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STANDARD VERSUS TUBELESS PCNL: A COMPARATIVE AND PROSPECTIVE STUDY

KEY WORDS: Percutaneous nephrolithotomy, COPD, CKD, hypertension, diabetes mellitus

Dr. Abhishek Jain*	M.S, M.Ch(Uro), Senior urologist, Vardhman Hospital & Research centre, Meerut & NCR medical college, Meerut. *Corresponding Author
Dr. Ginni Gupta	MBBS, D.A. Senior Anaesthetist , Vardhman Hospital & Research centre, Meerut.
Dr. Anuj Sharma	MBBS, M.S Prof. & Head Surgery NCR medical college, Meerut.

ABSTRACT

Introduction: PCNL is considered to be the standard procedure in patients with large renal calculus. The essential step in standard percutaneous nephrolithotomy (PCNL) procedure is placement of a percutaneous nephrostomy tube for drainage. On the other hand, in recent years, the procedure has been reformed to one called as 'tubeless' PCNL in which a double-J stent without nephrostomy tube is placed for internal drainage. **Materials And Methods:** This was a prospective comparative study, conducted in the department of Urology, Vardhman hospital and research centre Meerut and NCR medical college, Meerut between a period of 24 months from Jan. 2020 to Dec. 2021. Sample size estimated based on prevalence of the operable renal calculi. Results of study group were compared with other group of traditional PCNL. **Results:** We evaluated the data of 100 cases undergoing PCNL in our hospital. We divided total cases in to 2 groups. There are 48 cases in group 1 who underwent traditional PCNL and 52 patients in group B of totally tubeless PCNL. Both groups have similar demographics according to age sex and comorbidities. Among these 48 cases (group 1) 30 were male and 18 female patients. Male to female ratio is 1.66:1. The average age was 52 years with arrange of 20 to 65 years. Where as in group 2 male to female ratio is 1.42:1 and average age is 49 years. Out of 48 cases 31.2 % (15) have hypertension, 12.5% (6) have diabetes mellitus, 4 patients have COPDs, and 7 patients was known CKD. **Conclusion:** Our findings demonstrated that tubeless PCNLs can be safely and effectively performed by an experienced endourologist. Tubeless PCNL has an obvious advantage of significantly reduced postoperative pain, less analgesic requirement and shorter hospital stays. Complications rate are less with tubeless PCNL and blood transfusion is less when compared with traditional PCNL.

INTRODUCTION

Urinary stone disease is one of those diseases well-known to affect humans ever since olden times. There has been deviation in the occurrence of stone disease from the lower to upper urinary tract. The occurrence of stone disease is 2 to 3 times more in young males than females in the past nevertheless this difference is now declining [1]. The estimated prevalence of renal stone disease is 1% to 5%. Soucie et al proposed that the prevalence of stone disease is 10% in males and 4% in females. Whites are commonly affected than Asians and Afro-Americans [2]. The incidence of stone disease is highest in fourth to sixth decades. Hot arid climate, obesity and sedentary lifestyle predispose to stone formation. Hippocrates had described the renal colic symptoms as follows: "An acute pain is felt in the kidney, the loins, the flank and the testis of the affected side. The patient passes urine frequently. Gradually the urine is suppressed. With the urine, the sand is passed". Urinary stones are defined as the poly crystalline aggregates composed of variable amounts of crystal and organic matrix components. The most common stone types are calcium oxalate, calcium phosphate, uric acid, struvite i.e., magnesium ammonium phosphate and cysteine [3].

There had been a vast progress in the evaluation, imaging and management of this disease. Initially the management procedures had significant morbidity and sometimes mortality [5]. With advances in surgical techniques, the mortality has reduced considerably. PCNL is a standard procedure in patients with large renal calculus in which ESWL and RIRS can't be used. The essential step in standard percutaneous nephrolithotomy (PCNL) procedure is placement of a percutaneous nephrostomy tube for drainage. On the other hand, in recent years, the procedure has been modified to one called as 'tubeless' PCNL in which a double-J stent without nephrostomy tube is placed for internal drainage [7]. Tubeless PCNL is now proposed to have a comparatively lesser morbidity rates than the standard procedure.

The purpose of this study is to analyse the evidence -based literature regarding the 'nephrostomy-free' or 'tubeless' PCNL and to assess the safety, efficacy, possibility, and benefits of tubeless PCNL over standard PCNL.

Purpose Of The Study:

Purpose was to study outcomes and complications of tubeless PCNL and to systematically analyse the safety and efficacy of the tubeless PCNL.

MATERIAL AND METHODS:

This was a prospective comparative study, conducted in the department of Urology, Vardhman hospital and research centre Meerut and NCR medical college, Meerut between a period of 24 months from Jan. 2020 to Dec. 2021.

In our study, we included patients of both sexes over the age of 18 years in which the renal cavities were not perforated perioperatively. Patients with a single kidney or a congenital malformation and in whom more than one caliceal puncture was performed were excluded. All patients had a preoperative computed tomography urography (CTU) (a non-injected CT scan in patients with impaired renal function) or intravenous urography and negative urine culture. . All PCNLs were performed under spinal anaesthesia or sometime in general anaesthesia in the prone position.

The patients were divided into two groups:

Group 1 (standard PCNL) (n = 48) in which the renal cavity drainage was provided by a nephrostomy tube (Fr 18) and a double-J ureteral stent or ureteral catheter.

Group 2 (tubeless PCNL) (n = 52): No nephrostomy was performed and a double-J catheter was kept in for one month.

PCNL results were considered good in the absence of residual lithiasis or less than 5 mm residual stones. We considered bleeding as a major complication when a blood transfusion was needed. We evaluated postoperative pain by the usage or

non-usage of opioid analgesics. Age, medical history, PCNL efficacy, specific and nonspecific complications, postoperative pain, and duration of hospitalization were compared between the two groups.

Statistical Analysis:

Average comparisons in two independent series were performed using Students T-test. Pearson's Chi-square test was used to compare percentages in independent series. The significance level was set at 0.05.

RESULTS:

The clinical and demographic characteristics of our patients are detailed in Table 1. No statistically significant differences were noted between the two groups regarding age, sex, medical history, creatinine clearance, and prior surgery for lithiasis or shock wave lithotripsy (SWL).

Regarding the treated stones (Table 2), it was found that there were more staghorn stones in the PCNL group with nephrostomy (p = 0.007) and more pelvicalyceal stones in the tubeless group (p = 0.037). Patients who had standard PCNL had larger stones (p = 0.008) with no statistically significant difference between the two groups regarding stone numbers (p = 0.14).

Table 1: Patient Characteristics HTN: hypertension; PCNL: Percutaneous Nephrolithotomy;

	Standard	tubeless	P value
Age average (years)	52	49	0.32
Sex ratio	1.39	1.42	0.94
Diabetes	12.5%(6)	15.4%	0.53
HTN	31.2%(15)	26.9%(14)	0.55
History of surgery (for same-side lithiasis)	22.9%(11)	19.2%(10)	0.78
Kidney failure	7(14.6%)	4(7.6%)	0.24

Table 2: Characteristics Of Treated Stones

	Standard	Tubeless	P value
Average number -	1.5	1.8	0.14
Size	3.89 cm	3.35 cm	0.008
Hydronephrosis:			
Absent	15(31.3%)	21(40.4%)	
Mild	23(47.9%)	24(46.2%)	0.43
Severe	10(20.8%)	7(13.4%)	
Stone site:			
Pelvic	10 (20.8%)	27 (51.9%)	0.66
Staghorn	22 (45.8%)	8 (15.4%)	0.007
Pelvicalyceal	13 (27%)	10 (19.2%)	0.037
Calyceal	3 (6.4%)	7 (13.5%)	0.58

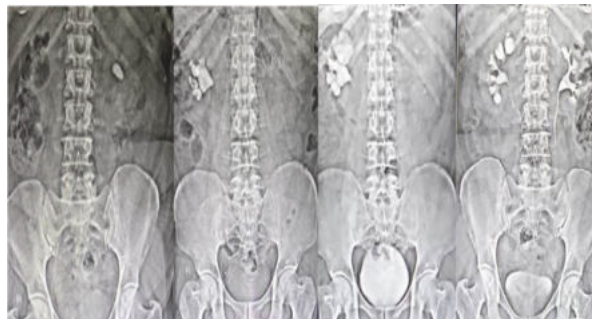


Fig. 1 Various Types Of Stones With IVU

No statistically significant difference was found between our two groups concerning the effectiveness of the PCNL (p = 0.13). Patients who had a tubeless PCNL had more postoperative infectious complications than the standard PCNL group (p = 0.042). No statistically significant differences were noted for other complications, postoperative pain (p = 0.51), or length of hospital stay (p = 0.16) (Table 3).

Table 3: Complication Rate, Length Of Hospital Stay, And Degree Of Postoperative Pain

	Standard	Tubeless	P value
Positive results	40 (83.3%)	44(84.6%)	0.13
Operative Time	55±15 min	48±12 min	0.034
Complimentary SWL	4 (8.3%)	6 (11.5%)	0.31
Number of patients transfused	5 (10.4%)	5 (9.6%)	0.47
Pyelonephritis	4 (8.3%)	7(13.5%)	0.042
Postoperative fever	2(4.1%)	6(11.5%)	0.082
Urinary fistula	3(6.3%)	0	0.058
Urinoma	1(2.1%)	1(1.9%)	0.79
Pleural breach	4(8.3%)	6(11.5)	
Digestive breach	0	0	0
Pseudoaneurysm	1(2.1%)	0	0.23
Postoperative pain (use of opioids)	5(10.4%)	2(3.8%)	0.51
Average length of hospital stay (days)	2.5	1.8	0.167

DISCUSSION:

Tubeless PCNL was introduced by Bellman in 1997 which consisted of performing a PCNL without nephrostomy drainage at the end of the procedure (8,9).

There is currently no consensus on the need for post-PCNL drainage, size and number of nephrostomy catheters (large or small, single or multiple), and type of ureteral drainage (ureteral catheter, double-J, mono-J, no drainage). This choice will often depend on the outcomes and difficulties encountered during the procedure and the surgeon's habits [10].

Their Prospective randomized studies designed to compare tubeless vs. mini vs. standard PCNL confirmed the superiority of the tubeless PCNL. In Our present study, we compared the effectiveness and safety of Standard PCNL and tubeless PCNL for operative time, postoperative analgesia, hospital stay, and stone-free rate. In the present study, there was no statistically significant difference between both groups for the age and sex of patients, comorbidities, stone side and location, this minimised the effect of any of them on the outcomes of the procedures. There was no significant difference in initial stone burden between tubed and tubeless groups[8].The mean operative time in our study was longer in the standard PCNL group than in the Tubeless PCNL group [for group 1 - 55min for group 2 48 min, respectively] this difference was statistically significant. Mi et al. reported that tubeless PCNL had a reduced operative time versus standard PCNL(11). But in authors opinion operative time mostly depends on stone burden, pelvicalyceal anatomy and Hydronephrosis. For the blood transfusion rate, there was a no significant difference between the two groups in the present study. Blood transfusion rate for group 1 was 10.4%, and for group 2 was 9.6%. In the study of Karami et al. there was no need for blood transfusion during or after the operation due to insignificant blood loss. (12) In studies conducted by Gupta et al and Crook et al there is no statistically significant difference in blood transfusion rates between two groups i.e standard PCNL and tubeless PCNL[13,14].Hospital stay plays an important role in the evaluation of a technique, in our present study it was lower in Tubeless PCNL group [1.8 versus 2.5 days] than standard PCNL group; this difference was statistically significant. This result was similar to other published studies, such as in the study of Karami et al. in which the mean (range) hospital stay was 1.7 (1–4) days in the tubeless PCNL group and 2.8 (3–4) days in the Standard PCNL [12].regarding pain and need of analgesia there is significant difference in tubeless vs standard PCNL, it was in accordance with previous study.

In fact, we believe that the slightest complication or procedural difficulty will motivate the surgeon to place a nephrostomy catheter in order to have a wider security

margin. This selection bias may falsely confirm the results observed with the tubeless PCNL studies, which remain largely dependent on the surgeon's experience and habits, as well as the inclusion criteria of the published series.

CONCLUSION:

Tubeless PCNLs can be safely and effectively performed by an experienced endourologist without limiting the number of eligible candidates by preoperative patient selection. Tubeless PCNL has an obvious advantage of significantly reduced postoperative pain, less analgesic requirement and shorter hospital stays. Complications rate are less with tubeless PCNL and blood transfusion is less when compared with traditional PCNL.

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