



Urology

MAJOR AND MINOR PCNL COMPLICATIONS AND THEIR MANAGEMENT : A SINGLE CENTRE EXPERIENCE

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ABSTRACT **Objective:** The prone position for percutaneous nephrolithotomy (PCNL) has been widely practiced. There has been a trend from the prone position to the supine, and it showed benefits. The aim of our study is to find out major and minor PCNL complications and their management. **Material And Methods:** We retrospectively reviewed the data of 400 patients who underwent supine PCNL at the center during the period of 6 years from January 2014 to December 2019. The data collection was done. Preoperatively, a complete examination of the patients with laboratory investigations were done. The modified Clavien classification system was applied to classify the complications of PCNL. **Results:** A total of 202 solitary stones with a mean size of 17.19 ± 5.82 mm, 100 stones in multiple calices, and 98 staghorns were treated. The mean operative time was 69.79 ± 30.92 minutes. A total of 310/400 patients had clearance or <2 mm stone on postoperative CT. Minor complications (Clavien-Dindo Classification [CDC] 1-2) occurred in 110 cases, and major complications (CDC ≥ 3) occurred in 40 cases. 7 cases required postoperative blood transfusion for bleeding complications. **Conclusion:** In our early preliminary experience, supine PCNL is an effective and safe treatment option with acceptable complications. With the improvements in the modalities, these complication rates can be reduced with an increase in the stone-free rate.

KEYWORDS : complications; nephrolithiasis; outcome; percutaneous nephrolithotomy; supine.

INTRODUCTION

Percutaneous Nephrolithotomy (PCNL) is the most recommended treatment for large kidney stones and is considered the "Gold Standard." [1] It is mostly done in the prone position. The first percutaneous renal puncture was performed in 1954 by a radiologist in a hydronephrotic kidney to do an antegrade pyelogram. [2] PCNL in the prone position was first reported in 1976. [3] Initially, it was done in the prone position because of the urologists' fear of injury to the colon during the procedure. [4,5] However, with the availability of better imaging, the delineation of interposed organs between the skin and the kidney became much easier. [2] As computed tomography (CT) became more commonly available for preoperative assessment; it became evident that the chances of retrorenal colon are lower in the supine than in the prone position. PCNL in the supine position was first reported in 1987-1988 by Valdivia. [4] Supine PCNL showed advantages of fewer complications and higher success rates. Supine PCNL was later considered a better option after the Galdakao modified

technique in 2007. [5] The supine position provides some edge over prone PCNL when it comes to anaesthesiologic management because of better cardiovascular and airway control, especially in emergency scenarios. [5, 7] In addition to these, there are fewer chances of injury to the backbone and a lower risk of thromboembolism by reason of the lack of inferior vena cava compression [8,9] In this study, we present a single Hospital's early experience for adopting supine position PCNL in its first 400 patients.

Method.

It is a preliminary retrospective study of 400 supine PCNL procedures, performed by urologists over 6 years, from January 2014 to December 2019. This study encompassed all patients aged ≥ 18 years to 70 years at our hospital who received surgical treatment for renal stones by PCNL (percutaneous nephrolithotomy). study purpose was to assess initial outcomes of performing supine PCNL at our department. These outcomes were assessed in terms of operative time, hospital stay, stone

clearance, and post-operative complications (e.g., vomiting, fever, sepsis), need for blood transfusion, perinephric collection, and extra need for administering pain killers.

Ethical Approval: The study was approved by our institution's ethical committee.

Inclusion & Exclusion Criteria:

Inclusion Criteria: All patients who underwent PCNL from January 2014 to November 2019 at Al-Khor Hospital and proven to have renal or upper ureteric stones on investigations.

Exclusion Criteria: Bleeding diathesis, severe skeletal malformation, and arterial aneurysm in the vicinity of stone.

Prior to the supine PCNL, patients were counseled regarding the procedure and the possible outcomes, and informed consent was then taken. They underwent essential preoperative assessment, including complete hematological analysis, renal function tests, a KUB radiograph, serum biochemistry, coagulation profiles, and urine cultures. Stone's location and size were assessed by non-contrast computed tomography (CT). Stone complexity was estimated by utilization of Guy's stone score. [8] Data was recorded in proformas, including Perioperative data included variables such as puncture and tract entry site, mean operative time and perioperative complications, and need for a nephrostomy tube after the procedure and need for analgesics. Stone-free status was checked on KUB radiograph and KUB ultrasound at three months post-operatively. Complications were documented in line with the modified Clavien-Dindo classification system. [9] Procedure technique: All procedures were done under general or epidural anesthesia. The anatomical safety landmarks were marked in neutral supine position, i.e., posterior axillary line, lowest rib and iliac crest. Patients were positioned in the cystoscopy position, and the ipsilateral ureteric orifice was catheterized, and a retrograde contrast study was done to plan appropriate renal calyx access. Ureteric catheter was fixed with a Foley's catheter, placed in the urinary bladder. We used Giusti's position [6] with the whole body slightly rotated 15 to 20 degrees towards the opposite side and this position was maintained by a folded cloth sheet placed under the scapula and buttocks. The patient's body was positioned about six centimeters from the edge of the table to avoid the table's metal items interfering with C-arm fluoroscopy. The ipsilateral arm was rotated over the chest to the opposite side. The ipsilateral leg was kept in a straight position while the opposite leg is placed in a cystoscopy position. This position allows simultaneous retrograde endourology procedures, if required. We used fluoroscopy in all cases to access the appropriate calyx. Access needle was passed posterior to the posterior axillary line, nearly parallel to the floor. Hydrophilic guide wire 0.035 inches was passed, preferably into the ureter and bladder. Tract was dilated using telescopic metallic dilators set, and a 26Fr or 30Fr Amplatz sheath was positioned. Pneumatic lithotripsy and fragments were removed. Supine position helped for spontaneous passage of smaller stone fragments. Finally, antegrade JJ Stent was passed over the existing hydrophilic guide wire under fluoroscopic control. A few patients required Nephrostomy tubes.

RESULTS

Patients ages ranged from 19 to 76 years (mean 33 years), comprising of 80% male and 20% female patients. 150 patients had their stones treated on the left side. Most of the patients were slightly overweight. Stone size 3.19±2.29 as shown in (Table-I). Patients with congenital renal abnormalities were excluded from this study. Most of the stones were GUY's score one and two (complexity wise), as can be seen. The procedure time ranged from 95 to 210 minutes (mean 147minutes) Table II. A mean hospital stay of 2.85 days was observed in this study. 10 patients required up to two units of packed RBCs as their Hemoglobin dropped below 9.0 gram/dl. 10 patient required Tranexamic acid postoperatively for persistent visible hematuria. 74.5% patients were stone-free. Residual stones of more than 4 mm size were seen in 26.5% patients, which could have been prevented by using Flexible cystoscopy during the procedure, if available. Ancillary procedures, including shock wave lithotripsy and flexible ureteroscopy laser stone procedures, were needed in thirty and twenty-nine patients, respectively. 151 patients had level I-II complications (Clavien-Dindo classification) (Table-III). The mean follow-up was three months (range 2–6 months). JJ Stent was passed in all patients, and 10 had nephrostomy tubes. JJ Stent was removed 4–6 weeks post PCNL.

DISCUSSION

Supine PCNL contributes to about 20% of all PCNL worldwide. [10] Supine PCNL has a short learning curve for an experienced endourologist. [10,11] Both prone and supine PCNL have comparable total operating time, complications, and stone-free rate. [10-12] Surgeon can sit comfortably during PCNL in supine position. Supine PCNL also reduces radiation exposure to Surgeon's hand compared to PCNL in prone position. Supine PCNL has low risk of injury to the colon. [13] Supine PCNL generates low intrarenal pressure and easy gravity retrieval of stone fragments with lesser risk of infection. [12] It is a very safe and convenient position from an anesthesia point of view, with less fluid absorption in patients with compromised cardiovascular status. [13] It improves ventilation in obese, overweight patients. [14] Unlike prone PCNL, it also provides a very convenient access to simultaneous performance of other transurethral endourology procedures, like retrograde intra renal surgery (RIRS), etc. [15] However, a big drawback in supine PCNL is increased mobility of the kidney, especially in low-body-weight patients, in whom kidney is not fixed by the patient's weight, as in prone PCNL. Supine PCNL may require a longer percutaneous tract, especially in obese patients requiring a longer length Amplatz sheath and rigid nephroscope. [16]

In a study by Ferreira et al. it was noted that during supine PCNL, only one thin (nonobese) patient (0.2%) encountered a colon perforation, which was diagnosed intraoperatively and was subjected to conservative management by utilizing separate drainage of the urinary and gastrointestinal tracts with sufficiently good outcomes. Apart from this, they also encountered trans splenic puncture (0.2%) in one patient, which they satisfactorily managed by keeping patient on bed rest and a nephrostomy tube for seven days to help tamponade the punctured site. Pelvicalyceal injury was seen in their patients in 5.2% cases. [17] They reported two deaths because of sepsis. In our study, 10 patients (Table-III) required up to two units of packed RBCs as their Hemoglobin dropped below 9.0 gram/dl. One patient (2%) required Tranexamic acid postoperatively for persistent visible hematuria. Complications such as bowel injury and septic shock were seen in 01 and 10 patients, respectively. This careful and less complex cases of stones in our study may be the factor for lower rate of complications. In a study by Jamil MN et al., they attained stone clearance rate of 87% in supine position and 89% in the prone positioning group. They did not categorize stone complexity as we did according to Guys Stone Score, but we may safely assume that probably we had initial experience of supine PCNL in this study and may be in future our results become much better. They observed transfusion in 3.56%, while in our study, 10 patients received transfusion. It is comparable to their results, keeping in view our initial experience. In a study done by Choudhury S et al., the mean post operative hospital stay was 4.1 days, while in present series it was 2.89±0.89 days. Reporting complications according to standard classifications is a better way to gauge results of any center. Recent studies have depicted that supine percutaneous nephrolithotomy is an efficacious option for renal stone treatment. It can be performed with a lower number of complications, especially if it is in experienced hands. [22]

Limitations And Strengths:

It was a retrospective single-center study with a smaller sample size. More studies are required in the future pertaining to the initial outcomes and learning difficulties in undertaking supine position PCNL at new centers. There is no study in Qatar to the best of our knowledge that addresses the learning curve of supine PCNL in an established hospital. This paper will help other centers regarding how the initial outcomes can be and how to proceed safely to progress the learning skills smoothly. We have graded complications in the standard Clavien-Dindo classification of surgical complications. In addition to treatment success, the numbers and severity of complications can be used as good indicators of competence.

CONCLUSION

In our early preliminary experience, supine PCNL is an effective and safe treatment option with acceptable complications. With the improvements in the modalities, these complication rates can be reduced with an increase in the stone-free rate.

Declaration

Financing. The study was not sponsored.

Conflict of interest. The authors declare no conflicts of interest.

Ethical approval. The study was approved by the MRC.

Authors' contribution:

KHB, JA, AH. —study design development, data analysis, drafting the

manuscript.

HA, NS, AMS—study concept, scientific editing.

KHB, AS, AA—statistical data processing, drafting the manuscript.

KHB, KAR—literature review.

KHB—data acquisition, data analysis.

KAR, AS—supervision, study design development, critical review.

Table I: Demographic Variables.

Demographic Variables	Values
Number	400
Mean Age	36.19±16.38
Male	320
Female	80
Right Renal stone	250
Left Renal stone	150
Body Mass Index	29.18±6.42
Mean stone size (cm)	3.19±2.29
Guys Stone Score	
Guys Stone Score 1	250
Guys Stone Score 2	100
Guys Stone Score 3	50
Guys Stone Score 4	00

Table II: Details of Procedure Outcomes

Procedural outcomes	Values
Stone free rate	74.5%
Residual stones	26.5%
Mean Operative time	140.57±56.78 mints
Hospital stays	2.89±0.89 days
Nephrostomy	10
Double J stent	400

Table-III: Complications

Complication grade	Type Complication	Number
1	Fever	45
1	Illeus without the need NG tube	20
1	Transient hematuria	25
1	Urine leak puncture wound site and perinephric collection	15
2	Transfusion	07
2	Sepsis	05
2	Bowel injury	01
3	Renal vascular injury	05
3	Injury requiring angioembolisation	03
3	Pneumothorax	01
4	Septic Shock ICU manage	03
5	Death	00

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