**ORIGINAL RESEARCH**

# Efficacy Evaluation of Ropivacaine as Post-Analgesic Agent in Laparoscopic Cholecystectomy Surgeries at a Tertiary Care Hospital

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**ABSTRACT**

**Background**:Laparoscopic cholecystectomy (LC) is the treatment of choice for symptomatic cholelithiasis substituting the conventional open method of cholecystectomy.Although post-operative pain is much less severe than that induced by open cholecystectomy, it is still not a pain-free procedure, which is why many patients refrain from early recovery, a major hurdle in enhanced recovery after surgery.This study was conducted to assess the efficacy of ropivacaine as post analgesic agent in patients undergoing laparoscopic cholecystectomy.**Materials and Methods:**This study comprised of 100 subjects undergoing laparoscopic cholecystectomy (LC). 2 doses of ropivacaine were used; 0.75% and 0.5%. 50 subjects were treated with 0.75% ropivacaine and had been assigned to Group 1 and the remaining 50 subjects had been treated using 0.5% ropivacaine. The efficacy of both the doses had been compared and the findings were tabulated. Statistical analysis was conducted using SPSS software.**Results:**The duration of surgery using 0.75% ropivacaine was 135.2±12 minutes and the duration of surgery using 0.5% ropivacaine was 129.7±9 minutes. The duration of stay in PACU with 0.75% ropivacaine and 0.5% ropivacaine was 163.5±64 minutes and 158.4±57 minutes, respectively. Blood loss with using 0.75% ropivacaine and 0.5% ropivacaine was 17.8±6.0 ml and 21.9±8.4 ml, respectively. Nausea was seen in 3 subjects of group 1 and 9 subjects of group 2. Vomiting was evident in 2 subjects of group 1 and 5 subjects of group 2. Pruritis was seen in 2 subjects of group 2 and respiratory depression was seen in only 1 patient of group 2.**Conclusion:**Intraperitoneal administration of ropivacaine before and after surgery significantly decreases postoperative pain. However; the duration of surgery and the duration of stay in PACU with 0.75% ropivacaine was longer compared to 0.5% ropivacaine. Side effects such as nausea, vomiting, pruritis and depression were seen commonly in subjects treated using 0.5% ropivacaine, while only a few side effects were observed among subjects treated with 0.75% ropivacaine.

**Keywords:**Ropivacaine, Laparoscopy, Cholecystectomy.



## INTRODUCTION

Laparoscopic cholecystectomy (LC) is the treatment of choice for symptomatic cholelithiasis substituting the conventional open method of cholecystectomy.[1] Although post-operative pain is much less severe than that induced by open cholecystectomy, it is still not a pain-free procedure, which is why many patients refrain from early recovery, a major hurdle in enhanced recovery after surgery (ERAS).[2]Different modalities have been proposed to relieve post-operative pain after laparoscopy, for example, non-steroidal anti-inflammatory drugs (NSAIDS), opioids, intraperitoneal (IP) local anaesthetics, IP saline, removal of insufflations gas or gas drains, low-pressure abdominal insufflations, acetazolamide administration, use of nitrous oxide instead of carbon dioxide, and so on.[3]

Among the various local anaesthetics (LA) techniques, IP use of LA has gained attention and various researches have been done to study its efficacy for post-operative analgesia. The rationale to use the IP route is that the peritoneum is exposed to block of visceral nociceptive conduction, thereby providing an additional mechanism of analgesia. Most

of the previous studies have shown that local anaesthetic with or without opioids can provide post-operative pain relief when instilled intraperitoneally.[4]LC has emerged as the procedure of choice with advancements in technology and awareness among patients. Pain remains the most common complaint in the early postoperative period.[5,6] This pain is classified into three components: somatic (abdominal wall incision), visceral (surgical manipulation), and shoulder tip pain (residual $CO_2$ in the peritoneal cavity).[7,8]This study was conducted to assess the efficacy of ropivacaine as post analgesic agent in patients undergoing laparoscopic cholecystectomy.

## MATERIALS AND METHODS

Present study was conducted in Department of Anesthesiology, LNCT Medical College and Sewakunj Hospital, Indore, Madhya Pradesh, India.This study comprised of 100 subjects undergoing laparoscopic cholecystectomy (LC). The aim of this study was to assess the efficacy of ropivacaine as a post-analgesic agent following LC. The subjects had been informed about the procedure and were asked to give consent. the subjects who denied giving consent had been excluded from the study. 2 doses of ropivacaine were used; 0.75% and 0.5%. 50 subjects were treated with 0.75% ropivacaine and had been assigned to Group 1 and the remaining 50 subjects had been treated using 0.5% ropivacaine. The efficacy of both the doses had been compared and the findings were tabulated. Statistical analysis was conducted using SPSS software.

## RESULTS

In this study, there were 100 subjects who were divided into two groups of 50 subjects each with group 1 comprising of subjects treated using 0.75% ropivacaine and group 2 comprising of subjects treated with 0.5% ropivacaine.

In this study, there were 64 males and 36 females. There were 26 males in group 1 and 38 males in group 2. There were 24 females in group 1 and 12 females in group 2.

The duration of surgery using 0.75% ropivacaine was 135.2±12 minutes and the duration of surgery using 0.5% ropivacaine was 129.7±9 minutes. The duration of stay in PACU with 0.75% ropivacaine and 0.5% ropivacaine was 163.5±64 minutes and 158.4±57 minutes, respectively. Blood loss with using 0.75% ropivacaine and 0.5% ropivacaine was 17.8±6.0 ml and 21.9±8.4 ml, respectively.

Nausea was seen in 3 subjects of group 1 and 9 subjects of group 2. Vomiting was evident in 2 subjects of group 1 and 5 subjects of group 2. Pruritis was seen in 2 subjects of group 2 and respiratory depression was seen in only 1 patient of group 2.

**Table 1: Group-wise distribution of subjects**

| Groups | Number of subjects | Percentage |
|---|---|---|
| **Group 1 (0.75% ropivacaine)** | 50 | 50 |
| **Group 2 (0.5% ropivacaine)** | 50 | 50 |
| **Total** | 100 | 100 |

**Table 2: Gender-wise distribution of subjects**

| Gender | Group 1 | Group 2 | Total |
|---|---|---|---|
| **Male** | 26 | 38 | 64 |
| **Female** | 24 | 12 | 36 |
| **Total** | 50 | 50 | 100 |

**Table 3: Comparison of the two doses of ropivacaine**

| Parameters | Group 1 (0.75%) | Group 2 (0.5%) |
|---|---|---|
| **Duration of surgery (min)** | 135.2±12 | 129.7±9 |
| **Duration of stay in Post Anaesthesia Care Unit (min)** | 163.5±64 | 158.4±57 |
| **Blood loss (ml)** | 17.8±6.0 | 21.9±8.4 |

**Table 4: Side effects**

| Side effects | Group 1 (0.75%) | Group 2 (0.5%) |
|---|---|---|
| **Nausea** | 3 | 9 |
| **Vomiting** | 2 | 5 |
| **Pruritis** | 0 | 2 |
| **Respiratory depression** | 0 | 1 |

## DISCUSSION

Laparoscopic cholecystectomy (LC) is the mainstay approach for the treatment of cholelithiasis. This is because it is considered to be minimally invasive and accelerates recovery.[9] However, this approach is associated with high post-operative pain intensity, especially in the early period.[10,11] Effective pain control is crucial for enhancing recovery after surgery

(ERAS).[12] Studies have shown that traditional pain management using opioids often lead to side effects, such as postoperative nausea, vomiting (PONV), and respiratory depression.[13]Previous studies have shown that multimodal analgesic strategies with local infiltration not only provide strong analgesic effects but also reduce incidence of opioid-related side effects, resulting in faster recovery and shorter hospital stay.[14-16] Several clinical studies have shown that local infiltration with ropivacaine effectively control postoperative pain and thus has been widely adopted in recent years.Ropivacaine at 0.75%, 0.5%, or 0.2% doses have been applied for postoperative pain management, but no study has compared the analgesic effects of different doses of ropivacaine in LC.[17]This study was conducted to assess the efficacy of ropivacaine as post analgesic agent in patients undergoing laparoscopic cholecystectomy.

In this study, there were 100 subjects who were divided into two groups of 50 subjects each with group 1 comprising of subjects treated using 0.75% ropivacaine and group 2 comprising of subjects treated with 0.5% ropivacaine. In this study, there were 64 males and 36 females. There were 26 males in group 1 and 38 males in group 2. There were 24 females in group 1 and 12 females in group 2. The duration of surgery using 0.75% ropivacaine was 135.2±12 minutes and the duration of surgery using 0.5% ropivacaine was 129.7±9 minutes. The duration of stay in PACU with 0.75% ropivacaine and 0.5% ropivacaine was 163.5±64 minutes and 158.4±57 minutes, respectively. Blood loss with using 0.75% ropivacaine and 0.5% ropivacaine was 17.8±6.0 ml and 21.9±8.4 ml, respectively. Nausea was seen in 3 subjects of group 1 and 9 subjects of group 2. Vomiting was evident in 2 subjects of group 1 and 5 subjects of group 2. Pruritis was seen in 2 subjects of group 2 and respiratory depression was seen in only 1 patient of group 2.Labaille T et al[18]assessed thirty-seven ASA physical status I or II patients who received in double-blinded fashion 20 mL of 0.9% saline solution (placebo), ropivacaine 0.25% (Rop 0.25%), or ropivacaine 0.75% (Rop 0.75%) immediately after trocar placement and at the end of surgery. They measured pain and morphine consumption until 20 h after surgery. Plasma ropivacaine concentrations were measured. The three groups were comparable for shoulder pain, parietal pain, and incidence of side effects. Visceral pain at rest, during cough, and on movement and total consumption of morphine were significantly smaller in Groups Rop 0.25% and Rop 0.75% when compared with Placebo. Although no adverse effect occurred in any patient, the largest dose led to large plasma concentrations of ropivacaine (2.93 +/- 2.46 microg/mL and 3.76 +/- 3.01 microg/mL after the first and second injection, respectively). They concluded that intraperitoneal administration of ropivacaine before and after surgery significantly decreases postoperative pain. Liang M et al[19] investigated the analgesic effects and pharmacokinetic profile of varying concentrations of ropivacaine at port sites under laparoscopy assistance. 132 patients were assigned to 4 groups: Group H: in which patients were infiltrated with 0.75% ropivacaine; Group M: 0.5% ropivacaine; Group L: 0.2% ropivacaine; and Group C: 0.9% normal saline only. The primary outcome was pain intensity estimated using numeric rating scale (NRS) at discharging from PACU and at 4hours, 6hours, 8hours, and 24hours after infiltration. Secondary outcomes included plasma concentrations of ropivacaine at 30minutes after wound infiltration, rescue analgesia requirements after surgery, perioperative vital signs changes, and side effects. The NRS in Group C was significantly higher at rest, and when coughing upon leaving PACU and at 4hours, 6hours, 8hours, and 24hours after infiltration ($P<.05$) and rescue analgesic consumption was significantly higher. Notably, these parameters were not significantly different between Groups H, Group M and Group L ($P>.05$). Intra-operative consumption of sevoflurane and remifentanil, HR at skin incision and MAP at skin incision, as well as 5minutes after skin incision were significantly higher in Group C than in the other 3 groups ($P<.01$). In contrast, these parameters were not significantly different between Groups H, Group M and Group L ($P>.05$). The concentration of ropivacaine at 30minutes after infiltration in Group H was significantly higher than that of Group L and Group M ($P<.05$). No significant differences were observed in the occurrence of side effects among the 4 groups.

## CONCLUSION

The duration of surgery and the duration of stay in PACU with 0.75% ropivacaine was longer compared to 0.5% ropivacaine. Side effects such as nausea, vomiting, pruritis and depression were seen commonly in subjects treated using 0.5% ropivacaine, while only a few side effects were observed among subjects treated with 0.75% ropivacaine.

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