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Original Research Article

A Comparative Study of Tubeless Percutaneous Nephrolithotomy with Standard Percutaneous Nephrolithotomy

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Abstract:

Introduction and Objective: To assess the efficacy, safety and morbidity of tubeless percutaneous nephrolithotomy.

Materials and Methods: From June 2022 to March 2023, 69 patients (71 renal units; group 1) fulfilling the following criteria were included in the study for tubeless PCNL under Department of Urology, GRMC, Gwalior. One hundred and fifty-two patients with renal and upper ureteric calculi were included in this study. Sixty-nine patients (71 renal units; group 1) in whom no nephrostomy tube was placed at the conclusion of the procedure was compared with a similar control group of 83 patients (group 2) in whom a nephrostomy tube was placed. Operating time, blood loss, analgesia requirement, puncture site urinary leakage, hospital stay and mean convalescence period were compared in both groups.

Results: Both groups were similar with respect to age, sex distribution and stone size. Operating time and blood loss were less in group 1 although they did not reach statistical significance. The mean analgesic requirement, puncture site urinary leakage and hospital stay were significantly less in group 1.

Conclusion: Tubeless percutaneous nephrolithotomy is a safe and effective procedure in this selected group of patients.

Keywords: PCNL., USG.

Introduction

Since percutaneous renal access was first developed by Goodwin et al. [1], it has become the method of choice for treating many urologic diseases. The first use of this tract for stone removal was documented in 1976 by Fernstrom and Johansson [2]. Percutaneous nephrolithotomy (PCNL) may now be carried out by urologists more effectively and with fewer difficulties thanks to technological and procedural advancements [3]. With benefits of less morbidity and quicker recovery, PCNL has replaced open surgical methods for the removal of large and difficult renal calculi. Placement of a postoperative nephrostomy tube and a 2- to 3-day hospital stay are regular components of PCNL [4]. The nephrostomy tube serves the purpose of aiding hemostasis, promoting healing and providing access for further endoscopic procedure or chemolysis [5]. Modifications have been made in an attempt to decrease the morbidity of the procedure, including the use of a smaller working sheath and

nephroscope, termed the 'mini-PCNL' and the avoidance of nephrostomy tube completely, termed the 'tubeless PCNL'. We evaluated the safety, morbidity, feasibility and complications of 'tubeless PCNL' as compared to the standard PCNL.

Materials and Methods

From June 2022 to March 2023, 69 patients (71 renal units; group 1) fulfilling the following criteria were included in the study for tubeless PCNL under Department of Urology, GRMC, Gwalior. Following are the inclusion criteria:

(1) Stone size less than 5 cm.
(2) No perforation or tear of the pelvicalyceal system during the procedure.
(3) No obstruction at the pelvi-ureteric junction.
(4) Clear efflux from the Amplatz at the end of the procedure.
(5) Complete clearance under fluoroscopy.
(6) No bleeding from the tract as inspected by the nephroscope after removal of the Amplatz sheath.
(7) Duration of surgery less than 90 min.

Methodology

Patients with calyceal diverticular stones, associated ureteropelvic junction obstruction and solitary kidney were excluded from the study. Under general anesthesia, percutaneous renal puncture, tract dilatation and placement of a 30/34 F Amplatz sheath were done using fluoroscopy guidance by the treating urologist. Stones were fragmented using Swiss lithoclast and complete stone clearance was ensured on fluoroscopy after removal of stone fragments by forceps. A 6F double pigtailed stent or 6F open-ended ureteral catheter was placed in all patients. The nephrostomy tract was inspected alongside a universal guidewire with the nephroscope after the removal of the Amplatz sheath and bleeders were fulgurated using a rigid electrode through the nephroscope under vision. Ultrasonography (USG) of the abdomen for perinephric fluid was done in all patients on postoperative days 2 and 8. Foley catheter along with the external ureteric catheter, if present, was removed the next morning. A stent when placed was removed after 2 weeks. This group was compared with a similar group of 83 patients, who underwent PCNL during the same time, by another urologist in our hospital meeting the above inclusion criteria but in whom a nephrostomy tube was placed (group 2).

Statistical Analysis

Data so obtained were subjected to statistical analysis. Data analysis was done by SPSS software ® version 22.0. Descriptive statistical analysis, which included frequency and percentages, was used to characterize the data. Inferential statistics included chi-square test and independent samples t test for different dependent variables of the study and $p < 0.05$ was considered statistically significant.

Results

Table 1: Comparison of stone characteristics

Variables	Group 1	Group 2	p-value
Side (L:R)	44:27	40:43	-
Location pelvic	44	43	0.31
Calyceal	12	14	
Ureteric	4	4	
Borderline staghorn	10	10	
Partial staghorn	1	0	
Size diameter	3.2	3.3	0.12
Area	1081.68	1162	0.11

As per table 1 the two groups were comparable in terms of age and sex distribution. The mean age of patients in group 1 and group 2 was 37.06 (range 12–66) and 38.12 (range 10–74) years, respectively. Sex ratio (M:F) was 1.67 and 1.5 in group 1 and group 2, respectively. Stone characteristics in terms of size and location in group 1 left was more predominant and in group 2 right is more predominant. Most common stone location was found to be pelvic but it was not significant. In terms of size they were not significant.

Table 2: Comparison of Operative characteristics

Variables	Group 1	Group 2	p-value
Site of puncture			0.11
Superior calyx	6 (8)	9 (4)	
Middle calyx	35 (49)	27 (32)	
Inferior calyx	30 (42)	47 (37)	
Puncture			0.21
Supracostal	4 (6)	3 (4)	
Infracostal	67 (94)	80 (96)	
Operation duration	59.42 minutes	64.10 minutes	0.32
Fall in hemoglobin	0.44	0.50	0.14

As per table 2 Operative characteristics of the two groups are shown in table 2. In group 1, one patient underwent bilateral simultaneous tubeless PCNL and another sequential PCNL on both sides during the same admission. Supracostal puncture was done in 4 patients (6%) in group 1 and 3 (4%) in group 2. The mean operating time and blood loss was less in Group 1 although not statistically significant.

Discussion

The removal of stones with the least amount of patient discomfort and a shorter hospital stay is the goal of percutaneous nephrolithotomy. It is common procedure to implant a nephrostomy tube after PCNL is finished. The tube is thought to provide access for any future endoscopic treatments as well as facilitate renal repair, prevent urine extravasation, and aid in hemostasis [5]. Nephrostomy tubes in the postoperative period increase the procedure's morbidity and lengthen hospital stays. Numerous studies have demonstrated the safety of omitting the tube in certain PCNL instances.

100 cases of PCNL in one stage were reported by Wickham et al. [5] and 100 cases of PCNL in two stages were compared. The nephrostomy tube was withdrawn following the procedure without leaving an internal stent behind. They came to the conclusion that the one-stage approach was just as secure as the two-stage operation, but it should only be used by skilled surgeons. The early removal of the nephrostomy tube in 2 cases led to severe morbidity and prolonged hospitalization, according to Winfield et al. [6]. Both of these patients lacked any stent-like internal drainage. They came to the conclusion that nephrostomy tube drainage is essential after PCNL since both patients experienced serious problems.

However, later research [7-9] showed that tubeless PCNL is a safe technique in a certain patient population and during the hospitalization stay demand for analgesics and the need to resume regular activities since using this new technology is substantially less expensive. Alken et al. [10] released a randomized trial of common practices. They displayed the least expensive that the tubeless technology was connected with comparing the best cost-effectiveness and the amount of morbidity using the alternative methods. No overall

benefit was discovered for the mini-PCN against the traditional method. [11]

The disadvantage of the procedure is the presence of residual calculi even after complete clearance was visualized under fluoroscopy as seen in 2 cases of the tubeless group. The absence of the nephrostomy tract prevents any further relook procedure. However, a thorough search of the pelvis and the calyces before removal of the Amplatz sheath can avoid such complications. This study establishes the safety of the omission of a nephrostomy tube in PCNL in selected cases. [12] We recommend use of the externalized ureteral catheter (used for ureteric catheterization) in place of the double-J internal stent, which further decreases the morbidity in the postoperative period, prevents an additional visit for its removal and makes the procedure more cost-effective. The inspection of the nephrostomy tract at the end of the procedure and fulguration in case of active bleeder, aids enhancement of the safety of the procedure.

Conclusion

In some PCNL patients, the use of a postoperative percutaneous nephrostomy tube is not required. If an externalized ureteral stent provides internal drainage, the nephrostomy, a catheter, or a twin pigtail internal stent. In a particular patient population, the tube can be skipped. Patients who receive tubeless PCNL see superior results in terms of discomfort and urine leaking from the nephrostomy with a shorter hospital stay at the site. Instead of using a double-pigtailed internal stent, an externalized ureteral catheter could save treatment costs and morbidity achievement of tubeless PCNL may make daycare-PCNL a workable choice in a particular patient population.

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