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Outcome and Complications of PCNL –A Single Centre experience

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Abstract
Introduction: *Kidney stones are a common problem affecting all population groups across the globe. Percutaneous extraction of renal stone has become a standard well-established procedure for the management of renal stones.*
Materials and methods: *A total of 105 cases of renal calculi who underwent PCNL from August 1, 2016 to November 30,2017 were studied. Intraoperative findings and immediate postoperative complications were noted. They were followed up for 1 month after the surgical procedure.*

Results: *Mean age of cases was 42.5 years. Multiple calculi were seen in 15.24%, while a staghorn calculus was seen in 9.5%. Stone clearance was done through a single tract in 85.71%. Additional tracts were made in 14.29%. Tubeless PCNL was done in 4.5%; 6.6% of the cases had urinary tract infection.*
Conclusion: *This study reveals that PCNL is a safe procedure with less complications and higher stone-free rates without compromising patient safety in a short period.*
Keywords: *Minimally invasive, Nephroscopy, Percutaneous nephrolithotomy, Renal calculi.*

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I. Introduction

Minimally invasive treatment options for treatment of kidney stones have evolved over the last several decades. Once the patient has history of urolithiasis, the risk of recurrence is 50% in next 5 years. The objective of stone clearance is to relieve obstruction, prevent further stone growth and any associated infection and preserve kidney function. Previously the surgical options to the urologist for treatment of larger renal calculi were limited to open surgical techniques, with their inherent disadvantages of prolonged morbidity. (1) PCNL provides stone-free rates between 76 and 84%.If not performed well, it can be associated with significant complications.This study evaluates the role of PCNL in the management of renal calculi in our setup with respect to efficacy and attending complications.

II. Materials And Methods

Prospective study of 105 patients of renal calculi, who underwent PCNL in our institution from August 1, 2016 to november 30, 2017, was carried out. Each patient's medical chart was reviewed to ascertain the history, examination findings, X-ray and ultrasonography of kidney, ureter, bladder (KUB), intravenous urography (IVU), and computed tomography (CT) KUB (plain or contrast). All patients were subjected to Prone PCNL under strict aseptic measures.Intraoperative findings and immediate postoperative complications were noted. Success rate was defined as patients who were stone-free or who were having clinically insignificant residual fragments (CIRF). The cut-off point of 4 mm was used to define the size of CIRF. Patients were reviewed 1 month following the surgical procedure with X-ray and ultrasonography of KUB, and requirement of any additional procedure was noted. The DJ stent was removed after 3 weeks if no stone was visible.

The data were analyzed statistically using Statistical Package for the Social Sciences statistical software (version 22.0.0) and primer. All the outcome variables, i.e., quantitative data, were summarized in the form of mean ± standard deviation.

III. Results

Figure-1 Sex ratio

Figure-2 Sidewise distribution

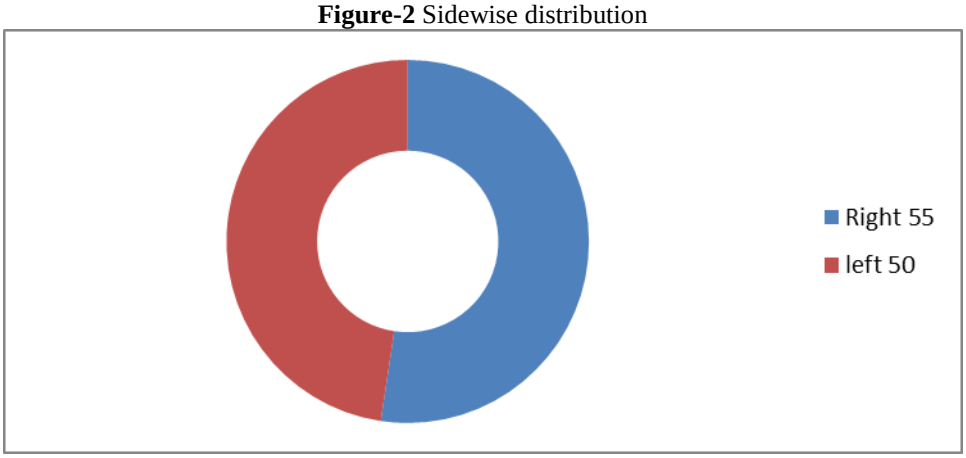

Figure-3- Stone position in the PCS

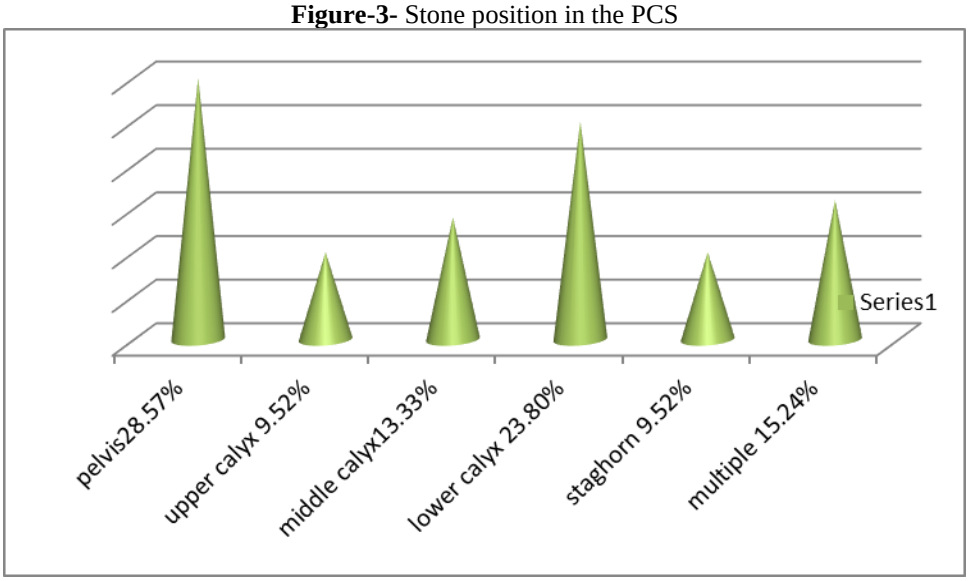

Figure-4 Number of tracts

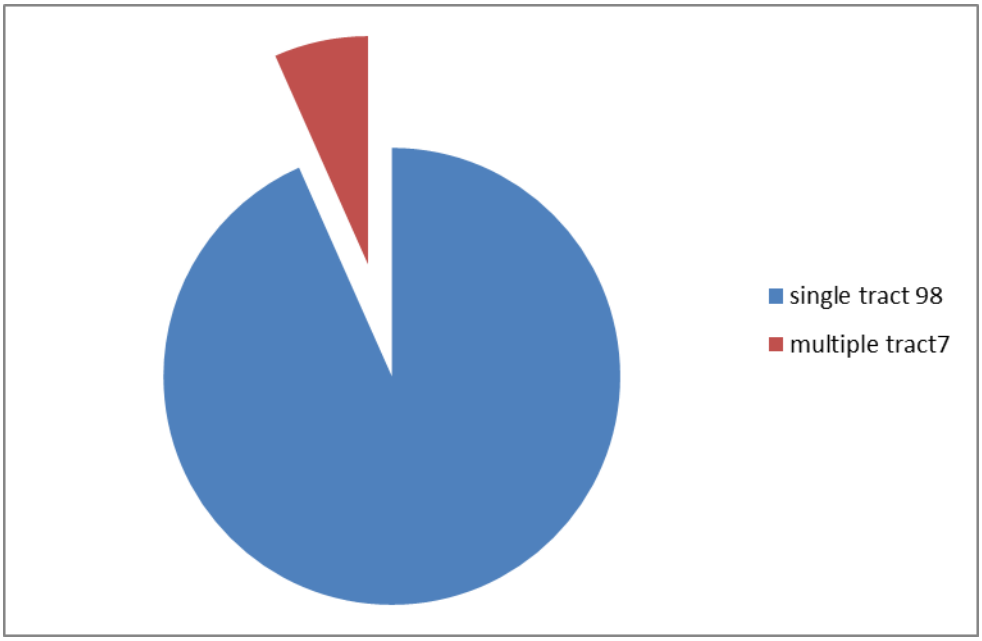

Table-1 Post operative complications

Complications	*Frequency*	*percentage*
Nausea	15	14
Vomiting	10	9.5
Fever	23	21.9
TUR syndrome	0	0
Urinary tract infection	7	6.6
Hemorrhage	4	3.8
Sepsis	0	0
Pulmonary complications	0	0
Urinary leak	0	0

Table-2 Outcome of surgery

Procedures	*Frequency*	*Percent*
Stone free (SF)	90	*85.71*
Retained stone	15	14.29

Mean age of cases considered for the study purposes was 42.5 years, with males comprising 62.9% and females 37.1%. Right side involvement was seen in 55(52.38%) and left 50 (47.62%) cases. 28.57% had pelvic calculi,upper ,middle,lower calyceal stones are 9.52%,13.33%,23.80% A staghorn calculus was seen in 9.5%,multiple calculus15.24%.Stone clearance was done through a single tract in 85.71%. Additional tracts were made in 14.29%. Average operative time required for PCNL was 1-2 hours with a mean of 1 hour 40 minutes. Tubeless PCNL was done in 4.5%, 21.9% had postoperative fever, and 6.6% developed urinary tract infection (UTI). Hemorrhage occurred in 3.8%. no sepsis or pulmonary complicationor Urinary leak occured in any patient .90 cases were stone free with overall success rate of 85.71%. Residual stones were seen in 14.29% .These patients were managed with additional procedures in the form of extracorporeal shock-wave lithotripsy (n = 11),relook pcnl (n = 4).

IV. Discussion

Mean age of cases was 42.5 years. Sohail et al did a study in September 2015 and found that most of the cases were around 40 years age group (2). More number of cases were males (62.9%) than females (37.1%). Khan et al did a study in 2005 and found that, out of 200 patients, 110 (55%) had right-sided stone and 90 (45%) had left- sided stone. Multiple calculi were seen in 43.9%, while another 11.2% had pelvic calculi. A staghorn calculus was seen in 16.8% cases.

In most of the cases kidney is approached through a subcostal access. However, in the presence of staghorn calculi or complex stones, supracostal access is preferable. Supracostal access offers optimal control and manipulation of stones in the mid and lower calyx (3). Subcostal access was chosen in 95.24%%, while supracostal access was preferred in 4.76% for the complete stone clearance. Stone clearance was done in maximum number of cases through a single tract (93.33). Additional tracts were made in an attempt to clear the stones in 6.67%. Hegarty and Desai in their study concluded that monotherapy with PCNL utilizing multiple percutaneous tracts is highly effective in the treatment of staghorn calculus and other large- volume renal calculi (4). It was found that average operative time required for PCNL was 60to 120 minutes with a mean of 100 minutes, while the nephroscopy time on an average was 35 minutes. It seems that staghorn and multiple calculi required significantly more time than other calculi with p-value <0.05.

Nephrostomy tube was inserted in 95.5% of the cases,while tubeless PCNL was done in 4.5%. Tubeless PCNL was associated with less postoperative pain and a shorter hospital stay. Also, tubeless PCNL can be safely done in patients.

The main complications of PCNL are residual calculi,bleeding. Infectious complications related to PCNL are reported in up to 21.9%. In most of the cases, it is limited to postoperative fever, despite antimicrobial prophylaxis, and it usually resolves with continuing antibiotics for 48 hours. Although rare postoperative septicemia or severe sepsis can induce life-threatening situations, reported other studies but our study no such cases reported (5).

Hemorrhage was seen in 3.8% of our cases which was managed conservatively.no pleural complications reported our study, which occurred in 4.6% of patients in Gupta et al (6) reported Others have reported the incidence of hydrothorax to be 0 to 12%. Pleural injury can be avoided by staying above the lateral half of the 12th rib. No Urinary leak was noted. Ali et al reported the incidence of urinary leakage in 8.57% of the patients (7)

Traditionally, post- PCNL radiographic imaging studies have been used to detect residual fragments (RF). The method for detecting RF in our study was a combination of ultrasonography KUB and plain radiography KUB. Most of the authors use sonography or KUB (sensitivity for RF: 47%), and only a few use CT as the most sensitive tool (8). Both success rate and complication rate are important for determination of the surgical outcome of PCNL. Success rate is defined as sum of CIRF and stone-free rates, where 80.71% of the cases were stone free, while only 5.71% had CIRF. The overall success rate was 85.71%. We attribute our high success rate to a well-organized team, where the anesthetist is prepared to deal with possible lengthy surgery and bleeding complications if any and the working staff are well trained with the equipment.

Residual stone was seen in 14.29%. It was also noted that maximum residual stones were seen in cases having staghorn calculus and multiple calculi with a significant p-value (<0.005). Findings of the study were comparable to the study of Gupta et al where the stone clearance was 75%. Aron et al in 2004 found that stone clearance was seen in 72% patients (9). It was observed that as the size of the stone increases, and as the complexity of the situation increases, the stone-free rate decreases Residual stone of varying size was seen in 15 (14.29%) cases. Re-PCNL was required in 4 patient and ESWL was given to 11(7.33%) patients. In this study, most patients who required additional postoperative procedures had staghorn or multiple calculi. Farhan et al in their study found that among patients with residual stones, six (29%) had additional treatments, with shock-wave lithotripsy in four and semi-rigid ureteroscopy and JJ stenting in one each. Average hospital stay was 10 days. Wickham et al did a study on elective PCNL in 50 patients and found that the stone-free rate was 71% with the average hospital stay of 8.3 days (10).

V. Conclusion

The findings of the study reveal that PCNL as first-line treatment modality for the management of the renal calculi offers the advantage of minimally invasive therapy with lower morbidity, shorter hospital stay, and higher stone-free rates without compromising patient safety. Data also suggest that the tubeless PCNL has better outcome. Advancements in technology, training, learning, experience of the urologist and availability of good, well-maintained instruments are critical in improving the success rate of PCNL.

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