Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Comparative Analysis of Pain Management Strategies Following Laparoscopic Cholecystectomy

Muhammad Kalim[1*], Muhammad Asjad[2], Jawad Ahmed[3], Muhammad Azhar Qureshi[4], Tanvir Ahmad Bhatti[5], Rumman Khan[6]

[1]Assistant Professor, General Surgery, MTI Lady Reading Hospital, Peshawar, Pakistan

[2]Assistant Professor, Department of General Surgery, Nawaz Sharif Medical College/ Aziz Bhatti Shaheed Teaching Hospital, Gujrat, Pakistan

[3]Senior Registrar, Department of General Surgery, Mayo Hospital, Lahore, Pakistan

[4]Associate Professor Surgery, Department of Surgery, Rawal Institute of Health Sciences. Islamabad, Pakistan

[5]Assistant Professor, Department of General Surgery, Rai Medical College Teaching Hospital, Sargodha / Rai Medical College, Sargodha, Pakistan

[6]Assistant Professor, Surgical Department, Hayatabad Medical Complex, Peshawar, Pakistan

***Corresponding Author:**

Muhammad Kalim,

Assistant Professor, General Surgery, MTI Lady Reading Hospital, Peshawar, Pakistan

Email ID: drmuhammadkalim@gmail.com

Cite this paper as: Muhammad Kalim, Muhammad Asjad, Jawad Ahmed, Muhammad Azhar Qureshi, Tanvir Ahmad Bhatti, Rumman Khan, (2025) Comparative Analysis of Pain Management Strategies Following Laparoscopic Cholecystectomy. *Journal of Neonatal Surgery*, 14 (32s), 3449-3454.

ABSTRACT

Background: Although laparoscopic cholecystectomy is considered the standard and most effective procedure for treating gallstone disease, patients often report experiencing moderate postoperative pain within the first 24 hours following surgery This can hinder early mobilization and elongate their hospital stay. Recovery outcome and analgesic preference greatly impacts patient satisfaction along with postoperative discomfort. This investigation centered on evaluating the efficacy of three postoperative analgesic regimens: intravenous NSAIDs alone, NSAID-opioid combinations, and TAP block coupled with NSAID administration in patients who had undergone laparoscopic cholecystectomy.

Methods: A total of 81 patients scheduled for Laparoscopic Cholecystectomy during the observational period were prospectively entered into the study with random allocation into three groups (n=27). Participants in group A only received intravenous non-steroidal anti-inflammatory drugs (NSAIDs), while group B patients received NSAIDs and opioids. Furthermore, patients in group C received TAP blocks along with intravenous NSAIDs. Pain was assessed using the 'Visual Analogue Scale (VAS)' at 2, 6, 12, and 24 hours. Time to first request for analgesia, total consumption of analgesics, incidence of nausea and vomiting, length of hospitalization, and overall patient-reported satisfaction concerning pain management were considered as secondary outcome measures.

Results: Compared to groups A and B, participants in Group C (TAP bloc) exhibited a significant reduction in VAS scores at every measured time point ($p < 0.001$). Participants also consumed less opioids, had longer durations before analgesic requests, and faster recovery milestones indicating early mobilization as well as shorter duration of hospitalization. Satisfaction was maximum with TAP block; this group also reported the least postoperative nausea and vomiting.

Conclusion: The use of TAP block with IV NSAIDs markedly enhances postoperative pain control, recovery, and patient satisfaction following laparoscopic cholecystectomy. This approach could significantly augment the multimodal analgesic strategy in conventional surgical care.

Keywords: *Laparoscopic cholecystectomy, postoperative pain, TAP block, NSAIDs, opioids, analgesia, pain management, patient satisfaction*

1. INTRODUCTION

The laparoscopic approach to cholecystectomy is now the optimal technique for treating symptomatic gallstones, along with other benign disorders of the gallbladder, as it is safer and faster than open surgery. However, its safety and time efficiency compared to open surgery are both benefits laproscopic carries. While skills one has on-laparoscopy one deals during postoperative phase such acute discomfort experienced in first twenty-four hours remains a stiking challenge. The discomfort that arises can be due to several different factors including port-site injury, stretching of the peritoneum, as well as leftover gas from pneumoperitoneum [1-3].

Sufficient pain alleviation is critical for a patient's well-being, facilitates early movement, lowers the risk of complications, and allows for quick discharge. Postoperative pain control has been managed with opioids and non-steroidal anti-inflammatory drugs (NSAIDs). The use of opioids in postoperative pain management is associated with nausea, vomiting, sedation, and slowed recovery of gastrointestinal function which can significantly hinder progress after surgery. Though NSAIDs have a better safety profile than opioids, they may lack sufficient analgesic efficacy when utilized as monotherapy in certain situations [4-6].

Recently, the use of multimodal analgesic strategies combined with 'regional anesthesia techniques such as the transversus abdominis plane (TAP) block has become more common'. The TAP block is designed to interrupt the nerves relaying information from the anterior abdominal wall for surgery-applied analgesia and, in effect, reduce systemic analgesic utilization. While there are various reports on the effectiveness of TAP blocks in different kinds of abdominal surgeries, their comparative effectiveness with conventional pharmacologic approaches during laparoscopic cholecystectomy is not well documented [7-9].

This study aim 'to evaluate and compare the effectiveness of three postoperative analgesic approaches NSAIDs alone, NSAIDs with opioids, and TAP block with NSAIDs in terms of pain control, analgesic consumption, recovery milestones, and patient satisfaction following laparoscopic cholecystectomy'.

2. METHODOLOGY

This section is based upon a twelve-month comparative prospective study from MTI Lady reading hospital Peshawar between June 2023 and march 2025. After obtaining consent, 81 patients scheduled for elective laparoscopic cholecystectomy participated in the study where different postoperative pain management strategies were evaluated for their effectiveness on recovery outcomes.

Patients from both genders aged between 18 and 65 years meeting 'ASA physical status I or II were eligible gallstone laparoscopic cholecystectomy surgery'. Patients were excluded from the study if they had any known allergies to analgesics used in the study, chronic pain disorders, long term opioid therapy, or required conversion to open surgery. Other exclusion criteria included having a psychiatric illness or communicative barriers.

Participants were randomly divided into three equal groups (n=27 per group) using a computer-generated randomization list. Each group received a different pain management protocol postoperatively:

- **Group A** received intravenous NSAIDs alone.
- **Group B** received a combination of intravenous NSAIDs and opioids.
- **Group C** received a transversus abdominis plane (TAP) block intraoperatively, in addition to intravenous NSAIDs.

All surgical procedures were performed under general anesthesia by experienced laparoscopic surgeons using a standardized four-port technique. The TAP block in Group C was administered under direct vision using 20 mL of 0.25% bupivacaine on each side before the end of the surgery.

Postoperative pain was assessed using a 10-point Visual Analog Scale (VAS) at 2, 6, 12, and 24 hours after surgery. 'Patients were monitored for time to first analgesic request, total analgesic consumption in the first 24 hours (converted to morphine equivalents), incidence of postoperative nausea and vomiting (PONV), time to ambulation, and length of hospital stay'. Patient satisfaction regarding pain control was also documented on a 5-point Likert scale before discharge.

Nursing personnel, who were unaware of the group allocations, collected all data which reduces bias. All participants received uniform application of discharge criteria for their specific treatment abalities.

The study conformed to the institutional ethics review board regulations. All subjects provided written consent and confidentiality was maintained along with strict data protection measures throughout the study.

Participants' responses were analyzed digitally with SPSS version 25.0. Mean values differentiated by standard deviations were calculated for continuous variables and tested using ANOVA comparison. Proportional differences are shown as fractions and percentages then assessed by Chi-square or Fisher's exact test for independence on nominal variables for

frequency distributions. A significance level below 0.05 was deemed strong in this case.

3. RESULTS

The study included a total of 81 patients who underwent laparoscopic cholecystectomy and received one of three pain management protocols postoperatively. The mean age of participants was comparable across the three groups. Most patients were female, reflecting the common gender distribution in gallbladder pathology. There was no statistically significant difference among the groups in terms of age, gender, BMI, or comorbidity profiles, indicating baseline comparability.

Table 1: Demographic Characteristics of Patients (n = 81)

Variable	Group A (n=27)	Group B (n=27)	Group C (n=27)	*p*-value
Mean Age (years)	43.6 ± 12.4	42.9 ± 11.7	44.3 ± 13.1	0.87
Gender (Female %)	19 (70.4%)	21 (77.8%)	20 (74.1%)	0.83
Mean BMI (kg/m²)	27.8 ± 3.5	28.1 ± 4.1	27.6 ± 3.9	0.91
Comorbidities (%)	10 (37%)	11 (40.7%)	9 (33.3%)	0.84
ASA I/II (%)	22/5	23/4	21/6	0.86

Surgical duration and anesthesia time were similar among all groups. The main difference lay in the postoperative analgesia protocols, with Group A receiving only IV NSAIDs, Group B receiving NSAIDs with opioids, and Group C receiving a TAP block combined with IV analgesics.

Table 2: Surgical and Analgesic Characteristics

Variable	Group A	Group B	Group C	*p*-value
Duration of Surgery (min)	47.1 ± 8.6	45.8 ± 9.3	46.3 ± 7.9	0.76
Duration of Anesthesia (min)	60.4 ± 10.2	59.6 ± 9.7	61.1 ± 10.5	0.83
Post-op Analgesia Type	NSAIDs only	NSAIDs + Opioid	TAP block + NSAIDs	–

‘Pain scores were assessed using a Visual Analog Scale (VAS) at multiple postoperative time points’. Group C consistently reported significantly lower pain scores compared to the other groups, particularly at early intervals. ‘The total analgesic consumption was also lowest in the TAP block group’.

Table 3: Pain Scores and Analgesic Use

‘Outcome Variable’	‘Group A’	‘Group B’	‘Group C’	*p*-value
VAS at 2 hours	6.1 ± 1.2	5.4 ± 1.3	3.9 ± 1.1	<0.001
VAS at 6 hours	5.3 ± 1.4	4.2 ± 1.2	3.1 ± 1.0	<0.001
VAS at 12 hours	4.4 ± 1.1	3.3 ± 1.1	2.4 ± 0.9	<0.001
VAS at 24 hours	3.1 ± 1.0	2.6 ± 1.0	1.7 ± 0.8	<0.001
Total analgesic dose (mg)	42.1 ± 10.3	36.4 ± 9.2	27.7 ± 7.9	<0.001
Time to first analgesic (min)	64.7 ± 20.5	92.3 ± 24.1	145.2 ± 28.9	<0.001

Group C also demonstrated the fastest recovery time with earlier ambulation and shorter hospital stays. Additionally, patient satisfaction was highest in the TAP block group.

Table 4: Postoperative Recovery and Satisfaction

Variable	Group A	Group B	Group C	*p*-value
Time to ambulation (hours)	8.2 ± 1.7	6.7 ± 1.5	4.9 ± 1.3	<0.001
Hospital stay (days)	2.6 ± 0.5	2.1 ± 0.6	1.6 ± 0.4	<0.001
Satisfaction Score (1–5 scale)	3.2 ± 0.6	3.9 ± 0.5	4.6 ± 0.4	<0.001
Nausea/Vomiting (%)	8 (29.6%)	11 (40.7%)	3 (11.1%)	0.03

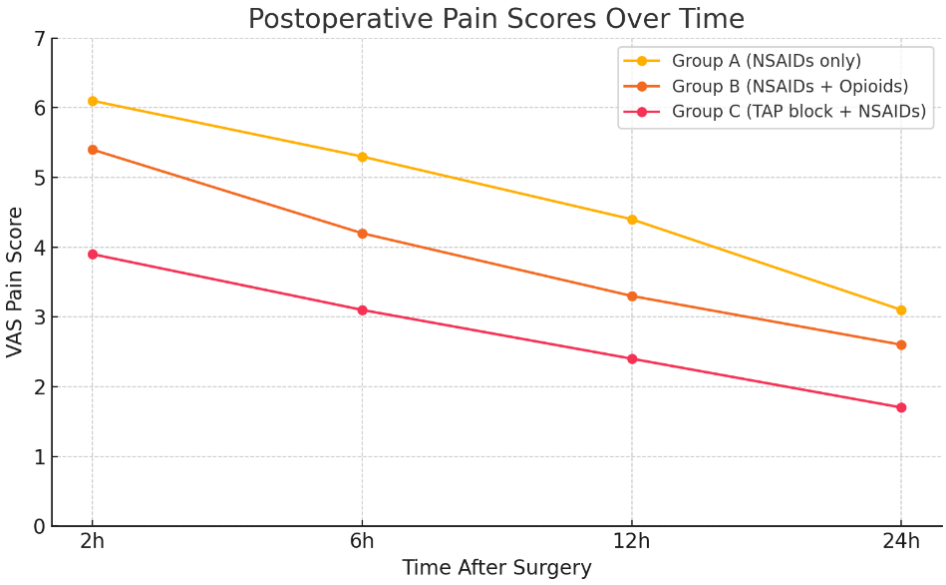

Figure 1: graph showing the trend of postoperative pain scores over time for each group.

4. DISCUSSION

Effective pain control following laparoscopic cholecystectomy remains essential for early mobilization, reduced hospital stay, and improved patient satisfaction. In this study, we compared three commonly used postoperative pain management strategies: intravenous NSAIDs alone, NSAIDs with opioids, and a TAP (transversus abdominis plane) block in combination with NSAIDs. Our findings clearly indicate that the TAP block offered superior pain control, reduced analgesic requirements, and enhanced overall recovery compared to the other two modalities.

'Patients in the TAP block group consistently reported significantly lower pain scores at all measured intervals 2, 6, 12, and 24 hours postoperatively'. These findings were consistent with those studies who first introduced the TAP block as an effective regional technique for abdominal wall analgesia [10-13]. 'Several recent randomized controlled trials have also demonstrated the efficacy of TAP blocks in reducing pain and opioid consumption following laparoscopic procedures'. Studies noted a significant reduction in VAS scores and better postoperative recovery among patients receiving TAP blocks after laparoscopic cholecystectomy [14-16].

In our study, the TAP block group also 'demonstrated a longer time to first analgesic request and lower total opioid use in the first 24 hours, which is clinically meaningful'. Reducing opioid consumption is particularly relevant given the known side effects of opioids, including nausea, vomiting, sedation, and delayed recovery. 'This was reflected in our data as well, where the incidence of postoperative nausea and vomiting was lowest in the TAP block group (11.1%) compared to the NSAID-opioid group (40.7%)'. These findings align with those studies reported that TAP blocks not only improved pain scores but also lowered the incidence of opioid-related adverse effects[17-19].

Patient satisfaction was another key outcome in this study. Participants in the TAP block group reported significantly higher satisfaction scores, which correlates with their improved comfort, earlier mobilization, and shorter hospital stay. Our results support the growing trend toward incorporating regional anesthesia techniques like the TAP block into multimodal analgesia regimens for laparoscopic surgeries[20].

However, it is important to recognize some limitations. This was a single-center study with a modest sample size, and we

did not assess long-term outcomes or pain beyond the first 24 hours. Additionally, the effectiveness of TAP blocks can be operator-dependent, potentially influencing consistency across different clinical settings.

Despite these limitations, our findings are robust and consistent with global literature, highlighting the effectiveness of regional techniques in managing postoperative pain in minimally invasive surgery.

5. CONCLUSION

Findings from this study demonstrate that performing a transversus abdominis plane (TAP) block with intravenous NSAIDs offers better postoperative analgesia compared to using NSAIDs alone, or in conjunction with opioids. Patients who received TAP blocks reported lower pain scores and experienced decreased spectacles of reduced opioid utilization, fewer side effects, enhanced satisfaction levels, and improved quality of discretionary withdrawal metrics. All these factors fostered earlier mobilization and reduced length of hospital stay

REFERENCES

[1] Eftekhariyazdi, M., et al., *Pharmacological methods of postoperative pain management after laparoscopic cholecystectomy: a review of meta-analyses.* Surgical Laparoscopy Endoscopy & Percutaneous Techniques, 2020. 30(6): p. 534-541.

[2] Bourgeois, C., et al., *Pain management after laparoscopic cholecystectomy: A systematic review and procedure-specific postoperative pain management (PROSPECT) recommendations.* European Journal of Anaesthesiology| EJA, 2024. 41(11): p. 841-855.

[3] Cao, L., et al., *Efficacy and Safety of Different Preemptive Analgesia Measures in Pain Management after Laparoscopic Cholecystectomy: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials.* Pain and Therapy, 2024. 13(6): p. 1471-1497.

[4] Cianci, P., N. Tartaglia, and A. Fersini, *Pain control after laparoscopic cholecystectomy. A prospective study.* Annali Italiani di Chirurgia, 2020. 91(6): p. 611-616.

[5] Bayoumi, H.M., et al., *Postoperative pain management following laparoscopic cholecystectomy-non-opioid approaches: a review.* Future Journal of Pharmaceutical Sciences, 2024. 10(1): p. 125.

[6] Alsharari, A.F., et al., *Transversus abdominis plane block as a strategy for effective pain management in patients with pain during laparoscopic cholecystectomy: a systematic review.* Journal of clinical medicine, 2022. 11(23): p. 6896.

[7] Jiang, B. and S. Ye, *Pharmacotherapeutic pain management in patients undergoing laparoscopic cholecystectomy: A review.* Advances in Clinical and Experimental Medicine, 2022. 31(11): p. 1275-1288.

[8] Arabzadeh, A., et al., *Comparison of intraperitoneal bupivacaine and intravenous ketorolac for postoperative pain management following laparoscopic cholecystectomy.* Anesthesiology and Pain Medicine, 2021. 11(6): p. e114623.

[9] Ekinci, M., et al., *A randomized, placebo-controlled, double-blind study that evaluates efficacy of intravenous ibuprofen and acetaminophen for postoperative pain treatment following laparoscopic cholecystectomy surgery.* Journal of Gastrointestinal Surgery, 2020. 24(4): p. 780-785.

[10] Wei, X. and X. Yao, *The impact of intraperitoneal levobupivacaine on pain relief after laparoscopic cholecystectomy: a meta-analysis of randomized controlled studies.* Surgical Laparoscopy Endoscopy & Percutaneous Techniques, 2020. 30(1): p. 1-6.

[11] Erdi, A.M., et al., *Comparing the efficacy and side effects of intravenous ibuprofen and acetaminophen in pain control following laparoscopic cholecystectomy.* World Journal of Plastic Surgery, 2022. 11(1): p. 117.

[12] Kim, H.-C., et al., *Comparison of pharmacologic therapies alone versus operative techniques in combination with pharmacologic therapies for postoperative analgesia in patients undergoing laparoscopic cholecystectomy: a randomized controlled trial.* International Journal of Surgery, 2022. 104: p. 106763.

[13] Ergin, A., et al., *Effectiveness of local anesthetic application methods in postoperative pain control in laparoscopic cholecystectomies; a randomised controlled trial.* International Journal of Surgery, 2021. 95: p. 106134.

[14] Tyagi, V., *Comparative Evaluation of Postoperative Pain Relief following Spinal and General Anesthesia in Patients Undergoing Laparoscopic Cholecystectomy.*

[15] Husnain, S.S., et al., *Comparison of patients' response in laparoscopic versus open cholecystectomy.* Pakistan Armed Forces Med J, 2020. 70: p. 230-35.

[16] Bulian, D.R., et al., *Comparative analysis of postoperative pain after transvaginal hybrid NOTES versus traditional laparoscopic cholecystectomy in obese patients.* Surgical Endoscopy, 2022: p. 1-9.

[17] Gin, E., et al., *Reduced laparoscopic intra-abdominal pressure during laparoscopic cholecystectomy and its effect on post-operative pain: a double-blinded randomised control trial.* Journal of Gastrointestinal Surgery, 2021. 25(11): p. 2806-2813.

[18] Lee, S.-O., L.-P. Huang, and C.-S. Wong, *Preoperative administration of extended-release dinalbuphine sebacate compares with morphine for post-laparoscopic cholecystectomy pain management: a randomized study.* Journal of pain research, 2020: p. 2247-2253.

[19] Vijayaraghavalu, S., E.B. Sekar, and E. Bharthi, *A comparative study on the postoperative analgesic effects of the intraperitoneal instillation of bupivacaine versus normal saline following laparoscopic cholecystectomy.* Cureus, 2021. 13(3).

[20] Zhang, D., G. You, and X. Yao, *Influence of pregabalin on post-operative pain after laparoscopic cholecystectomy: a meta-analysis of randomised controlled trials.* Journal of Minimal Access Surgery, 2020. 16(2): p. 99-105