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Efficacy and Safety of Simultaneous Bilateral Tubeless PCNL

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Annotation: Background: Patients burdened with bilateral kidney stones are challenging cases for endourologists. Multiple and bilateral renal stones incidence is increasing, being reported in 15% of patients. In cases with bilateral renal stones, PCNL may be performed in a single session as a synchronous bilateral PCNL (SBPCNL) or as a planned staged procedure. Improvement in PCNL technique, marked reduction in morbidity, shorter operative time, hospital stay, and improvement in stone clearance encouraged the introduction of SBPCNL.

Aims of the study: is to evaluate the impact of SBPCNL on complication rate and stone-free status.

Patients and methods: From December 2021 to October 2023, 116 patients with bilateral renal stones were selected to undergo PCNL and prospectively followed up.

These patients were divided into two groups

- Group A, Tubeless SBPCNL, was done.
- Group B, staged tubeless PCNL, was done.

The groups were compared for stone-free status, operative times, post-operative hematocrit drop, creatinine level rise, need for additional analgesia, and any other postoperative events.

Results: One hundred and sixteen patients with bilateral renal stones were divided into two groups: group A (62 patients) and group B (54 patients). Group A patients showed statistically significant higher operative times (77.12 (±19.9)) compared to group B patients (59.72 (±19.8)). In addition, group A patients required more analgesic medications (17.75%) than group B patients (5.55%). This difference was statistically significant also. The stone-free rate, hematocrit drop, infection rate, and creatinine level rise showed comparable results between groups.

Conclusion: SBPCNL is a safe procedure, showing a comparable stone-free rate to a staged procedure as well as a comparable complication rate. However, SBPCNL showed statistically significant higher operative time and use of extra analgesia when compared to staged PCNL.

Keywords: PCNL, Bilateral, Tubeless, Staged.

Introduction

Percutaneous nephrolithotomy (PCNL) is the treatment of choice for renal stones>2cm. Patients burdened with bilateral kidney stones are challenging cases for endourologists. [1]

Multiple and bilateral renal stones incidence is increasing, being reported in 15% of patients with kidney calculi.[2]

In cases with bilateral renal stones, PCNL may be performed in a single session as a synchronous bilateral PCNL (SBPCNL) or as a planned staged procedure.

Improvement in PCNL technique, along with the implementation of new devices and technologies, resulted in a marked reduction in morbidity, shorter operative time, less hospital stays, and better stone clearance. This encouraged the introduction of the SBPCNL.[3]

SBPCNL has been demonstrated to be well tolerated, safe, and effective for the treatment of bilateral renal calculi [4,5].

Advantages include fewer analgesic agents, quick return to daily activities, and shorter surgical time, decreasing the overall hospital stay and the cost of surgery.[6]

While reports of the safety and efficacy of same-session bilateral endourological management of nephrolithiasis exist, there is no standard of care or guideline in terms of how to manage patients with bilateral nephrolithiasis. [7]

Aims of the study

is to evaluate the impact of SBPCNL on complication rate and stone-free status

Patients and methods

During the period from December 2021 to October 2023, 116 patients with bilateral renal stones were selected to undergo PCNL and were prospectively followed up. An informed consent was signed by all patients. Preoperative urinary tract infections were treated with culture-specific antibiotics.

These patients were randomly divided into two groups

- **Group A:** Tubeless SBPCNL was done.
- **Group B** staged tubeless PCNL was done.

Pre-operative exclusion criteria were patients who presented with pyonephrosis or, if discovered after renal puncture during the procedure, congenital renal anomalies, elevated serum creatinine (>2 mg/dl), uncorrected coagulopathies, Hemoglobin <10gm/dL, body mass index (>35kg/m2) and pediatric patients (age \15 years).

Technique of PCNL

Under the effect of general anesthesia, placement of a ureteral catheter was done, and percutaneous renal access was performed using C-arm fluoroscopic guidance.

All planned tracts placed to the desired calices and guidewires were fixed prior to the dilatation of any tract. Dilation was performed using a single-step Amplatz dilator to 30 French (F). The nephroscope passed through an Amplatz sheath. Pneumatic lithotripters are used for stone fragmentation.

Intraoperative fluoroscopy is used for the detection of residual stones. Flexible nephroscopy is used to retrieve calyceal stones away from the tract and to confirm stone-free status. A 6 f JJ stent was placed under fluoroscope control.

For group B patients, the second session was performed after one month.

Post-operative analgesic medication was nefopam 20 mg and paracetamol 1 gm every 8 hours. All patients were discharged after 24 hours unless they develop complications; in such cases, they were kept in the hospital for an extra day.

The groups were compared for stone-free status, operative times, post-operative hematocrit drop, creatinine level rise, need for additional analgesia, and any other postoperative events.

Statistical analysis

Statistical analysis was done using Statistical Package for Social Sciences, version 26 (SPSS). Categorical variables were compared using the Chi-square test, and continuous variables were compared using a t-test. P value<0.05 was considered statistically significant.

Results

One hundred sixteen patients with bilateral renal stones were selected for this study. They were divided into two groups: group A (62 patients), who underwent tubeless BSPCNL, and group B (54 patients), who underwent staged tubeless PCNL. Male and female distribution among the groups is shown in table (1).

The mean age in group A patients was 36.03 ± 8.14 years, while group B was 40 ± 7.6. (Table 2)

The mean stone burden for group A patients was 31.48 ± 3.84 mm, while it was 35.2 ± 6.2 for group B patients, and it was statistically significant. (Table 2)

Table 1 Gender distribution among study groups

	Male	Female	Total
BSPCNL	37	25	62
Staged PCNL	28	26	54
Total	65	51	116

Table 2 Mean stone burden among study groups

	Age	Stone burden	P value
BSPCNL	36.03 ± 8.14	31.48 ± 3.84	0.024
Staged PCNL	40 ± 7.6	35.2 ± 6.2	0.003*

Table 3 demonstrates stone-free status and complication rates for both groups. Regarding operative time, group A patients showed higher operative times (77.12 (±19.9)) compared to group B patients (59.72 (±19.8)), and it was statistically significant (P<0.00001).

In regard to pain management, group A patients required more analgesic medications (17.75%) than group B patients (5.55%). This difference was statistically significant (P<0.04).

The stone-free rate, hematocrit drop, infection rate, and creatinine level rise showed comparable results between groups and, as shown in Table 3.

Table 3 Stone-free status and complication rates

	Group	No.	Mean	St.deviation	P-value
Stone free	BSPCNL	Free 59 (95.2%) Residual 3 (4.8%)			
	Staged PCNL	Free 53 (98.1%) Residual 1(1.9%)			
Hematocrit drop	BSPCNL		0.75 (±0.46)		0.28
	Staged PCNL		0.66 (±0.3)		
Operative Time	BSPCNL		77.12 (±19.9)		0.0001*
	Staged PCNL		59.72 (±19.8)		
Creatinine	BSPCNL		0.176 (±0.09)		0.134
	Staged PCNL		0.152 (±0.05)		
	BSPCNL	Yes 7 (11.1%)			

Infection		No 55 (87.3%)			0.2
	Staged PCNL	Yes 3 (5.6%) No 51 (94.4%)			
Need extra analgesia	BSPCNL	Yes 11 (17.75%) No 51 (82.25%)			0.04*
	Staged PCNL	Yes 3(5.55%) No 51 (94.45%)			

Discussion

Surgeon experience, hospital facilities, and overall patient condition are key factors when facing cases of bilateral renal stones, which are amenable for PCNL as a treatment option. However, many urologists will prefer staged procedures rather than single-session bilateral PCNL to minimize risks and decreasing operative times.

In this study, the mean stone burden for group A patients was (31.48 ± 3.84 mm) while it was (35.2 ± 6.2 mm) for group B patients, and it was statistically significant. These results are comparable to those published by Fabio while they were different from those published by Elsheemy *et al* [8]. This may be attributed to the fact that a higher stone burden will drive the surgeon to staged PCNL rather than a single session, fearing from complications arising from the large stone burden.

In the present study, we found that group B patients have statistically higher mean age (40±7.6) than those of group A patients (36.03±8.14). These results are similar to those reported by Elsheemy *et al.* [8]. This is mainly explained that the higher the age of the patient, the higher the tendency to staged procedures to minimize risks of the procedure in elderly patients.

In the current study, group A patients showed higher operative times (77.12 (±19.9)) compared to group B patients (59.72 (±19.8)), and it was statistically significant (P<0.00001). These results are comparable to those published by Torricelli *et al.* [9](172 vs. 126 min), Elsheemy *et al.* [8](126 vs. 84), and Holman *et al.* [10](45 vs. 37 min). However, these results are different from those published by Silverstein *et al* [11] (83 vs 168 min).

In regard to pain management, we noticed that group A patients required more analgesic medications (17.75%) than group B patients (5.55%). This difference was statistically significant (P<0.04).

In this study, we found that the stone-free rate was comparable between groups (95.2% for group A and 98.1% for group B). These results are comparable to those of Elsheemy *et al.* [8] (90% vs. 92%), Pillai *et al.* [12] 2013 (95%), and Dushinski *et al.* [13] (96% stone-free), while it was different from those results reported by Torricelli *et al.* [9] (43% vs. 69%), Silverstein *et al* [11] (40% vs 36%) Proietti *et al* [7] (26% to 100%).

Regarding hematocrit drop and creatinine rise, we found no statistical difference between groups. These results are similar to those published by Fabio and different from those published by Elsheemy *et al.* [8].

Regarding postoperative infection, there was no statistical difference between the study groups. These are comparable results with those published by Torricelli *et al.* [9].

The observed findings are the result of improved scope, setting, experience, and imaging that provided us with a better stone-free rate and less complications.

Conclusion

SBPCNL is a safe procedure, showing a comparable stone-free rate to a staged procedure as well as a comparable complication rate. However, SBPCNL showed statistically significant higher operative time and use of extra analgesia when compared to staged PCNL.

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