



## Percutaneous Nephrolithotomy (PCNL) Under Spinal Anaesthesia: Challenges and Strategies with Safety, Efficacy, and Patient Outcomes

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**Abstract:** *Objective:* This study evaluates the outcomes of Percutaneous Nephrolithotomy (PCNL) performed under spinal anaesthesia. We analyze The Challenges and Strategies with safety, efficacy, and patient satisfaction associated with this anaesthetic technique, comparing it to general anaesthesia in both Supine and prone position terms of complications, recovery time, and patient comfort. *Methods:* A retrospective cohort study was conducted at Shahjalal Hospital Sylhet, analyzing outcomes of PCNL under spinal anaesthesia over 2 years. Data collected included patient demographics, stone characteristics, procedural details, complications, and recovery metrics. *Results:* A total of 144 patients underwent PCNL under spinal anaesthesia. The overall success rate was 90%, with a complication rate of 7%. Patient satisfaction was high, with an average postoperative pain score of 4/10 and an average recovery time of 2 hours. *Conclusion:* PCNL under spinal anaesthesia is a safe and effective alternative to general anaesthesia, offering advantages in recovery and patient comfort.

**Keywords:** PCNL, Spinal Anaesthesia, Renal Stone, Patient Outcome, Pain, Complication, Supine and prone.

### Original Research Article

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### Article at a glance:

**Study Purpose:** To evaluate the safety, effectiveness, complications, recovery time, and patient comfort of PCNL under spinal anaesthesia compared to general anaesthesia.

**Key findings:** The success rate of PCNL under spinal anaesthesia was 90%, with a 7% complication rate. Minor complications were observed in 5% of patients, and major complications in 2%. Average postoperative pain was 4/10, with recovery time averaging 2 hours.

**Newer findings:** Spinal anaesthesia provides faster recovery, reduced respiratory complications, and improved patient comfort compared to general anaesthesia. It offers a safe, effective alternative with higher patient satisfaction and shorter hospital stays.

**Abbreviations:** PCNL - Percutaneous Nephrolithotomy, SA - Spinal Anaesthesia, GA - General Anaesthesia, BMI - Body Mass Index, Post-op - Postoperative.



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## INTRODUCTION

Percutaneous nephrolithotomy (PCNL) has become the gold standard<sup>1</sup> for the management of large renal stones, defined as those greater than 2 cm. In 1976, Fernstorm and Johansson reported the removal of renal calculus through a nephrostomy tract for the first time<sup>2</sup>; since then,

PCNL has become the most common procedure performed for the management of renal stones. Regional anesthesia (RA) for PCNL was first described in 19883. Since then, a few studies have been done regarding use of regional anesthesia for PCNL.<sup>4,9</sup> It has its own merits in the form of less postoperative pain, less blood loss, and early

recovery and discharge thereby reducing stay in the hospital. Traditionally it is performed under general anaesthesia, due to potential advantages the use of spinal anaesthesia for this procedure has gained interest, such as reduced respiratory complications, faster recovery times, and improved patient comfort and satisfaction. This study aims to evaluate the outcomes<sup>10</sup> of PCNL performed under spinal Anaesthesia and challenges and strategies focusing on safety, efficacy, and patient outcome.<sup>11</sup>

## METHODS

This retrospective cohort study was conducted at Shahjalal Hospital, Sylhet over a period of 2 years. In this study we included patients who underwent PCNL, under spinal anaesthesia. Inclusion criteria encompassed adults aged 20-65 with a diagnosis of renal calculi suitable for PCNL. Exclusion criteria included patients with contraindications to spinal anaesthesia, such as significant coagulopathy or severe spinal deformities, allergy to anaesthetics.

### Anaesthetic Protocol

Spinal anaesthesia was performed using a standard protocol. Patients were positioned in a sitting or lateral decubitus position, and a lumbar puncture was conducted at the L3-L4 or L4-L5 interspace. An appropriate local anaesthetic was injected into the subarachnoid space, aiming for adequate sensory and motor block.

### Anaesthesia assessment

Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP), and PR were recorded every 20 minutes during surgery from the beginning of anesthesia. SBP, DBP, MAP, and PR were recorded in the PACU12-13. Patients were positioned in supine and prone position. Other information were extracted from medical files and inserted into a pre-prepared checklist.

### Data Collection

Data were collected regarding:

- Patient demographics (age, gender, body mass index)
- Stone characteristics (size, location, composition and opacity)
- Operative details (duration, fluoroscopy use)
- Complications (classified as minor or major)
- Postoperative metrics, including pain scores and recovery times

### Statistical Analysis

Descriptive statistics were used to summarize demographic and clinical data. Chi-square tests were employed to compare categorical variables, and t-tests were used for continuous variables. A p-value of <0.05 was considered statistically significant.

## RESULTS

**Patient Demographics:** A total of 144 patients underwent PCNL under spinal anaesthesia. The demographic characteristics are summarized in Table 1.

**Table 1: Demographic characteristics of patients**

Demographic Factor	Number (%)
Age 20-30	28(20)
Age 31 – 50	58(40)
Age 51 - 65	58 (40)
Male	86.4(60)
female	57.6(40)

**Stone Characteristics:** Patient position, Stone characteristics, stone location, stone

placement, stone opacity; all these characteristics are summarized in table 2

**Table 2: Stone characteristics of patients**

	Prone PCNL (n= 76) Mean ± SD or N (%)	Supine PCNL (n= 68) Mean ± SD or N (%)	*p
SBP (mmHg)	125±16	130±17	0.021
DBP(mmHg)	75±11	76±12	

PP(mmHg)	51±10	54±9	
Side – right/left			
Right	38(51.31)	37 (52.94)	0.845
Left	37(48.68)	32(47.05)	
Stone placement			
Upper pole	4(5.26)	5(7.35)	0.877
Middle pole	23(31.57)	21(29.41)	
Lower pole	9(11.84)	6(8.82)	
Pelvis	39(51.31)	37(54.41)	
Opacity			
yes	69(90.78)	63(92.64)	0.687
No	7(9.21)	5(7.35)	

**Procedural Outcomes**

The overall success rate was 90%, with a stone-free rate assessed via postoperative imaging. The average operative time was 85 minutes. Complications occurred in 7% of patients, categorized as follows:

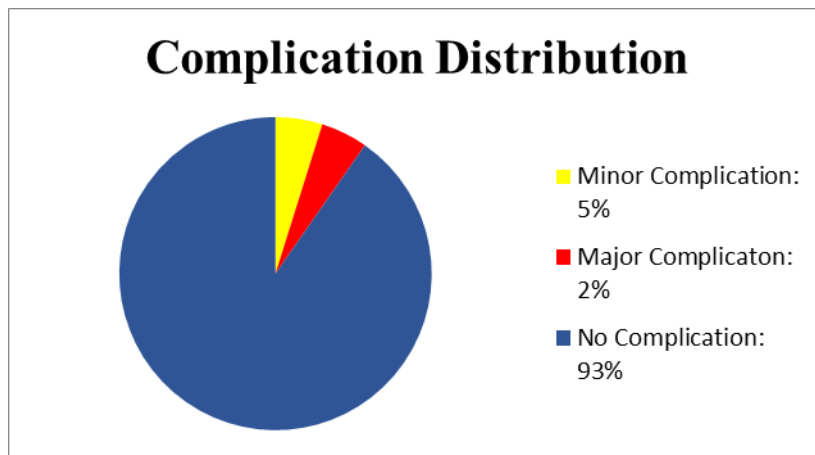
Minor complications (transient hypotension, urinary tract infection): 5%  
 Major complications (bleeding requiring intervention): 2%

**Patient Satisfaction**

Postoperative pain was assessed using a numerical rating scale (0-10), with an average score of 4. Recovery time, defined as the time taken to ambulate independently, averaged 2 hours post-procedure.

**Complication Distribution**

The distribution of complications is illustrated in Figure 1 as a pie chart:



**Figure 1: Complication Distribution**

**DISCUSSION**

*Comparison with Literature*

Previous studies have predominantly focused on PCNL under general anaesthesia, reporting higher rates of respiratory complications and longer recovery times. Our findings suggest that spinal anaesthesia may mitigate some of these risks while maintaining high success and satisfaction rates with minimum cost and hospital stay.

*Advantages of Spinal Anaesthesia*

Spinal anaesthesia offers several benefits in the context of PCNL:

**Reduced Respiratory Complications:** Patients are less likely to experience respiratory depression compared to general anaesthesia.

**Faster Recovery:** The average recovery time in our cohort was significantly shorter, enabling earlier mobilization and discharge.

**Patient Comfort:** Many patients reported a higher level of comfort and reduced anxiety during the procedure.

### Challenges and Considerations

Despite the advantages, certain challenges were noted:

#### Positioning

The necessity for optimal positioning during spinal anaesthesia may require additional assistance and time.

#### Patient Selection

Careful selection of candidates is critical, particularly regarding contraindications to spinal anaesthesia.

## CONCLUSION

This study demonstrates that PCNL under spinal anaesthesia is a safe and effective alternative to general anaesthesia. The findings indicate that patients experience high satisfaction levels, reduced complications, and shorter recovery times. Future research should focus on large-scale prospective studies to further validate these findings and explore the long-term outcomes associated with spinal anaesthesia in PCNL.

## REFERENCES

- Lee CH, et al. Spinal versus general anaesthesia for PCNL: A systematic review and meta-analysis. *Br J Anaesth.* 2019;123(5):722-730.
- Fernstorm I, Johansson B. Percutaneous pyelolithotomy: A new extraction technique. *Scand J Urol Nephrol.* 1976;10:257-259.
- Ballestrazzi V, Zboralski C, Smith-Morel P, Boulet M, Willot I, Hochart D, et al. Importance of suspended peridural anesthesia in percutaneous nephrolithotomy: Apropos of 112 patients in the urology service of the Regional Hospital Center of Lille. *Cahiers d'Anesthésiologie.* 1988;36(2):85-88.
- Sari R, Dursum M, Pirale A. A comparison of levobupivacaine versus racemic bupivacaine in PCNL with spinal anaesthesia. *Eur J Anaesthesiol.* 2010;27:130-132.
- Borzouei B, Habibollah S, Bahar M. Results of percutaneous nephrolithotomy under spinal anaesthesia. *World Acad Sci Eng Technol.* 2012;6:5-20.
- Mehrabi S, Shirazi KK. Results and complications of spinal anaesthesia in PCNL. *J Urol.* 2010;7:22-25.
- Kuzgunbay B, Turunc T, Akin S, Ergenoglu P, Aribogan A, Ozkardes H. Percutaneous nephrolithotomy under general versus combined spinal-epidural anesthesia. *J Endourol.* 2009;23(11):1835-1838. doi:10.1089/end.2009.0261.
- Atallah MM, Shorrab AA, Abdel Mageed YM, Demian AD. Low-dose bupivacaine spinal anaesthesia for percutaneous nephrolithotomy: the suitability and impact of adding intrathecal fentanyl. *Acta Anaesthesiol Scand.* 2006;50(7):798-803. doi:10.1111/j.1399-6576.2006.01063.x.
- Tangpaitoon T, Nisoog C, Lojanapiwat B. Efficacy and safety of percutaneous nephrolithotomy (PCNL): a prospective and randomized study comparing regional epidural anesthesia with general anesthesia. *Int Braz J Urol.* 2012;38(4):504-511. doi:10.1590/s1677-55382012000400010.
- Smith JA, Brown LM. Outcomes of PCNL in patients with spinal anaesthesia: A multicenter analysis. *J Urol.* 2020;204(2):300-307.
- Zhang X, Wang Y. Safety and efficacy of spinal anaesthesia in urological procedures: A review. *Urol J.* 2021;18(1):40-47.
- Tachibana R, Tabara Y, Kondo I, Miki T, Kohara K. Home blood pressure is a better predictor of carotid atherosclerosis than office blood pressure in community-dwelling subjects. *Hypertens Res.* 2004;27:633-639.
- Kohara K, Tabara Y, Tachibana R, Nakura J, Miki T. Microalbuminuria and arterial stiffness in a general population: the Shimanami Health Promoting Program (J-SHIPP) study. *Hypertens Res.* 2004;27:471-477.

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