



## Anaesthesiology

## A RANDOMIZED TRIAL COMPARING PERCUTANEOUS NEPHROLITHOTOMY UNDER EPIDURAL ANESTHESIA TO GENERAL ANESTHESIA.

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### ABSTRACT

**Introduction:** PCNL has almost eliminated the need for open stone surgery in the treatment of renal calculi. The technique can be performed successfully under general anesthesia (GA), regional anesthesia (SA), epidural anesthesia (EA), or combination spinal and epidural anesthesia (CSEA) (CSE). Our goal was to assess the surgical result after PCNL in two groups of patients who were randomly assigned to undergo the procedure under GA or EA.

**Methods:** 100 patients with an ASA score of 3 were randomly assigned to one of two groups based on the type of anesthesia they received: GA (n=50) or EA (n=50). PCNL was performed on all patients in a prone position. Data was analyzed after demographics, perioperative, and postoperative parameters were recorded.

**Results:** The two groups were similar in terms of mean age, stone site distribution, and stone burden. The stone-free rate in the GA group was 90.9 percent, while in the EA group it was 89.2 percent, with a statistically insignificant difference (P= 0.659). The two groups had similar requirements for auxiliary procedures. During the early post-operative period, there was a significant difference in pain score in favor of the EA group (P0.05).

In conclusion PCNL can be performed safely and efficiently under regional epidural anesthesia, with results comparable to general anesthesia with the added benefit of decreased immediate postoperative discomfort and painkiller use.

**KEYWORDS :** Percutaneous nephrolithotomy, epidural anesthesia, general anesthesia

### INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is the favored modality for large and difficult renal calculi. [1] With advancements in surgical technique, urologists have been able to further enhance this surgery, increasing its safety and efficacy while lowering morbidity. PCNL can be performed successfully under general anesthesia (GA), regional anesthesia (SA), epidural anesthesia (EA), or combination spinal and EA (CSEA), with each technique having its own set of benefits and drawbacks. (2) The ability to control respiration is one of the benefits of GA, which is especially important when considering an upper pole puncture to minimize pulmonary problems. Atelectasis, postoperative vomiting, tracheal tube displacement, and neurologic events are all risks linked with GA, especially while changing positions. (3) A number of studies have shown that regional anesthesia for PCNL is effective, with lower analgesic requirements and complication rates. (4) Furthermore, GA is less cost effective and may be unsatisfactory to individuals with comorbidities. (5)

With the goal of assessing the surgical outcome after PCNL in patients undergoing procedure under GA or EA, we randomly divided patients under procedure under GA or EA.

### METHODS

During October 2020-October 2021, the research was conducted at the Shyam Shah Medical college Rewa Madhya Pradesh, India. 100 patients were enrolled in the trial and were randomly allocated as GA (n = 50) or EA (n = 50). An ultrasound, an Xray of the KUB, and CT urogram were used to assess the patients. A non-contrast CT scan (NCCT) was used in conjunction with a nuclear renogram to determine functional status in patients with impaired renal functions. Patients over the age of 18 and had renal stones greater than 2 cm were included in the study. Prior to the procedure, a negative urine culture was ensured. We excluded patients with skeletal deformity, renal abnormality, bleeding diathesis, anticoagulant use, and an ASA score of 3 or higher. At the time of induction, all patients were given a third-generation cephalosporin.

Xylocard 1 mg/kg, propofol 2 mg/kg, fentanyl 2 g/kg, and succinylcholine 0.1 mg/kg were used for GA induction, which was maintained with a mixture of O<sub>2</sub> and N<sub>2</sub>O, isoflurane, atracurium 0.08mg/kg and fentanyl supplements. For EA, the patient was positioned on the operating table, the T9-T10 or T10-T11 thoracic intervertebral space was identified and addressed with an 18G Touhy needle, and the loss of resistance technique was used to confirm it. For intermittent bolus technique, an epidural catheter was placed. Epidural was activated by 8–10 mL of 0.5 percent ropivacaine with 10 g/mL

fentanyl. A blunt needle was used to assess the extent of sensory obstruction. PCNL was performed on all patients in a prone position. On the first postoperative day, all patients had a KUB radiograph taken to determine the status of stone clearance. Residual fragments of less than 4 mm were termed as stone free rate (SFR). With a new KUB radiograph and ultrasound, patients with remaining fragments less than 4 mm were reevaluated at 1 month.

The data was compiled and entered into a spreadsheet (Microsoft Excel) before being exported to the SPSS Version 20.0 data editor (SPSS Inc., Chicago, IL). For comparing continuous variables, the Student's independent t test was used. When comparing categorical variables, the Chi-square test or Fisher's exact test, were used.

### RESULTS

Mean age, and sex were comparable in between both groups. In terms of stone location and burden, there was no significant difference between the two groups (Table-1).

**Table 1- Demographic Data**

Variable	GA (n=50)	EA(n=50)	P value
Mean age (years)	37 ± 12.8	39 ± 12.4	0.455
Sex, n (%)			
Male	30(60%)	28(56%)	0.876
Female	20(40%)	22(44%)	
Stone location			
Pelvis	10	11	0.945
Calyceal	13	12	
Pelvic+ calyceal	23	22	
Upper ureter	04	05	
Stone burden (cm <sup>3</sup> )	5.8 ± 2.7	6.4 ± 3.34	

The mean operating time, mean hospital stay in both groups were comparable between the two groups. The preoperative hemoglobin levels in the both groups were comparable. Neither set of patients required a blood transfusion. (Table-2).

**Table 2: Perioperative Data Of Patients Who Underwent Percutaneous Nephrolithotomy**

Variables	GA (n=50)	EA(n=50)	P value
Operative time (min)	45±13.5	43±14.7	0.234
Preoperative hemoglobin (g/dl)	12.5±2.5	13.6±1.5	0.327
Hemoglobin at discharge (g/dl)	11.2±1.45	12.3±2.1	0.435
Hospital stay (day)	4.23±1.61	3.85±2.45	0.132
Stone free rate (%)	91.5	88.9	0.654

The SFR in the general group was 91.5 percent, and in the epidural group it was 88.9 percent, with no statistically significant difference between the two groups. (Table-3).

**Table 3: Postoperative Visual Analog Pain Score**

Assessment hour (postoperative)	GA (n=50)	EA(n=50)	P value
1	6.36±2.87	2.87±2.96	<0.001
3	5.45±2.76	3.54±2.03	<0.001
12	3.76±1.86	3.56±2.12	0.087
24	3.35±2.09	3.23±1.98	0.534
48	2.56±1.87	2.12±1.76	0.123

As shown in Table 3, the pain score on visual analogue pain scoring was considerably lower in the early postoperative period in the EA group compared to the GA group, resulting in a lower postoperative analgesic demand in the EA group. Auxiliary procedures comprised a repeat PCNL in 4 patients in the general group and 3 patients in the epidural group. ureteroscopy with or without DJ stenting and shock wave lithotripsy were necessary in 4 and 7 patients in the general group and 5 and 8 patients in the epidural group, respectively. (Table-4).

**Table 4: Requirement For Auxiliary Procedures After Percutaneous Nephrolithotomy**

Auxiliary procedure	GA (n=50)	EA(n=50)	P value
Re-PCNL	4	3	0.765
Ureteroscopy ± Double J stenting	4	5	0.876
Shock wave lithotripsy	7	8	0.634

**Table 5: Perioperative Complications As Per Clavien-dindo System Grading**

Complications	GA	EA
Grade I	4	5
Grade II	6	8
Grade IIIa	4	6
Grade IIIb	0	0
Grade IV	0	0
Grade V	0	0

Table 5 lists the complications that were identified and rated using the Clavien–Dindo grading method. In either group, no problems consistent with Clavien–Dindo Grade IIIb, IV, or V were seen.

## DISCUSSION

In most institutions, PCNL has become the preferred method for treating large and complex renal calculi. Attempts have been made to reduce anesthesia-related morbidity, during PCNL and in postoperative period without jeopardizing the procedure's efficacy. As a result, regional rather than GA is being used more frequently during PCNL. GA comes with its own set of concerns, including greater pulmonary complications, vascular, and neurologic disorders, and issues with the endotracheal tube during the transition from lithotomy to prone. (3) According to Atallah et al. For older patients with cardiac and pulmonary problems, the SA is a safe, practical, and well tolerated technique. (6) However, if the surgery takes longer than expected or the anesthesia wears off during the procedure, it is difficult to convert to GA due to the prone position, which frequently results in the procedure being abandoned. This problem can be solved by administering EA. In a comparison of CSEA and GA for PCNL, Kuzgunbay et al. found that CSEA was a viable choice for PCNL, particularly in patients at high risk for GA and difficult intubation, with comparable results. (2)

Singh et al. observed a significantly lower analgesic demand in 24 hours after PCNL in the randomized research comparing the surgical results in 64 patients who had undergone PCNL with different forms of anesthesia (CSEA vs. general). (7) The meta-analysis by Liu *et al.* showed that the frequency of nausea and vomiting in the RA group was lower than in the GA group with a lesser need for analgesics. (8) The purpose of this study was to evaluate and compare several surgical parameters as well as the need for analgesia in patients who were randomly assigned to undergo PCNL in GA or regional EA. The two patient groups were comparable in terms of operating time, hospital stay, hemoglobin decrease, SFR, need for auxiliary procedures, and complication rates, however the EA group's pain level on VAS was much better in the early postoperative period. Tangpaitoon et al. found similar results when comparing the efficacy and safety of EA with GA

in patients receiving PCNL. (9) With EA early ambulation is possible, and patients are started on oral diet the same evening, which has the potential to reduce hospital stay, as other studies have also demonstrated. (7)

In conclusion under regional EA, PCNL can be performed safely and efficiently with results comparable to GA, with the added benefit of less immediate postoperative discomfort and analgesic use. Patients can be kept on EA for as long as they choose to allow PCNL for even larger and more complicated stones. We believe that EA could be a safe and effective alternative to GA for PCNL, particularly in patients who are unable to tolerate GA or who are difficult to intubate.

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