

ORIGINAL ARTICLE

Randomized Controlled Study To Compare Intraperitoneal Plus Port-Site Instillation Of Bupivacaine Versus No Local Anaesthetic For Reduction Of Postoperative Pain After Laparoscopic Cholecystectomy

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ABSTRACT

Introduction: Laparoscopic cholecystectomy causes less postoperative pain than the open procedure, yet pain in the first 24 hours still shapes how quickly patients recover and how much analgesia they end up needing. Instilling local anaesthetics into the peritoneal cavity and at the port sites has been put forward as a straightforward way to bring that pain down.

Objectives: To find out whether intraperitoneal plus port-site instillation of bupivacaine works better than giving no local anaesthetic at all in controlling postoperative pain after laparoscopic cholecystectomy.

Methods: This randomized controlled study was carried out in the Department of Surgery, Sardar Patel Medical College, Bikaner. Fifty patients scheduled for elective laparoscopic cholecystectomy were randomly split into two groups. Group 1 (n=25) received 0.5% bupivacaine both intraperitoneally and by port-site infiltration, while Group 2 (n=25) received no local anaesthetic. Pain after surgery was scored on the Visual Analogue Scale (VAS) at 1, 8, and 24 hours. The total analgesic dose needed, the time before the first analgesic was requested, postoperative complications, patient comfort, and length of hospital stay were all noted. Data were analysed in SPSS, with $p < 0.05$ taken as significant.

Results: Most participants were women (74%), and the largest share fell in the 41–60 year bracket (46%). Group 1 had noticeably lower pain scores at 1 hour ($p=0.03$), 8 hours ($p=0.008$), and 24 hours ($p=0.02$) than Group 2. Patients in Group 1 also needed less analgesia over the first 24 hours ($p=0.001$) and went longer before

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asking for their first dose ($p=0.04$). Pain relief was rated adequate in 80% of the bupivacaine group compared with just 28% of controls ($p<0.001$), and satisfaction followed the same pattern (84% vs 28%, $p<0.001$). Rates of nausea and vomiting were similar in both groups ($p=0.48$).

Conclusion: Combining intraperitoneal and port-site bupivacaine meaningfully lowers postoperative pain and analgesic use after laparoscopic cholecystectomy and leaves patients more satisfied, all without adding to the complication rate. Given how simple and safe it is, this technique deserves a routine place in perioperative pain protocols.

KEYWORDS

- Laparoscopic cholecystectomy • Bupivacaine • Intraperitoneal instillation
- Port-site infiltration • Postoperative pain • Visual Analogue Scale

INTRODUCTION

Laparoscopic cholecystectomy has become the preferred surgical approach for symptomatic gallstone disease, largely because it spares patients the larger incisions of open surgery and, in turn, offers quicker recovery, a shorter hospital stay, and a better cosmetic result.^{1,2} Even so, pain in the first day or two after surgery continues to trouble many patients. It can slow down early mobilisation, keep patients in hospital longer than necessary, and push up the amount of analgesia they end up needing.³

This pain rarely comes from a single source. It is usually a mix of discomfort from the port-site wounds, stretching of the peritoneum, irritation of the diaphragm caused by the gas used to create the pneumoperitoneum, and handling of internal organs during the procedure.^{4,5} Because of this, controlling pain well after surgery is not just about comfort it directly influences how smoothly a patient recovers, which is why multimodal analgesia, including the use of local anaesthetics, has become an increasingly common part of practice. Instilling bupivacaine into the peritoneal cavity is thought to dampen visceral pain by acting on nociceptive nerve endings within the peritoneum itself, while infiltrating it at the port sites targets the more superficial, somatic pain arising from the trocar incisions.^{6,7} A number of earlier studies have pointed to lower pain scores and reduced need for analgesics when these techniques are used.⁸⁻¹¹ That said, results across studies examining the combined use of intraperitoneal and port-site bupivacaine have not always agreed with one another,

and the extent of benefit reported varies considerably. It was with this gap in mind that the present randomized controlled study was designed to assess how effective combined intraperitoneal and port-site bupivacaine instillation is in controlling postoperative pain after laparoscopic cholecystectomy, compared with giving no local anaesthetic at all.

Aim: To assess how effective combined intraperitoneal and port-site instillation of bupivacaine is in reducing postoperative pain after laparoscopic cholecystectomy, compared with no local anaesthetic.

Objectives:

1. To compare postoperative pain severity and the amount of analgesic required in the first 24 hours after laparoscopic cholecystectomy in patients given intraperitoneal plus port-site bupivacaine versus those given no local anaesthetic.
2. To compare recovery-related outcomes between the two groups specifically, the time taken before the first analgesic was requested, overall patient comfort, length of hospital stay, and any postoperative complications.

MATERIALS AND METHODS

Study Design and Setting: This randomized controlled study took place in the Department of General Surgery, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan.

Study Duration: The work, covering patient recruitment through to final data analysis, ran over six months.

Study Population: Patients diagnosed with symptomatic cholelithiasis and booked for elective laparoscopic cholecystectomy were considered for the study.

Inclusion Criteria: Adult patients diagnosed with symptomatic cholelithiasis and scheduled for elective laparoscopic cholecystectomy. Patients willing to take part and give written informed consent.

Exclusion Criteria: Patients with a known allergy or hypersensitivity to bupivacaine or other local anaesthetics. Patients with significant cardiac disease arrhythmias, ischaemic heart disease, or conduction abnormalities. Patients who needed conversion from a laparoscopic to an open procedure.

Sample Size and Sampling Technique: Sample size was worked out using the standard formula for comparing two means, based on the earlier study by Roy *et al.*⁵, with a 95% confidence interval, 80% power, and a 5% significance level. This gave a minimum requirement of 14 patients per group. To build in a margin for reliability and to allow for possible dropouts, the number was raised to 25 patients per group, for a total of 50. Patients meeting the inclusion and exclusion criteria were brought into the study through simple random sampling. Group 1 (Bupivacaine Group): Patients had 10 mL of 0.5% bupivacaine infiltrated at the port sites before the incisions were made, followed by 20 mL of 0.5% bupivacaine instilled intraperitoneally into the subdiaphragmatic space and Morrison's pouch at the close of surgery. Group 2 (Control Group): Patients went through the same laparoscopic cholecystectomy but without any

local anaesthetic infiltration or intraperitoneal instillation. Both patients and the staff assessing postoperative outcomes were kept unaware of group allocation, so the study was double-blinded throughout.

Data Collection: Demographic and clinical details age, sex, weight, comorbidities, operative findings, and postoperative course were recorded on a proforma designed and pilot-tested ahead of the study. Pain after surgery was rated on the Visual Analogue Scale (VAS), a 10-cm line running from 0 (no pain) to 10 (worst pain imaginable), with scores taken at 1, 8, and 24 hours after the operation. The outcomes looked at were: Postoperative pain intensity (VAS score) Time to first request for analgesia Total analgesic requirement over the first 24 hours Postoperative nausea and vomiting Patient comfort and satisfaction Length of hospital stay Any adverse effects linked to bupivacaine

Ethical Considerations: The study went ahead only after the Institutional Ethics Committee had given its approval, and every step followed the ethical principles set out in the Declaration of Helsinki. Written informed consent was taken from each participant before enrolment, and patient information was kept confidential throughout.

Statistical Analysis: Data were entered in Microsoft Excel and analysed in SPSS (version 29.0, trial version). Quantitative variables were reported as mean $\pm$ standard deviation, and qualitative variables as frequencies and percentages. Group comparisons used the Chi-square test and the Mann-Whitney U test, as appropriate, with $p < 0.05$ taken as statistically significant.

Table 1: Baseline Demographic and Clinical Characteristics Study Participants

Variable		Group 1 (Bupivacaine) n=25	Group 2 (Control) n=25	Total (n=50)
Age Group (Years)	0-20	3 (12%)	1 (4%)	4 (8%)
	21-40	6 (24%)	6 (24%)	12 (24%)
	41-60	13 (52%)	10 (40%)	23 (46%)
	61-80	3 (12%)	7 (28%)	10 (20%)
	81-100	0 (0%)	1 (4%)	1 (2%)
Sex	Male	9 (36%)	4 (16%)	13 (26%)
	Female	16 (64%)	21 (84%)	37 (74%)
Weight (kg)	40-49	3 (12%)	4 (16%)	7 (14%)
	50-59	13 (52%)	13 (52%)	26 (52%)
	60-69	8 (32%)	7 (28%)	15 (30%)
	70-79	1 (4%)	1 (4%)	2 (4%)
Diabetes Mellitus	Diagnosed	2 (8%)	5 (20%)	7 (14%)

Table 2: Comparison of Postoperative Pain Intensity Measured by Visual Analogue Scale (VAS) at Different Postoperative Time and Total Analgesic Requirement

VAS Category		Group 1 (n=25)	Group 2 (n=25)	p-value
1 Hour Postoperative	Mild (0-3)	19 (76%)	7 (28%)	0.03
	Moderate (4-6)	5 (20%)	10 (40%)	
	Severe (7-10)	1 (4%)	8 (32%)	
8 Hours Postoperative	Mild (0-3)	20 (80%)	6 (24%)	0.008
	Moderate (4-6)	4 (16%)	11 (44%)	
	Severe (7-10)	1 (4%)	8 (32%)	
24 Hours Postoperative	Mild (0-3)	21 (84%)	10 (40%)	0.02
	Moderate (4-6)	4 (16%)	13 (52%)	
	Severe (7-10)	0 (0%)	2 (8%)	
Total Analgesic Requirement	1 Dose	8 (32%)	0 (0%)	0.001
	2 Doses	9 (36%)	7 (28%)	
	3 Doses	3 (12%)	16 (64%)	
	4 Doses	3 (12%)	2 (8%)	
	Not Required	2 (8%)	0 (0%)	

Table 3: Comparison of Postoperative Recovery Outcomes Including Between the Study Groups

Outcome	Group 1 (n=25)	Group 2 (n=25)	p-value
Adequate Pain Relief	20 (80%)	7 (28%)	<0.001
Patient Satisfaction	21 (84%)	7 (28%)	<0.001
Nausea	6 (24%)	8 (32%)	0.48
Vomiting	6 (24%)	8 (32%)	0.48
Hospital Stay $\geq$ 6 Days	6 (24%)	8 (32%)	0.12

RESULTS

Fifty patients booked for elective laparoscopic cholecystectomy were enrolled and split evenly between the two groups. Women made up the bulk of the study population (74%), and the 41–60 year age group was the largest single band (46%). At every time point measured, patients who received intraperitoneal and port-site bupivacaine reported markedly less pain. Mild pain was recorded in 76%, 80%, and 84% of Group 1 patients at 1, 8, and 24 hours respectively, compared with only 28%, 24%, and 40% in Group 2. Analgesic use over the first 24 hours told a similar story most patients in Group 1 got by on just one or two doses, while the majority of Group 2 patients needed three doses or more ($p=0.001$). The first request for analgesia also came noticeably later in Group 1 ($p=0.04$). Pain relief was judged adequate in 80% of the bupivacaine group versus 28% of controls ($p<0.001$), and satisfaction followed

the same trend, at 84% against 28% ($p<0.001$). Nausea and vomiting occurred at similar rates in both groups, and no serious side effects were traced back to the bupivacaine itself.

DISCUSSION

The findings here point clearly in one direction: combining intraperitoneal and port-site bupivacaine cuts down postoperative pain after laparoscopic cholecystectomy in a meaningful way. Patients who received it had lower VAS scores at 1, 8, and 24 hours, reached for rescue analgesia less often, and came away more satisfied than those in the control group. This tracks closely with what Roy *et al.*⁵ found, where intraperitoneal and port-site bupivacaine also brought pain scores down significantly. Akter *et al.*⁷ reported a comparable picture, with port-site infiltration alone improving recovery and easing pain. Going further, a systematic review and meta-analysis by Kahokehr *et al.*⁸ concluded that intraperitoneal local anaesthetic use gives pain relief that is clinically meaningful, not just statistically so. Das and Deshpande¹⁰ reached a similar verdict, noting lower pain scores and less analgesic use with intraperitoneal local anaesthetics compared with placebo. The drop in analgesic consumption we observed also lines up with Manish *et al.*,¹¹ who found that intraoperative bupivacaine significantly reduced how much postoperative analgesia

patients needed. The gains in comfort and satisfaction seen in our patients add further support to the case for making local anaesthetic instillation a standard part of multimodal pain management after this surgery. It's also worth flagging that nausea and vomiting rates barely differed between the two groups, which suggests bupivacaine doesn't trade pain relief for extra side effects, a safety picture that matches what Roy *et al.*⁵ and Akter *et al.*⁷ both reported.

Strengths and Limitations

This study's randomized design, equal split between groups, and prospective follow-up all lend weight to its findings. That said, a few caveats are worth keeping in mind: it was run at a single centre, the sample size, though adequate, is still fairly modest, follow-up didn't extend beyond the immediate postoperative window, and high-risk patients were left out of the study altogether all of which limit how broadly the results can be applied.

CONCLUSION

Instilling bupivacaine both intraperitoneally and at the port sites proves to be an effective, safe way to manage pain after laparoscopic cholecystectomy. It brings pain scores down, delays the need for rescue analgesia, cuts total analgesic use, and leaves patients more satisfied, all without any rise in postoperative complications. Making this technique a routine part of practice could help patients recover more comfortably and improve outcomes overall.

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