

Safety and efficacy of tubeless percutaneous nephrolithotomy

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Abstract

Objective: To determine the safety and efficacy of tubeless percutaneous nephrolithotomy (PCNL).

Methods: A quasi- experimental study conducted on 50 patients, at a specialized urology centre.

Results: The primary success rate of the procedure in terms of stone clearance was 70%. Mean length of hospital stay was 2.44 days. There were no significant complications during or after the surgery.

Conclusion: Tubeless PCNL is a safe and effective modification of the conventional procedure. Absence of the nephrostomy tube may help in keeping the patient comfortable after the surgery and reduction in the length of hospital stay (JPMA 57:584;2007).

Introduction

Percutaneous nephrolithotomy (PCNL) is the procedure of choice for removal of large and complex renal calculi. The procedure usually results in less morbidity as compared to open surgery.^{1,2} In standard practice, at the end of the PCNL procedure, a nephrostomy tube is placed, which is used for external drainage.

Percutaneous procedures without a nephrostomy tube were first described nearly 20 years ago by Wickham^{3,4}, but it was not generally practiced due to fear of complications.

In 1997, Bellman⁵ suggested that placement of a double "J" (DJ) stent alone, is sufficient in most PCNL procedures. This results in less post-operative discomfort and rapid recovery. Since its reintroduction, the procedure has been found to be safe and feasible by many researchers.⁶⁻¹²

In 1999, a large case series, found an externalized ureteral catheter or internal ureteral stent, to be a safe and economical alternative.¹³ It is only within the last 2-3 years that the procedure is considered not only safe but it is also most cost effective and associated with least morbidity when compared to "Standard" and "Mini" PCNL.¹⁴ Among the complications, haemorrhage is the most commonly encountered problem. Others include formation of urinoma, infection/sepsis and electrolytes imbalance.¹⁵

The objective of the present study was to determine the safety and efficacy of tubeless PCNL in terms of stone clearance, intra/post-operative complications and the length of hospital stay.

Patients and Methods

This was a quasi- experimental study, conducted at The Kidney Centre Postgraduate Training Institute, from

June 2005 to November 2006. The procedure was performed in 50 patients using non-probability purposive sampling method.

The inclusion criteria was patients with renal and/or upper uretric calculi of greater than 2.5cm, negative urine culture and no coagulopathy. Those patients with solitary kidney, more than 2 percutaneous accesses, significant perforation of the collecting system and significant intra-operative bleeding were excluded.

Pre-operative assessment included indication for surgery and patient's present, past and family history and physical examination. Important laboratory parameters such as urinalysis and culture / sensitivity, haemoglobin, electrolytes and urea/creatinine were checked before and after the surgery. Pre-operative intravenous urography (IVU) and ultrasound kidney, urinary bladder (KUB) was performed in all cases. Ultrasound and/or X-ray KUB were repeated 24 hours after surgery. Mean stone burden was calculated in each case by multiplying the horizontal and vertical dimensions of the stone, as seen on IVU. For multiple stones, the stone burden for each stone was added together. The collected data was entered in a performa and results analyzed by using SPSS version 10.0.

The surgical technique was carried out under general anaesthesia. A 4F transurethral uretric catheter was placed. Percutaneous access was created in all cases under fluoroscopic guidance with the patient in prone position. Subcostal puncture for lower pole access was done in most cases but upper pole and middle calyceal punctures were also done in selected cases to achieve maximum stone clearance. The nephrostomy tract was dilated with metal dilators and Amplatz sheath was left in situ. A 26 Fr angled Storz nephroscope was used and calculus disintegration was performed using EMS Swiss lithoclast.

In patients with supracostal access tract, chest fluoroscopy was performed to confirm the integrity of the costophrenic angle and to rule out significant pneumothorax.

On completion of the procedure, the Amplatz sheath was removed. The wound was stitched with Prolene 4/0 mattress suture. The uretric catheter was retained and a Foley's catheter was left in the bladder at the end of the procedure.

Results

A total of 50 patients underwent tubeless PCNL under general anaesthesia, during an 18 months period. Among these, there were 36 male and 14 female patients. The average age was 39.3 ± 13.20 years with a range of 16 to 73 years.

Thirty four percent patients had a past history of stone disease while 10 (20%) had a synchronous stone at other site (bladder etc.). In 9 (18%) patients, there was a positive family history for renal stone disease. The mean stone burden was 7.92 centimeters (cm), with the largest being 33.40 cm and smallest 2.5cm.

In 43 (86%), there was a single tract access. Out of these 36 (72%) had a lower pole puncture and 6(12%) had an upper pole puncture. In 1 case there was a middle calyx puncture, 07 (14%) patients had a double tract access usually a combination of subcostal lower calyceal and supracostal upper calyceal access. Metachronous bilateral PCNL was performed in 1 case, while synchronous bilateral tubeless PCNL was not performed. Only 01 procedure was performed on Horseshoe kidney as shown in Table 1. There were no significant intra-operative complications, except in 1 case of extravasation at the pelvi-uretric junction (PUJ).

The mean operative time (from "Induction of anaesthesia" till "patient shifted from operation theatre") was 48.4 ± 16.5 minutes with a range of 30 to 180 minutes.

Sixteen (32%) patients developed fever after the surgery. Most of these had one or two spikes not exceeding 38.5°C . They were treated with antibiotics and blood and urine was sent for culture/sensitivity (C/S). Urine C/S was positive in 1 patient.

The mean post-operative drop in haemoglobin was 1.51g/dl. Maximum drop was 4.1 g/dl, and 2 patients required post-operative blood transfusion.

There was no hyponatraemia (<130meq/l) after the procedure in any case. This was due to use of normal saline during the procedure. Two patients developed hypokalemia (less than 3 meq/l) and were treated accordingly. Serum creatinine of 01 patient rose from 1.6 mg/dl to 2.0mg/dl in first 24 hours after the procedure but it returned to normal

Table 1. Operative Details.

Mean operative time	48.4 minutes
Single tract access	43 (86%)
Lower pole puncture	36 (72%)
Upper pole puncture	06 (12%)
Middle calyx puncture	01 (2%)
Double tract access	07 (14%)
Metachronous bilateral PCNL	01 (2%)
PCNL in horse shoe kidney	01 (2%)

Table 2. Stone Clearance.

Procedure	Patients (%)	Days to achieve stone clearance
PCNL Monotherapy	28 (56%)	01
PCNL + Conservative	7 (14%)	14
Additional ESWL	13 (26%)	14
Additional URS	01 (2%)	19
Additional push back+ DJ+ESWL	01 (2%)	28

within 36 hours. There were no chest complications.

The stone clearance was evaluated by X-ray KUB on first post-operative day and then again after 2 weeks. Ultrasound of kidneys was done in certain cases. Stone clearance was 100% in 28 (56%) patients. Residual stones of less than 05mm were found to be present in 7 (14%) cases. All of these patients responded well to conservative management and were found to be completely stone free on follow-up X-ray KUB at two weeks. The primary success rate of the procedure in terms of stone clearance was thus 70% (35 patients).

Thirteen (26%) patients required an additional extracorporeal shock wave lithotripsy (ESWL) for the residual stones. Twelve patients required a single session of ESWL while 1 underwent 3 sessions.

One patient had to undergo ureterorenoscopy (URS), while 01 had a push back with insertion of DJ stent and ESWL. These 2 patients were readmitted for the subsequent procedure and discharged on next day.

Mean length of hospital stay was 2.44 ± 1.06 days after the procedure with a range to 4 days (Table 2). All the stones were of calcium oxalate with additional ammonium, phosphate, magnesium and urate components on chemical examination.

Discussion

Over the period of years, PCNL has emerged as a safe and less morbid procedure compared to open stone surgery. With its low cost, short operative time, decreased requirement for blood transfusion and analgesics and early return of the patients to daily life activities, it is the

procedure of choice for the renal and upper uretric calculi.¹⁵

Following the footsteps of Wickham et al¹⁶, in 1984, Bellman et al⁵, proposed the option of PCNL without a draining nephrostomy tube. They suggested that a nephrostomy tract is a controlled trauma, which, if properly drained, should heal spontaneously. This improvement in the procedure makes it feasible and safe with advantage of reduced post operative analgesia requirement and early return to normal life.

Most of the results of the current study are consistent with the international case series. The stone clearance ranged from 87-100% in various case series.¹⁵⁻¹⁸ In the study the stone clearance (PCNL Monotherapy) was 70%. This may be because of very large size of the calculi in some patients. However, a clearance of 100% was achieved with additional ESWL to the residual stone fragment within 30 days.

As observed by Shah et al¹⁷, there were no major complication like haemorrhage, chest complication or urinary leakage after the surgery. Only 1 patient had extravasation at PUJ during the procedure, but he recovered fully after the surgery.

Although there have been some published reports on synchronous/simultaneous bilateral PCNL^{12,17}, we conducted metachronous PCNL of 1 patient later on.

The mean drop in haemoglobin in this study was 1.5g/dl and 2 of our patients required blood transfusion after the surgery, which is consistent with other published series.^{10,17}

There have been very few attempts to study if there is any electrolyte imbalance after the operation.² The electrolytes both before and after the surgery was checked in this study and found that there was no significant decline in sodium levels. Creatinine level of 1 patient had risen from 1.6 to 2.0mg/dl after the operation. This rise was insignificant, as the level returned to normal the other day. The mean operative time was 48.4 minutes, comparable to other similar studies.¹⁸

The mean length of hospital stay was 2.5 days. In almost all studies, researchers have found that the technique significantly decreases the hospital stay and speeds up the recovery process.^{2,10,17,18}

Conclusion

Tubeless PCNL is a safe and effective modification

of the conventional procedure. Absence of the nephrostomy tube may help in keeping the patient comfortable after the surgery and reduction in the length of hospital stay. It may also expedite the process of recovery and the patient is able to resume daily life routine earlier. The procedure does not carry any significant risk of complications. It should be employed whenever possible in suitable patients.

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