Percutaneous nephrolithotomy with or without nephrostomy tube

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Abstract

The study has been designed to compare the outcome of percutaneous nephrolithotomy with (Group A) or without nephrostomy tube (Group B) for the management of renal stone disease. JJ stents were given to all cases of both groups. Comparison of outcome between groups shows that urinary leakage time was significantly longer in Group B than that in Group A (24.0 ± 6.2 vs 7.3 ± 3.9 hours; $p<0.001$). Visual analogue pain score was also significantly high in Group B than in Group A (4.7 ± 0.8 vs 2.4 ± 0.5; $p<0.035$). Patients in Group B stayed in hospital on an average 4 days, while the Group A patients stayed in hospital on an average 2.5 days ($p<0.029$). The mean hemoglobin decrease in 24 hours in Group B and in Group A (0.5 ± 0.4 and 0.5 ± 0.4 respectively) did not show any significant difference ($p<0.895$). In conclusion, percutaneous nephrolithotomy without nephrostomy tube can be practiced in the management of selective cases of renal stones diseases.

Introduction

Urinary calculi are one of the common diseases of the urinary tract.[1] The goal of surgical stone management is to achieve maximal stone clearance with minimal morbidity to the patients. Some related factors like size, number, location, composition of stone, renal anatomy, and patients clinical factors all come in consideration in conjunction with the morbidity associated with various surgical modalities and the availability of equipment before the preferred surgical approach is selected.[2]

Percutaneous nephrolithotomy, as a primary procedure, was first described by Fernstrom and Johanson in 1976.[3] Subsequent report on percutaneous nephrolithotomy from the Mayo Clinic[4] and the University of Minnesota[5] and from West Germany[6] and England[7] established percutaneous nephrolithotomy and refined the technique. It is currently the procedure of choice for removing large and complex renal calculi and refractory to ESWL.[8] This method of removing renal stones was a dramatic improvement over open surgical procedures and was shown to shorten hospital stay and decrease complications.[9] Traditionally, a large bore (20-26 F) nephrostomy tube was left in place after percutaneous nephrolithotomy to facilitate hemostasis and urinary drainage.[10] There are many prospective randomized controlled studies which concluded that patients with a nephrostomy have more post-operative discomfort, analgesic requirement and prolonged hospital stay than those with a tubeless percutaneous nephrolithotomy.[11-13]

The term tubeless percutaneous nephrolithotomy was first reported in 1997.[14] In this method the percutaneous nephrostomy was replaced by an indwelling ureteric stent at the end of an uncomplicated percutaneous nephrolithotomy. Since then there have been increasing reports of tubeless percutaneous nephrolithotomy, but in most of them tubeless percutaneous nephrolithotomy was advocated only in appropriately selected patients.[15, 3, 16, 17] Repor-ted benefits of the tubeless approach include reduced admission durations, lower analgesia requirements, faster time to return to normal activities, and lower cost.[14, 18]

The present study compares tubeless percutaneous nephrolithotomy with conventional percutaneous nephrolithotomy in regard to post-operative outcome, complications and safety.

Placement of a nephrostomy tube and ureteric stent or ureteric catheter after completing a percutaneous procedure is commonly practiced. A nephrostomy tube is placed in patient *in situ* for reasons like: Tamponade of bleeding, to permit second look, to prevent peri-nephric collection and retroperitoneal hematoma. But recent studies to show advantages of the tubeless percutaneous nephrolithotomy approach like: Reduced analgesic requirements, low post-operative pain, shorter hospitalization and

convalescence, less complications like urinary leakage, infection at the site of wound, post–operative UTI, fever, post-operative hydronephrosis.

This study was performed to compare post-operative complications and outcome between percutaneous nephrolithotomy without nephrostomy tube and percutaneous nephrolithotomy with nephrostomy tube.

Materials and Methods

Patients with renal stones who underwent percutaneous nephrolithotomy after admission in the Department from January 2014 to July 2015, were included in this study. According to selection criteria, they were assigned for percutaneous nephrolithotomy. After completion of percutaneous nephrolithotomy but before giving nephrostomy tube and exclusion of cases according to selection criteria, cases were allocated in study group, Group A (without nephrostomy tube) and Group B (with nephrostomy tube) by simple random sampling, following conventional sampling formula and calculated 18 sample in each group with a total 36 samples. Patients with age 18-65 years, stone size up to 4 cm, stone refractory to ESWL, single tract access, complete clearance of stone, normal serum creatinine were included in the study. Patients with significant bleeding during the procedure and calyceal perforation, major anatomical anomalies of kidney stone size more than 40 mm, making multiple access tracts, radiolucent stone, patients need for blood transfusion, patients who did not give consent were excluded.

All the required investigations for confirmation of diagnosis and anesthetic fitness were performed. Patients under general anesthesia ureteral catheterization on the site of percutaneous nephrolithotomy followed by image-guided puncture of appropriate calyx. A safety guide wire was inserted through the puncture needle in the collecting system up to the bladder. After tract dilatation over the guide wire a 24-30 F Amplatz sheath was inserted. A 24 or 26 Fr nephroscope was used, and fragmentation of stone was done and removed. Then JJ stents were given in all patients. Nephrostomy wound was closed by single skin stitch but without keeping a nephrostomy tube in Group A. Group B patients were managed by putting a nephrostomy tube within the tract.

Out of 40 cases, 4 cases were excluded from the study, among which 2 cases needed multiple punctures and complete clearance was not possible in 2 cases. The procedure of rest 36 cases fulfilled the criteria of this study.

An ultrasonogram of the renal region was done on 2nd post-operative day to see any perirenal collection which may be urinoma or hematoma. Hemoglobin was estimated in post-operative ward and on 1st post-operative day, also urine color was monitored and recorded. By this way amount of post-operative blood loss was measured from differences of the two values. Operating time was recorded from the time of puncture to closing of nephrostomy tract. The pain was measured by the visual analogue pain scale questionnaire and recorded as mild (score 0 to 3) moderate (score 4 to 6) and severe (score 7 to 10).[19] The patient was discharged after urine appeared clear, cessation of urine leakage, adequate relief of pain and normal body temperature. For analysis of the study the age of patient, gender stone size was taken as baseline variable and urine leakage time, perirenal collection on ultrasonogram, post-operative hemoglobin decrease, operation time, post-operative pain score, hospital stay were taken as the outcome variable.

Statistical analysis

Data were analyzed using SPSS (statistical package for social science) 22 version. The test statistics used to analyze the data were descriptive statistics, Chi-square and student's t-test. The data measured on a continuous scale were presented as mean and SEM compared between groups using Student's t-test, while categorical data were expressed as the percentage and compared between groups with the help of Chi-squared test.

Results

Most of the patients were between 30-50 years of age. Males were 12 in Group A and 15 in Group B. The male female ratio was 2:1 in Group A whereas 5:1 in Group B. There was no statistically significant (p=0.260) difference in age and sex in between two groups.

The stones size in 11 patients in Group A and 9 patients in Group B were 8-20 mm. No significant difference was observed between the groups in terms of stone size (20.4 ± 10.2 vs 21.9 ± 8.7 mm, p=0.381) (Table I).

No patient of Group A or B was found to have any perirenal collection on ultrasonographic examination of the kidney on 2nd post-operative day.

In Group A, 44.4% patients and in Group B 50% patient's hemoglobin were decreased ≥0.5 mg/dL after 24 hours. On the other hand, 24 hours hemoglobin decrease was <0.5 mg/dL in 55.6% patients of Group A and 50% patients of Group B.

In Group A, only 5.6% patients stayed for more than 3 days but over 66.7% of patients in Group B stayed in the hospital for more than 3 days following operation.

Table I

Stone size and outcome of the study population

	Group A (n=18)	Group B (n=18)
Stone size (mm)		
8 - 20	11	9
20 - 30	4	5
30 - 40	3	4
Outcome		
Hemoglobin decrease (mg/dL)	0.5 ± 0.4	0.5 ± 0.4
Operation time (min)	52.5 ± 9.6	54.4 ± 7.3
Urine leakage time (hour)	7.3 ± 3.9	24.0 ± 6.2
Pain score (VAS)	2.4 ± 0.5	4.7 ± 0.8
Hospital stay (days)	2.5 ± 0.5	4.1 ± 0.9

Only 11.1% of patients in Group A continued urine leakage for >24 hours but 100% of patients in Group B continued urine leakage for >24 hours following operation.

Post-operative pain on first post-operative day in Group A was assessed and 94.4% had mild pain, 5.6% had moderate pain and none had severe pain. In Group B 11.1% had mild pain, 77.8% had moderate pain and 11.1% had severe pain.

Comparison of outcome between groups shows that continuation of urine leakage was significantly longer in Group B than that in Group A (7.3 ± 3.9 vs 24.0 ± 6.2 hours, p<0.001). Visual analogue pain score was also significantly high in Group B than in Group A (2.4 ± 0.5 vs 4.7 ± 0.8, p<0.035). Patients in Group B stayed in hospital on an average 4 days, while the Group A patients stayed in hospital on an average 2.5 days (p<0.029). The mean hemoglobin decrease in 24 hours in Group B and A (0.5 ± 0.4 and 0.5 ± 0.4 respectively) did not show any significant difference (p<0.895). Operation time in Group B and A was 52.5 ± 9.6 and 54.4 ± 7.3 min respectively and there was no significant difference (p=0.401).

Discussion

The age of the patients, size, composition and location of stones, renal anatomy and functional status are the main factors to achieve maximum stone clearance and least morbidity for the surgical management of renal stone diseases, .[2, 3, 14] The tubeless percutaneous nephrolithotomy and placement of ureteric catheter for 48 hours done by other studies on tubeless percutaneous nephrolithotomy where the age range and stone burden was more or less similar to the present study.[15, 20, 21]

After completion of the procedure, we evaluated the patient by post-operative pain assessment, hemoglobin decrease, urinary leakage time through the percutaneous tract, peri-renal collection and hospital stay. Percutaneous nephrolithotomy tract urine leakage, peri-renal collection were negligible in this study. In comparison to other studies, the post-operative pain score was significantly low in nephrostomy tubeless group in this study due to adequate use of weight-adjusted dose of analgesic and strict hospital pain management protocol. No patients' needs post-operative blood transfusion.[5, 8, 12] The post-operative hospital stay in both groups in this study were also significantly correlated to other studies. In this study, all the above mentioned evaluated post-procedure factors were similar to other studies with low pain score in tubeless percutaneous nephrolithotomy.[20, 22]

Conclusion

Percutaneous nephrolithotomy without nephrostomy tube is safer than percutaneous nephrolithotomy with nephrostomy tube in the management of renal stone in selected cases.

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