

ORIGINAL ARTICLE

Standard Versus Tubeless percutaneous nephron lithotomy: A single center comparative study.

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ABSTRACT

Keywords:

percutaneous
nephrolithotomy, stones,
kidney.

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Introduction: Tubeless PCNL is safe and efficient procedure which can be effectively performed based on intraoperative factors, without preoperative contraindications. **Objective:** The aim of our study is to compare between the outcomes of standard and tubeless PCNL regarding operation time, blood loss, changes in serum creatinine levels, length of hospitalization, post-operative complications, and auxiliary treatment. **Patient and Methods:** 30 patients with renal stones who were candidates for PCNL were classified into 2 groups; standard group and tubeless group. Mean age of study group 40.27 ± 10.85 years. All patients were with solitary kidney stone $>2\text{cm}$. 30 patients with renal stones underwent PCNL (Standard Vs Tubeless). **Results:** We evaluated the data of 30 cases underwent PCNL. There were 15 patients in Group 1 (Standard group) and 15 in group 2 (tubeless group). The groups had nearly similar socio-demographic data. Time of the procedure was higher among standard group than tubeless group (36.2 ± 6.62 min and 22.13 ± 4.5 min respectively). Residual stone rate was higher in standard group than tubeless group (46.77% and 6.77% respectively). **Conclusion:** Although PCNL offers a low morbidity compared to that of open surgery, many features such as presence of postoperative percutaneous drainage tube still cause discomfort and prolong hospitalization.

INTRODUCTION

Percutaneous nephrolithotomy and nephrolithotripsy (PNL) is a minimally invasive procedure aiming at removal of renal stone or disintegration of large renal stone for subsequent management through a tract created from the skin to the kidney where the stones are situated [1]

Choosing the appropriate modality of treatment for a stone depends on two stone factors (size and hardness) and two

environmental factors (stone location and the degree of hydronephrosis) [2].

The placement of a percutaneous tube after the completion of the procedure has been considered standard practice to aid in hemostasis, to ensure proper drainage of urine and to facilitate easy access in case repeat PNL is required [3].

Tubeless PCNL has been promoted by Bellman in 1997 and consists in a PCNL

without placing a nephrostomy tube at the end of the procedure. Double J stent or ureteral stent are the most common internal drainage used but totally tubeless PCNL has been described by using no ureteral stent. Tubeless PCNL is safe and efficient.

Significantly less pain, lower analgesia requirement, and shorter hospital stay with early return to normal activities were observed in the tubeless PNL procedure vs the standard nephrostomy tube PNL procedure. Tubeless PNL in selected patients is a secure, effective, and less morbid procedure that does not compromise patient safety and concerns [4].

The aim of our study is to compare between the outcomes of standard and tubeless PCNL regarding operation time, blood loss, changes in serum creatinine levels, length of hospitalization, postoperative complications, and auxiliary treatment.

Patient and Methods:

This is a prospective case series of 30 patients with renal stones, all candidates for PCNL were classified prospectively into 2 groups; standard group (G1) which included 15 cases and tubeless group (G2) which included 15 cases. All cases have been operated at urology department of Aswan university hospital. All patients involved in this study are adults 40.27 ± 10.85 years old, with solitary kidney stone $>2\text{cm}$ or multiple kidney stones not ideal for open surgery or ESWL with normal serum creatinine level. Patients with radiolucent stones, bilateral renal stones, Staghorn stone $>3\text{cm}$ or renal impairment were excluded from this study.

Patients were submitted to thorough history, physical examination, laboratory and radiological investigations.

Surgical technique:

All patients were done under general anesthesia. PCNL performed in prone position and tilted 30 degrees up on the side stone. The procedure started by the cystoscopic placement of a ureteric catheter 7 Fr. Next, we opacify and distend the collecting system, by instillation of contrast material into ureteric catheter (diluted half and half with saline) was used. Also, the ureteric catheter in situ will minimize the passage of the stone fragments into the ureter during lithotripsy. Once the point of puncture and the preferred calyx selected, the C-arm unit is angled in the direction opposite the line of puncture. Proper location of the needle verified by urine aspiration. Occasionally all the needle must be withdrawn gradually while applying constant suction until urine appears in the suction syringe. After the needle is satisfactory positioned in the collecting system, a J-type guide wire is introduced. 22 Fr amplatz sheath then 24 Fr amplatz sheath were introduced for dilatation of the tract. The stone removed using endoscopic techniques by pneumatic disintegration then ante grade double J is inserted. The procedure terminated by tube or tubeless insertion according to time of operation, intraoperative bleeding and residual stones.

Postoperative Management: CBC in the first day postoperatively and KUB performed after 3 days to all patients, urinary catheter removed after 24 to 48 hours of the operation and the DJ stent removed one month after the procedure.

Follow up: All patients are followed early postoperatively as regard pain, fever, bleeding severity, its duration, need for blood transfusion, and continue follow up at 3,6,9 months as regard postoperative urinary leakage and stone free rate.

Statistical analysis: data entry and data analysis were done using SPSS version 23.0. data were presented as numbers, mean and standard deviation. An independent sample T-test and single factor ANOVA test

were used to compare quantitative variables between groups. Pearson correlation was done to measure the correlation between quantitative variables.

Results:

We evaluated the data of 30 cases underwent PCNL at Aswan university hospital urology department. There were 15 patients in Group 1 (Standard group) and 15 in Group 2 (tubeless group). The groups had nearly similar socio-demographic data. Table (1)

Table (1) Socio-demographic data of patient.

		Group 1 (n=15)	Group 2 (n=15)	P value
Age	Mean ± SD	38.47 ± 11.03	42.07 ± 10.73	0.373
Sex	Male	11/15 (73.33%)	8/15 (53.33%)	0.256
	Female	4/15 (26.67%)	7/15 (46.67%)	
:Stone characteristics				
Size (cm)		2.41 ± 0.47	2.34 ± 0.25	0.602
Density (HU)		1300 ± 100	1370 ± 100	0.122
Number of stones:				
Single		6/15 (40%)	11/15 (73.33%)	0.248
Double		6/15 (40%)	3/15 (20%)	
Multiple (pelvis, lower and middle calyx)		3/15 (20%)	1/15 (6.67%)	
Time of procedure (min)		36.2 ± 6.62	22.13 ± 4.5	<0.001

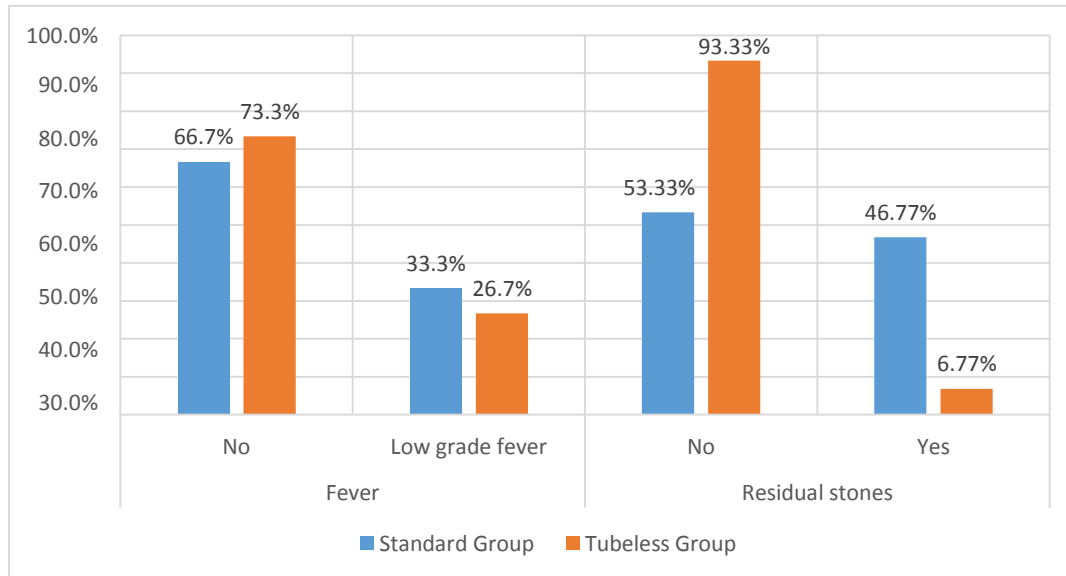
(F) Monte Carlo Fisher's Exact of Significance. (T) Student T –test of Significance
 N.B time calculated from the beginning of the puncture to termination of the procedure by tube or tubeless insertion.

Mean stone size among study group was 2.38± 0.37 cm while 56.7% of cases had single stone,30% had double stones and 13.3% had multiple stones. Mean preoperative hemoglobin level among study

group was found to be 11.78 ±1.12 . Time of the procedure was found to be significantly higher among standard group than tubeless group (36.2 ± 6.62 min and 22.13 ± 4.5 min respectively) P value <0.001.

Figure (1) Postoperative complications between both groups.

(F) Monte Carlo Fisher's Exact of Significance. (T) Student T –test of Significance
 N.B: all complications which happened in our study underwent grade I and II according to Clavien Dindo Scoring system.



Intraoperative bleeding and intraoperative complications were found to be similar in both groups. Residual stone rate was found to be higher in standard group than tubeless group (46.77% and 6.77% respectively) P value <0.001 **chart (1)**. Hospital stay was found to be higher among standard group than tubeless group

(3 ± 1 days and 1.07 ± 0.26 days respectively) P value <0.001.

Postoperative complications were found to be nearly equal among both groups as regard postoperative fever, need for blood transfusion and changes in serum creatinine level. **Table (2)**.

Table (2) Post-operative evaluation between standard and tubeless groups.

	Group 1 (n=15)	Group 2 (n=15)	P value
Bleeding (needed blood transfusion or not)	0/15	0/15	
Fever	5/15 (33.33%)	4/15 (26.67%)	1.00
Changes in serum creatinine level	0/15	0/15	
Hospital stay (hours)	72 ± 24	25.68 ± 6.24	<0.001
Significant Residual stones (Sizable one or more stones)	7/15 (46.77%)	1/15 (6.77%)	0.035
Hb Post-operative	10.87 ± 1.25	10.81 ± 1.02	0.899
Postoperative pain	6 ± 1	4 ± 1	0.057

Table (3) Comparison between our study and other studies

Study	Number of cases	Stone size (cm)	Operative time (min)	Hospital stay	Complications
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			(days)					
Our study	Standard (n=15)	group	2.41 ± 0.47	36.2 ± 6.62	3 ± 1	46.77%	residual stones	
	Tubeless (n=15)	group	2.34 ± 0.25	22.13 ± 4.5	1.07 ± 0.26	6.77%	residual stones	
N. Moosanejad et al,	Standard (n=40)	group	3.8±1.3	53.37±5.54	2.95±1.17	15%	residual stones	
	Tubeless (n=44)	group	4.2± 1.08	50.32±3.83	1.25±0.49	9.1%	residual stones	
Ismail Nalbant et al, [5]	Standard (n=110)	group	3.24± 1.69	81.9 ± 28.7	3.5 ± 1.5	5.4%	residual stones	
	Tubeless (n=85)	group	3.21± 1.02	78.8 ± 27.9	1.6 ± 1.1	4.1%	residual stone	

Discussion:

PCNL remains superior over open surgery as regard safety, easily usability, higher stone-free rates and patient satisfaction; it is commonly used on stone disease. Recently, the PCNL technique has been improved several times aiming to reduce pain, hospitalization time, and the rate of complications. Using small-caliber nephrostomy, an external ureteral stent, a double J stent, or avoiding nephrostomy drainage results in reduced postoperative pain and hospitalization time.

TPCNL is now accepted for a selected group of patients with kidney stones. Eleven prospective randomized controlled trials compare this method of drainage with either standard nephrostomy tube drainage and/or small calibre nephrostomy drainage. All these studies clearly found TPCNL to be equivalent to standard PCNL in terms of disease specific outcome and complication rate. Nine of these 11 studies also found TPCNL to be superior in terms of patient comfort. The authors of the remaining two studies who failed to show an

advantage for comfort of TPCNL felt that this was due to the inclusion of more complex patients in the TPCNL category.

In our study, there were no significant differences between the two techniques regarding the patients' age, gender, mean change in hemoglobin, mean change in creatinine levels, and blood transfusion. Similar results were reported by N. Moosanejad et al [6], who reported in his randomized control trial which included 84 cases that there were no significant differences in stone size, hemoglobin levels, and blood transfusion between totally tubeless PCNL and standard PCNL.

In our study, there was significant difference between standard group and tubeless group as regard operative time of procedure (36.2 ± 6.62 min and 22.13 ± 4.5 min respectively). Similar results were observed by N. Moosanejad et al who reported that operative time was significantly lower in the tubeless PCNL group compared with the standard PCNL group.

Postoperative pain and hospital stay are among the most important determinants of patient satisfaction. Different postoperative analgesics could be used including morphine, pethidine or diclofenac. In our study, diclofenac and pethidine were administered to patients, but the need for analgesics in the totally tubeless PCNL group was significantly lower compared with that in the standard PCNL group, which is in accordance with other studies such as N. Moosanejad et al and Aghamir et al [7]. In our study, avoiding the use of a nephrostomy catheter and double J stent appeared to lead to reduced pain and need for analgesics in the totally tubeless PCNL group.

The mean hospitalization time in the totally tubeless PCNL group was also significantly lower compared with the standard PCNL group (1.07 ± 0.26 days and 3 ± 1 days respectively) Which could be due to decreased pain and avoiding insertion of a nephrostomy and ureteral catheter. This similar to findings reported by N. Moosanejad et al. Postoperative morbidity and complications are major concerns in selection of appropriate procedures. The goal of adequate management of renal stones is to obtain high stone free rate concomitant with low complication rate. In our study, Residual stones was assessed by plain x-ray films in the 1st post-operative day and ultrasound one to three months post-operative. We found that there is significant difference between standard group and tubeless group as regard residual stone rate (46.77% and 6.77% respectively). As regard postoperative fever, we found that there is no significant difference between both standard and tubeless group (33.33% and 26.67% respectively).

N. Moosanejad et al, reported in his study that complications were observed in 6 patients in the standard PCNL group (15%)

(prolonged urine drainage, n=4; fever, n=1; pseudoaneurysm, n=1) and in 4 patients in the totally tubeless PCNL group (10%) (long-lasting renal colic, n=2; fever, n=2), with no significant difference between the groups. However, Ismail Nalbant et al. reported more frequent complications in the standard PCNL method in comparison with the tubeless technique. Our results showed that totally tubeless PCNL is a safe and effective technique This technique is associated with decreased pain, analgesic need, operation time, and hospitalization time. We believe that a normal peristaltic ureter is the best drainage tube. However, a further study with a larger sample size is required to investigate the effectiveness of this technique in these patients.

Conclusion:

The technique of percutaneous renal surgery has revolutionized the way renal stone are treated. Although PCNL offers a low morbidity compared to that of open surgery, many features such as presence of post-operative percutaneous drainage tube still cause discomfort and prolong hospitalization. Tubeless PCNL is now associated with better patient satisfaction and less hospital stay. e believe that two main concerns could still preclude the accomplishment of tubeless PCNL are residual stones and significant bleeding.

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