



Anaesthesiology

A STUDY OF LIVER BED INFILTRATION WITH 0.25% BUPIVACAINE FOR POST-OPERATIVE PAIN MANAGEMENT IN LAPAROSCOPIC CHOLECYSTECTOMY AT AIMS & RC, DEVANAHALLI, BENGALURU RURAL.

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ABSTRACT **Background:** Effective postoperative pain management is critical for enhancing recovery and patient satisfaction after laparoscopic cholecystectomy. This study evaluates the efficacy of liver bed and subdiaphragmatic infiltration with 0.25% bupivacaine in reducing postoperative abdominal and referred shoulder pain. **Objective:** To assess the impact of local infiltration of bupivacaine on postoperative pain intensity, duration of analgesia, and overall patient satisfaction. **Methods:** In this prospective, randomized controlled trial, 60 patients scheduled for elective laparoscopic cholecystectomy were randomized into two groups: Group A received 15 ml of 0.25% bupivacaine infiltrated into the subdiaphragmatic region and gallbladder bed, while Group B received no infiltration. Pain intensity was assessed using the Visual Analogue Scale (VAS) at multiple postoperative time points (1, 2, 4, 6, 8, 12, and 24 hours). The primary outcomes were pain scores, time to first rescue analgesic, number of rescue doses in 24 hours, and patient satisfaction. **Results:** Group A showed significantly lower VAS scores (2.6 ± 0.5) at all postoperative intervals. The time to first rescue analgesic was longer (6.2 ± 1.3), and the total number of rescue doses required within 24 hours was lower in Group A (1.8 ± 0.6) compared to Group B. Additionally, patients in Group A reported higher satisfaction levels. No adverse effects related to bupivacaine were observed. **Conclusion:** Subdiaphragmatic and liver bed infiltration with 0.25% bupivacaine significantly improves postoperative analgesia following laparoscopic cholecystectomy, reduces analgesic requirements, and enhances patient comfort.

KEYWORDS : Bupivacaine infiltration, laparoscopic cholecystectomy, postoperative pain, visual analogue scale, liver bed, subdiaphragmatic analgesia.

INTRODUCTION:

Laparoscopic cholecystectomy is widely recognized as the standard of care for symptomatic gallstone disease due to its minimally invasive nature and quicker recovery. Despite smaller incisions and reduced surgical trauma, postoperative pain, particularly in the early recovery period, remains a significant concern. This pain originates from multiple sources including the port sites, peritoneal stretch, and most notably, irritation of the diaphragm leading to referred shoulder pain.

While multimodal analgesia remains the cornerstone of pain management, the role of local anesthetic infiltration in the surgical bed has gained increasing attention. Bupivacaine, a long-acting amide local anesthetic, offers prolonged analgesia when used in regional techniques. This study was undertaken to assess the efficacy of liver bed and subdiaphragmatic infiltration of 0.25% bupivacaine in reducing postoperative pain after laparoscopic cholecystectomy and to determine its effect on analgesic consumption and patient satisfaction.

METHODOLOGY:**Study Design And Population**

This prospective, randomized controlled trial included 60 patients undergoing elective laparoscopic cholecystectomy at Akash institute of medical sciences and research center Devanahalli Bengaluru Rural. Patients were randomly allocated into two groups (Group A and Group B), with 30 participants in each group.

Inclusion Criteria:

- Age between 18 and 65 years
- ASA physical status I or II
- Elective laparoscopic cholecystectomy

Exclusion Criteria:

- Known allergy to local anesthetics
- Chronic opioid or analgesic use
- Severe hepatic, renal, or cardiac dysfunction

Anesthetic And Surgical Technique

All patients received standard general anaesthesia. Induction was with intravenous propofol, followed by vecuronium to facilitate intubation. Anaesthesia was maintained with a mixture of $O_2:N_2O$:Isoflurane and controlled ventilation. A four-port laparoscopic cholecystectomy was performed in all cases.

- Group A (Intervention): Received 15 ml of 0.25% bupivacaine infiltrated into the subdiaphragmatic liver surface and gallbladder bed after gallbladder removal and before port closure.
- Group B (Control): Did not receive any local infiltration.

No local anesthetic was used at port sites. Postoperatively, no scheduled analgesics were given. Pain was assessed using a Visual Analogue Scale (VAS) at 1, 2, 4, 6, 8, 12, and 24 hours. Rescue analgesia (1 gm parenteral paracetamol) was administered if VAS ≥ 4 .

Outcome Measures:

- VAS scores at predefined intervals
- Time to first rescue analgesic (at VAS-4)
- Number of rescue doses in 24 hours
- Patient satisfaction score study.

RESULTS:

A total of 60 patients undergoing elective laparoscopic cholecystectomy were enrolled and randomized equally into two groups: Group A (bupivacaine infiltration, $n = 30$) and Group B (control, no infiltration, $n = 30$). Both groups were comparable in baseline demographic and clinical characteristics, including age, gender, ASA physical status, BMI, and duration of surgery (Table 1). Statistically not significant.

Table-1:

Characteristics	Group-A (Bupivacaine, $n=30$)	Group-B (Control, $n=30$)	P value
Age (Years, mean $\pm$ SD)	41.2 ± 10.5	42.6 ± 9.8	0.56
Gender (Male/ Female)	12/18	13/17	0.796
ASA Grade 1,2	20/10	21/09	0.793
BMI (kg/m^2 , mean $\pm$ SD)	24.1 ± 2.3	23.9 ± 2.4	0.712
Duration of surgery (min, mean $\pm$ SD)	47.8 ± 8.5	48.5 ± 9.1	0.702

Pain Scores (VAS)

Group A demonstrated significantly lower Visual Analogue Scale (VAS) scores at all postoperative time intervals compared to Group B. The mean VAS score in Group A was 2.6 ± 0.5 versus 4.0 ± 0.6 in Group B ($p < 0.001$). This difference was statistically significant at each measured interval (1, 2, 4, 6, 8, 12, and 24 hours postoperatively),

indicating more effective pain control in the bupivacaine group (Table 2).

Time To First Rescue Analgesia

The duration of pain relief, as indicated by the time to first rescue analgesic requirement, was significantly longer in Group A (6.2 ± 1.3 hours) compared to Group B (4.1 ± 1.2 hours), with a p value of < 0.001 . This suggests a delayed onset of moderate-to-severe pain in patients receiving local infiltration.

Rescue Analgesic Requirements

The total number of rescue analgesic doses required within the first 24 hours postoperatively was significantly lower in Group A (1.8 ± 0.6 doses) than in Group B (2.9 ± 0.7 doses), with a p value of < 0.001 . This reflects the sustained analgesic effect of liver bed infiltration with bupivacaine.

Patient Satisfaction

Patient satisfaction, measured on a 5-point Likert scale (1 = very dissatisfied, 5 = very satisfied), was significantly higher in Group A (4.6 ± 0.5) compared to Group B (3.2 ± 0.6), with a p value of < 0.001 . Higher satisfaction scores in Group A indicate a superior postoperative experience in terms of comfort and analgesia.

Safety Profile

No significant adverse events, including local anesthetic toxicity or procedure-related complications, were reported in either group. All patients tolerated the anesthetic and analgesic protocols well, supporting the safety of subdiaphragmatic and liver bed infiltration with 0.25% bupivacaine.

Table-2:

Parameter	Group- A (Bupivacaine,n=30)	Group-B (Control,n=30)	P value
Number of patients with abdominal pain	10	20	0.02
Number of patients with shoulder pain	8	18	0.01
Time to first dose of rescue analgesia(hours)	6.2 ± 1.3	4.1 ± 1.2	0.001
Number of rescue analgesic doses in 24 hours	1.8 ± 0.6	2.9 ± 0.7	0.0002
Average VAS score(at 24 hours)	2.6 ± 0.5	4.0 ± 0.6	0.0000
Patient satisfaction score	4.6 ± 0.5	3.2 ± 0.6	0.001
Adverse effects observed	None	None	

DISCUSSION:

This randomized controlled study demonstrates that liver bed and subdiaphragmatic infiltration with 0.25% bupivacaine significantly improves postoperative pain management following laparoscopic cholecystectomy. Patients receiving local anesthetic infiltration (Group A) experienced markedly lower pain scores, delayed requirement for rescue analgesia, reduced total analgesic consumption, and higher satisfaction compared to those who did not receive infiltration (Group B).

The significant reduction in VAS scores at all postoperative time points in Group A indicates that infiltration of the liver bed and subdiaphragmatic region effectively attenuates both somatic and visceral pain components associated with laparoscopic cholecystectomy. These findings are consistent with prior literature demonstrating the benefit of local anesthetic techniques in laparoscopic procedures for improving early postoperative analgesia. The mean time to first rescue analgesia in the bupivacaine group (6.2 hours) was significantly longer than in the control group (4.1 hours), highlighting the prolonged analgesic effect of bupivacaine when used at the surgical site. This delay in analgesic requirement not only improves patient comfort but also reduces the need for systemic analgesics, potentially minimizing the risk of side effects.

Furthermore, the significantly lower number of rescue analgesic doses

in Group A supports the role of local infiltration in achieving opioid-sparing effects—an important consideration in enhanced recovery protocols. The higher patient satisfaction scores in the bupivacaine group reinforce the clinical value of improved analgesia in the perioperative experience.

Importantly, no adverse effects or complications related to bupivacaine infiltration were observed, supporting the safety and feasibility of this technique in routine practice. The simplicity and cost-effectiveness of local infiltration make it an attractive option for widespread implementation, especially in resource-limited settings.

Limitations:

This study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Pain assessment was limited to the first 24 hours postoperatively; long-term outcomes and return to daily activities were not evaluated. Future multicenter studies with larger cohorts and longer follow-up are warranted to validate these results.

CONCLUSION:

Liver bed and subdiaphragmatic infiltration with 0.25% bupivacaine is a safe, simple, and effective method for reducing postoperative pain following laparoscopic cholecystectomy. It significantly lowers VAS scores, delays the need for rescue analgesia, decreases total analgesic requirements, and enhances patient satisfaction. Incorporating this technique into routine practice can contribute to improved postoperative outcomes and patient-centered care.

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