

ORIGINAL RESEARCH**A comparative study of general anaesthesia and subarachnoid block (SAB) in patients undergoing percutaneous nephrolithotomy (PCNL) surgeries**Anubhav Raj¹, AamirLaique Khan², Abhishek Tiwari³, Raghavendra Vagyannavar⁴¹Assistant Professor, Department of Surgery, Integral Institute of Medical Science And Research (IIMSR), Lucknow, Uttar Pradesh, India^{2,4}Assistant Professor, Department of Anaesthesia, Integral Institute of Medical Science And Research (IIMSR), Lucknow, Uttar Pradesh, India³Associate Professor, Department of Anaesthesia, Integral Institute of Medical Science And Research (IIMSR), Lucknow, Uttar Pradesh, India**Corresponding author:**Dr.RaghavendraVagyannavar, Assistant Professor, Department of Anaesthesia, Integral Institute of Medical Science And Research (IIMSR), Lucknow, Uttar Pradesh, India,
Email: raghuspgims@gmail.com**ABSTRACT****Background:** percutaneous nephrolithotomy (PNCL) is a common method for extracting renal and urinary stones, and a choice modality in large, multiple, and stag-horn stones. The present study compared general anaesthesia and subarachnoid block (SAB) in patients undergoing percutaneous nephrolithotomy (PCNL) surgeries.**Materials & Methods:** 100 patients were divided into 2 groups of 50 in each group. Group A: Patients received general anaesthesia (GA). Group B: Patients received subarachnoid block (SAB). Parameters such as hemodynamic variables, intraoperative blood loss, intraoperative mean arterial pressure and heart rate were recorded.**Results:** The mean heart rate (per minute) in group A and group B at 5 minutes was 80.3 and 82.2, at 10 minutes was 92.5 and 94.2, at 15 minutes was 88.5 and 90.1, at 20 minutes was 80.7 and 80.2, at 30 minutes was 78.2 and 76.4, at 45 minutes was 75.4 and 73.2, at 60 minutes was 76.5 and 74.5 and at 90 minutes was 75.2 and 76.2 respectively. The mean arterial pressure in group A and B at 5 minutes was 93.2 and 90.5, at 10 minutes was 95.4 and 84.3, at 15 minutes was 95.2 and 80.6, at 20 minutes was 90.5 and 78.6, at 30 minutes was 88.4 and 77.2, at 45 minutes was 86.5 and 75.4, at 60 minutes was 88.9 and 82.1 and at 90 minutes was 90.3 and 82.4 respectively. The mean VAS at 15 mins in group A was 3.0, at 30 mins was 3.2, at 1 hour was 3.6 in group A, at 2 hours was 2.8 in group A and 3.1 in group B, at 4 hours was 2.5 in group A and 3.0 in group B, at 12 hours was 3.0 in group A 3.4 in group B, at 18 hours was 3.1 in group A and 3.2 in group B and at 24 hours was 3.4 in group A and 3.5 in group B. Side effects were nausea seen 1 in group A and 3 in group B, vomiting 4 in group A and 1 in group B and shivering 1 in group A and 2 in group B.**Conclusion:** In patients undergoing percutaneous nephrolithotomy, subarachnoid block is as effective and safe as general anesthesia.**Key words:** percutaneous nephrolithotomy, general anesthesia, subarachnoid block**Introduction**

Nowadays, percutaneous nephrolithotomy (PNCL) is a common method for extracting renal and urinary stones, and a choice modality in large, multiple, and stag-horn stones.¹ Furthermore, PNCL can be used in patients with failed shock and endoscopic trials.² In about 20% of cases, urologic procedures are undertaken with general anesthesia (GA) or regional anesthesia such as spinal anesthesia (SA). Despite good results of PNCL with GA, it may cause atelectasis, drug reactions, nausea, and vomiting.³ In abdominal and lower extremities surgeries, SA is mainly employed by a single drug and comprises some advantages such as less bleeding, and reduces venous pressure in the surgery field.⁴ However, there are recent reports regarding the use of SA in PNCL demonstrating lower post-operation pain, less drug intake, and reduced adverse effects. Some studies have also shown that surgeries with SA had better outcomes in spinal surgeries.⁵ 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. Therefore, BP and pulse rate (PR) can be helpful to monitor sympathetic drive in these patients.⁶ There are many studies comparing GA and SA in several surgeries; however, there is no definite comparison made by BP and PR in PNCL during surgery and in recovery room and to see the cost effectiveness and patient satisfaction.⁷ The present study compared general anaesthesia and subarachnoid block (SAB) in patients undergoing percutaneous nephrolithotomy (PCNL) surgeries.

Materials & methods

This prospective randomized study over the period of 24 months was conducted among 100 patients in the department of anesthesia, IIMS & R, Lucknow (UP).

The patients were assigned serial numbers and allotted into either of the two groups by Randomization. The patients were divided into 2 groups of 50 in each group. Group A: Patients received general anaesthesia(GA). Group B: Patients received subarachnoid block(SAB)

Group A patients received Injpropofol 2mg/kg and Inj fentanyl 2mcg/kg were used intravenously for induction of anesthesia. Tracheal intubation of patients was facilitated with 0.5 mg/kg atracurium intravenously. Maintenance of anaesthesia with 1.0%-2.0% isoflurane and 50% nitrous oxide & 50% oxygen and inj. atracurium was performed. The ventilator (Drager) was used to support the patients after endotracheal intubation. Respiration rate of patients was set at 14-16/min with tidal volume (6-8 mL/kg). The residual neuromuscular block was reversed by using glycopyrrolate and neostigmine intravenously at the end of the surgery.

Group B patients received 15 mg/kg ringer lactate solution at 20-30 minutes through intravenous infusion in the supine position. After this medication, Inj Bupivacaine heavy 20mg with Inj fentanyl 25mcg was administered through the intervertebral space L4-L5 into the subarachnoid space with a 25-gauge Quinckes spinal needle in the lateral decubitus position. Parameters such as hemodynamic variables, intraoperative blood loss, intraoperative mean arterial pressure and heart rate were recorded. Results were assessed statistically. P value less than 0.05 was considered significant.

Results

Table I Comparison of intraoperative variables

Parameters	Group A	Group B	P value
Duration of surgery (min)	123.7	128.9	0.91
Volume of irrigation fluid used (ml)	15342.2	14872.3	0.80
Change in Hb from pre- to post-surgery (g/dl)	1.32	1.12	0.12
Hb of irrigated fluid- blood mixture (g/dl)	1.82	1.23	0.03
Blood loss (ml)	214.5	154.2	0.05
Average stone size (mm)	30.4	28.6	0.17

Table I shows that mean duration of surgery (min) was 123.7 in group A and 128.9 in group B, volume of irrigation fluid used (ml) was 15342.2 in group A and 14872.3 in group B, change in Hb from pre- to post-surgery (g/dl) was 1.32 in group A and 1.12 in group B, Hb of irrigated fluid- blood mixture (g/dl) was 1.82 in group A and 1.23 in group B, blood loss (ml) was 214.5 in group A and 154.2 in group B and average stone size (mm) was 30.4 in group A and 28.6 in group B. The difference was non-significant ($P > 0.05$).

Table II Comparison of intraoperative heart rate

Heart rate (per minute)	Group A	Group B	P value
5 minutes	80.3	82.2	0.04
10 minutes	92.5	94.2	0.02
15 minutes	88.5	90.1	0.12
20 minutes	80.7	80.2	0.32
30 minutes	78.2	76.4	0.17
45 minutes	75.4	73.2	0.12
60 minutes	76.5	74.5	0.05
90 minutes	75.2	76.2	0.92

Table III Comparison of mean arterial pressure

Mean arterial pressure(mm Hg)	Group A	Group B	P value
5 minutes	93.2	90.5	0.91
10 minutes	95.4	84.3	0.01
15 minutes	95.2	80.6	0.05
20 minutes	90.5	78.6	0.01
30 minutes	88.4	77.2	0.04
45 minutes	86.5	75.4	0.01
60 minutes	88.9	82.1	0.91
90 minutes	90.3	82.4	0.05

Table II shows that mean heart rate (per minute) in group A and group B at 5 minutes was 80.3 and 82.2, at 10 minutes was 92.5 and 94.2, at 15 minutes was 88.5 and 90.1, at 20 minutes was 80.7 and 80.2, at 30 minutes was 78.2 and 76.4, at 45 minutes was 75.4 and 73.2, at 60 minutes was 76.5 and 74.5 and at 90 minutes was 75.2 and 76.2 respectively. The difference was non- significant ($P > 0.05$).

Table III, graph I shows that mean arterial pressure in group A and B at 5 minutes was 93.2 and 90.5, at 10 minutes was 95.4 and 84.3, at 15 minutes was 95.2 and 80.6, at 20 minutes was 90.5 and 78.6, at 30 minutes was 88.4 and 77.2, at 45 minutes was 86.5 and 75.4, at 60 minutes was 88.9 and 82.1 and at 90 minutes was 90.3 and 82.4 respectively. The difference was significant ($P < 0.05$).

Graph I Comparison of mean arterial pressure

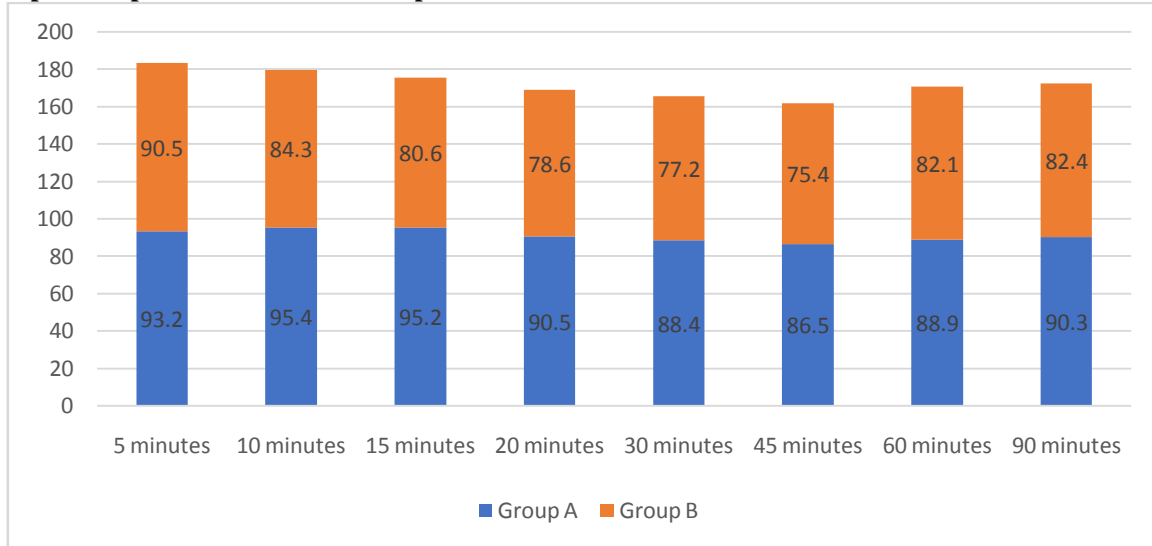


Table IV Comparison of parameters

Parameters	Variables	Group A	Group B	P value
Pain score (VAS)	15 mins	3.0	0	0.04
	30 mins	3.2	0	
	1 hour	3.6	0	
	2 hours	2.8	3.1	
	4 hours	2.5	3.0	
	12 hours	3.0	3.4	
	18 hours	3.1	3.2	
	24 hours	3.4	3.5	
Side effects	Nausea	1	3	0.05
	Vomiting	4	1	
	Shivering	1	2	

Graph II Comparison of parameters

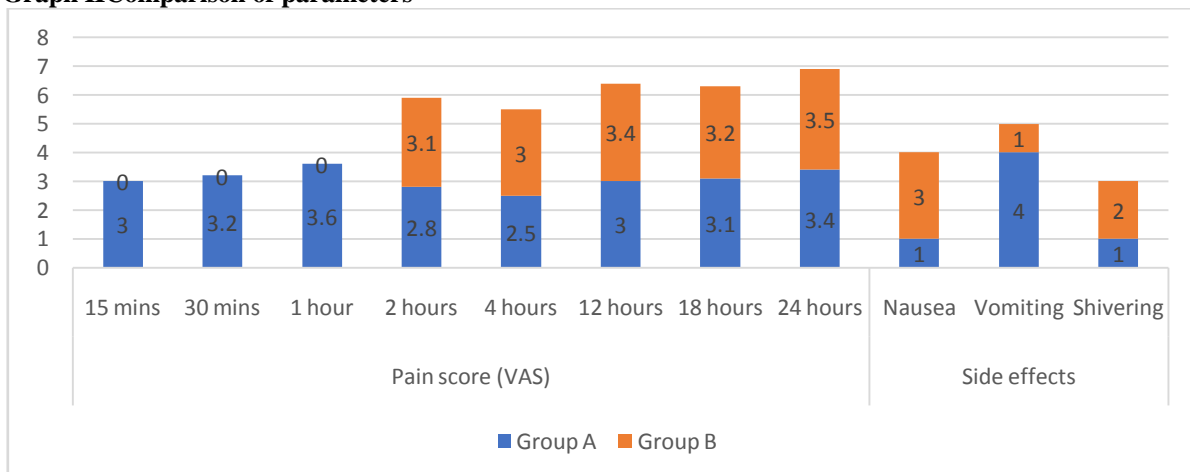


Table IV, graph II shows that mean VAS at 15 mins in group A was 3.0, at 30 mins was 3.2, at 1 hour was 3.6 in group A, at 2 hours was 2.8 in group A and 3.1 in group B, at 4 hours was 2.5 in group A and 3.0 in group B, at 12 hours was 3.0 in group A 3.4 in group B, at 18 hours was 3.1 in group A and 3.2 in group B and at 24 hours was 3.4 in group A and 3.5 in group B. Side effects were nausea seen 1 in group A and 3 in group B, vomiting 4 in group A and 1 in group B and shivering 1 in group A and 2 in group B. The difference was significant ($P < 0.05$).

Discussion

Percutaneous nephrolithotomy (PCNL) is considered to be the gold standard treatment for renal calculi especially when limitations of extracorporeal shock wave lithotripsy (ESWL) are countered. PCNL can be performed under spinal (SA), epidural (EA) or general anesthesia (GA).⁸ From urological perspective, the particular advantages of GA in PCNL procedure include its feasibility to control tidal volume, secure patient airway especially in prone position, and extensibility of anesthesia time.⁹ The feasibility to control tidal volume minimizes renal mobility secondary to respiration while extensibility of anesthesia time allow surgeon to create multiple punctures with subsequent increased efficacy of the procedure especially in cases with large stone burden. Moreover, GA is more comfortable for the patients and the ability to carry out prolonged operation in prone position without limitation of airway is another advantage.¹⁰ On the other hand, SA has some advantage over GA, such as lower postoperative pain, lower consumption of analgesic drugs and avoidance of side effects from multiple medications used in GA.¹¹ The present study compared general anaesthesia and subarachnoid block (SAB) in patients undergoing percutaneous nephrolithotomy (PCNL) surgeries.

In present study, mean duration of surgery (min) was 123.7 in group A and 128.9 in group B, volume of irrigation fluid used (ml) was 15342.2 in group A and 14872.3 in group B, change in Hb from pre- to post-surgery (g/dl) was 1.32 in group A and 1.12 in group B, Hb of irrigated fluid- blood mixture (g/dl) was 1.82 in group A and 1.23 in group B, blood loss (ml) was 214.5 in group A and 154.2 in group B and average stone size (mm) was 30.4 in group A and 28.6 in group B. Moawad et al¹² compared the efficacy and safety of general anesthesia (GA) vs. spinal anesthesia (SA) in percutaneous nephrolithotomy (PCNL) on two hundred patients. Vital parameters were maintained at safe values throughout procedures in both groups. Visual analog pain score was lower in SA group till 1 hour postoperative in comparison with GA group ($P < 0.05$). Patients in SA group recorded lower consumption of analgesia in the 1st postoperative day in comparison with GA group ($P < 0.05$). Postoperative shivering was higher in SA group than GA group (8% vs. 2%) while nausea and vomiting was higher in GA group than SA group (5% vs. 2% and 4% vs. 1% respectively). Patients in GA group reported higher overall satisfaction scores than SA group (mean 9.6 ± 0.4 vs. 8.6 ± 0.8 , $P < 0.05$). Similarly, surgeon's satisfaction score was higher in favor of GA group compared with SA group.

We found that mean heart rate (per minute) in group A and group B at 5 minutes was 80.3 and 82.2, at 10 minutes was 92.5 and 94.2, at 15 minutes was 88.5 and 90.1, at 20 minutes was 80.7 and 80.2, at 30 minutes was 78.2 and 76.4, at 45 minutes was 75.4 and 73.2, at 60 minutes was 76.5 and 74.5 and at 90 minutes was 75.2 and 76.2 respectively. The mean arterial pressure in group A and B at 5 minutes was 93.2 and 90.5, at 10 minutes was 95.4 and 84.3, at 15 minutes was 95.2 and 80.6, at 20 minutes was 90.5 and 78.6, at 30 minutes was 88.4 and 77.2, at 45 minutes was 86.5 and 75.4, at 60 minutes was 88.9 and 82.1 and at 90 minutes was 90.3 and 82.4 respectively. Movaseghiet al¹³ compared the preference of spinal anaesthesia (SA) or general anaesthesia (GA) on 59 patients who underwent PCNL divided into SA and GA groups. 15-20 mg from intrathecal bupivacaine 0.5%, and premedication of 0.01-0.02 mg from midazolam, were given to patients in SA group ($n = 29$). Patients in GA group ($n = 30$) received premedication of 1-2 $\mu\text{g}/\text{kg}$ from fentanyl and 0.01-0.02 mg/kg from midazolam, and intravenously anaesthetized with 100 $\mu\text{g}/\text{kg}/\text{min}$ of propofol and 0.5 mg/kg of atracurium, given by continuous infusion and N₂O/O₂ 50%. Mean arterial pressure (MAP) and heart rate were recorded intra-operatively and during recovery. MAP and heart rate show no significant differences at designated time points between two groups ($P > 0.05$). Surgery time, anesthesia time, bleeding volume, and analgesic intake were significantly reduced in SA group ($P < 0.05$).

We observed that mean VAS at 15 mins in group A was 3.0, at 30 mins was 3.2, at 1 hour was 3.6 in group A, at 2 hours was 2.8 in group A and 3.1 in group B, at 4 hours was 2.5 in group A and 3.0 in group B, at 12 hours was 3.0 in group A 3.4 in group B, at 18 hours was 3.1 in group A and 3.2 in group B and at 24 hours was 3.4 in group A and 3.5 in group B. Side effects were nausea seen 1 in group A and 3 in group B, vomiting 4 in group A and 1 in group B and shivering 1 in group A and 2 in group B. Ranjan et al¹⁴ found that compared intraoperative blood loss, intraoperative mean arterial pressure and heart rate. Hemodynamic parameters were similar in both the groups preoperatively. The Hb drop was significant in Group A ($1.28 \pm 0.35 \text{ g.dl}^{-1}$) as compared to Group B ($1.10 \pm 0.67 \text{ g.dl}^{-1}$). On calculating Hb in irrigated fluid-blood mixture, it was found to be significantly higher in Group A ($1.87 \pm 0.44 \text{ g.L}^{-1}$) as compared to Group B ($1.25 \pm 0.25 \text{ g.L}^{-1}$).

Conclusion

Authors found that in patients undergoing percutaneous nephrolithotomy, subarachnoid block is as effective and safe as general anesthesia.

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