

Percutaneous Nephrolithotomy

Mohammed Abdulla Rafie, MD, CABS(Uro) FEBU*

Akbar A. Jalal, MBBS, CABS(Uro)**

Hasan Khudhur, MBBS***

ABSTRACT

Objective: To study the outcome of Percutaneous Nephrolithotomy (PCNL) procedures for renal stone management.

Setting: Urology Unit, Salmaniya Medical Complex, Bahrain.

Design: Retrospective Study.

Method: Twenty-five patients who had PCNL from January 2011 to April 2013 were reviewed.

Result: Twenty-five patients were reviewed. Only one case had failed access. The majority of our patients were of young age group, a mean age of 39 years. Fifteen (60%) patients were diagnosed to have renal stone by the combination of KUB and IVP; most of the stone sizes were >2 cm, 21(87.5%). The overall stone clearance rate was 19 (76%) and the overall complications rate reported was 5 (20%).

Conclusion: This revealed good success rate and minimal acceptable complications. Based on our early experience, it is believed that the general experience of PCNL in SMC is adequate and should be considered as the first line of treatment for indicated renal stones.

* Consultant Urologist

** Specialist Urologist

*** Senior Resident Urologist

Department of Surgery

Salmaniya Medical Complex

Kingdom of Bahrain

drakbarjalal@gmail.com

INTRODUCTION

Renal stone could be a major health problem in some regions because of the size and recurrence^{1,2}. Overall global prevalence of nephrolithiasis was 3.25% in the 1980s and 5.64 in the 1990s. In the United States, overall incidence increased during 1971 to 1978 and the rates among men are increasing compared to women^{1,2}.

The aim of stone treatment is to be less invasive and effective. The management of stone disease has evolved since the introduction of extracorporeal shock wave lithotripsy (ESWL) and percutaneous nephrolithotomy (PCNL)³.

Kidney percutaneous procedure access was first described in 1955. In 1973, the percutaneous access was used to remove kidney stones⁴. The improvements in the nephroscopes and the availability of new sets for stone disintegration techniques have paved the way to PCNL⁵.

The current management of large upper renal tract stones is evolving and PCNL is now considered an established technique as the first-line treatment for the removal of symptomatic large and complex kidney stones. Open stone surgery is now almost never used^{3,6,7}.

The clinical research office of endourological society (PCNL study group) has agreed that the most important outcome is stone clearance rate, but currently there is no standardized method of reporting stone clearance rate. Several studies of staghorn stones treatment concluded that the PCNL is safe and a feasible method of treatment and with minimal complication^{6,8}.

The aim of this study is to study the outcome of Percutaneous Nephrolithotomy procedures for renal stone management.

METHOD

From January 2011 to April 2013, 25 patients with renal stone disease had PCNL procedures performed by a single surgeon in SMC. The patients were reviewed for age, sex, investigations, morphology, stone site, stone number, preoperative stone size, postoperative stone size, stone position, staghorn stones, preoperative antibiotic use, surgical approach, operative length, abandon procedure, postoperative complications, hospital stay and adjuvant therapy.

Data were entered and analyzed through SPSS version 17.

RESULT

The majority of patients were >30 years of age, with the mean age of 39. Sixteen (64%) were males and 9 (36%) were females, see table 1.

Table 1: Personal Characteristic of Patients

Variables	Number & percentage
Total Patients	25
Sex	
Male	16 (64%)
Female	9 (36%)
Age (mean)	(39 yrs)
Hospital stay (mean) days	3-15 (6)
Operative time (mean) minutes	30 – 195 (118)

Fifteen (60%) patients were diagnosed for renal stone by the combination of KUB and IVP. Ultrasound was performed in 5 (20%) as initial diagnostic tool for renal colic and renal stone disease. KUB and non-contrast CT scan was performed in 3 (12%) cases. Renogram was done for two (8%) patients to confirm the renal function prior to PCNL.

The stones were defined according to the size: large (>2cm) and small (<2cm). Twenty-two (88%) were >2cm and 3 (12.5%) were <2cm. Out of the 22 patients with large stones (>2cm), 8 were staghorn stones and 14 were non-staghorn. Single stone found in 15 (60%) compared to multiple stones in 10 (40%). Eighteen patients (72%) had right side renal stones, 5 (20%) had left side stones and 2 (8%) had bilateral stones. Out of these cases one patient had horseshoe kidney and another had duplex system.

Twelve (48%) stones were in the renal pelvis, 8 (32%) were in the lower calyx and 5 (20%) were of mixed combination; one patient had stone in a calyceal diverticulum, see table 2.

Table 2: Stone Position and Characteristics

Stone position & character	Number & Percentage
Location	
Left	5 (20%)
Right	18 (72%)
Bilateral	2 (8%)
Size	
Large (> 2cm)	22 (88%)
Staghorn	8
Non-staghorn	14
Small (< 2cm)	3 (12%)
Single Stone	15 (60%)
Multiple Stone	10 (40%)
Stone Position	
Pelvic	12 (48%)
Lower Calyx	8 (32%)
Mixed / Combination	5 (20%)

The oblique subcostal approach was the main access being performed. The specialty of person placing the tract was not recorded because in our practice the urologist performs all his own punctures. One procedure was abandoned due to failed access.

Overall complete stone clearance on first post-operative day was achieved in 19 (76%). The complete clearance for non-staghorn stones greater than 2 cm was achieved in 12 (48%). Staghorn calculi complete clearance was achieved in 4 (16%) cases. Complete clearance for stones <2 cm was achieved, see table 3.

Table 3: Stone Clearance Rate on First Postoperative Day

Stone Clearance Rate	Clearance Rate %
Overall clearance rate	76%
Non-staghorn stones >2 cm	48%
Staghorn calculi	16%
Stones <2 cm	100%

Five patients out of the 25 had not cleared their stone. One patient was advised repeat PCNL, but he lost follow up and the remaining 4 patients underwent adjuvant therapy. Three patients (12%) underwent extra corporeal shock wave lithotripsy (ESWL) and ureteroscopy in 1 (4%) patient.

Prophylactic antibiotics were given in almost all cases for one day pre-operatively; mid-stream urine MSU was done pre-operatively for all patients, the incidence of postoperative fever was noted in 15% but no sepsis.

Two patients had intravenous antibiotics for ten days due to urinary tract infection with extended spectrum Beta Lactamase. One (4%) patient required post-operative transfusion.

The overall complication rate was 19%; however, there were no fatal or life-threatening complications.

DISCUSSION

The management of large upper renal tract stones is evolving. In mid 1980s, less invasive treatment such as ESWL, URS and PCNL began to replace open surgery. Each has a role depending on several factors such as stone features, renal anatomy and patient characteristics. Improvement of endourologic instruments and lithotripsy devices has yielded greater success and lower complications rates for percutaneous renal surgery⁷.

Our results show that IVP and ultrasound were the two most common pre-operative investigations after plain X-ray KUB. Helical CT has replaced the traditional radiological investigation in kidney stone disease⁸. Most stones resided in the lower calyx or PUJ or both (80%) similar to the result found in other study⁹.

All renal access for PCNL was performed by the urologist; other studies showed that radiologist performed 62%^{10,11}. In a study, only 11% of urologist performed PCNL because of the lack of training and comfort level^{10,11}. Our data would appear to support the current view in the literature that urologists can safely perform their own renal access^{10,11}.

A nephrostomy was used for post-operative drainage in all cases. Others studies have concluded that postoperative tube placement is associated with less postoperative discomfort, less analgesic requirement and shorter hospital stay¹². Other studies of nephrostomy-free PCNL have shown no evidence of an increase in major or minor complications¹².

In our study the overall stone-free rate was 79.16%. This may be related to majority of our sample stone size which was more than 2 cm; our rate is higher than Maghraby et al and Singla et al after a single session (70%)^{13,14}. In 1989, McDougal et al were the first to compare the outcome of PCNL with ESWL for lower calyx calculi; they found that PCNL was associated with higher stone-free rates than ESWL (86.2 % vs. 54.3%)¹⁵.

The mean operative time in our study was 118 minutes which is shorter than that reported by Kurtulus et al, 2.3 and 2.2 hours¹⁶.

In our study the overall complication rate was 19%. Singla et al reported the occurrence of hydrothorax in 7 patients and hemothorax in one¹⁷. Using the lower pole subcostal oblique approach for access, we believe that most of the significant complications could be avoided.

Because of the small number of procedures performed in our study, no firm conclusion can be made from the complication rate which could be encountered in large series¹⁸⁻²¹.

CONCLUSION

Based on our study, it is believed that the general experience of PCNL in SMC is adequate; the success rate is 79.16% with minimal acceptable complications.

It is recommended that the patients should be informed about the available modalities of treatment, their efficacy and safety.

It is recommended as well to evaluate the current practice and outcome by applying the PCNL data registry for auditing purposes.

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