

## Original Article

# TUBELESS & STENTLESS PCNL IN SELECTED CASES – OUR EXPERIENCE IN BANGLADESH

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### Abstract

**Introduction:** PCNL is well-accepted method of management of renal stone. In PCNL post operatively usually Nephrostomy tube and JJ stent are used. But Nephrostomy tube and JJ stent has some morbidity. Tubeless and JJ stentless PCNL in selected cases reduces the morbidity. This study will evaluate the results of PCNL with and without Nephrostomy tube and JJ stent in the management of renal stone in selected cases.

**Methods:** From July 2008 to June 2010 total 70 cases of renal stone were managed by PCNL dividing into two groups Group A -PCNL with nephrostomy tube and JJ stent, Group B- Nephrostomy tubeless and JJ stent less PCNL with only ureteric catheter for 24 – 48 hour post operatively. All cases were operated in Urology department of Bangladesh Medical College Hospital, and two other private hospitals located in Dhaka. In all cases initially placed a ureteric catheter and at the end of the procedure compression at renal angle about 10 min in Group –B, in Group A Procedure ended with Nephrostomy tube and JJ stent. Ureteric catheter was removed 24 hour-48 hour after operation. JJ stent was removed 3 weeks after operation. Exclusion criteria for the tubeless and JJ stentless approach were more than one percutaneous access, significant perforation of the collecting system, large residual stone burden, significant postoperative bleeding, ureteral obstruction and renal anomaly. The incidence of complication, length of hospitalization, analgesics requirement and interval to return to normal activities were evaluated.

**Results:** All 70 percutaneous procedures were performed without significant complication, none of the patients demonstrated urinoma in postoperative renal Ultrasound scan. In Group- B length of hospital stay was < 3 days, the average analgesia requirement was 98 mg of Inj.Pethedin, patient return to normal activity earlier then Group -A.

**Conclusion:** Nephrostomy tubeless and JJ stent less Percutaneous Nephrolithotomy with ureteric catheter for 24- 48 hours post operatively is a safe and effective procedure. Hospital stay and analgesia requirements are less and returns to normal activities are faster.

### Introduction

Fernstrom J and Johansson B reported the establishment of percutaneous tract specifically for stone removal in 1976. Subsequent reports on PCNL

from the Mayo clinic (Segura JW et al., 1982) and the University of Minnesota (Clayman RV et al., 1984a) and from Germany (Alken p et al., 1981) and England (Wickham JEA and kellet MJ, 1981) established PCNL and refined the technique. Further advances in technique and equipment have allowed urologists to perform percutaneous stone removal with increasing efficacy and decreasing complications (Ligeman JE et al., 1995) Placement of a nephrostomy tube and JJ stent after completing a percutaneous procedure

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is consider standard practice. The purposes of the nephrostomy tube after percutaneous nephrolithotomy are temponade bleeding provides adequate renal drainage, allowing renal healing, and avoiding extravasation and allow the nephrostomy tract to mature for second look nephroscopy easier. Despite these apparent advantages, nephrostomy tube and JJ stent has been implicated in causing postoperative discomfort and morbidity. In selective cases, with normal preoperative renal function and when an uncomplicated percutaneous nephrolithotomy can be completed through a single tract and with minimum bleeding, complete clearance of stones, nephrostomy tube and JJ stent may not be indicated. In such cases, without nephrostomy tube and JJ stent would potentially lead to less discomfort and more rapid recovery (AGHAMIR SMK et al 2004). Several surgeons in different part of the world studied on tubeless and JJ stent less percutaneous surgery. Totally tubeless percutaneous nephrolithotomy done by S.M.K.Aghamir and found encouraging result. Hemendra et al 2005 showed that bilateral simultaneous tubeless PCNL appears feasible, safe and effective procedures. Tubeless and stent less percutaneous nephrolithotomy done by vikas gupta et al 2004 and found very good result .Modified tubeless percutaneous nephrolithotomy done by Jay Yew et al 2003 with successful outcome. Tube less percutaneous renal surgery done by Gray c Bellman et al 1997 and found encouraging result. Most of the Urologists have been giving nephrostomy tube and JJ stent after completion of procedures. Recently we are practicing tubeless and JJ stent less PCNL with ureteric catheter for 24- 48 hours postoperatively in selective cases to observe the feasibility, implication and results per operatively and immediate post operatively.

### Materials & Methods

This prospective comparative study was carried out in the Department of Urology, Bangladesh Medical College Hospital, two other private hospitals located in Dhaka during the period of July 2008 to June 2010. The patients suffering from renal stone disease admitted in Hospital undergoing PCNL were included as study population. Selection criteria were age 19 years and above, Incomplete Staghorn calculi, Stone in renal pelvis, Stone in middle calyx and lower calyx, Stone in lower calyx, Stone size above 2.5cm, Single subcostal percutaneous puncture, Normal preoperative renal function, Complete calculus clearance as assessed by intraoperative nephroscopy and fluoroscopy. Some patients were excluded from the study those are Patient with bleeding Disorder,

Patient with anatomic abnormality of the kidney (horseshoe Kidney/Malrotated kidney), Upper calyceal stone, Complicated procedure e.g. excessive bleeding, injury to adjacent organ, Deformity of the body that causes difficulty in positioning for PCNL. 70 patients were selected for the study.

All patients were given an explanation of the study and informed written consent was taken from each patient .All patients were evaluated by history, physical examination, and investigation. History taken about previous renal surgery, ESWL, Bronchial asthma, Diabetes mellitus, Hypertension, Urinary tract infection.

In physical examination examination of Kidney region and examination of body for any deformity that could difficulty in positioning of patient for PCNL. All patients were investigated properly by Urine for R/M/E and C/ S–to identify urinary tract infection if infection present identifies the organism and sensitivity. Ultrasonogram of kidney ureter and bladder region to see any hydronephrotic change or hydroureter or any other pathology in KUB region. Intravenous urogram – to see the anatomy of pelvic calyceal system and locatiion of stone . Any obstruction in PUJ, Ureter, VUJ.

Other routine investigation for Anaesthesia fitness also done Blood for CBC, Hb%., Serum creatinine, Blood suger-fasting and 2 hour after break fast, X ray chest P/A view, ECG.

After proper evaluation patient were selected for PCNL those fulfill the inclusion criteria. Infomed consent about surgery and study were taken from each patient. For study patients were grouped as Group-A for PCNL with nephrostomy tube and JJ stent and Group –B for PCNL with ureteric catheter for 24 – 48 hours post operatively without nephrostomy tube and JJ stent. Prophylactic chemoprophylaxis was done in all cases.

All PCNL done under standard protocol of the operative procedure. under general anaesthesia.and Complete clearance of stone was confirmed fluoroscopically and by direct vision through nephroscope. On completion of the procedure the Amplatz sheath was removed and Group A patients were managed by putting a 6 F JJ stent antigradely over a safety guide wire under direct vision was adjusted with the grasping forcep and putting a nephrostomy tube within the tract and Group B patients were managed without keeping nephrostomy tube, only 6 F ureteric catheter kept in situ for 24 to 48 hours, bimanually compress the lumber region for 5 to 10 minutes then compressed

dressing applied. Randomization was performed in alternate cases.

Out of 70 cases, 6 cases were excluded from the study, among which multiple punctures were needed in 3 cases, 2 cases were excluded due to excessive bleeding, complete clearance of stone was not possible in 1 cases. Procedure of rest 64 cases fulfilled the criteria of this study. Hence every alternate case received nephrostomy tube a 6 F JJ stent in 32 patients grouped as A and rest 32 patients with ureteric catheter without nephrostomy tube and without JJ stent grouped as B. The nephrostomy tube was removed when the urine was clear. The JJ stent was removed after 3 weeks. Ureteric catheter was removed 24-48 hours after operation according the colour of urine.

During post operative period, both groups were compared with respect to fever, analgesia requirements, haematuria, urinary leakage, formation of haematoma or urinoma and hospital stay.

After completion of procedure intravenous analgesics-inj. Pethedine given in every cases and further analgesic introduced as per demand. Immediate post operative parenteral analgesic requirement according to severity of pain was estimated in mg of pethedine.

In post operative period routinely recorded the temperature, temperature more than 100°F for 24 hours categorized as fever.

During procedure and after completion of procedure by seeing the urine color assessed the haematuria.

Urine leakage was estimated by change of dressing every 4 hours and duration of urine leak was determined after the wound was completely dry for 4 hours. In Group A patients urine leakage was estimated after removal of nephrostomy tube. Just before discharge the patient were assessed for any haematoma or urinoma at puncture side. At the time of discharge patients were advised to come after 3 weeks for follow up.

### Results and Observations

A total of 64 patients were selected to compare the outcome Group A (Percutaneous Nephrolithotomy with nephrostomy tube and JJ stent) and Group -B (Nephrosnotmy tubeless, JJ stentless Percutaneous nephrolithotomy with ureteric catheter for 24- 48 hours post operatively). The outcome variables were fever, duration of haematuria, total amount of analgesics needed, continuation of urine leakage, hospital stay,

urinoma and hematoma. The findings derived from data analysis are presented below.

### Age distribution:

Majority (around 63%) of the patients in both the groups were in the age range 30 – 50 years. About 19% in Group-A and 22% in Group-B were between 50 – 60 years. Only 4 (12.4%) in Group A and 2(6.3%) in Group B were found below the age of 30 years. Out of 32 cases in each group only 2(6.3%) in Group A and 3(9.4%) in group B were above 60 years of age. The groups were not statistically different in terms of age ( $p = 0.386$ ) (Table-I).

**Table I**  
Age distribution between groups (n = 64)

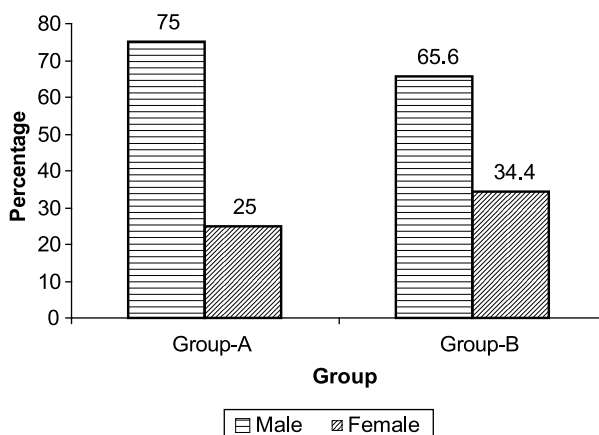
Age (years)	Group		p-value <sup>#</sup>
	Group-A (n = 32)	Group-B (n = 32)	
< 30	4(12.4)	2(6.3)	
30 – 40	10(31.3)	11(34.4)	
40 – 50	10(31.3)	9(28.1)	
50 – 60	6(18.8)	7(21.9)	
>60	2(6.3)	3(9.4)	
Mean ± SD	41.8 ± 9.7	44.0 ± 10.0	0.386

\*Values in the parentheses denote corresponding %.

# Data were analysed using Student's t-Test and level of significance was 0.05.

### Sex distribution:

Three quarters (75%) in Group-A and about two-third (65.6%) in Group-B were males. The male to female ratio was 3:1 in Group-A and roughly 2:1 in Group-B.



**Fig.-1: Sex distribution between groups (n = 64)**

**Size of stone:**

Majority of the patients in both the groups (87.5% in Group-A and 84.4% in Group-B) had stone size bigger than 3 cm. No significant difference was observed between groups in terms of stone size (3.79 ± 0.46 cm vs. 3.76 ± 0.51 cm, p = 0.938).

**Table-II**  
Size of stone between groups (n = 64)

Size of stone (cm)	Group		p-value#
	Group-A (n = 32)	Group-B (n = 32)	
d" 3	4(12.5)	5(15.6)	
> 3	28(87.5)	27(84.4)	
Mean ± SD	3.79 ± 0.46	3.76 ± 0.51	0.938

Values in the parentheses denote corresponding %.

# Data were analysed using Student's t-Test and the level of significance was 0.05.

**Location of stone:**

Location of the stones shows that 62.5% of the patients in Group-A had stone located in pelvis, 28.1% in middle and lower calyx and 9.4% in the lower calyx only. In group-B about 60% of the patients had stone in pelvis, 34.4% in middle & lower calyx and 6.3% in the lower calyx alone. The groups were not observed to be different with respect to location of stone (p = 0.808) (Table III).

**Table III**  
Location of stone between groups (n = 64)

Location of stone	Group		p-value#
	Group-A (n = 32)	Group-B (n = 32)	
Pelvis	20(62.5)	19(59.4)	
Middle & Lower calyx	9(28.1)	11(34.4)	0.808
Lower calyx	3(9.4)	2(6.3)	

\* Values in the parentheses denote corresponding %.

# Data were analyzed using Chi-squared (c<sup>2</sup>) Test and level of significance was 0.05.

**Operating time:**

Over 80% of the patients of Group-A required more than 60 minutes for operation to be completed, while

62.5% of Group-B required > 60 minutes for operation (Table IV). The mean time required for operation was although higher in the former group (79.06 ± 13.99 minutes) than that in the latter group (72.97 ± 14.25 minutes), the difference did not approach the level of significance (p = 0.089).

**Table IV**  
Comparison of operating time between groups (n = 64)

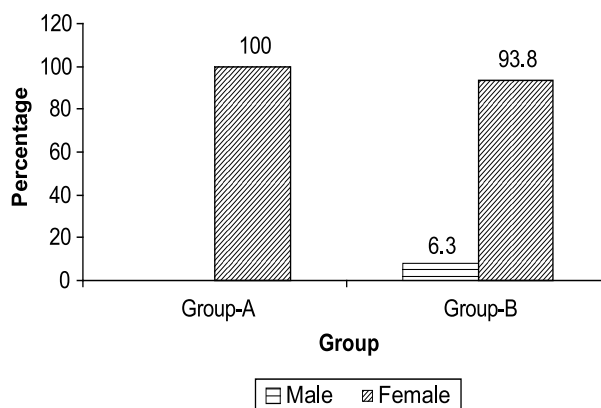
Operating time (minutes)	Group		p-value#
	Group-A (n = 32)	Group-B (n = 32)	
d" 60	6(18.8)	12(37.5)	
> 60	26(81.3)	20(62.5)	
Mean ± SD	79.06 ± 13.99	72.97 ± 14.25	0.089

\*Values in the parentheses denote corresponding %.

# Data were analyzed using Student's t-Test and the level of significance was 0.05.

**Fever following operation:**

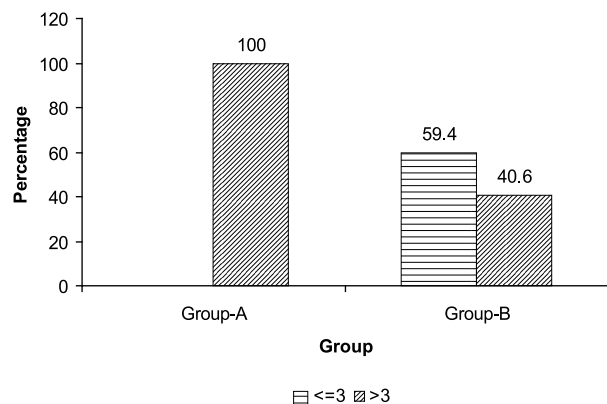
Comparison of fever between groups shows that none of the Group-a develop fever following operation, while 6.3% of Group-B developed fever (Fig. 3).



**Fig. 2:** Comparison of fever between groups (n = 64)

**Continuation of haematuria:**

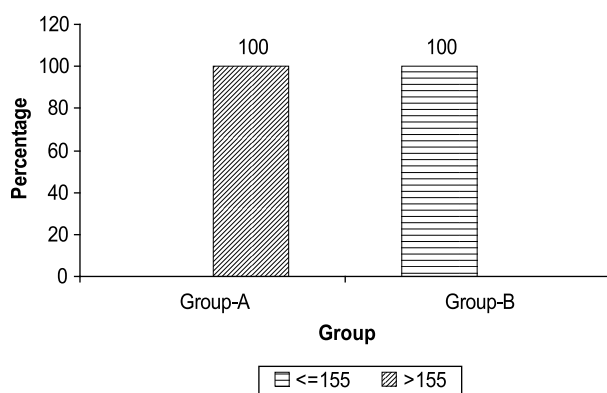
Continuation of haematuria shows that all the subjects of Group-A continued haematuria for more than 3 hours, where as 59.4% continued haematuria for 3 and less than 3 hours of and the rest 40.6% of Group-B.



**Fig.-3:** Continuation of haematuria between groups

**Analgesics needed:**

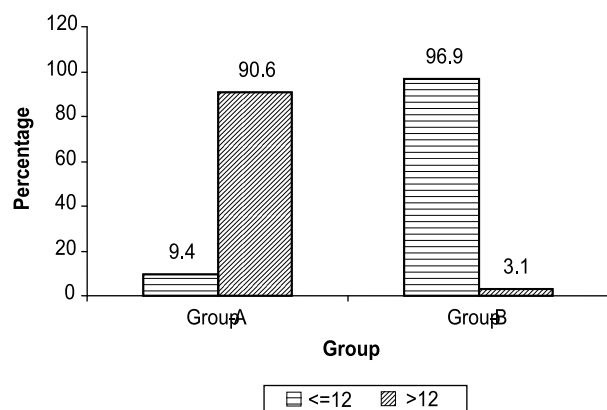
All the subjects of Group-A required up to 155mg of analgesics (Inj.Pethedine), while all the subjects of Group-B needed <155 mg of analgesics (Inj. Pethedine) on an average.



**Fig. 4:** Analgesics requirement between groups

**Continuation of urine leakage:**

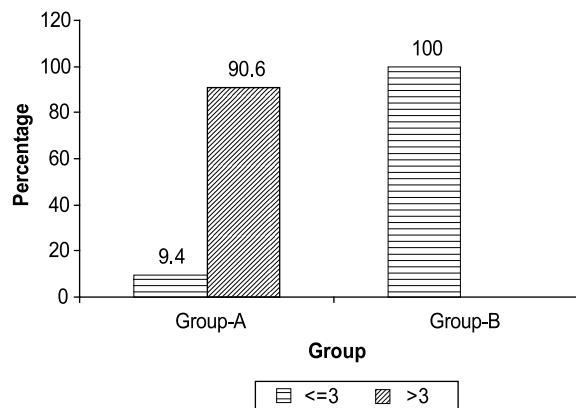
90.6% of Group-A continued urine leakage for > 12 hours following operation, where as only 3.1% continued leakage for the same period of time.



**Fig. 5:** Continuation of urine leakage between groups

**Hospital stay:**

Comparison of hospital stay between groups demonstrates that over 90% of the subjects of Group-A had stay at hospital for more than 3 days following operation. In Group-B none had to stay at hospital for > 3 days (Fig. 6).



**Fig.- 6:** Comparison of hospital stays between groups

**Comparison of outcome between groups:**

Comparison of outcome between groups shows that amount analgesics needed after operation was significantly higher in Group-A than that in Group-B (291.0 ± 27.26 vs. 91.45 ± 11.89 mg, p < 0.001). The continuation of urinary leakage was also significantly longer in the former group than that in the latter group (27.5 ± 9.07 vs. 6.00 ± 2.92 hours, p < 0.001). The former group had stays in the hospital on an average 5 days, while the latter group stayed in the hospital on an average of 2.59 days (p < 0.001). Only 1(3.3%) patient in Group-B had fever following operation. The mean duration of continuation of haematuria although was higher in Group-B (2.41 ± 0.66 hours) compared to Group-A (2.22 ± 0.55 hours), the difference did not turn to significant (p = 0.225) (Table V).

**Table-V**

Comparison of outcome between groups (n = 64)

Outcome	Group		p-value
	Group-A (n = 32)	Group-B (n = 32)	
Fever*	0(0.0)	1(3.3)	0.500
Continuation of haematuria (hrs)#	2.22±0.55	2.41 ± 0.66	0.225
Analgesics needed (mg)#	291.0±27.26	91.45±11.89	< 0.001
Continuation of urine leakage (hrs)#	27.5±9.07	6.00 ± 2.92	< 0.001
Hospital stay (days) #	5.0±3.53	2.59 ± 0.49	< 0.001

\* Data were analyzed using Fisher's Exact Test and presented as n(%). # Data were analyzed using Student's t-Test and were presented as mean ± SD

**Outcome at follow up after 3 weeks:**

Assessment of outcome after 3 weeks showed that out of 32 subjects in Group-A over half (53.1%) complained of loin pain 13(40.6%) dysuria and another 13(40.6%) frequency of micturition. None of the subjects of Group-B reported same type of complications (Table VI).

**Table VI**  
*Outcome at follow up after 3 weeks (n = 64)*

Outcome at 3 weeks of follow up	Group	
	Group-A (n = 32)	Group-B (n = 32)
Loin pain	17(53.1)	0(0.0)
Dysuria	13(40.6)	0(0.0)
Frequency of micturition	13(40.6)	0(0.0)

\* Total will not correspond to 100%, because of multiple responses.

**Discussion**

The present prospective comparative study has been designed to compare the outcome of PCNL with and without nephrostomy tube and JJ stent for the management of renal stone disease. Patients with renal calculi undergone PCNL were divided into 2 groups. Patients belong to Group A were managed by PCNL with nephrostomy tube and JJ stent, patients belong to Group B were managed by PCNL without nephrostomy tube and JJ stent(Only ureteric catheter for 24 to 48 hour post operatively). A total 70 patient of renal stone admitted for PCNL in the department of urology, Dhaka Medical College Hospital were included in the study. Results of treatment of both groups were compiled and compared. Age, sex, size and location of the stone, operating time, were compared between groups. Postoperative fever, analgesic requirements, duration of haematuria, urine leakage through percutaneous tract, hospital stay, Loin pain, Dysuria, Frequency were compared as outcome variables.

Age range of the present in the present study were between 25 years and 60 years. Majority of the cases in the cases in this study were between the age 30 years and 50 years. About 19% of cases in Group A and 22% in Group B were between the age 50 years and 60 years. Only 4 (12.4%) in Group A and 2(6.3%) in Group B were found below the age of 30 years. Out

of 32 cases in each group only 2(6.3%) in Group A and 3(9.4%) in group B were above 60 years of age. The age range of the present study more or less comparable with the study done by Bellman G.C. et al in 1997 to evaluate the role of routine placement of nephrostomy tube following percutaneous surgery on 50 patients. Average age was 48.69 years for the patient with nephrostomy tube and 51.50 years for the tubeless patients. Tubeless Percutaneous Nephrolithotomy and placement of ureteric catheter for 48 hours done by B.Lojanapiwat et al 2001. The mean age was  $46 \pm 12.8$  years. This is more or less comparable with the present study. Study done by Aghamir S.M.K. et al 2004 and Vikas Gupta et al 2004 on tubeless and stentless PCNL where the age range was similar to the present study.

Stone size was another baseline variable .In this study, large stagehorn calculi excluded because it needs multiple puncture and longer operating time. Possibilities of residual stone burden exist in large stagehorn calculi. The stone size was calculated radiologically in centimeter. The mean stone size in Group A was  $3.79 \pm 0.46$  and  $3.76 \pm 0.51$ cm in Group B. The stone size of both groups was compared and no significant difference was found ( $p = 0.938$ ). In a review article of tubeless percutaneous renal surgery in 120 patients done by Limb J. and Bellman G.C. 2002 where the mean stone burden was  $3.30 \pm 2.79$  cm. this is nearly similar to present study.

Mean operating time in this study were  $79.06 \pm 13.99$  min in PCNL with nephrostomy tube and JJ stent and  $72 \pm 14.25$  min in PCNL without nephrostomy tube and JJ stent. Desai M.R. et al 2004, have done a study on PCNL with large bore nephrostomy tube, small bore nephrostomy tube and tubeless group where the mean minutes operation time  $\pm$  SD were  $44.5 \pm 13.2$ ,  $45 \pm 11.7$  and  $45 \pm 13.7$  in large bore nephrostomy tube , small bore nephrostomy tube and tubeless group respectively. In the study of Aghamir S.M.K. et al 2004, A total of 43 patients underwent totally tubeless PCNL where the operating time did not differ significantly between groups, being 75 mins in tubeless group and 68 mins in PCNL without nephrostomy tube group. This is nearly similar to the present study.

After completion of the procedure, we evaluate the patient by fever, analgesic requirements, duration of macroscopic haematuria, urinary leakage through percutaneous tract, haematoma, urinoma and hospital stay.

One patient of PCNL without nephrostomy tube and JJ stent had fever, which was not significant. Fever was associated with urinary tract infection which resolved quickly after changing antibiotic.

The duration of macroscopic haematuria in both groups were compared. In present study haematuria in Group A was  $2.22 \pm 0.55$  hours and Group B was  $2.41 \pm 0.66$  hours. No significant difference observed between the groups. None of the patients in both groups required postoperative blood transfusion. In a study done by Desai M.R. et al in 2004 where the mean duration of haematuria was  $2.5 \pm 0.5$  hours in patients of PCNL with large bore nephrostomy tube and  $2.7 \pm 0.5$  hours in tubeless group. No significant difference in occurrence of haematuria were observed in that study.

In the present study percutaneous nephrolithotomy with nephrostomy tube and JJ stent had a significantly higher analgesic requirement compare to percutaneous nephrolithotomy without nephrostomy tube and JJ stent. In Group A mean analgesic requirement (Inj. Pethedine) was  $291.0 \pm 27.26$  mg but in Group B (Inj. Pethedine)  $91.4 \pm 11.89$  mg. Significant difference in requirement of Inj. pethedine were observed between groups. In the study of Feng M.I. et al 2001, the tubeless PCNL group used significantly less morphine in the hospital (5.52 mg) than did the mini PCNL (24.0 mg) or standard PCNL (52.0mg) groups. In department of urology, Sina Hospital Tehran University of Medical Science, Tehran, Iran, Aghamir S.M.K. et al underwent tubeless and stent less PCNL with 43 patients compared with same patient of PCNL with nephrostomy tube. Average analgesic requirements were 3 times more in PCNL with nephrostomy tube than that of without nephrostomy tube. Above all study showed that analgesic requirement much less in tubeless PCNL than that of PCNL with tube, which is similar to the present study. These findings confirm that the presence of nephrostomy tube is the source of postoperative pain and discomfort and the tubeless and stentless approach is associated with the least post operative pain.

In the present study mean percutaneous tract side urine leak was 6 hours in tubeless and JJ stentless group and 27.5 hours in PCNL with nephrostomy tube group, which was statistically significant. The tubeless approach was also associated with the shortest duration of postoperative percutaneous tract site urine leak. Desai M.R. et al studied that tubeless PCNL had

the shortest duration (4.8 hours) of percutaneous tract site urine leak compared to PCNL with nephrostomy tube 21.4 hours,  $p < 0.05$ . Although urine leak usually resolve spontaneously, its leak from the percutaneous tract site can often be bothersome to the patients.

Patients undergone the tubeless and JJ stentless PCNL had lower hospital stay to compare with PCNL with nephrostomy tube and JJ stent. In this study Ureteric catheter was removed 24 to 48 hours after procedure and the patients kept in the hospital for 12 hours thereafter. In this study  $5.0 \pm 3.53$  days for the patient of PCNL with nephrostomy tube and JJ stent and  $2.59 \pm 0.49$  days for tubeless and JJ stentless PCNL Group. In a comparative study by Bellman et al 1997 reported that hospitalization was 2.5 days for the patients without nephrostomy tube and 4.6 days for the patient with nephrostomy tube. Between April 1997 and June 1998, tubeless PCNL was performed on 33 patients by Delnay K.M. et al in 1998 and retrospectively reviewed these cases with tubeless technique the mean length of hospitalization was 1.5 days. Tubeless percutaneous nephrolithotomy in selected 37 patients done by Lojanapiwat B. et al where mean hospital stay was  $3.63 \pm 0.49$  days. Harris N.M. et al 2001 retrospectively reviewed all patients undergoing PCNL at their institution over the previous 5 years ; the mean hospital stay was 3 days in the tubeless group and 4.8 days in the nephrostomy tube group. The study of B. Lojanapiwat et al 2001 and Aghamir S.M.K. et al 2004, Gupta V. et al 2004 on nephrostomy tubeless and JJ stentless percutaneous nephrostomy compared with percutaneous nephrolithotomy with nephrostomy tube with JJ stent. They found significant shorter hospital stay for PCNL without nephrostomy tube and JJ stent.

In the present study assessment of outcome after 3 weeks showed that out of 32 subjects in Group-A over half (53.1%) complained of loin pain, 13(40.6%) dysuria and another 13(40.6%) frequency of micturition. None of the subjects of Group-B reported same type of complications.

### Conclusion

Comparing the findings of the present study, it can be concluded that Nephrostomy tubeless and JJ stent less Percutaneous Nephrolithotomy with ureteric catheter for 24 – 48 hours postoperatively is a safe and effective procedure. The hospital stay and analgesics requirements are less and return to normal activity are faster.

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