

# Comparison of Analgesic Efficacy of Peritubal Infiltration of Ropivacaine versus Ropivacaine and Morphine in Percutaneous Nephrolithotomy Under Fluoroscopic Guidance

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## Abstract

**Background:** The root cause of pain in percutaneous nephrolithotomy (PCNL) surgery is dilatation of renal capsule and parenchymal tract which is rich in pain-sensitive nerve fibers. A nephrostomy tube is retained which causes discomfort to the patients postoperatively. Local anaesthetics (LA) infiltrated into nephrostomy tract was done which decreases the pain scores significantly.

**Aim:** The aim of this study is to compare the efficacy of peritubal infiltration of ropivacaine versus ropivacaine with morphine in PCNL surgeries under fluoroscopic guidance for post-operative analgesia.

**Materials and Methods:** A prospective randomized, double-blinded study was compared the efficacy of peritubal infiltration of ropivacaine (0.25%) versus ropivacaine with morphine (0.1 mg/kg) under fluoroscopic guidance in 60 patients undergoing PCNL surgeries under general anaesthesia. They were allocated into two groups Group R - injection ropivacaine 0.25% and Group RM - injection ropivacaine 0.25% (10 mg) with morphine (0.1 mg/kg). Hemodynamic parameters, visual analog scale score, and any adverse effects were recorded.

**Results:** The mean duration of analgesia was more in group RM than the patients in Group R. The mean dose of the analgesic requirement was less in group RM compared to Group R. Other hemodynamic parameters were comparable in both groups.

**Conclusion:** Addition of morphine (0.1 mg/kg) to ropivacaine (0.25%) in peritubal infiltration offers a significant advantage over plain ropivacaine (0.25%) in terms of duration of analgesia and the need for rescue analgesia.

**Key words:** Morphine, Percutaneous nephrolithotomy, Ropivacaine, Visual analog scale scores rescue analgesics

## INTRODUCTION

Nephrolithiasis or stone formation in the kidney is a common problem around the world. Percutaneous nephrolithotomy (PCNL) is procedure in which cutaneous puncture is done and stones are removed from the kidney and is generally done for larger intrarenal stones

resistant to shock wave lithotripsy, staghorn calculi, and some proximal ureteric calculi.<sup>[1,2]</sup> This is relatively safe but associated with certain complications. Open surgeries are more invasive and morbid than PCNL. The root cause of pain in PCNL surgery is dilatation of renal capsule and parenchymal tract which are rich in pain-sensitive nerve fibers.<sup>[3]</sup> A nephrostomy tube is retained which causes discomfort to the patients postoperatively. LA infiltrated into nephrostomy tract was done which decreases the pain scores significantly. Tubeless PCNL was done which decreases the post-operative pain but have their own risks like infection. Parenteral drugs such as opioids and NSAIDs will decrease the pain but have their own side effects. Skin infiltration was not very effective as LA infiltrated up to renal capsule. The addition of adjuvants

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to local anaesthetics such as ropivacaine prolongs the effect and decreases the post-operative pain significantly.<sup>[4-6]</sup>

## Aim

The aim of this is to compare the analgesic efficacy of ropivacaine (0.25%) with 0.5 ml normal saline versus ropivacaine (0.25%) with morphine 11,12, (0.1 mg/kg) by peritubal infiltration on post-operative pain and analgesic requirement for patients undergoing PCNL.

## MATERIALS AND METHODS

A prospective comparative study was conducted in Madras Medical College Hospital, Department of Anaesthesiology. The Institutional Ethics Committee approval and written informed consent were obtained. A total of 60 patients aged 18–60 years, ASA physical status 1 and 2 scheduled for elective PCNL surgery under general anaesthesia (GA), were enrolled in this study. Exclusion criteria were as follows: Patient refusal, allergy to LAs, posted for emergency surgery, and patients with more than one nephrostomy tube. Patients were administered GA following routine protocols and toward the end of surgery drugs were infiltrated with the help of 23 G spinal needle along the Amplatz tube reaching the renal capsule under fluoroscopic guidance. The drugs were infiltrated along 6” clock and 12” clock position of the kidney. Patients were randomized into two groups: Group R patients received - injection ropivacaine 20 ml (0.25%) with 0.5ml normal saline and Group RM - injection ropivacaine 20 ml (0.25%) with 0.5 ml of morphine. The study medications were prepared by a different anesthetist and data measurements and recording was carried out by different anesthetists. Post-operative pain score and need for demand analgesia were noted. Intraoperative hemodynamic parameters were monitored. Side effects of opioids such as nausea, vomiting, and sedation were also noted. If visual analog scale (VAS) score was more than 4, patients were given injection tramadol 13,14 1 mg/kg intravenously as rescue analgesia, and the time of rescue analgesia was also noted. Anesthesia time, surgery time, and any adverse events were also recorded. Heart rate (HR), mean arterial blood pressure, oxygen saturation, and VAS scores were recorded in all patients at 15 min interval over 1 h postoperatively.

## RESULTS

Both the study groups were comparable in view of demographic data [Table 1]. Patients in group RM had a lower HR on average than those in group R [Figure 1]. There was not much statistically significant variation in mean respiratory rates across intervention groups. The patients in the RM group had a lower respiratory rate on average than those in the Group R. There was no statistically significant difference in the mean systolic and diastolic BP across the intervention groups [Figures 2 and 3]. The systolic BP had less fluctuations, and the diastolic BP was lower on average in group RM patients.

The differences in the VAS scores are compared in table. The patients in RM group had lower VAS scores on an average than those in R group which was statistically significant [Figure 4]

The mean duration of analgesia for both the intervention groups are given. Patients in RM group had the analgesic effect lasting for 4.267 hours more on an average than those in group R which was statistically significant. [Table 2]. The difference in the requirement of a mean dose of analgesic requirement was less in group RM than in group R which was statistically significant [Table 3]. Side effects such as nausea and vomiting were similar in both groups.

## DISCUSSION

PCNL is one of the most common urological procedures done in our institution. Pain affects the post-operative quality of patients’ life during the recovery period. Pain increases anxiety, decreases respiratory efforts, delays mobilization, and prolongs hospitalization. Due to the better understanding of pain and physiology, the efficacy of LA infiltration has been used to relieve pain and addition

**Table 1: Distribution of study patient’s characteristics**

Parameters	Group RM	Group R
Age	42.4±7.86	36.63±9.89
Male	15	22
Female	15	8
Duration of surgery	1.5±30 min	1.6±35 min

**Table 2: Duration of analgesia-comparison across intervention groups**

Duration of analgesia in hours	Group RM	Group R	Mean difference±S.E difference	95% CI		P
				Lower bound	Upper bound	
Mean	12.87±1.14	8.6±0.93	4.267±0.268	3.729	4.804	<0.001*

CI: Confidence interval, SE: Standard error

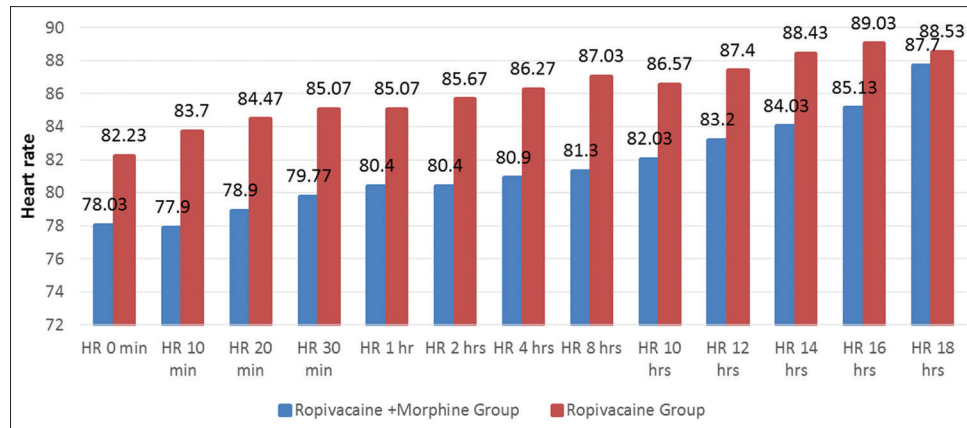


Figure 1: Comparison of heart rate of the study group

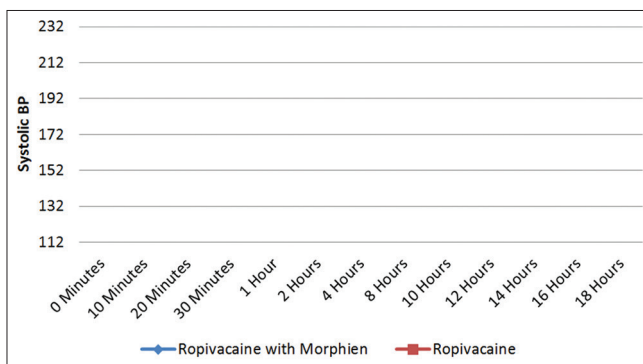


Figure 2: Comparison of systolic blood pressure of the study group

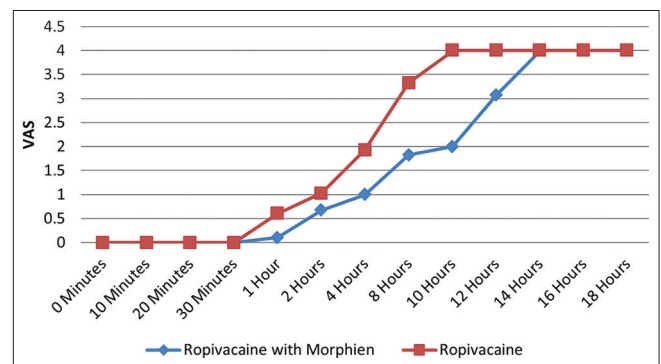


Figure 4: Comparison of visual analog scale of the study group

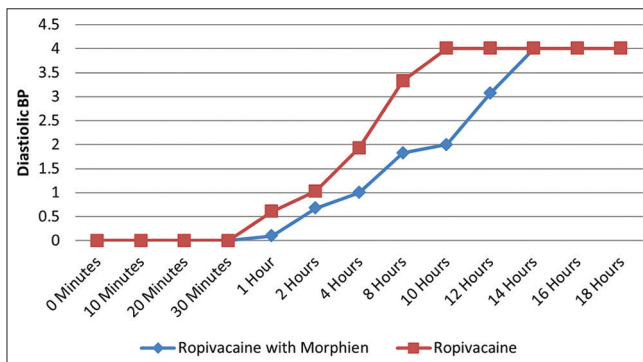


Figure 3: Comparison of diastolic blood pressure of the study group

of opioids which exert their action through peripheral opioid receptors.<sup>[7]</sup> A study conducted by Vaddineni *et al.* which compared the effect of various local anaesthetics infiltration under fluoroscopic guidance.<sup>[8]</sup> The study group R had more number of males which occurred by chance, and it was insignificant which was similar with the results obtained by Parikh *et al.* There is the statistical difference in VAS scores between R and RM group at 1, 2, 4, 8, and 12 h which has not occurred by chance. Similar results were obtained in a study done by Mehta *et al.* in which buprenorphine was added to LAs for wound

Table 3: Difference in the mean dose required between the groups

Group	n	Mean±SD	Std error mean	P
R	30	135.00±46.60916	8.50963	<0.0001
RM	30	76.665±50.74163	9.26411	

SD: Standard deviation

infiltration. The VAS scores were lower in patients received bupivacaine with buprenorphine. Ugras *et al.* studied the effect of ropivacaine infiltration in PCNL surgeries and showed the lower VAS scores and peak expiratory flow rate were higher in groups who received LA infiltration.<sup>[9]</sup> Similarly, Likar *et al.* demonstrated that addition of morphine to LAs for submucosal infiltration in dental surgery prolonged the duration of analgesia.<sup>[10]</sup> The patients in RM group had the analgesic effect lasting longer than in patients in group R which is consistent with the study conducted by Parikh *et al.* and Mehta *et al.*<sup>[11,12]</sup> The mean number of rescue analgesic doses for group R is 2.7000, whereas for group RM, it is 1.5333. The mean dose of tramadol in group R is 135 mg, whereas for group RM, it is 76.665 mg. These results were similar to the study conducted by Parikh *et al.*<sup>[11]</sup> and Mehta *et al.*<sup>[12]</sup> Regarding the side effects in both the Groups R and RM 2 patients in

the group, RM experienced nausea compared to 1 patient in group R. Similar results were obtained by Parikh *et al.*<sup>[11]</sup>

## CONCLUSION

It is concluded that addition of morphine to LA in peritubal infiltration significantly prolonged the duration of analgesia. The need for rescue analgesia is significantly delayed in patients received morphine with ropivacaine. Addition of morphine to ropivacaine in peritubal infiltration offers the significant advantage regarding the duration of analgesia and need for rescue analgesia.

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