



## Postoperative pain relief after laparoscopic cholecystectomy: To compare the effectiveness of intraperitoneal ropivacaine vs lidocaine

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**ABSTRACT** **Introduction:** Patients undergoing laparoscopic procedures do experience postoperative pain, especially in the abdomen, back, and shoulder region. Intraperitoneal injections of a local anaesthetic have been proposed to minimize postoperative pain after laparoscopic surgery. Therefore, this prospective, randomized study was conducted to compare the effectiveness of intraperitoneal lidocaine with that of Intraperitoneal Ropivacaine for postoperative analgesia after laparoscopic cholecystectomy (LC) surgery.

**Material and methods:** Institute of Medical Sciences, Banaras Hindu University, Department of Anaesthesiology & Critical care, Varanasi, Uttar Pradesh. Fifty patients with ASA I or II undergoing LC were included in the study. They were classified randomly into two groups: group L which comprised 25 patients who were given 200 mg Lidocaine in 20 ml normal saline intraperitoneally and group R which included 25 patients who were given 0.2% Ropivacaine 20ml intraperitoneally. Postoperative pain was recorded using the visual analogue scale for 24 h after LC. Postoperative analgesic consumption was also recorded.

**Results:** The difference in VAS scores of the two treatment groups at the four times points (0, 4, 8 and 12) in both the treatment groups hours across the 12 hours time period is not significant. The mean visual analogue scale over 24 hours was higher in the ropivacaine group ( $4.57 \pm 0.48$ ) when compared to lignocaine group ( $4.18 \pm 0.56$ ) but was statistically significant ( $p < 0.05$ ) ( $P = 0.010$ ). The incidence of shoulder pain was 24 % in lidocaine group and 16 % in ropivacaine group. The mean value of total analgesic consumption in the form of intravenous paracetamol was significantly lower in the both lidocaine group ( $2.3 \text{ g} \pm 0.60$ ) as well as in ropivacaine group ( $2.5 \text{ g} \pm 0.63$ ) and were statistically not significant. There were no significant differences between the two groups with regards to haemodynamic.

**Conclusion:** Intraperitoneal instillation of ropivacaine or lignocaine is an effective method of postoperative pain relief in laparoscopic cholecystectomy. Both these drugs significantly reduced the postoperative pain.

**KEYWORDS :** Intraperitoneal, laparoscopic cholecystectomy, Ropivacaine, Lignocaine

### Introduction

Laparoscopic cholecystectomy is a minimally invasive technique and is associated with reduced surgical trauma, smaller and more cosmetic incision, and reduced blood loss, and is associated usually with fewer postoperative complications and decreased length of hospital stay. Hence, it is gradually replacing open surgery techniques when possible. However, patients undergoing laparoscopic procedures do experience postoperative pain, especially in the upper and lower abdomen, back, and shoulder region. Pain intensity usually peaks during the first few postoperative hours and usually declines over the following 2 or 3 days<sup>[1]</sup>.

Pain after laparoscopy results from the stretching of the intra-abdominal cavity<sup>[2]</sup>, peritoneal inflammation, and phrenic nerve irritation caused by residual carbon dioxide in the peritoneal cavity<sup>[3,4]</sup>. Intraperitoneal administration of local anaesthetics<sup>[5-13]</sup> or opioids<sup>[14-18]</sup> was carried out to induce postoperative analgesia and decrease analgesic requirements.

Therefore, this randomized controlled study was conducted to compare the effectiveness of intraperitoneal ropivacaine versus lidocaine for postoperative pain relief after laparoscopic cholecystectomy.

### Materials and methods

This study was conducted in Institute of Medical Sciences, Banaras Hindu University, Department of Anaesthesiology & Critical care, Varanasi, Uttar Pradesh University Hospitals from December 2015 to June 2016 after approval from the local ethics committee and after obtaining informed consent from each patient.

Fifty patients with ASA I aged 19-50 years and undergoing laparoscopic cholecystectomy were included in this study. They were classified randomly into two groups: group R, which comprised 25

patients who were given 20 ml of 0.2% ropivacaine intraperitoneally and group L, which included 25 patients who were given 200 mg intraperitoneal lidocaine in 20 ml normal saline. All intraperitoneal drugs were instilled immediately after laparoscopic removal of the gall bladder and after performing complete washing of peritoneal cavity and aspiration of the solution used for irrigation and before wound closure. All drugs used in the study were packed in white plastic syringes labelled with numbers that coded its content.

Patients with chronic respiratory disease, neurological disease, impaired cardiac functions or serious dysrhythmias, advanced renal or hepatic diseases, or with previous abdominal surgery were excluded from research.

Before starting anaesthesia, the visual 100 mm visual analogue score (VAS) (where 0 mm indicated total dissatisfaction and 100 mm indicated total satisfaction) was explained to every patient. For all included patients, general anaesthesia was induced by intravenous propofol sodium of 2-3 mg/kg, and all patients were given intravenous fentanyl at 2µg/kg; endotracheal intubation was facilitated using intravenous atracurium besylate 0.5 mg/kg. Maintenance of anaesthesia was performed by inhalational Isoflurane 0.5-1.5% in 100% oxygen, and a state of muscle relaxation was maintained by top up doses of 0.5 mg/kg atracurium besylate with controlled mode of mechanical ventilation and adjusted parameters to keep end-tidal CO<sub>2</sub> at normal values. All patients were continuously monitored by both lead II and V5 ECG, repeated non-invasive mean arterial blood pressure (MAP) measurement every 5 min, and continuous end-tidal CO<sub>2</sub> and oxygen saturation (SpO<sub>2</sub>) by pulse oximetry. Neuromuscular blockade was reversed using reversal agents followed by extubation of trachea, and no analgesics were given to patients before recovery.

After recovery, patients were monitored for heart rate (HR) and MAP measurement every 15 min during the first hour from recovery and

then every 4 h for 24 h. Patients were assessed for severity of pain using VAS immediately after recovery, after 1 h, and then every 4 h from recovery in the first 24 h. If VAS was 3 or more, intravenous infusion of 1 g paracetamol was given. Any complications such as respiratory depression, nausea, vomiting and/or itching were also recorded. Also, the total dose of consumed postoperative analgesics was reported.

### Statistical analysis:

The data were collected and presented as mean  $\pm$  SD, proportion, or n (%) and entered on Microsoft excel to be analyzed using the statistical package for social science (version 15; SPSS Inc., Chicago, Illinois, USA). The  $\chi^2$  -test were used to check that the study groups were matched in terms of demographic data. Significance level was considered if the P value was less than 0.05.

### Results

The two groups were comparable for demographic data of patients and were showed no significant difference between both these groups [Table 1]. The mean visual analogue scale over 24 hours was higher in the ropivacaine group (4.57 $\pm$  0.48) when compared to lignocaine group (4.18 $\pm$  0.56) but was statistically insignificant. The total dose of intravenous paracetamol consumed in both group R as well as group L was lower but this decrease was not statistically different. A total of four patients from group R (16 %) and six patients from group L (24%) developed shoulder pain within the first 24 h, which required intramuscular 30 mg ketorolac for pain relief. There were no significant differences between the two groups with regards to haemodynamic parameters.

**Table 1: Demographic data and duration of operation**

Demographic data	Group R (n=25)	Group L (n=25)	P value
Age (Years)	39.8 $\pm$ 13.4	42.5 $\pm$ 12.8	0.469
Sex (M:F)	29:11	25:15	
Weight (kg)	71.8 $\pm$ 15.3	75.2 $\pm$ 16.4	0.452
Duration of surgery	89.8 $\pm$ 16.4	85.2 $\pm$ 17.8	0.346

### Data expressed as Mean $\pm$ SD

The difference in VAS scores of the two treatment groups at the four times points (0, 4, 8 and 12) in both the treatment groups hours across the 12 hours time period is not significant. (Table 2). There is a significant reduction in VAS over the 12 hour period in both the treatment groups (Table 2), (P value < 0.05) (P=0.010)

**Table 2: Visual analogue in both groups**

VAS	Group R (n=25)	Group L (n=25)	P value
Immediate after recovery 0 Hour	4.19 $\pm$ 0.54	4.43 $\pm$ 0.65	0.162
4 Hour	4.38 $\pm$ 0.44	4.34 $\pm$ 0.56	0.780
8 Hour	4.29 $\pm$ 0.65	4.56 $\pm$ 0.64	0.414
12 Hour	3.78 $\pm$ 0.58	3.89 $\pm$ 0.43	0.449
24 Hour	4.57 $\pm$ 0.48	4.18 $\pm$ 0.56	0.010

Although the total dose of intravenous paracetamol consumed in both group R as well as group L was lower but this decrease was not statistically different.

**Table 3: Postoperative complications**

Parameter	Group R (n=25 )	Group L (n=25 )
Shoulder Pain	4 (16)	6 (24)

**Table 4: Mean value of total analgesic consumption**

Parameter	Group R (n=25)	Group L (n=25)	P value
Mean analgesic concentration	(2.5 g $\pm$ 0.63)	(2.3 g $\pm$ 0.60)	0.256

Limitations of our study: Major limitation was smaller sample size, control group was not present in our study group as we directly compared the efficacy of ropivacaine and lignocaine. Other limitation was not including PONV incidence to our study however we successfully Postoperative nausea and vomiting.

### Discussion

The present study shows that intraperitoneal instillation of local

anaesthetics as mentioned in previous studies beneficial method for providing post-operative analgesia. Both Ropivacaine 0.2% and lignocaine 200mg are equally effective in a volume of 20 ml for postoperative pain relief. We used the low dose of ropivacaine (0.2%) in accordance with study of Labaille et al.<sup>[11]</sup> in which they concluded that low dose of ropivacaine was equally effective in reducing the postop pain after laparoscopic cholecystectomy when compared to higher doses.

In the present study, we found out that the difference in the VAS scores of two treatments groups at four times points across the 12-hour time period is not significant.

Almost all studies available in literature compared either use of commonly used local anaesthetics with a placebo like normal saline or the different concentration of same local anaesthetics with each other. Some author has even tried to change the timing of intraperitoneal local anaesthetics like before the dissection of gall bladder bed or after the procedure. We used the intraperitoneal instillation of local anaesthetics at the end of procedure in tredenlenberg position with the trocar intact. No local anaesthetics were instilled into the surgical wound created. Similar results with ropivacaine and placebo were obtained by Pasqualucci A et al.<sup>[5]</sup> were they compared the effects of intraperitoneal ropivacaine (150 mg) in patients undergoing laparoscopic cholecystectomy. They found that for preventing postoperative pain 150 mg ropivacaine instilled intraperitoneally was useful.

We instilled the local anaesthetic in the tredenlenberg position at the end of surgery which may have resulted in better dispersion of the drug and hence beneficial effect up to 12 hour post-operative period. Also instillation of local anaesthetic in supine position prevented its flow over the celiac plexuses and phrenic nerve endings which can be an important pathway in post op pain relief<sup>[19]</sup>

Our results matched with those of Hernandez-Palazón et al.<sup>[14]</sup>, who studied the analgesic effect of the intraperitoneal administration of bupivacaine and morphine, and with those of Pasqualucci et al.<sup>[5]</sup> who used a local anaesthetic (bupivacaine) intraperitoneally as an analgesic for laparoscopic cholecystectomy. They found that pain intensity and analgesic requirements were significantly less in the group receiving bupivacaine after surgery compared with placebo. Several studies used intraperitoneal lidocaine to control post laparoscopic pain and most of these studies demonstrated significant improvement in postoperative pain and lower consumption of postoperative analgesics during the first 24 h. postoperative pain, but we did not find any previous study in which intraperitoneal nalbuphine was administered for postoperative pain relief.

### Conclusion

Intraperitoneal instillation of lidocaine or ropivacaine is an easy, cheap, and non-invasive method that provides good analgesia in the postoperative period after laparoscopic cholecystectomy. Ropivacaine has better cardiovascular safety profile can be an effective alternative for intraperitoneal infiltration.

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