

PERCUTANEOUS NEPHROLITHOTOMY; RANDOMIZED COMPARISON OF LARGE BORE, SMALL BORE AND TUBELESS

ORIGINAL
PROF-1836

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ABSTRACT... Purpose: We compared postoperative outcome of conventional large bore percutaneous nephrolithotomy (PCNL) with small bore and tubeless percutaneous nephrolithotomy (PCNL). **Study Design:** prospective randomized trial. **Period:** August 2008-2009 **Setting:** Shaikh Zayed Hospital Lahore. **Materials and Methods:** The study included 90 patients randomized in three groups. Group 1 included 30 patients who underwent conventional PCNL with large bore 16 fr nephrostomy tube, Group 2 included 30 patients, PCNL with small bore 10 fr nephrostomy tube, and Group 3 included 30 patients who had tubeless PCNL. Comparison was made in the terms of analgesia requirement, fever, duration of urinary leak and hospital stay. **Results:** In Group 1 analgesia requirement ranged from 40-70mg mean 50mg, in Group II, it was 30-60mg with mean 47.3mg while in Group III, The requirement of analgesia was 10-50mg with mean 21.1mg, $p < 0.005$. Hospital stay was between 4 to 7 days, mean 5.7 days in group I while in group II, stay was between 3 to 5 days, mean 4.3 days and in group III, it was between 1 to 4 days, mean 3.17 days, $p < 0.005$. Twelve patients had fever in group I, In group II, eleven patients while in group III, five patients developed fever, $p < 0.005$. Leakage of urine from site of wound in group I was observed between 0 to 5 days while in group II leakage was between 0 to 4 days, and the leakage period reduced in group III from 0 to 2 days $p < 0.005$. **Conclusions:** Tubeless PCNL is associated with the least postoperative pain, urinary leakage, fever and hospital stay, it's a good option after an uncomplicated percutaneous renal procedure.

Key words: Percutaneous nephrolithotomy, tubeless, out comes.

INTRODUCTION

The formation of stones in the urinary tract is an ancient disease, which affects 2-4% of the general population. The incidence varies throughout the world. In Pakistan it is believed that there is a higher incidence in lower Punjab and Northern Sindh¹. Management of urolithiasis constitutes 40-50% of the urological workload in hospitals of these areas².

Since the clinical introduction of Extracorporeal shock wave lithotripsy (ESWL) and endourological techniques such as ureterorenoscopy and percutaneous nephrolithotomy (PCNL), the management of urolithiasis has been changed completely. Renal stone management moved from open surgery to minimally invasive procedures with the aim of achieving maximum stone clearance with the least morbidity and mortality². The high risk of stone recurrence also favors minimally invasive treatment rather than repeated open surgery³.

PCNL is an effective treatment of large renal calculi. PCNL with conventional post operative nephrostomy

tube drainage is a routine approach in patients with renal calculi. It serves several purposes: tamponades bleeding emanating from the nephrostomy tract allows proper drainage of urine and facilitates access to the collecting system if a secondary PCNL is required. Nephrostomy tube have been implicated in causing postoperative discomfort and morbidity, prolonged hospital stay and continuous urinary leakage. In this study, we assessed in a prospective comparative study, the influence of nephrostomy tube on post operative morbidity.

MATERIALS AND METHODS

Between August 2008 to May 2009, Ninety selected patients were randomized into three groups. Group 1 included 30 patients who underwent PCNL with large bore (16fr) nephrostomy tube, Group 2 had 30 patients of PCNL with small bore (10fr) nephrostomy tube and Group 3 had 30 patients of tubeless PCNL. Patients more than 15 years of age, stone larger than 2.5 cm in size and those who required only a single percutaneous nephrostomy tract were included in the study.

Written informed consent was taken with explanation of risks and benefits of the procedure to the patient and family. General anesthesia was administered. Retrograde ureteric Catheter Passed. Retrograde pyelography was performed in all patients in modified lithotomy position to delineate the anatomy and to fill the peliv-caliceal system with contrast so as to facilitate the percutaneous access. The standard PCNL performed in all patients. To reduce the number of residual fragments continuous removal of small fragments by suction or extractions was performed. At the end of procedure nephrostomy tube was placed in group 1 and group 2, while group 3 was without nephrostomy tube.

After completion of the procedure and recovery from anesthesia all patients were shifted to the ward. For analgesia injection Nalbuphine 10mg with metaclopramide 10mg was administered intravenously. Ureteric catheter was removed after 24 hours in all patients and post operative X-Ray KUB, Ultrasonography of abdomen pelvis was performed before discharge. Complete blood count was performed before surgery and repeated 48 hours post operatively to determine decrease in hematocrit. All three Groups were observed and compared with each others in terms of analgesia requirement, fever, duration of urinary leak through percutaneous tract and hospital stay. Data were entered and processed using SPSS program.

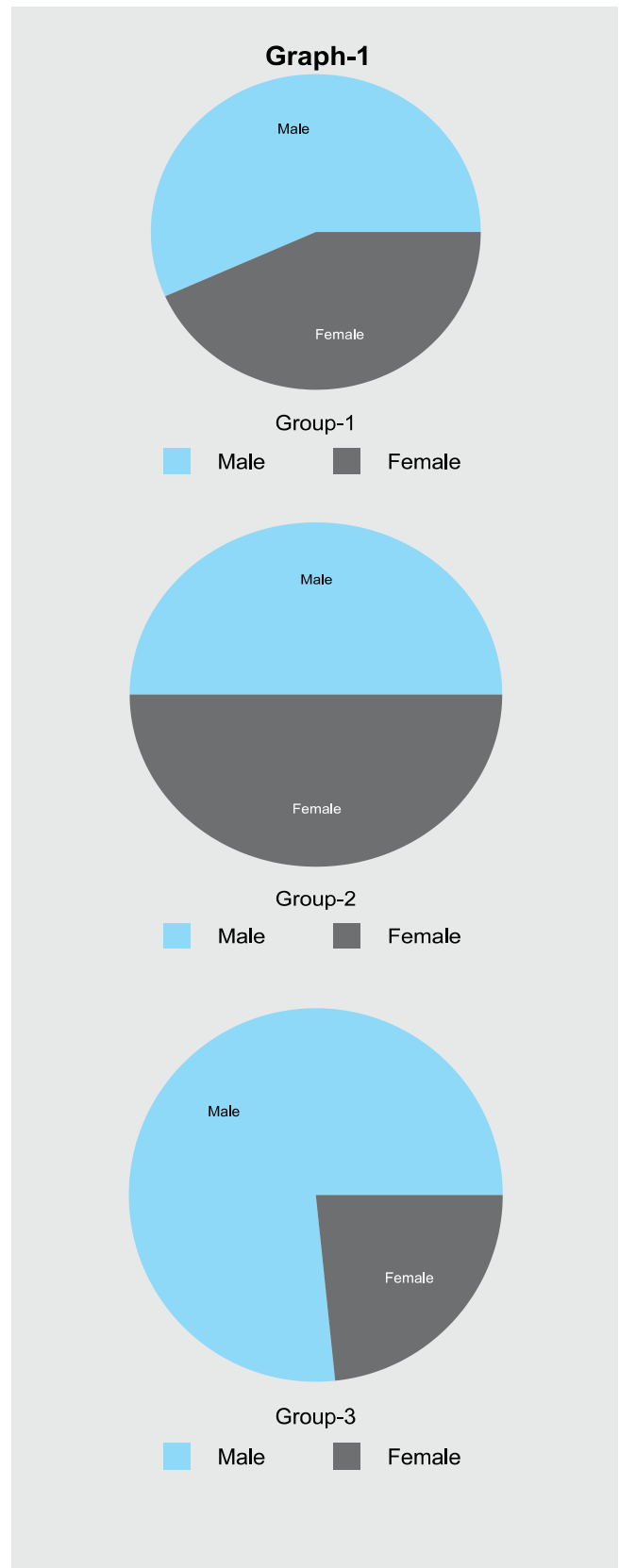
Numerical variables were described with mean ± standard deviation and analyzed using student “t” test.

Nominal variables were described in frequencies and percentages and analyzed by Chi Square. P value of <0.05 was taken as significant.

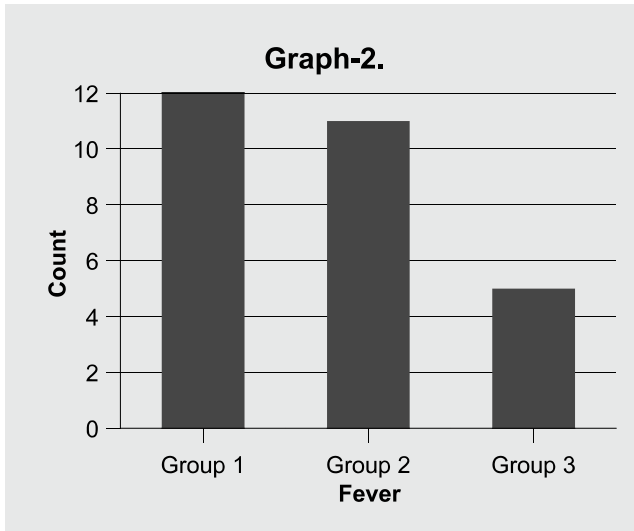
RESULTS

Results are summarized in table 1. Mean age In group 1, group II and group III was 35.9, 36.7 and 35.1 years respectively. Seventeen patients In group I were males and 13 females, in group II, fifteen males and 15 females while group III have twenty three male and 7 female, (graph1).

Sixteen patients underwent right sided operation and 14 had their left side surgery in group I, while in group II,



sixteen patients underwent right sided and 12 left sided surgery. In group III, eighteen patients were operated for right sided and 12 for left sided stones. Twelve patients in group I, eleven in group II and five patients in group III, developed fever, $p < 0.05$ (graph 2).



Analgesia requirement (Inj: Nalbuphine) ranged from 40-70mg mean 50mg in group I, in group II, 30-60mg mean 47mg while in group III, analgesia requirement was from 10-50mg with a mean dose of 21mg ($p < 0.05$).

In group I, hospital stay was between 4 to 7 days mean 5.7 days while in group II, it was 3 to 5 days mean stay 4.3 days and in group III, it reduced to 1 to 4 days with mean stay 3.17 days ($p < 0.05$).

In group I, leakage of urine from site of wound also significantly reduced from group I to group III. In group I leakage of urine period ranged from 0 to 5 days, mean leakage was 2.57 days, in group II it was 0 to 4 days with mean 2.31 days while in group III leakage was between 0 to 2 days $p < 0.005$.

DISCUSSION

PCNL is an effective treatment for large renal calculi, the technique of PCNL has been steadily refined and improved. Placement of a nephrostomy tube is the last step in conventional PCNL, the aim of placing a nephrostomy tube is to provide reliable urinary drainage, haemostatic tamponade of percutaneous renal tract and maintaining access for future percutaneous

Table-I. Male female ratio				
Parameters	Large bore tube PNCL	Small bore tube PNCL	Tubeless PNCL	P value
Mean Age (years)	35.9	36.7	35.1	-----
Fever	12	11	05	<0.05
Mean length of stay (days)	5.7	4.3	3.17	<0.05
Mean analgesia (mg)	50	47.3	21.13	<0.05
Mean urinary leakage (days)	2.5	2.3	0.10	<0.05

Table-II.			
Study parameters	Comparison of p value of group 1 and group 2	Comparison of p value of group 1 and group 3	Comparison of p value of group 2 and group 3
Fever	0.273/0.144	0.273/0.001	0.144/0.001
Length of stay	0.519/0.045	0.519/0.001	0.045/0.001
Analgesia	0.49/0.11	0.49/0.004	0.11/0.004
Urinary leakage	0.025/0.015	0.025/0.001	0/015/0.001

manipulations. Despite these apparent advantages nephrostomy tubes have been implicated in causing post operative discomfort and morbidity⁴. To reduce discomfort and tube related morbidity, modifications have been made, like using smaller nephrostomy tube (10-12 Fr), or avoiding tube placement in selected cases. Some urologist use DJ stents along with a nephrostomy tube. Every technique has its own advantages and disadvantages.

In 1984, Wickham et al⁵ reported their experience with percutaneous stone extraction and stated that in selected cases it is not unreasonable to avoid leaving a nephrostomy tube. However, in 1986, Winfield et al⁶, reported prolonged hospitalization and pain in two patients after percutaneous stone removal when

nephrostomy tubes were not left in place. Thereafter, placing a nephrostomy tube at the end of a percutaneous procedure became standard. Since then, with improvements in technique, the morbidity of percutaneous procedures has decreased dramatically.

The present challenge is to make a percutaneous renal operation an outpatient procedure, which would be more palatable to patients and more cost-effective, without compromising safety. This study was designed to assess in prospective comparative fashion, the influence of nephrostomy tube and its size on post operative morbidity.

In the present study we evaluated 90 patients which were randomized in three groups. Group I, 30 cases of conventional PCNL with large bore (16fr) nephrostomy tube, Group II, 30 patients of PCNL with small bore (10fr) nephrostomy tube and group III, 30 cases of tubeless PCNL. In all groups we placed a ureteric catheter which was removed after 24 hours. These results demonstrated that 60 patients treated with small bore nephrostomy tube and tubeless PCNL had a shorter hospital stay and less morbidity than using larger bore nephrostomy tube after PCNL.

Limb and Bellman⁷ reported tubeless percutaneous procedure in 116 kidneys in 112 patients in which PCNL was done in 86 patients and endopylotomy performed in 26. Hospital stay was 1.25 and 1.56 days ($p=0.001$) and complications occurred in 6% and 4% in the stone extraction and endopylotomy groups, respectively. The author concluded that tubeless approach was reasonably safe in selected patients with uncomplicated percutaneous procedure and low calculus burden. In our study the hospitalization in group 3 was 2.30 days which was comparatively shorter than group 1,(5.7 days) and group 2,(4.3 days) . In our Institute we usually remove the nephrostomy tube after 48 hours, routine postoperative nephrostomy drainage for 48 hours increases the hospital stay by a couple of days.

In another randomized study by Desai et al⁸ uncomplicated PCNLs were randomized to have a small 9fr nephrostomy versus a conventional 20fr versus a DJ stent. The group with smaller tube had reduced

analgesia requirement and hospital stay without additional complications, and the group with double j stent had the lowest analgesia requirement and shortest hospital stay ($p=0.0001$). However this induced stent related morbidity and required second procedure for removal. Crook and Lockyer⁹ performed randomized control trial of nephrostomy placement versus tubeless PCNL, in which 50 patients were randomized in two groups, group 1 with nephrostomy tube and group 2 underwent tubeless PCNL. The study demonstrated no difference between the groups as regards to hemorrhage, infection and other parameters.

Analgesia requirements favored the tubeless group. Length of stay was greater in those patients who had a nephrostomy placed. In our study analgesia requirement was minimal in the tubeless group requiring 21.3mg compared to 50mg in group 1 and 47.3mg in group 2. These findings supported our results that the presence of nephrostomy tube is a source of postoperative pain and discomfort.

Basiri and Ahmadania¹⁰ performed a randomized comparative study on conventional PCNL with two of its modified procedure. 60 patients were taken and randomly divided in 3 groups. Results showed only one patient with nephrostomy tube and DJ stent had urinary leakage after removal of nephrostomy tube. No urinary leakage seen in other groups. None of patients developed hemorrhage or fluid collection which also supports our results.

In another study by Shah¹¹, 45 tubeless PCNLs were performed in 40 patients. All were successful, with no significant complications. The mean hospital stay was 26 hours, none with urinary extravasation or urinary leakage after PCNL. A concern with the tubeless approach is the potential for extravasation and perinephric urinary collection. None of the patients in our study showed any perinephric collection on postoperative ultrasonography. Studies revealed that fever is one of the most frequent postoperative complications of PCNL with incidence of 12% to 25%¹², It may be seen in the presence of preoperative sterile urine culture and prophylactic antibiotics. The exact mechanism of fever is unknown, various reasons, such as atelectasis, hyperthermia,

thrombo-embolism, bacterial endotoxins release, colonized stone and some bacterial agents, have been proposed as the probable causes of fever¹³.

Vorrakitpokatorn¹⁴ et al suggested that prolonged operative time more than 120min, volume of irrigation fluid more than 20 liters and postoperative transfusion seems to increase the risk of postoperative fever. In Aghdas¹⁵ study a significant correlation was observed between fever, female sex, positive urine culture and nephrostomy tube insertion.

In our study, we observed fever only those patients who remain febrile for more than 48 hours, the frequency of fever was higher in the presence of a tube. The exact reason is not clear, but despite other causes, it may be result of the nephrostomy tube which can act as a foreign body.

CONCLUSIONS

Our recommendations are that the nephrostomy tube must be placed in selected cases only. Patients with large complex calculus, prolonged procedure, multiple renal tracts, bleeding, perforation or pre-existing urinary infection should have a nephrostomy tube.

Tubeless PCNL is associated with the least postoperative pain, urinary leakage, fever and hospital stay, and it is a good option after an uncomplicated percutaneous renal procedure.

In those cases where placement of tube is necessary, small bore tube can be placed with least morbidity and analgesia requirement.

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Article received on: 27/08/2011

Accepted for Publication: 13/09/2011

Received after proof reading: 02/12/2011

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Article Citation:

Husain I, Tahir MM, Ashraf S, Khan MU. Percutaneous nephrolithotomy; randomized comparison of large bore, small bore and tubeless. Professional Med J Dec 2011;18(4): 575-580.

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