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ORIGINAL ARTICLE

Complications of Standard Percutaneous Nephrolithotomy versus Tubeless Percutaneous Nephrolithotomy

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ABSTRACT

Objective: To compare grade I complication as per Clavien-Dindo classification in patients undergoing standard (with tube) verses tubeless percutaneous nephrolithotomy.
Study design: Hospital based randomized control study.
Place and Duration of Study: Urology Clinic, Sindh Institute of Urology & Transplantation Karachi from 3rd June 2016 to 2nd December 2016.
Methodology: Seventy four patients (37patients) in each group were enrolled. In group 1 patients, a 20 F nephrostomy tube were placed in the kidney over the guide wire, which was removed later. Group II patients had antegrade placement of a Double-J stent without nephrostomy and the wound compressed for 5min. The demographic like age, gender and complications grade I complications according to Clavian-Dindo classification were noted.
Results: The mean age was 49.42±7.06 years. There were 46 (62.16%) males and 28 (37.84%) females. There was no significant difference in stone clearance rate between the groups; 91.9% in standard percutaneous nephrolithotomyg roup and 94.6% in tubeless percutaneous nephrolithotomy group. Need for analgesics for pain control was high in standard percutaneous nephrolithotomy group 86.5% versus 64.9% in tubeless percutaneous nephrolithotomy group (p=0.03). Frequency of urine leakage was 18.9% in standard percutaneous nephrolithotomy group and only 2.7% in tubeless percutaneous nephrolithotomy group (p=0.02).
Conclusion: Tubeless percutaneous nephrolithotomy procedure has fewer complications as per Clavien-Dindo classification regarding need for analgesics and urine leakage. In suitable cases, the tubeless procedure can be safely used as the standard for percutaneous nephrolithotomy.
Keywords: Percutaneous nephrolithotomy (PCNL), Clavien-Dindo classification, Complication

INTRODUCTION

Renal stone disease is a major public health issue that has significant social and economic ramifications. Urological stone patients make up the vast majority of all urological patients in Pakistan, among other places.[1] Almost 50% of all adult urologic workload in adults and 60% in children in SUIT.[2]

It was discovered in the 1970s that percutaneous nephrolithotomy (PCNL) might be used in conjunction with open surgery to treat large renal calculi. Because of its excellent success rate, low morbidity, and low complication rate, this minimally invasive procedure has virtually replaced open surgery.[3] After the procedure, a temporary nephrostomy tube is frequently kept in place to facilitate drainage, bleeding tamponade, and delayed second-look nephroscopy. This is to ensure a smooth recovery. Instead of a nephrostomy tube, the tubeless PCNL uses an internal stent and bladder catheter to internalise the postoperative renal drainage.[4]

It's been shown that tubeless PCNL is connected with lower analgesic dose requirements, postoperative fever, transfusions, operating time, post-operative hydronephrosis and residual fragment when compared to traditional PCNL by Garofelo et al.[5] Following PCNL with single sub-costal access, Gonulalan et al[6] found that the ureter catheter and double "J" stent were more comfortable, effective, and safe in urine drainage.

To illustrate that tubeless PCNL was successful as standard, Akin et al[7] also shows that in the short term, it had a shorter hospital stay and caused less kidney damage than normal PCNL; however, both treatments may cause damage that is virtually comparable in the long run. Tubeless PCNL, according to De Cógáin et al[8], appears to reduce postoperative discomfort and shorten hospital stays, according to the researchers.

There are no risks associated with the surgery, according to Zhong and Colleagues.[9] It shortened the patient's hospital stay, painkiller usage, and recovery time before returning to normal activities.[10] In the end, the Clavien-Dindo classification was created, and it has since been validated, widely recognized, and put to use in a variety of surgical settings across the globe.[11] Patients who had tubeless PCNL had complications at a rate of 65.3%, while those who had standard PCNL had a rate of 89.3%, according to the Clavien-Dindo classification.[12]

As far as we know, tubeless PCNL is still a rarity in this part of the world. Western research have shown that tubeless PCNL has fewer issues and it can be suggested over normal PCNL if local data also indicates tubeless PCNL to be a safer option when it comes to difficulties. To better understand the differences between tubeless PCNL and regular PCNL, researchers are conducting this study. The more effective of the two approaches will be used going forward.

MATERIALS AND METHODS

This hospital based randomized control study carried out at Urology Clinic Sindh Institute of Urology & Transplantation from 3rd June 2016 to 2nd December 2016 and comprised 74 patients (37 in each group). Patients in group A, underwent standard PCNL and group B patients under went tubeless PCNL. Patients age range 35 to 65 years, either gender, stones of <3 cm, assessed on ultrasound, single-tract access, normal anatomy of the pelvi-calyceal system, complete clearance at the end of the procedure, as judged by intraoperative fluoroscopy and normal renal functions were included. Exclusion criteria included: altered renal function, significant bleeding or perforation of the pelvi-calyceal system, incomplete clearance as determined by intraoperative fluoroscopy, and patient refusal to participate in the research. After a cystoscopy and retrograde ureteric catheterization, the patients were put to sleep prone. A 22 G Skinny Needle (Cook Medical, Bloomington, IN, USA) was used under ultrasonography supervision to do a selective calyceal puncture, usually at the posterior lower pole calyx. A guide wire, preferably extending into the ureter, was placed in the desired location. The second-best location for a guide wire is on the upper pole. Using metallic telescopic coaxial dilators, the tract creation process continued until a 24–28 F Amplatz dilator functioning sheath was inserted (Cook Medical). Lithoclast was used to break up or remove stones found during rigid nephroscopy. If no renal calculi were found after intraoperative fluoroscopy, the patients were deemed eligible for randomization in the research.

Patients in both groups had their vital signs checked to make sure they remained stable. Non-contrast CT was performed on all patients the morning following PCNL. Group 1 patients with an in-situ nephrostomy were eligible for re-treatment, whereas group 2 patients were merely observed or underwent an auxiliary operation as a substitute for re-treatment. If further therapy was not indicated, all of the external body tubes (nephrostomy tube, ureteric and Foley catheter) were withdrawn after CT. After 24 hours, a follow-up treatment was contemplated. The Foley and ureteric catheters were withdrawn from patients in group 2 regardless of the presence of remaining fragments. Before deciding whether or not to discharge the patient, doctors will keep an eye on him for around six hours. After a one-month follow-up, the groups were evaluated to see what the ultimate results were.Patient'sbio-data like age, gender and complications grade I complications according to Clavian-Dindo classification were noted. The data was entered and analyzed through SPSS-20. Student's t-test and Chi square test were applied on quantitative variables andchi-square was applied on qualitative variables, P≤0.05 considered to indicate statistical significance.

RESULTS

There were 46 (62.16%) males and 28 (37.84%) females (Fig. 1). The mean age was 49.42±7.06 years. Mean height of patients was 164.71±8.10 cm and mean weight was 70.85±13.73 Kg. Mean body mass index of patients was 26.00±4.06 Kg/m^2 (Table 1).

Mean decrease in haemoglobin levels was 2.11±0.56mg/dl and 1.89±0.45 mg/dl and mean residual stone size was5.0±1.0mm in standard PCNL group and 4.50±0.70mm in tubeless PCNL, statistically no significant (P>0.05) difference between the groups [Table 2).

There was no significant (P=0.64) difference in stone clearance rate between the groups. Stone clearance rate was 91.9% in standard PCNL group and 94.6% in tubeless PCNL. Need for analgesics for pain control was high in standard PCNL group 86.5% versus64.9% in tubeless PCNL group and there was significant (P=0.03) difference between the groups. The urine leakage was 18.9% in standard PCNL group and only 2.7% in tubeless PCNL group and this difference was statistically significant (P=0.02) difference was found (Table 3).

Table 1: Descriptive statistics of the patients

Variable	Mean±SD
Age (years	49.42±7.06
Height (cm)	164.71±8.10
Weight (kg)	70.85±13.73
Body mass index (kg/m^2)	26.0±40.06

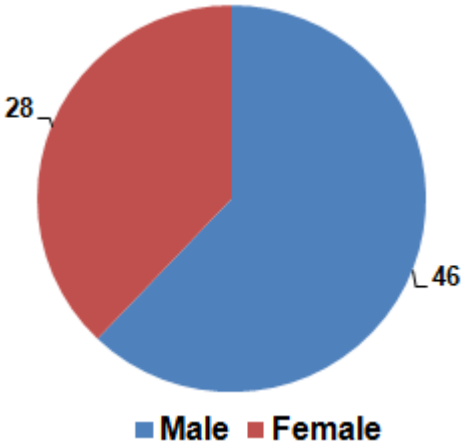
Table 2: Comparison of variables according to standard PCNL versus tubeless PCNL groups

Variable	Standard PCNL	Tubeless PCNL	P value
Decrease in haemoglobin	2.11±0.56	1.89±0.45	0.08
Residual stone size	5.0±1.0	4.50±0.70	0.59

Table 3: Comparison of variables between standard PCNL versus tubeless PCNL groups

Variable	Standard PCNL	Tubeless PCNL	P value
Stone clearance			
Yes	34 (91.9%)	35 (94.6%)	0.64
No	3 (8.1%)	2 (5.4%)	
Need for analgesics			
Yes	32 (86.5%)	24 (64.9%)	0.03
No	5 (13.5%)	13 (35.1%)	
Urine leakage			
Yes	7 (18.9%)	1 (2.7%)	0.02
No	30 (81.1%)	13 (87.3%)	

Fig. 1: Frequency of gender



DISCUSSION

In spite of the fact that it is performed by highly skilled hands, percutaneous nephrolithotomy is a sophisticated

and challenging procedure, with a reported complication rate ranging from 1-7%.[13] The most common complication of PCNL is haemorrhage, which can occur in up to 10% of patients during PCNL. Bleeding can occur after needle entry, tract dilatation, or nephroscopy procedures, among other things. The PCNL procedure has seen numerous developments in recent years, with the goal of lowering the risk of complications, alleviating post-operative discomfort, and shortening the length of hospitalization.[14-18] Using a small-caliber nephrostomy, a double J stent, or not draining the nephrostomy leads in less postoperative pain and inpatient stay.

Shah et al[19] showed that patients in the tubeless PCNL group experienced less pain, used fewer analgesics, and had a shorter hospital stay. It was also found that 39.4 % of patients in the tubeless PCNL group experienced pain from the DJ stent.[19] As a result we adopted a whole tubeless PCNL approach to minimize pain in our trial.

In the current study, the stone clearance rates in both groups were comparable, with 91.9% in the regular PCNL group and 94.6% in the tubeless PCNL group, respectively. Although the rate of problems was much lower in the tubeless PCNL group, it was not statistically significant. We found that the regular PCNL group had a high requirement for analgesics for pain control, with 86.5% needing them compared to 64.9% in the tubeless PCNL group. According to the findings of this study, the frequency of urine leakage was 18.9% in the standard PCNL group and only 2.7% in the tubeless PCNL group, indicating that entire tubeless PCNL was linked with a lower risk of problems.

Furthermore, according to Garofalo et al[20], 86.7% of patients in the traditional PCNL group require analgesics, compared to only 68.4% of patients in the tubeless PCNL group. The findings of our investigation were identical to and within a few percentage points of the findings of the previous study.

Karakoyunlu[12] showed no statistically significant difference in the frequency of urine leakage between the tubeless PCNL group and the conventional PCNL group; 9.1% in the tubeless PCNL group and 10% in the standard PCNL group. However, in our investigation, the frequency of urine leakage in the standard PCNL group was considerably higher than the frequency of urine leakage in the tubeless PCNL group.

Shaikh and Colleagues[21] reported that tubeless PCNL is a safe and effective modification of the normal PCNL process, based on their research conducted in Pakistan. In some cases, the absence of a nephrostomy tube may assist in keeping the patient comfortable after surgery and in shortening the time of the patient's hospital stay. According to Moosanejad et al[22], the tubeless PCNL approach is both safe and effective, even in patients with staghorn stones, and they concluded that the treatment is safe and successful. Reduced discomfort, analgesic need, and operation and hospitalization duration are all connected with this method.

The reduction in complication rates for PCNL has been achieved as a result of technological advancements and improving expertise gained over the last two decades. Using the modified Clavien scale, Tefekli et al[23] reported that the overall complication rate for PCNL was only 29.2% in their study, which was in line with previous findings. Goh and Wolf[24] similarly found that the overall morbidity rates were lower when tubes were not used in their study.

Goh and Wolf[24] stated that modified Clavien scale is the most widely used grading method for reporting surgical complication rates. When a second research was conducted on conventional PCNL, the most often encountered problems were Grades 2 and 3a.[25] In our study, the conventional PCNL group had a considerably greater rate of Grade 1 than the other groups. There is a possibility that this difference was caused by discomfort induced by the nephrostomy tube in the first postoperative hour; nevertheless, this problem was cured with the use of analgesic medication. The other complication rates identified in this study were similar with those previously reported in the literature[24,25] and were not unexpected. In accordance with the new Clavien grading system, only a few studies have been conducted to compare standard and fully tubeless PCNL. In addition, it was discovered in our study that lower incidence of Grade 1 complications were associated with a reduced requirement for analgesics. Because of the presence of the nephrostomy tube in Group 2, longer hospitalizations were required in this group.

This determination is made intraoperatively, while deciding whether to close a PCNL procedure using a regular or entirely tubeless approach. The surgeon must ensure that urine can pass through the bladder spontaneously and without obstruction, and the vision through the nephroscope must be clear in order to demonstrate that the procedure is bloodless. According to our findings, the tubeless treatment has fewer problems, improves postoperative patient comfort, results in a shorter hospital stay, and reduces the need for analgesics during the procedure. Because of these changes, it is possible that tubeless PCNL will become the new norm. In appropriate instances, the tubeless method can be employed as the gold standard for PCNL without risk of complications.

CONCLUSION

Tubeless PCNL procedure has fewer complications as per Clavien-Dindo classification regarding need for analgesics and urine leakage. In suitable cases, the tubeless procedure can be safely used as the standard for PCNL.

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