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Tubeless Percutaneous Nephrolithotomy

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ABSTRACT

OBJECTIVE: To evaluate the efficacy and safety of tubeless percutaneous nephrolithotomy (PCNL).

PATIENTS AND METHODS: We studied 43 patients with kidney stones who underwent tubeless PCNL. All procedures were done in a 1-stage operation. Patients with ureteropelvic junction (UPJ) obstruction and a stone burden less than 2 cm were excluded from the study. Double puncture was performed in 6 patients, and each puncture was closed separately. The ureteric catheter was left indwelling for a period of 24 to 48 hours. This was compared to a control group of 45 patients who underwent standard PCNL.

RESULTS: Of the 43 patients who underwent tubeless PCNL, 29 were males and 14 were females. Their age ranged from 17 to 45 years. Ureteric catheters were left in for 24 hours in 37 patients and for about 48 hours in 6 patients. The hospital stay ranged from 36 hours to 2 days. The mean (SD) hospital stay was 34.65 (5.37) hours. This was compared to the mean hospital stay of the control group 118.5 (45.15) (P = .000068). There was no bleeding from the nephrostomy site and no urine leakage in any of the patients. Some experienced mild hematuria but none required blood transfusion. There were no residual stones in any patients and mild pain in 5 cases who respond well to anti-inflammatory drugs.

CONCLUSION: Tubeless PCNL is suitable for any patient who can be rendered stone-free with a single procedure, as it decreases the hospital stay, recovery time and cost, and improves the quality of life.

KEYWORDS: Tubeless percutaneous nephrolithotomy

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INTRODUCTION

Fernstorm and Johansson performed the first percutaneous nephrolithotomy (PCNL) in 1976 [1]. Urologists then began to realize the potential for renal surgery through small percutaneous tracts. Progress in this area has ultimately benefited patients by reducing morbidity, convalescence, and recovery time. Recent technological advances have contributed to the high success rates of PCNL. Modifications have been made to the PCNL technique in an attempt to decrease the morbidity of the procedure, including the use of smaller working sheaths and nephroscopes [2-4] and the avoidance of nephrostomy tubes completely (tubeless PCNL) [5-7].

Tubeless PCNL is safe and effective. It has significantly less morbidity, a shorter hospital stay, and less postoperative analgesic requirement in comparison with standard PCNL [8,9]. A randomized comparison between tubeless and standard PCNL was done by Agrawal *et al.* [10], and they reported that nephrostomy-free or tubeless PCNL reduces postoperative urinary leakage and local pain related to the drainage tube. It also minimizes hospital stay, with the majority of patients discharged from the hospital in less than 24 hours.

The aim of this study is to evaluate the efficacy and safety of tubeless PCNL.

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MATERIALS AND METHODS

From May 2006 to May 2008, we studied 43 patients with kidney stones who underwent tubeless PCNL with externalized ureteric catheters and without nephrostomy tubes. All procedures were done in a 1-stage operation. Another 45 patients were studied as control group. Control patients underwent standard percutaneous nephrolithotomy with both percutaneous tubes and ureteral catheters left indwelling postoperatively. All patients underwent routine preoperative laboratory investigations (complete blood profile; plain and kidney, ureter, and bladder (KUB) x-ray; abdominal sonography; intravenous urogram (IVU)). Hemoglobin percent (HB%), blood urea, serum creatinine, and random blood sugar were all taken.

Exclusion criteria included patients with ureteropelvic-junction (UPJ) obstruction and a stone burden less than 2 cm. Inclusion criteria included patients with normal renal function with a stone burden 2 cm or greater.

Double puncture was performed in 6 patients, and each puncture was closed separately. The ureteric catheter was left indwelling for a period of 24 to 48 hours.

RESULTS

Of the 43 patients who underwent tubeless PCNL, 29 were males and 14 were females. Their age ranged from 17 to 45 years. Ureteric catheters were left in for 24 hours in 37 patients and for about 48 hours in 6 patients. Removal of ureteric catheter was done when the urine became clear, and KUB was done before removal of the ureteric catheter to confirm that there were no residual stones. The hospital stay ranged from 36 hours to 2 days, and the mean (SD) hospital stay was 34.65 (5.37) hours. This was compared to the mean hospital stay of the control group's mean of 118.5 (45.15) hours ($P = .000068$).

Postoperatively, patients received antibiotics according to culture and sensitivity for 7 days and non-steroidal anti-inflammatory drugs when needed. There was no bleeding from the nephrostomy site and no urine leakage in any patient. There was mild hematuria in some, but there was no need for blood transfusion in any patient. There were no residual stones (all stones were cleared), but there was mild pain in 5 of the tubeless PCNL patients in the early postoperative days. All respond well to anti-inflammatory drugs, and the pain disappeared after the removal of the ureteric catheter. In the control group, 7 patients had mild pain postoperatively and respond well to a single dose of pethidine. Pain disappeared after removal of the nephrostomy tube.

DISCUSSION

Advances in surgical instruments, radiological imaging, and urologists' skills have made PCNL surgery easier, safer, and more effective in the management of renal stones. Clayman *et al.* [11] reported that there was no significant difference in the size of the resultant renal scar when comparing renal parenchymal damage associated with 24 F and 36 F nephrostomy tracts. Traxer *et al.* [12] found that renal parenchymal damage resulting from the creation of a nephrostomy tract is small compared to overall renal volume regardless of the size of the nephrostomy tract, and there is no advantage to using a small-access sheath based on renal scarring alone. Feng *et al.* [13] reported that there is no statistical difference in patient pain response between mini-PCNL and the classic technique. Bellman *et al.* [5] found that there was proper drainage to the urinary tract with the use of double pigtail stent alone, and the urinary tract healed without complications in the vast majority of patients. Feng *et al.* [13] reported that patients treated with tubeless PCNL required significant less analgesia compared with standard and mini-PCNL patients. This was confirmed in our study in that there was mild loin pain in our patients that disappeared by removal of the ureteric stent. Comparing classic PCNL, mini-PCNL, and tubeless PCNL, Feng *et al.* [13] reported that the tubeless technique was associated with the least amount morbidity and lowest cost.

Simultaneous bilateral tubeless PCNL has been performed successfully as well [14], but this requires the use of an internal Double-J stent, which has the disadvantage of having more irritative symptoms than nephrostomy tubes [14,15]. Patients with internal stents are required to return 1 week after being discharged to remove the stint. This causes the cost, discomfort, and time needed to return to work to be greater than with external ureteric catheters, which are removed when hematuria cleared up [16-18].

Agrawal *et al.* [10] randomized 202 patients undergoing PCNL into 2 groups: Group A (standard PCNL) with nephrostomy tube placement postoperatively, and Group B (tubeless PCNL) with antegrade placement of a Double-J stent without nephrostomy. Inclusion criteria included normal renal function, single tract procedure with complete clearance, and minimal bleeding at completion. The 2 groups were comparable in age and sex and in metabolic and anatomic features. Factors evaluated included postoperative pain, analgesia requirement, blood loss, postoperative morbidity, hospital stay, and time to recovery. Their results were as follows: All patients had an uneventful postoperative recovery. The average visual

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analogue pain scale score on postoperative Day 1 for Group A was 59 (5.1) compared with 31 (4.8) in Group B ($P < 0.01$). The mean analgesia requirement for Group A [meperidine 126.5 (33.3) mg] was significantly more compared with Group B [meperidine 81.7 (24.5) mg] ($P < 0.01$). The difference in average blood loss and urinary infection for the 2 groups was not statistically significant. The incidence of urinary leakage from the nephrostomy site was significantly less for the tubeless group (0 out of 101), compared with the standard PNL group (7 out of 101). The average hospital stay in the tubeless group [21.8 (3.9) hours] was significantly shorter than that of the standard PCNL group [54.2 (5) hours] ($P < 0.01$). The tubeless group patients took 5 to 7 days for complete convalescence, whereas the standard PCNL patients recovered in 8 to 10 days.

No long-term sequelae were noticed in the median follow-up period of 18 months in any patient.

The complications reported in our study were discomfort from urethral catheter and mild-loin pain from the passage of clots in all patients. This is acceptable and comparable to other reported studies [5,10,11,19].

CONCLUSIONS

Tubeless PCNL is suitable for any patient who can be rendered stone-free with a single procedure. It decreases the hospital stay, recovery time and cost, and improves the quality of life.

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