to regain their routine daily life activities sooner make tubeless PCNL the preferred procedure at recent times.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Williams SK, Hoenig DM. Synchronous bilateral percutaneous nephrolithotomy. J Endourol. 2009;23:1707-12.
2. Rupel E, Brown R. Nephroscopy with removal of stone following nephrostomy for obstructive calculus anuria. J Urol. 1941;46:177-9.
3. Wong MY. An update on percutaneous nephrolithotomy in the management of urinary stone. Curr Opin Urol. 2001;11:367-72.
4. Goodwin WB, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. JAMA. 1955;157:891-904.
5. Fernstrom I, Johannson B. Percutaneous nephrolithotomy: a new extraction technique. Scand J Urol Nephrol. 1976;10:257-61.
6. Smith NC, Hegarty N, Glass J, Thomas K. 824 novel system for grading complexity of PCNL procedures: the 'guzy's stone score'. Eur Urol Suppl. 2009;4(8):326.
7. Thomas K, Smith NC, Hegarty N, Glasse JM. The Guy's stone score- grading the complexity of PCNL procedures. Urology. 2011;78(2):277-81.
8. Wickham JE, Kellet MJ. Percutaneous nephrolithotomy. Br J Urol. 1981;53:297-9.
9. Sivalingam S, Al-Essawi T, Hosking D. Percutaneous nephrolithotomy with retrograde nephrostomy access: a forgotten technique revisited. J Urol. 2013;189:1753-6.
10. Jung GH, Jung JH, Ahn TS, Lee JS, Cho SY, Jeong CW, et al. Comparison of retrograde intrarenal surgery versus a single-session percutaneous nephrolithotomy for lower-pole stones with a diameter of 15 to 30 mm: a propensity score-matching study. Korean J Urol. 2015;56:525-32.
11. Manzoor MA, Mujeerabrahman M, Rekha PD. Association of serum biochemical panel with mineralogical composition of kidney stone in India. Acta Med Int. 2017;4(2):26.
12. Sohga A, Bigoniya P. A review on epidemiology and etiology of renal stone. Am J Drug Discov Dev. 2017;7(2):54-62.
13. Homayounieh F, Doda Khera R, Bizzo BC, Ebrahimian S, Primak A, Schmidt B, et al. Prediction of burden and management of renal calculi from whole kidney radiomics: a multicenter study. Abd Radiol. 202;46(5):2097-106.
14. Thomas K, Smith NC, Hegarty N and Glasse JM; The Guy's stone score- grading the complexity of PCNL procedures. Urology. 2011;78(2):277-81.
15. Kumar U, Tomar V, Yadav SS, Priyadarshi S, Vyas N, Agarwal N, et al. STONE score versus Guy's Stone Score-prospective comparative evaluation for success rate and complications in percutaneous nephrolithotomy. Urol Ann. 2018;10(1):76.
16. Khadgi S, Darrad M, El-Nahas AR, Al-Terki A. Tubeless mini-percutaneous nephrolithotomy for renal stones larger than 20 mm. Indian J Urol. 2021;37(1):54-8.
17. Bhat S, Lal J, Paul F. A randomized controlled study comparing the standard, tubeless, and totally tubeless percutaneous nephrolithotomy procedures for renal stones from a tertiary care hospital. Indian J Urol. 2017;33:310-4.
18. Bhangu GS, Bansal D, Shah AS, Vyas N, Priyadarshi S, Sharma KK. Totally tubeless percutaneous nephrolithotomy: one year single institute prospective study. Int Surg J. 2017;4:224-8.
19. Lai WH, Jou YC, Cheng MC, Shen CH, Lin CT, Chen PC, et al. Tubeless percutaneous nephrolithotomy: Experience of 1000 cases at a single institute. Urol Sci. 2017;28(1):23-6.

Cite this article as: Sengamuthu A, Sharma AK, Mehendale AV. Single institutional study on tubeless percutaneous nephrolithotomy. Int Surg J 2022;9:1822-5.