

Safety of Tubeless Double Access Percutaneous Nephrolithotomy Compared to Single Access Approach

Majed A. Mohammad, PhD* Abdula Yousif Al-Timary, PhD** Ali Malik Tiriyag, MSc***

ABSTRACT

Rationale: Comparison between single and double tubeless PCNL procedures outcomes was the justification of this article.

Aim: To contrast tubeless double access PCNL's follow-up issues with a single access method.

Patients and Method: A comparative evaluation research carried out at Dar Alshifa Private Hospital over the period of January 2017 to November 2020. In this study, 90 patients with renal stones were enrolled. Single access (Group A, number = 58) or double access (Group B, number = 32) totally tubeless PCNL procedures were performed. Blood transfusion frequency and hemoglobin (Hb) decline after the first 24 hours post-operatively were used to measure bleedings. Also, the rates of stone-free pee and urine leakage were evaluated.

Results: A total of 90 patients underwent tubeless PCNL, with a mean age of 45.1 13.5, and 40.9 17.2 respectively. Single access (Group A, number = 58) and double accesses (Group B, number = 32) were used. The ratios of men to women were (2.9:1) and (1.6:1), respectively. There are no appreciable statistical differences in this disparity. Hemoglobin levels postoperatively, bleeding from tract sites, leaking from the tract site between the first and third postoperative days, urinoma, and hematoma formation did not differ significantly statistically from one another. Also, there were no differences in the two groups' hospital stays or rates of stone-freeness.

Conclusion: Double access PCNL approach does not significantly differ from the Single access PCNL regarding the hemoglobin drop, hospital stay, infection rate, leakage rate, and stone clearance rate. Tubeless PCNL is considered an efficacious, safe procedure in the treatment of renal stone disease.

Keywords: PCNL, Double access, Single access, Basra

INTRODUCTION

In the 1970(s), Percutaneous nephrolithotomy (PCNL) had been developed as an alternative to procedures of surgery done in an open way for renal stones of large size¹.

This minimally invasive procedure is of low morbidity, high success rate, and of low rates of complications. This modality of treating renal stones has been replaced by the open surgical modality largely. Now a day PCNL is considered an intervention of choice in the management of complex, large renal stones²⁻⁶. Historically, varying types and caliber

of nephrostomy tubes were placed temporarily after PCNL procedures for the following purposes; Bleeding tamponade, drainage and second look procedures permeation^{1,3,8,11}. Much ever-growing literature is based on numerous documentations of procedural and technological modifications and improvements to this methodological approach, like nephrectomies of smaller caliber^{4,6,10}. In 1997, Bellman et al⁹ defined the nephrostomy need in the workup seminal field, where fifty patients were well crossly matched regarding their age and gender, and procedure. A tubeless approach had been implemented and the researcher high lightening the advantages of this approach through assessment of hospitalization length and development of a complication, requirement

* Assistant Professor
Dean of College of Nursing
University of Basrah
Iraq.

** Department of Surgery
College of Medicine
University of Basrah
Iraq

*** Fundamentals of Nursing Department
College of Nursing
University of Basrah
Iraq.
E-mail: ali.malik@uobasrah.edu.iq

of analgesia, economic burden reduction and convalescent rate improvement that making many kinds of literature focusing on these outcomes^{3-5,8-14}. While using this procedure, the kidney drainage process is internalized (JJ stent implantation or ureteric catheter) or not at all (completely tubeless PCNL)⁵. Despite these potential approach benefits, widespread use had just recently begun¹⁵. Inserting a nephrostomy tube is the fourth step of other procedures. In tubeless PCNL, is not carried out¹⁶. A tubeless PCNL is the more recent PCNL procedure that was introduced. With this procedure, a ureteral catheter, double J stent, or nephrostomy catheter are not placed following surgery¹⁷⁻²⁰. Pollakiuria and dysuria are side effects of ureteral stents. Complication risks are significantly higher when the stent is removed later¹⁷. Tubeless PCNL can be indicated in solitary kidney, complex, multiple and staghorn stones, UPJ obstruction concurrently, open surgery that was done previously in an ipsilateral way, high serum creatinine level, can be done synchronously for both kidneys, successful in children, obese patients, recurrent stones patients and after open surgery. Clinical randomized trials proved these extended indications prospectively²¹. Measurement of the differences in special sequel and complications as outcomes in-form drop in hemoglobin, complete cure rate (stone-free rate), pain, and other unpredictable complications was the main aim of our study.

PATIENTS AND METHOD

Study Design: An evaluative comparative study, extended from Jan 2017 till the end of Nov 2020 done in Shifaa private hospital, where ninety renal stone patients recruited in this study.

Study Population: Ninety individuals with renal stones were involved in this interventional evaluation study. Tubeless PCNL procedures were carried out using single access (Group A, number = 58) or double access (Group B, number = 32). The amount of blood loss was calculated using the hemoglobin (Hb%) drop after the first 24 postoperative hours and the blood donation rate.

Inclusion Criteria: Among the patients with these conditions were those who had large renal stones "> 25 mm in the pelvis or > 20 mm in the lower calyx", extracorporeal shock wave extracorporeal failure, or stones in diverticulum or shuttered calyx that were impacts and ranged from single calyx stones to full staghorn stones.

The Exclusion Criteria were:

- Multi-access (more than 2)
- High morbidity e.g., IHD, DM, renal impairment
- Infected stones despite the use of antibiotics
- Intra-operative bleeding which makes the procedure prolonged or difficult
- Perforation of the renal pelvis
- Significant Changes in BP, PR, or RR.
- Active bleeding from the renal parenchyma at the access site.
- Patients who reported previous surgery
- Children (age less than 15 years)

Ethical Consideration: Written consent had obtained from the director of the Shifaa hospital, also full written consent was obtained from all patients before undergoing the surgical intervention with a full explanation of the suspected outcome from this intervention.

Tools of the Study

- **Questionnaire Forma:** Including a biography of the recruited patient.

- **Procedure of Work and Work in the Field:** All patients were investigated by urinalysis, urine culture, CBC, renal function test, prothrombin time (PT), partial prothrombin time (PTT), INR, viral hepatitis screen, enhanced CT scan, and medical consultation for co-morbid patients.

All PCNLs were operated on under epidural anesthesia, prone position using fluoroscopy and ultrasonic guidance for calyx puncture. The first access Allken serial dilatation was up to 26-30 French size, while the second access dilatation was up to 26 French. Ballistic pneumatic lithotripsy was used for stone fragmentation. Flexible endoscopes were used to search for any residual stones. The treatment was completed with the placement of a Double J stent. The second approach was made because the patients still had substantial residual stones. Following successful stone removal, the Amplatz sheath was gradually removed while a guide wire was present in the renal pelvis. The access wound was checked for any active bleeding. Manual compression was applied on the access site for five minutes. If no significant bleeding was detected, the guide wire was withdrawn. Otherwise, the Amplatz sheath was reinserted over the guide wire and nephrostomy catheter 14 Fr. After examining the patient's Hb% and vital signs, the bladder catheter was removed after 24 hours if there was no wound leaking, and the patient was sent home. In case of the presence of leakage from the wound then the bladder, the catheter is kept for 2 days more. Renal ultrasonography was done after one week to check any residual stones, hydronephrosis, urinoma, and perinephric hematoma. Blood transfusion was given to patients with Hb less than 10 or hemodynamically unstable.

Statistical Analysis: The collected data were entered and analysed using the SPSS version 26 datasheet. The analytical study employed multivariate analysis, the Mann-Whitney test for dependent variable, and the chi-square test for nominal variables. P values < 0.05 were regarded as significant in statistics²²⁻³⁵.

RESULTS

Tubeless PCNL was performed on 90 patients in total, with either single access "Group A, 58 patients or two accesses Group B, 32 patients". The patients' ages ranged between 45.1 and 13.5, or 40 and 17.2, respectively. The ratios of men to women were (2.9:1) and (1.6:1), respectively (Table 1 & Figure 1).

Table 1: Biographic character of the studied population

	Gr A (single access) N= 58	Gr B (double access) N= 31	P value
Age (mean ± SD)	45.1 ± 13.5	40.9 ± 17.2	0.765
Sex	Male (n%)	43 (74.1%)	0.212
	Female (n%)	15 (25.9%)	
Stone size (Cm ³)			

Table 2: Evaluative outcomes of studied parameters

	Gr A (single access) N= 58	Gr B (double access) N= 31	P value
Hb preoperative	11.7 ± 1.6	12.1 ± 1.9	0.067
Hb postoperative	9.7 ± 1.5	10.2 ± 1.7	0.098
Bleeding from tract site	1 (1.7%)	0 (0%)	0.652
Leakage from tract site	Day 1	4 (6.9%)	0.565
	Day 2	0 (0%)	
	Day 3 +	1 (1.7%)	
Double J insertion for leakage (n%)	1 (1.7%)	1 (3.2%)	0.651

Urinoma (n%)	0 (0%)	1 (3.2%)	0.267
Hematoma (n%)	1 (1.7%)	0 (0%)	0.652
Hospital stay in hours (median)	48	60	0.068
Stone free rate (%)	55 (94.8%)	30 (96.7%)	0.675

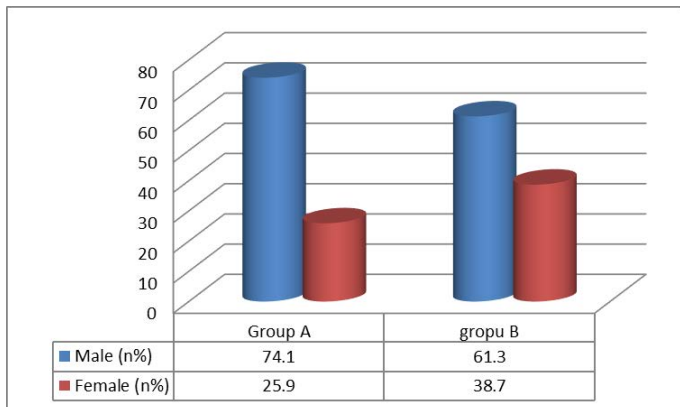


Figure 1: Distribution according to gender

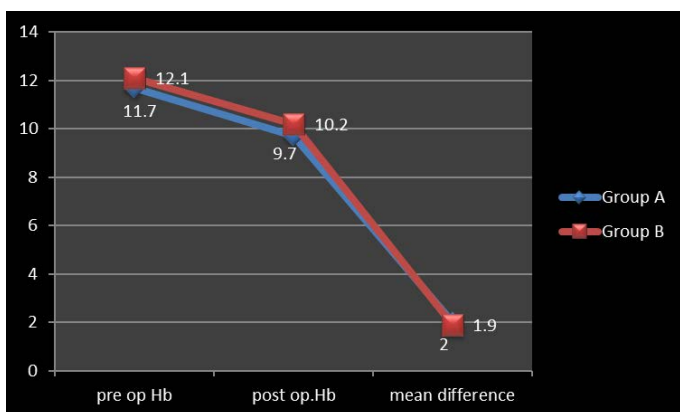


Figure 2: Hemoglobin levels all over the study

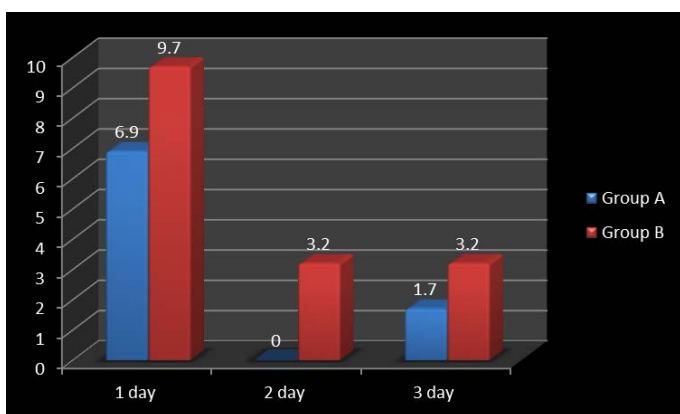


Figure 3: Duration of leakage from the tract site

Also, there were no significant statistical differences in the drop of hemoglobin level postoperatively, bleeding from tract sites, leakage from the tract site within different days from 1st to more than 3rd days, double J insertion for leakage, urinoma, hematoma, hospital stay in hours and stone-free rate, where P value >0.05 (Table 2, Figure 2 and Figure 3).

DISCUSSION

Current study had one limitation which is the short-term follow-up because it tended to assess the short-term complications and safety of the procedure and clearance rate of the renal stone(s). Its strength was through the full assessment of the sequel and complication of the two procedures of interest (tubeless double access percutaneous nephrolithotomy and single access approach). The main finding regarding these two approaches was: There were no discernible statistical disparities in the distribution of age and gender among the population recruited for the study due to the avoidance of selection bias (p-value > 0.05) and complications A- Hb% drop: there were no significant differences in the Hb% drop between the means of the Hb% drop (2 and 1.9 gm/dl) in both groups respectively, with P values of (0.098) for the double and single access tubeless approaches. This was comparable to the Aghmiretal research³⁶ in which groups A and B's mean (SD) hemoglobin falls by 1.97 (1.24) and 2.31 (1.24), respectively; p = 0.176 Organ transplant rates were 7.1 and 10.8% for the two groups, respectively (p = 0.716). Angioembolization was not necessary for either group of patients. In addition, other studies such as Agrawal et al.³⁷ (0.36gm% reduction), Desai et al.³⁸ (4.2gm% reduction), and Singh et al.³⁹ (1.2gm% reduction) were consistent with these findings. On average, hemoglobin reductions and transfusion rates with the double tracts were within standard limits and roughly similar to those in the single tract group. Additionally, the results of our study were consistent with a number of studies on hospital stays, including those by Shah et al.⁴⁰, Jou et al.⁴¹, and Arone et al.⁴², in which the average length of stay per day was 1.43, 2.2, and 1.89 respectively. It was also comparable to the Aghmiretal study³⁶. Also similar with the Aghmiretal trial, there was no statistically significant difference between the two techniques for tract hemorrhage^{36,43,44}. And contrast with Wickham et al.²⁹ who found a high rate of bleeding that reached 22%, which may have been caused by a lack of practice with this approach. The infection rate was very low in comparison with Wickham et al⁴³ reached 10%, and Mikhail et al study³⁰ (10%) but it consistent with many studies. When a durable comparison was made between the two approaches within the first, second, and third day and more P value >0.05, there was no statistically significant difference between them regarding leakage from the tract, in contrast to Aghmir et al. study³⁶, where there was no leakage from the puncture site/s. In terms of the stone-free rate clearance, both groups had very high rates (94.8%, 96.7%, p-value>0.05, respectively), which was greater than other studies like Aghmir et al research³⁶ 85.7 & 97.3% (p = 0.093) and Shah et al.⁴⁰, and Jou et al.⁴¹ nearly 80% but lower than Aroneetal⁴² reached 100%.

CONCLUSION

Favorable outcome resulting through the usage of tubeless PCNL among selected patients' criteria, where stone size less than 3cm. Where there was the ease of access, minimal bleeding no significant complication perforation or residual stones, and secondary intervention is not required, also decrement of postoperative pain potentially minimize the requirement of analgesia, in turn, prevent their side effect, and lastly decrease the rate of hospital stay. When the stone size was less than 3 cm, tubeless PCNL is a surgery with good results in carefully chosen patients. In the treatment of renal stones, double access PCNL is a safe operation with minimal bleeding and no serious side effects (perforation or residual stones). There was no need for a second intervention. Also, because there was less post-operative pain, there was little need for analgesics. The length of hospital stay may be reduced by this technique.

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Potential Conflict of Interest: None

Competing Interest: None

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