e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(5); 1071-1076

Original Research Article

Effect of Intra-Peritoneal Bupivacaine for Post-Operative Analgesia Following Laparoscopic Cholecystectomy

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Received: 01-02-2026 / Revised: 15-03-2026 / Accepted: 21-04-2026

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Conflict of interest: Nil

Abstract

Introduction: Laparoscopic cholecystectomy surgery is now-a-days the commonest surgery related to abdomen. But post-operative pain decrease not only the patient outcome but also increase the hospital stay. All this will increase the opioid dependence which results in its side effects like nausea, vomiting, constipation etc. So, we decided a study in which we gave intra-peritoneal bupivacaine spray after laparoscopic cholecystectomy for post-operative analgesia.

Methodology: 60 patients who were posted for routine laparoscopic cholecystectomy surgeries were equally divided into 2 groups with 30 patients each (Group IPB and Group GA). In group IPB, General anaesthesia along with intra-peritoneal bupivacaine spray (after completion of surgery) were given, while in group GA, we only gave general anaesthesia. We observed Post-operative analgesic requirement as well as hemodynamic stability of the patients.

Result: Total analgesic requirements were significantly less in group IPB as compared to group GAduring post-operative period. There was decrease in the time spent by the patient in post-operative anaesthesia care unit in group IPB as compared to group GA.

Conclusion: Intra-peritoneal bupivacaine spray after completion of laparoscopic cholecystectomy will not only decrease the post-operative analgesic requirements but also increase the post-operative hemodynamic stability.

Keywords: Intra-peritoneal bupivacaine, Laparoscopic cholecystectomy.

DOI: 10.25258/ijcpr.18.5.174

Introduction

Now-a-days, Laparoscopic surgical procedures are famous not only for surgeons but also in general population. This popularity is gained because of its several merits over non-laparoscopic surgeries, i.e. improved postoperative recovery, less complications, early mobilization which results in earlier discharge & reduced hospital stay [1]. Few studies suggested the possibility of less post-operative pain associated with laparoscopic procedures; however, it can never be totally pain free [2]. Laparoscopic procedures carry the risk of severe pain with increased analgesic requirements in immediate post-operative period than open laparotomies [3,4]. There is difference in pain generators between laparotomy and laparoscopy surgery which gives us an idea about the pain control of each surgery. Parietal pain is the main generator in laparotomies, visceral pain is predominant after laparoscopic surgeries. This visceral pain is caused by stretching of intra-abdominal cavity, peritoneal inflammation & phrenic nerve irritation caused by residual carbon dioxide in peritoneal cavity resulting in post-operative abdominal and shoulder pain after laparoscopy [2,5]. Various modalities are used for maintaining post-operative pain relief, including IV

or IM NSAIDs [6] & Opioids [7], Infiltration at incision site with local anesthetics [8], intraperitoneal infiltration of local anesthetics [8], local anesthetics with adjuvants [9], & regional anesthesia techniques such as epidural analgesia and nerve blocks [10-11]. These techniques have been found to have variable rates of success depending on type of surgery and duration. The aim of our study is to assess the effectiveness of intra-peritoneal administration of bupivacaine on post-operative rescue analgesics after laparoscopic cholecystectomy.

Methodology

This Prospective, Randomized, Observational Controlled study was performed after taking permission from Institutional Ethics Committee of LNMC & JK Hospital, Bhopal (M.P.) The study was conducted from April 2025 to March 2026 in our hospital. Patients aged between 18 to 60 years, having American Society of Anesthesiologists (ASA) physical status I and II, and undergoing routine laparoscopic cholecystectomy (should be less than 2 hours) were included in the study. Patients with ASA status III & above, allergy to local anaesthetic drug, bleeding disorder, surgical time exceeded 2 hours, pregnancy or not willing to attend the study were excluded. After taking written informed consent, 60 patients were randomized using coin method and allocated into two groups (Group B or Group G). Patients in group B (n = 30) received intra-peritoneal bupivacaine spray administration after completion of surgery. Group G (n = 30) patients did not receive any infiltration.

Pre-operatively, patients were advised a fasting period of at least 6 hrs. Before surgery. In the preoperative room, two intra-venous access was secured as a part of routine care. On arrival in the operating room, standard monitors including 5 leads ECG, Non-invasive blood pressure and Pulse oximetry were applied and baseline values were recorded.

All patients were given intravenously 0.2mg Inj. Glycopyrrolate, 1mg Inj. Midazolam before the induction of anaesthesia. General anaesthesia was induced following 3 min of preoxygenation with fentanyl 2 µg/kg and 1.5-2mg Inj. Propofol given until response to verbal commands was lost. Vecuronium bromide 0.1 mg/kg was provided intravenously to assist tracheal intubation. Anaesthesia was maintained with 1% Isoflurane & 33% Oxygen and 66% Nitrous oxide. Positive pressure ventilation was initiated with a tidal volume of 8 mL/ kg with an adjusted respiratory rate to maintain end-tidal carbon dioxide between 35 and 40 mmHg. After the completion of surgical procedure, intra-peritoneal infiltration of 0.5% 15ml bupivacaine was done. At the end of surgery, isoflurane administration was discontinued and the fresh gas flow rate was increased to 6 L/min of oxygen only. At the beginning of spontaneous breathing by the patient, the reversal of neuromuscular blockade was done with a standard dose of Neostigmine and Glycopyrrolate. The trachea was extubated when the patient spontaneously breathed with tidal volume 5–8 mL/kg and could respond to a verbal request. In the PACU, the quality of recovery was assessed using modified Aldrete scoring on arrival and then every 15 min until 60 min.

On the same schedule, pain intensity was assessed using the pain Visual Analogue Scale (VAS), and the time taken for the first request of analgesia was noted (period from the PACU arrival to the first request made by the patient for rescue analgesics).

Both for intra-operative & post-operative analgesia, we use Inj. Tramadol for mild to moderate pain and Inj. Fentanyl for severe pain. For any increase from 15%-20% in heart rate & blood pressure, we gave rescue analgesia. Patients having any complications like PONV, Anxiety, etc. were noted. Pain scores and opioid consumption data were collected and recorded by nursing staff who were not involved in the study.

Result

This study included 60 patients by coin sampling method. Patient's demographic data were statistical non-significant with a p-value of more than 0.1. Mean age of patients were 48±0.8 years, Mean weight of patients were of 68±0.1 kgs, & Mean height of patients were 159±0.4cms. We had observed the analgesic requirement in both the groups, by measuring intra-operative & post-operative hemodynamic variation as well as postoperative VAS score. In Figure 1, we compared the mean heart rate during intraoperative & postoperative period. O hours is considered as time of extubation. On comparing 2 groups, there was a very well differentiation of heart rate between 2 groups. As in group B, Heart rate was very well maintained within normal range, with statistical significant (p-value< 0.003).

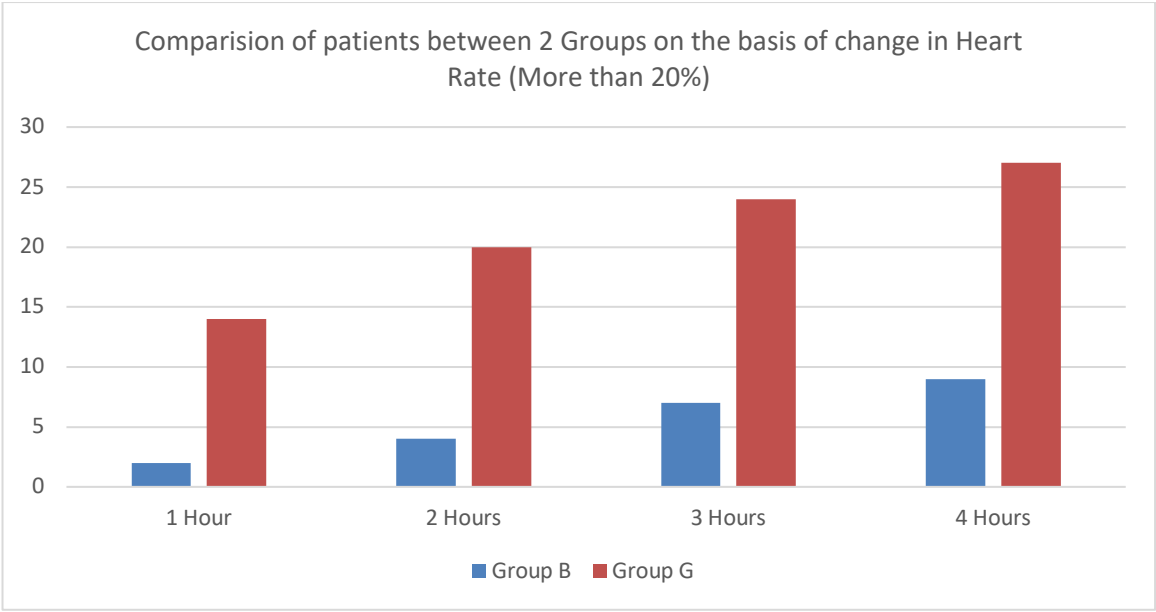

Figure 1: Comparision of patients between 2 Groups on the basis of change in Heart Rate (More than 20%)

In Figure 2, we compared the Mean blood pressure during intra-operative & post-operative period. O hours is considered as time of extubation. On comparing 2 groups, there was a significant difference in mean blood pressure between 2 groups. In group B, at different time interval blood pressure was not fluctuating from normal range, and it was statistically significant also (p-value< 0.003).

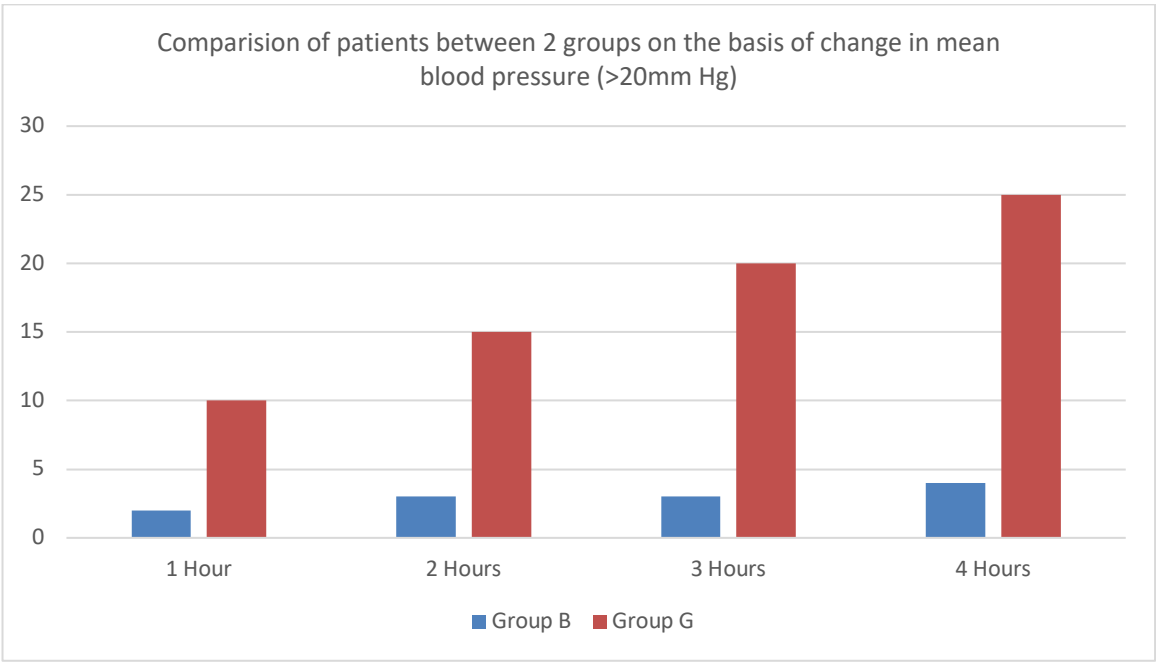

Figure 2: Comparision of patients between 2 groups on the basis of change in mean blood pressure (>20mm Hg)

In Figure 3, we compared the analgesic requirement of patients both in intraoperative as well as postoperative period. 0 hour is considered as time of extubation & time of bupivacaine infiltration. And if we compared post-operative analgesic requirement, almost all 30 patients requires analgesic drug in group G while in group B, approx. 50% of the patients doesn't required analgesic drug upto 6 hours of surgery. Certain patients doesn't feel any pain upto 24 hours of surgery. We gave Inj. Tramadol for mild (VAS>3) to moderate (VAS 3-6) pain & Inj. Fentanyl for severe (VAS<7) pain during post-operative period. During postoperative period, patients of group G was having moderate to severe pain while patients of group B had only mild to moderate pain. 12

patients of group G had PONV while only 1 patient of group B had the same.

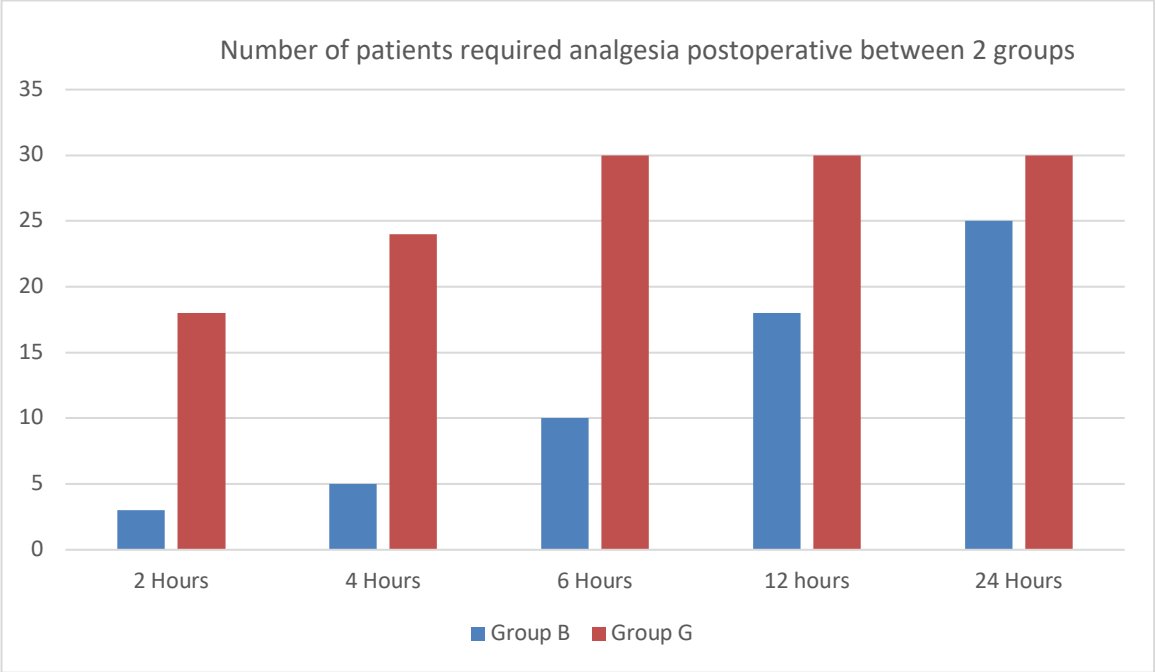

Figure 3: Number of patients required analgesia postoperative between 2 groups

Discussion:

During laparoscopic cholecystectomy, the most common side effect is patient's discomfort along with post-operative pain. Laparoscopic cholecystectomy can be associated with incidence of pain, bleeding and increased hospital stay, thereby delaying recovery.[12] Multiple interventions are applied to the patient before, during and after surgery for the above reason's & the commonest be the combined use of Narcotic and NSAIDS. However, they can be associated with GIT and Neurological Side effects, which may cause patient's discomfort.[13,14] Post-operative pain is characterized as acute inflammatory pain that originates with surgical trauma and typically resolves with tissue healing. When pain triggers, there is a release of catecholamines, which may precipitate cardiovascular incidents, undesirable neuro-endocrine or metabolic changes, thromboembolic events, pulmonary complications, and prolonged hospital stays.[15] After surgical procedures, pain becomes a significant factor influencing patient well-being. Early analgesic approaches or the introduction of additional interventions, that aim to reduce the need for analgesics and improve patient well-being is become important.[16,17] Therefore, many patients often undergo treatment using a mix of non-opioid analgesic agents, or known as multimodal analgesia.[18] The main goal of this approach is to achieve a additive beneficial effect while reducing individual analgesic doses. This will not only helps in preventing adverse effects but also reduces dependence on opioids and its related side effects.[19,20] Commonly used non-opioid drugs included in multimodal analgesic strategies are Paracetamol, NSAIDs, Corticosteroids, Ketamine, Local anaesthetics, and Gaba-pentinoids.[21] In our study, we gave intra-peritoneal spray of 15ml of 0.5% bupivacaine spray after completion of surgical procedure but before extubation. Few studies investigates the effect of intra-peritoneal instillation of local anesthetics has proven its efficacy in improving post-operative pain and reducing opioid consumption [22]. Bupivacaine is the most common local anesthetic used intraperitoneally for postoperative pain relief because of its high potency and longer duration of action. In our study, the VAS score was lower in Group B as compare to Group G, & this finding was similar to the results reported in Devalkar and Salgaonkar[23] and Suma and Vikranth[24] in their study respectively. Raetzell et al. compared lower concentrations of bupivacaine (0.125% and 0.25%) with normal saline and found no difference in the pain scores between the groups [25]; this could be attributed to the lower concentration of bupivacaine that was used.

In meta-analysis by Choi et al., who studied 39 random control trial reviews, the authors concluded that intra-peritoneal local anesthetics did'nt significantly reduce parietal pain and exhibited a favorable analgesic effect towards visceral pain and shoulder pain[26]. There are a few studies in which the administration of a local anesthetic didn't show any efficacy. These failures could be due to the use of lower drug dose, lower concentration or because the dose was infiltrated under the right hemi-

diaphragm [25,27-28]. In our study, post-operative shoulder tip pain was lower in Group B as compare to Group G. Putta et al. also showed that the incidence of shoulder pain was significantly reduced in groups receiving bupivacaine in comparison to those receiving normal saline and that the timing of the bupivacaine infiltration was not significant[29]. In our study, the time taken for first dose of analgesic was more in Group B as compare to Group G which was similar with the study by Sulekha, they showed that the dosing of rescue analgesia was more frequent and the highest in patients who received normal saline in comparison to those that received bupivacaine[30]. Goldstein A et al. showed a lower rate of PONV in patients that were administered bupivacaine [31], which was quite similar with our study.

In our study, intra-peritoneal bupivacaine spray not only decrease the time to PACU discharge following laparoscopic cholecystetomy but also have a useful effect on post-operative pain management. Although the group receiving intra-peritoneal bupivacaine spray had a significantly longer mean time to first analgesia when compared with the control group, the mean time to PACU discharge and the incidence of PONV was comparable between the groups and didn't show early recovery.

Our findings suggest that intra-peritoneal bupivacaine spray administered to patients undergoing laparoscopic cholecystectomy provides effective pain control with minimal complications and reduces the dependence on post-operative opioids.

Conclusion:

Intra-peritoneal bupivacaine spray provides better hemodynamic stability (postoperative) and it also decreased the post-operative analgesic consumption. Therefore, we recommends intra-peritoneal bupivacaine spray as a multimodal analgesic regimen for laparoscopic cholecystectomy.

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