

## EFFECT OF INTRAVENOUS LIGNOCAINE INFUSION ON POSTOPERATIVE ANALGESIA IN PERCUTANEOUS NEPHROLITHOTOMY

Susan T Cheeran<sup>1</sup>, Elizabeth Joseph<sup>2</sup>, Santhi K S<sup>3</sup>, Anuraj V T<sup>4</sup>

<sup>1</sup>Associate Professor Department of Anesthesiology, Government medical college, Kottayam, Kerala, India

<sup>2</sup>Associate Professor of Anesthesiology, Government medical college, Kottayam, Kerala, India

<sup>3</sup>Professor Department of Anesthesiology, Government medical college Kottayam, Kerala, India

<sup>4</sup>Associate Professor Department of Anesthesiology, Government medical college Kottayam, Kerala, India

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Corresponding Author:

Dr. Anuraj V T,  
Email: anuraj42@gmail.com

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### Abstract

**Background:** Percutaneous nephrolithotomy (PCNL) is usually performed under general anaesthesia. Optimal pain management has been attempted with various modalities like regional anaesthesia and opioids. Many recent studies have shown that intravenous lignocaine infusion can reduce anaesthetic and opioid requirements in perioperative period. **Objectives:** To determine the effects of intravenous lignocaine infusion to provide post-operative analgesia and intraoperative haemodynamic stability in patients undergoing PCNL with General Anesthesia. **Materials and Methods:** Sixty patients of American Society of Anesthesiologists Grade 1 and 2 in the age group of 25 to 65 years undergoing PCNL were allocated randomly into 2 groups of thirty patients each. Group A was administered preservative free 2% lignocaine 1.5mg/kg iv [volume of 6ml with normal saline] over ten minutes which was followed by an infusion of the same drug at the rate of 1.5mg per kg/hour [6ml/hour] till end of the surgery or when the maximum dose of lignocaine is reached. Group B was given 6ml of normal saline as bolus over ten minutes and 6ml normal saline/hour infusion till the end of surgery. The heart rate (HR) and the mean arterial blood pressure (MAP) values before inducing anaesthesia were recorded as baseline. Then HR and the MAP were also recorded 1 minute after intubation and 1 minute after extubation. Duration of analgesia [VAS<4] was taken from time of extubation to first requirement of rescue analgesia. **Result:** The time to first rescue analgesia was 174 ± 51.30 minutes in Group A as compared to 114 ± 39.01 minutes in Group B. Mean difference was 60 minutes which is statistically significant. In Group B, increase in the HR and the MAP after intubation and extubation are statistically significant. In Group A, increase in the HR and the MAP after intubation and extubation was not statistically significant. **Conclusion:** Intravenous lignocaine infusion administered intraoperatively provides postoperative analgesia and perioperative haemodynamic stability.

## INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is a minimally invasive technique used to remove large and or multiple renal calculi, staghorn calculi and those renal stone which could not be treated with extracorporeal shockwave lithotripsy. The procedure can be performed under general anaesthesia or spinal and or epidural anaesthesia. General anaesthesia offers several advantages including better control over breathing and respiratory movements as well as excellent control of the airway in the prone position. Despite these advantages, haemodynamic responses to intubation

and extubation, post-operative pain, nausea and vomiting are significant issues associated with general anaesthesia. Optimal pain management can be achieved by combining general anaesthesia with various modalities like regional anaesthesia and opioids. However regional anaesthesia is associated with hypotension and opioids can cause respiratory depression, nausea and vomiting in the postoperative period. Lignocaine is an amino amide local anaesthetic. It has anti-inflammatory, analgesic and anti-arrhythmic effects. Many recent studies have shown that intravenous lignocaine infusion can reduce anaesthetic and opioid requirements in perioperative period. This study is being done to

evaluate the effects of lignocaine infusion to provide post-operative analgesia and intraoperative haemodynamic stability in patients undergoing PCNL under general anaesthesia.

### Objectives

Primary objective was to determine the effect of intravenous lignocaine infusion on postoperative analgesia. Secondary objective was to determine the effect of intravenous lignocaine infusion on intraoperative haemodynamic stability.

## MATERIALS AND METHODS

This was a prospective observational study conducted in the Main operation theater under the department of Anesthesia in a tertiary care center in Kerala, India. The duration of the study was six months and was started after getting the Institutional review board approval as well as the Informed consent from all the participants of the study.

Sixty patients belonging to American Society of Anaesthesiologists physical status I and II with age ranging between 25 and 65 years undergoing percutaneous nephrolithotomy were selected for the study. Patients with history of allergy to local anaesthetics and those with anticipated difficult airway were excluded from the study. The patients were randomly divided into two groups – Group A and Group B of 30 patients each. Intraoperative monitoring was done with heart rate, oxygen saturation, electrocardiogram, mean arterial pressure and end tidal carbon dioxide. Ten minutes prior to induction of anaesthesia, patients in Group A received 2% preservative free lignocaine 1.5 mg/kg IV bolus (made to a volume of 6 ml with normal saline) administered over a period of 10 minutes and thereafter an infusion at a rate of 1.5 mg/kg/h (pre-diluted in normal saline and administered at a rate of 6ml/h). Lignocaine infusion was continued until the surgery was over or the maximum dose of the drug was administered (3mg/kg or total dose of 300mg) whichever came first. Patients in Group B, received 6 ml normal saline as bolus over 10 minutes, followed by 6 ml/h infusion. It was continued till the

end of surgery. All patients were given premedication with injection midazolam 0.025 mg/kg IV, injection fentanyl 2µg/kg and injection ondansetron 0.1 mg/kg IV. Pre-oxygenation with 100% oxygen for 3 minutes was started after completion of lignocaine bolus. The induction agent of choice was Inj Propofol 2mg/kg IV and the patients were intubated after giving Inj Vecuronium 0.1mg/ kg IV. Adequate depth of anesthesia was maintained with the help of Oxygen, Nitrous oxide and Sevoflurane. After the completion of the surgery residual neuromuscular blockade was reversed with a mixture of neostigmine 0.05mg/kg and glycopyrrolate 0.1mg/kg IV and patients were extubated and subsequently shifted to the recovery room. Post-operative pain intensity was recorded using visual analogue scale [VAS]. First dose of fentanyl 1µg/kg IV was administered when the VAS  $\geq$ 4 was reported by the patient. Post-operative analgesia was assessed by recording pain-free period [time to first rescue analgesia]. Pain-free period (VAS <4) was taken as the period from the time of extubation to the first requirement of injection fentanyl. Haemodynamic assessment was done using heart rate (HR) and mean arterial pressure (MAP). HR and MAP were documented immediately before starting the infusion of lignocaine, 1 minute after tracheal intubation and 1 minute after tracheal extubation.

Data was entered into MS EXCEL software and analysed using IBM SPSS version 18. Association between various factors was assessed using Independent t- test and Paired t-test for quantitative variables and the Chi-squared test for qualitative variables. Significance was taken as p value less than 0.05.

## RESULTS

Study was completed in all the sixty participants and the data were collected. The baseline demographic data was comparable in Group A Group B with respect to Age, Sex, BMI, and ASI status.

**Table 1: Demographic variables**

Variable	Group A	Group B	P value
Age	50.63 $\pm$ 7.19	50.33 $\pm$ 6.10	0.862
BMI	24.82 $\pm$ 2.72	24.61 $\pm$ 4.11	0.814
Gender [male/female]	24/6	23/7	0.500
ASA status	4[1], 26[2]	4[1], 26[2]	0.647
Duration of surgery[minutes]	49.83 $\pm$ 8.86	50.67 $\pm$ 7.63	0.698

Both Group A and Group B were comparable with no statistically significant difference with respect to age, BMI, gender, ASA status and duration of surgery.

**Table 2: Change in Heart rate [HR] (per minute)**

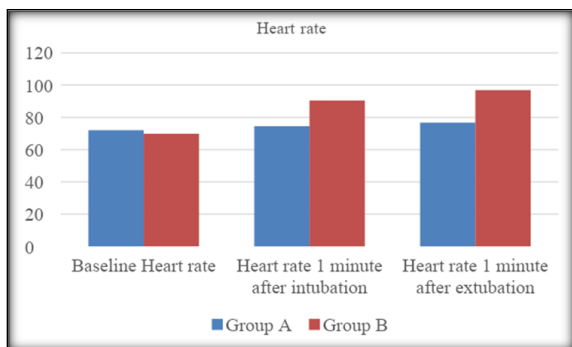
Group	Baseline	1 minute after intubation	P value	1 minute after extubation	P value
A	72.07 $\pm$ 6.98	74.46 $\pm$ 7.23	0.001	76.67 $\pm$ 6.86	0.000
B	69.87 $\pm$ 6.54	90.40 $\pm$ 11.04	0.000	96.83 $\pm$ 10.03	0.000

**Table 3: Change in Mean arterial pressure [MAP](mmHg)**

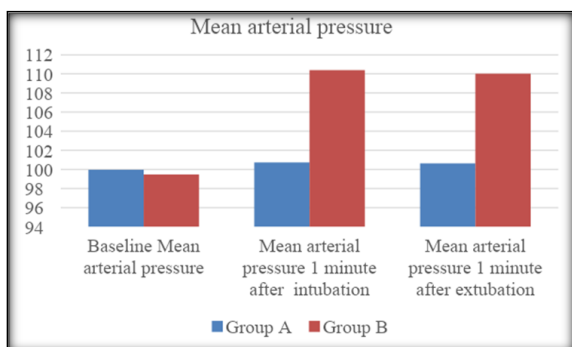
Group	Baseline	1 minute after intubation	P value	1 minute after extubation	P value
A	99.97 ± 8.98	100.73 ± 9.54	0.546	100.63 ± 6.76	0.441
B	99.47 ± 8.20	110.40 ± 7.74	0.000	110.03 ± 7.03	0.000

**Table 4: Duration of analgesia (minutes)**

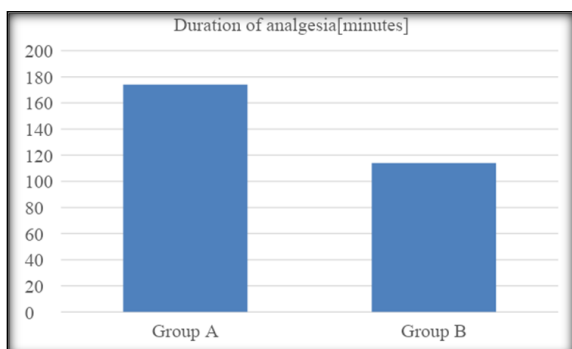
	Group A	Group B	P value
Duration of analgesia	174 ± 51.30	114 ± 39.01	0.000

**Figure 1:**

The increase in HR, 1 minute after intubation and 1 minute after extubation was significant in both Group A and Group B. However in Group A, the increase was lesser when compared to Group B.

**Figure 2:**

The increase in MAP, 1 minute after intubation and 1 minute after extubation was not significant in Group A but significant in Group B.

**Figure 3:**

The time to rescue analgesia was significantly higher in Group A as compared to Group B.

## DISCUSSION

Systemic lignocaine infusion has been used as an analgesic adjunct for the management of acute perioperative pain in many clinical settings and is associated with good hemodynamic stability.<sup>[1]</sup> The opioid sparing effect of lignocaine can be of great use particularly in obese patients with obstructive sleep apnoea, where there is an increased risk of sedation and severe respiratory depression with opioid use. Enhanced Recovery after Surgery (ERAS) protocols recommend intravenous lignocaine as a component of opioid-sparing multimodal analgesia, particularly after major gastrointestinal surgery.<sup>[2]</sup> In 2015, a Cochrane review was published including 45 trials, comparing the effect of continuous perioperative lignocaine infusion with epidural analgesia in adults undergoing general anaesthesia. The results suggested that the lignocaine infusion was equally effective in the reduction of postoperative pain, expedited gastrointestinal recovery time, reduced postoperative nausea and vomiting, reduced opioid usage, and a reduction in hospital length of stay.<sup>[3],[4]</sup> The two groups A and B in this study were comparable with respect to age, BMI, gender, ASA status and duration of surgery ( $p > 0.05$ ). Group B showed a statistically significant increase in HR ( $p = 0.000$ ) and MAP ( $p = 0.000$ ) following intubation and extubation [Table 2, Table 3. Figure 1, Figure 2]. Group A showed an increase in HR following intubation ( $p = 0.001$ ) and extubation ( $p = 0.000$ ) [Table 2] but it was lesser than that in Group B. However there was no significant increase in MAP in Group A, following intubation ( $p = 0.546$ ) and extubation ( $p = 0.441$ ) [Table 3] [Figure 2]. These findings are similar to the study conducted by Ali et al. using intravenous lignocaine in laparoscopic cholecystectomy where MAP and HR were significantly lower in lignocaine group compared with placebo after intubation and pneumoperitonium.<sup>[5]</sup> Intravenous lignocaine was found to reduce the stress response to intubation and extubation in the study by Jain and Khan,<sup>[6]</sup> as well as in the study by Murthy and Kumar.<sup>[7]</sup> The duration of analgesia which was taken as the time from extubation to time when the patient required first rescue analgesia [VAS  $\geq 4$ ] was compared between the two groups. The duration of analgesia was  $174 \pm 51.30$  minutes in Group A as compared to  $114 \pm 39.01$  minutes in Group B. The

mean difference of 60 minutes was statistically significant. Studies by Dogan SD et al,<sup>[8]</sup> and De Oliveira et al,<sup>[9]</sup> showed similar results. Tauzin-Fin and Bernard studied the effect of adding lignocaine infusion to standard anaesthesia protocol in patients for laparoscopic nephrectomy and got similar results.<sup>[10]</sup> Kim et al. in their patients undergoing lumbar surgery,<sup>[11]</sup> Yon et al. in their patients for subtotal gastrectomy,<sup>[12]</sup> and Koshyari et al. in patients undergoing total abdominal hysterectomy,<sup>[13]</sup> observed decreased analgesic requirements in post-operative period with intravenous lignocaine infusion. A systematic review of randomised controlled trials by McCarthy GC et al on impact of IV lignocaine infusion on post-operative analgesia and recovery from surgery showed similar results.<sup>[14]</sup> Movasaghi G et al. did a similar study in patients undergoing percutaneous nephrolithotomy and demonstrated better pain scores after surgery.<sup>[15]</sup>

## CONCLUSION

Intravenous lignocaine infusion administered intraoperatively was found to provide postoperative analgesia and decrease the use of opioids in the postoperative period. Lignocaine infusion was also observed to reduce the stress response associated with endotracheal intubation and extubation.

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