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# COMPARATIVE STUDY OF SPINAL VERSUS GENERAL ANAESTHESIA IN PERCUTANEOUS NEPHROLITHOTOMY

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**KEYWORDS :**

## Introduction

Percutaneous nephrolithotomy (PCNL) is the treatment of choice for large renal calculi, staghorn calculi and calculi which fail treatment with extracorporeal shockwave lithotripsy and ureteral endoscopy [1-3].

PCNL can be performed under general anaesthesia, regional anaesthesia or local anaesthesia. Nowadays, PCNL is usually performed under general anaesthesia due to better control of breathing and more comfort for the patients. However, there are some occasionally side effects from general anaesthesia such as lung atelectasia, drug allergy and postoperative nausea and vomiting [4,5].

Recently, PCNL under spinal anaesthesia was reported as having some advantage over general anaesthesia, such as lower post operative pain, lower dose requirement for analgesic drugs, and avoidance of the side effects from multiple medication during general anaesthesia [4-6].

There are controversies among researchers regarding the use of SA in PNCL due to the most important issue which is acute hypotension, resulting from sympathetic block [7-10].

## Objectives

Considering the type of anesthesia as well as patients' hemodynamics that can influence on surgery outcomes and relevant morbidity and mortality of the intervention, and that these factors directly reflect on regional health-care, we aimed this study to compare mean BP and PR among PNCL patients underwent GA and SA.

## Patients and Methods

Subjects- In this randomized clinical trial, all patients coming to Patna medical college & hospital as PNCL candidates were included sequentially if they met these inclusion criteria: age between 18-65 years with physical status I or II of American Society of Anaesthesiologists (ASA). The included patients were divided into SA and GA groups using randomized number table. Standard monitoring included continuous electrocardiogram, pulse oximetry, and end-tidal carbon dioxide. Non-invasive BP measurements were performed at 5-min intervals. All patients were routed with a green (18-gauge) catheter and infused with 3-4 cc/kg isotonic crystalloids.

### GA Group-

Premedication of 1-2 µg/kg from Inj Fentanyl and 0.01-0.02 mg/kg from Midazolam was administered. Oxygen with an inspired fraction of 1.0 was administered for 3 min before intubation. Then, GA was induced by 2mg/kg Inj Propofol, and to obtain desired anaesthesia, 0.5 mg/ kg of Inj Atracurium was injected intravenously for easier intubation; then, all patients were intubated by a suitable endotracheal tube. For maintaining GA, an intravenous 100 µg/kg/min of Inj Propofol with 50% O2 and 50% N2O were induced. Inj Atracurium and Inj Fentanyl re-administration was done every 45 minutes or as required.

### SA Group-

Premedication of 0.01-0.02 mg/kg from Inj Midazolam was administered. The patients were placed in a sitting posi¬tion. The drug was administered by a 25-gauge Quincke needle in midline of L3-L4 or L4-L5 level by a physician. For inducing SA, isobar intra-thecal 15-20 mg of Inj Bupiva¬caine 0.5% without any additives was administered. Then, the patients' positions were changed to prone and intra¬nasal 100% oxygen was administered. Sensory blockade was evaluated by a cotton peak (for heat perception) or a needle (for touching sense) every 15-20 seconds; then, motor blockade was tested by Bromage scale with follow¬ing score: 0 = no paralysis; 1 = inability to raise extended leg; 2 = inability to flex knee; 3 = inability to move leg joints. Blood pressure below 100 mmHg of 30% from the baseline was corrected by 6 mg ephedrine and crystal¬loids, and all PR descents (less than 60/min) were treated by intravenous Atropine.

Anaesthesia Assessment- Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP), and PR were record¬ed every 20 minutes during surgery from the beginning of anaesthesia. Intra-operative blood loss was calculated by blood volume of suction devices, and estimated volume of blood in sponges and drapes already were weighted before operation.

SBP, DBP, MAP, and PR were recorded in the PACU, every 10 min from entering PACU. All patients were positioned in supine. MAP and PR were evaluated every 10 minutes for 1 hour. Other information were extracted from medical files and inserted into a pre-prepared checklist.

## Statistical Analysis

The data were evaluated and analyzed by SPSS version 19 (SPSS Inc., Illinois, USA). All quantitative data were ex-pressed as mean ± SD, and qualitative data as No. (%). For comparing the groups, t-test and Mann-Whitney-U test were used for parametric and non-parametric data, evaluated by Kolmogorov-Smirnov test, respectively. P less than 0.05 were considered as significant.

## Results

Demographic Data- Fifty nine patients were enrolled in the study consisting of 38 males and 21 females. The patients were randomly divided into SA (n = 29) and GA (n = 30) groups. Table 1 demonstrates all demographic data. Surgery duration (P = 0.016) and anaesthesia duration (P = 0.044) were significantly lower in SA (Table 2). According to Bromage scale, motor block level was zero in all patients in SA group.

**Table-1**: Duration of Surgery, Anesthesia, Recovery time, Blood Loss, Analgesic Demand, and Blood Transfusion Amount in Both Groups

| Variable | General Anesthesia | Spinal Anesthesia | P value |
|---|---|---|---|
| Surgery Duration, Mean ± SD, min | 112.2 ± 18.3 | 99.3 ± 21.1 | 0.016 |
| Anesthesia Duration, Mean ± SD, min | 112.2 ± 18.3 | 101.3 ± 22.03 | 0.044 |
| Recovery Duration, Mean ± SD, min | 42.2 ± 12.8 | 41.5 ± 19.1 | 0.878 |
| Blood Loss, Mean ± SD, ml | 331.7 ± 151.1 | 211.03 ± 89.6 | 0.001 |
| Analgesicdemand, Mean ± SD | 6.3 ± 8.9 | 2.03 ± 6.3 | 0.038 |
| Blood Transfusion, No. (%) | | | 0.321 |
| Positive | 1 (3.3) | 0 (0) | |
| Negative | 29 (96.7) | 29 (100) | |

Endpoint Results- Table 2 demonstrates blood loss, analgesic demand, and blood transfusion amount in both groups. As seen, blood loss (P = 0.001) and analgesic demand (P = 0.038) were significantly higher in GA group.

**Discussion**

Recently PCNL under regional spinal anaesthesia was reported to gain benefits because regional spinal anaesthesia achieves better postoperative quality of life due to earlier postoperative recovery but most reports were not part of the controlled study [4,5]. Using SA in PNCL surgery is acceptable and more secure. By faster discharge and reduced recovery time, the patients' quality of life can be improved using SA, which can be a good choice for urologist[14].

Overall, our study demonstrated that SBP, DBP, MAP, and PR in the whole surgery and recovery times did not have any significant difference between 2 groups and that the trend was also somewhat similar in SA and GA, however, patients' hemodynamics were more stable in SA group. Furthermore, bleeding and analgesic demand were significantly higher in GA group. None of the patients needed blood transfusion. These results were similar to other studies demonstrating that SA group had better hemodynamics and lower bleeding during and after the surgery[15-17].

It seems that SA can result in vasodilation and hypotension following sympathetic block. On the other hand, reduced intra-thoracic pressure and epidural vein distension, due to spontaneous ventilation, result in reduced bleeding. Therefore, the results do not seem to be irrational because SA can inhibit stress hormone secretion better than GA.

SA blocks pre-ganglionic sympathetic nerves with many advantages compared to GA, such as redistribution of blood flow to musculoskeletal system, skin, and subcutaneous tissues, as well as reducing SBP, DBP, MAP, and PAP, and better hemostasis. Furthermore, other studies demonstrated better PNCL surgery results, lower blood loss, and lesser side effects (such as nausea, vomiting, and post-op pain) in SA [15].

Among these advantages of SA, decreasing blood loss is a main issue of SA in PCNL surgery. Recent studies investigated the effects of a 200-µg of oral clonidine tablet 60 - 90 minutes before anaesthesia, which reduced blood loss significantly in several kinds of surgeries under GA that could be a future choice along with SA in PCNL [18]

Tetzlaff et al. have also shown that in spinal surgeries, SA was a better choice for anaesthesia compared to GA resulting in lower side effects [19].

In another prospective randomized study on PCNL, 52 patients underwent general anaesthesia and 58 patients received spinal anaesthesia. PCNL was performed by standard technique. Intra-operative hypotension, postoperative headache, and low back pain were significantly higher in spinal group but compared to SA, the cost of anaesthetic drugs was more than five times and post-operative analgesic consumption about two times in GA group. Finally authors suggested SA as a safe, effective, and cost-effective method in adult PCNL, the same as our results.

Moreover, in other studies, additional analgesic consumption was reduced in SA group compared to GA group. This may be due to afferent nociceptive block of the spinal cord and faster block of sensory than that of motor nerves [8, 15].

In this study, patients with stone in upper pole of kidney, tolerated efficiently, but our sample size was designated for a whole kidney and not solely for upper pole; so because of general concerns about this subtype of kidney stones, future studies are needed with a study population designated for upper pole stones to compare competency and efficacy of SA versus GA.

In view of the results of our study, SA is a faster and safer method of anaesthesia in PNCL surgeries. Using this ¬method can help surgeons to maintain patient in a better hemodynamic and hemostatic state, reduce the GA complications, decrease the need of analgesics, and duration of surgery

**Conclusions**

Percutaneous nephrolithotomy under regional anaesthesia is as effective as PCNL under general anaesthesia. The advantages of regional anaesthesia over general anaesthesia are higher patient satisfaction, less early postoperative pain and less analgesic usage without increasing complications

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