

Original Article

**RETROSPECTIVE ANALYSIS COMPARING THE EFFICACY AND SURGICAL OUTCOME BETWEEN MODIFIED SUPINE PERCUTANEOUS NEPHROLITHOTOMY(PCNL) VS PRONE PERCUTANEOUS NEPHROLITHOTOMY FOR MANAGEMENT OF RENAL CALCULI.**

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**Abstract**

**Background** Retrospective analysis comparing the efficacy and surgical outcome between modified Supine PCNL and Prone PCNL in patients with renal calculi.

**Materials and Methods:** Comparison of Efficacy between modified Supine PCNL vs Prone PCNL in terms of stone free rates (SFR) and comparison of surgical outcomes between modified supine PCNL vs Prone PCNL in terms of mortality, morbidity, radiation exposure, duration of hospital stay. The study involved 100 patients who underwent percutaneous nephrolithotomy (PCNL) at our facility between April 2019 and March 2020. The patients were randomly assigned to two groups of 50, with the first group undergoing PCNL in a modified supine position and the second group undergoing prone PCNL. A comparison between the radiation exposure, operative time, puncture attempts, duration of hospital stay, stone free rates and complications were made.

**Results:** There were no differences in number of punctures, stone free or complication rates between both the groups. However, the modified supine group had lesser operative time, lower mean radiation exposure and a brief hospital stay.

**Conclusion:** Modified supine PCNL is just as safe as conventional prone PCNL, but it requires far less radiation and requires less time to complete the procedure.

**Keywords:** PCNL, Prone Position, Supine Position.

**Introduction:**

For huge and complicated renal calculi, percutaneous nephrolithotomy (PCNL) is the recommended strategy for management<sup>1</sup>. Because of the surgeon's experience, the wider surface

area for puncture, and the posterior calyceal puncture, PCNL has conventionally been done in the prone position<sup>2</sup>. However, the prone position has anaesthetic disadvantages<sup>3</sup>, especially in overweight and obese patients, or those with pulmonary complications. The modified supine position (The Galdakao-modified Valdivia position) offers several advantages<sup>4,5,6</sup> like reduced impact on the patient's circulatory and ventilatory system, easier monitoring of anaesthesia, simultaneous retrograde access, without the need to reposition and subsequent draping. The main characteristic of this position is a slight lateralization of the Valdivia supine position, with the contralateral leg flexed and the patient is placed in the flank free oblique supine modified lithotomy position<sup>7</sup>.

**Aim & Objectives:** Retrospective analysis comparing the efficacy and surgical outcome between modified Supine PCNL and Prone PCNL in patients with renal calculi. **Objective:** Comparison of efficacy between modified Supine PCNL vs Prone PCNL in terms of stone free rates (SFR) and comparison of surgical outcomes between modified supine PCNL vs Prone PCNL in terms of mortality, morbidity, radiation exposure, duration of hospital stay.

### **Material and Methods:**

Collection of retrospective data from the department of Urology, at our institute within a 1 year time period and the study group consisting of two groups with 50 patients in Modified Supine PCNL group and another 50 patients in Prone PCNL group. The study was approved by an institutional review committee and that the subjects gave informed consent. Efficacy is assessed in terms of stone free rate which is defined as presence of less than 4mm of residual stone fragment at the end of one month, which will be detected by X-ray KUB. Incidence of complications such as Extravasation, Septicaemia, Colonic injury, Pleural injury, Persistent bleeding, Pseudo –Aneurysms were studied to assess mortality and morbidity. Radiation exposure studied as the duration of exposure to C-ARM during the procedure. Duration of hospital stay is the postoperative period. Data were summarized using percentages, mean and Standard deviation. Categorical variables were analyzed using Chi-Square Test. Accuracy Analysis also done. (Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value and Likelihood Ratio). Significance was assessed at p value < 0.05. All data were entered into Excel format and Statistical analysis were done through SPSS version 16.

#### **Inclusion criteria**

- Renal stones > 1.5 cm

#### **Exclusion Criteria**

- Renal stones less than 1.5cm and additional ureteric stones

### **Results:**

The patient characteristics are tabulated in Table 1. There was no significant difference between the age and sex distribution of the patients in the two groups. Operative parameters are shown in Table 2. The modified supine group had a statistically significant (< 0.0001) shorter operating time (75.1+15.9 min) compared to the prone group (97.8+16.6 min). The modified supine group also had a shorter radiation exposure of 469.5±51.8 seconds, which was lesser than 604.5+/-91.2 seconds of the prone group and this was also statistically significant (0.0001). The modified supine group also had a statistically significant (0.0001) shorter duration of stay at the hospital, compared to the prone group (4.7+/-1.1 days vs 6.1+/-1.1days). Post-operative parameters are shown below . There were less minor complication rates in modified supine group such as

fever, hematuria, transfusion rates, nephrostomy site urine leak and urinary extravasation (Table3).

**Discussion:**

PCNL has been traditionally performed in the prone position, and still is the commonly used position. However, a number of different approaches to patient positioning for PCNL have been put into practice over the last ten years. In 1998, Valdivia was the first person to report a supine position with a 3-L saline bag beneath the flank. The Galdakao modified Valdivia position, that gave some rotation to the supine placement of the contralateral leg in flexion and the ipsilateral leg in extension, was another modification made to this position in 2006<sup>8</sup>. First described in 2008, the Bart's modified Valdivia posture results in a greater surface area for simple access by adjusting the Nephroscope<sup>9</sup>. Kumar and colleagues provided a description of "the Bart's flank-free oblique supine modified lithotomy position" in 2012<sup>10</sup>.

Less patient handling<sup>11</sup>, improved drainage of the Amplatz sheath, antegrade and retrograde approaches, the surgeon's ability to sit, ease of transitioning from spinal or regional to general anaesthesia, and increased tolerance—particularly in patients with pulmonary or cardiovascular disease—are some benefits of the supine position. Simultaneous antegrade and retrograde access<sup>11</sup> which is an advantage of the modified supine position also gives dual access to large stag horn calculi as well as ureteric calculi provides better stone clearance in a single procedure. Furthermore, this angle allows gravity to empty the fluid and any leftover stone particles when the nephroscope enters from below the posterior axillary line. The modified supine posture has a number of benefits for anesthesia<sup>12</sup>. First off, compared to lying prone, the patient's lungs are under less pressure while they are lying supine during the surgery. This lessens the challenges of providing patients with steady breathing when they are prone, especially obese patients whose abdominal constriction may result in lower venous output. In the event that reintubation is required, accessing the airway in the supine position is also quicker and simpler.

Also, the prone position is associated with increased risk of postoperative visual loss<sup>13</sup>, direct pressure injuries and peripheral nerve damage, particularly to obese patients. All of these issues are avoided with modified supine PCNL.

Our research indicates that the modified supine position requires 20 minutes or less for surgery. This is likely because the patient is not shifted, prepared, or draped once the ureteric catheter is inserted. Similar studies by Jones et al.<sup>14</sup>, Liu et al.<sup>15</sup>, show a similar result of shorter operative times with modified supine position. Our study also showed a shorter radiation exposure, with modified supine position, which suggests that the time to access and the ease of access in supine position is similar or better than that of prone Pcnl. Our study has also shown that patients with modified supine Pcnl have a shorter duration of stay at the hospital, which can probably be attributed to the lesser anesthetic morbidity and early recovery associated with supine positioning. Comparable outcomes have been found in many additional studies adopting supine Pcnl<sup>16</sup>. In our research, none of the participants had significant problems. Complications may occur during or after PCNL and may include extravasation, transfusion, and fever, with an overall complication rate of up to 26%. The rates of major complications, however, including septicemia, colonic or pleural injury and serious bleeding, have been found to vary from 2 to 4 %. The prevalence of minor complications and transfusion requirements did not differ significantly between the two groups. However, some studies have shown higher complication and

transfusion rates with supine Pcnl<sup>17,18</sup> which could be attributed to the surgeon's learning curve and the differing threshold for transfusion at various centres<sup>18</sup>. Limitations of our study include the small sample size, non-randomization of stone burden, multiple surgeons performing the procedure, and not considering the experience and learning curve of individual surgeons. Furthermore, we did not account for the hardness (composition) of the stone, its placements (renal pelvis, upper and lower calyx), or its multiplicity (single or multiple stones).

### Conclusion:

We concluded that PCNL in the modified supine position is a safe and efficient procedure, with comparable rates of stone clearance and complications to traditional prone PCNL. It also has the benefit of requiring less time in the hospital, less radiation exposure for the patient and surgeon, and a shorter surgical time.

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Table 1: BASELINE PARAMETERS AMONG THE STUDY SUBJECTS

S.NO	PARAMETERS		SUPINE PCNL (N=50)	PRONE PCNL (N=50)	p VALUE
1	AGE (Mean and S.D)		43.36(12.3)	40.32(13.8)	0.24
2	SEX	Male	39(78%)	37(74%)	0.814
		Female	11(22%)	13(26%)	
3	BMI (Mean and S.D)		24.85(2.12)	25.75(1.9)	0.029*
4	STONE SIDE	LEFT	23(46%)	27(54%)	0.549
		RIGHT	27(54%)	23(46%)	

5	STONE LOCATI ON	PELVICALYCE AL	31(62%)	35(70%)	0.69 5
		PELVIS	11(22%)	9(18%)	
		STAGHORN	8(16%)	6(12%)	

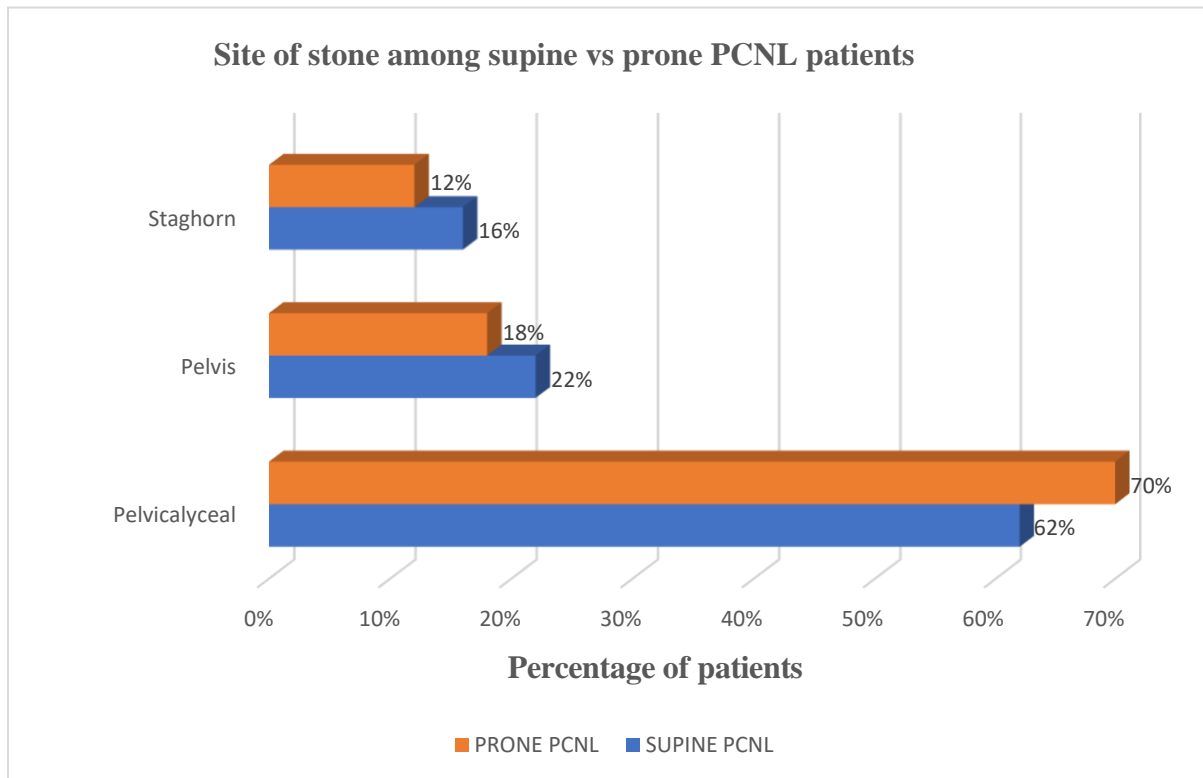


Table 2: POST – OPERATIVE PARAMETERS AMONG THE STUDY SUBJECTS

S.NO	POST – OPERATIVE PARAMETERS		SUPINE PCNL	PRONE PCNL	P VALUE
1	OPERATIVE TIME (minutes)		75.1(15.9)	97.8(16.6)	0.0001*
2	RADIATION TIME (seconds)		469.5(51.8)	604.5(91.2)	0.0001*
3	DAYS OF HOSPITAL STAY		4.7(1.1)	6.1(1.1)	0.000*
4	PUNCTURE ATTEMPTS	<3 ATTEMPTS	43(86%)	42(84%)	1.000
		>3 ATTEMPTS	7(14%)	8(16%)	
5	STONE CLEARANCE	COMPLETE	43(86%)	42(84%)	1.000
		INCOMPLETE	7(14%)	8(16%)	
6	COMPLICATION	MAJOR	1(2%)	2(4%)	0.805
		MINOR	10(20%)	11(22%)	
		NIL	39(78%)	37(74%)	
7	POST OP TRANSFUSION	YES	5(10%)	5(10%)	1.000
		NO	45(90%)	45(90%)	

TABLE 3: COMPARISON OF TYPES OF COMPLICATIONS AMONG SUPINE VS PRONE PCNL PATIENTS

S.NO	TYPES OF COMPLICATIONS	SUPINE PCNL	PRONE PCNL
1	FEVER	4(8%)	5(10%)
2	HEMATURIA	3(6%)	4(8%)
3	NEPHROSTOMY SITE URINE LEAK	1(2%)	1(2%)
4	URINARY EXTRA VASATION	2(4%)	1(2%)
5	COLON INJURY	1(2%)	0
6	PLEURAL INJURY	0	1(2%)
7	SEPTICAMIA	0	1(2%)
	TOTAL	11(22%)	13(26%)



COMPARISON OF COMPLICATIONS BETWEEN SUPINE AND PRONE

