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(4); 1789-1795

Original Research Article

Effect of Multimodal Analgesia Protocol on Postoperative Opioid Consumption and Recovery after Major Abdominal Surgery

Aswini T.[1], Veereshkumar Gobburkar[2], Ankita[3]

[1]Medical Officer, Department of Anaesthesiology, ESIC Medical College, Gulbarga, Karnataka, India
[2]Senior Resident, Department of Anaesthesiology, ESIC Medical College, Gulbarga, Karnataka, India
[3]Senior Resident, Department of Anaesthesiology, ESIC Medical College, Gulbarga, Karnataka, India

Received: 01-01-2026 / Revised: 15-02-2026 / Accepted: 21-03-2026
Corresponding author: Dr. Aswini T
Conflict of interest: Nil

Abstract

Background: Effective postoperative pain management is essential for improving recovery after major abdominal surgery. Although opioids remain the mainstay of postoperative analgesia, their use is associated with several adverse effects that may delay recovery. Multimodal analgesia has emerged as an opioid-sparing strategy that combines analgesic modalities with different mechanisms of action to improve pain control and enhance postoperative recovery.

Methods: This prospective, randomized, comparative study included 120 patients undergoing elective major abdominal surgery. Patients were randomly allocated into two equal groups: the Multimodal Analgesia Group (Group M, n=60) and the Conventional Analgesia Group (Group C, n=60). Group M received a standardized multimodal analgesia protocol, whereas Group C received conventional opioid-based analgesia. The primary outcome was total postoperative opioid consumption during the first 24 hours. Secondary outcomes included postoperative pain scores, time to first rescue analgesia, rescue analgesic requirement, functional recovery, opioid-related adverse effects, quality of recovery, and length of hospital stay.

Results: Baseline demographic and perioperative characteristics were comparable between the groups. Group M demonstrated significantly lower 24-hour opioid consumption (14.8 ± 4.2 vs. 27.3 ± 6.1 mg morphine equivalent; $p<0.001$), longer time to first rescue analgesia (10.8 ± 2.4 vs. 5.9 ± 1.8 hours; $p<0.001$), fewer rescue analgesic doses (1.2 ± 0.6 vs. 2.6 ± 0.8; $p<0.001$), and significantly lower postoperative pain scores at all assessment intervals ($p<0.001$). Functional recovery was significantly enhanced with earlier ambulation, earlier return of bowel function, earlier oral intake, shorter hospital stay, and higher patient satisfaction (all $p<0.001$). The incidence of postoperative nausea and vomiting, sedation, pruritus, and postoperative ileus was significantly lower in the multimodal group.

Conclusion: A standardized multimodal analgesia protocol significantly reduced postoperative opioid requirements while providing superior pain control and enhancing postoperative recovery after major abdominal surgery. Its routine incorporation into perioperative care may improve clinical outcomes and support Enhanced Recovery after Surgery (ERAS) pathways.

Keywords: Multimodal analgesia; Major abdominal surgery; Postoperative pain; Opioid consumption; Enhanced Recovery After Surgery; Postoperative recovery; Opioid-sparing analgesia.

DOI: 10.25258/ijcpr.18.4.285

Introduction

Major abdominal surgery is associated with considerable postoperative pain resulting from extensive tissue injury, visceral manipulation, and the inflammatory response induced by surgical trauma [1]. Despite advances in surgical techniques and perioperative care, moderate to severe postoperative pain remains common during the first 24–72 hours after surgery. Inadequately controlled pain adversely affects respiratory mechanics, delays ambulation, impairs gastrointestinal recovery, prolongs postoperative ileus, increases the risk of thromboembolic and pulmonary complications, extends hospital stay, raises healthcare costs, and reduces patient satisfaction. Furthermore, severe acute postoperative pain has been recognized as an important predictor of persistent postsurgical pain, underscoring the importance of effective perioperative analgesic strategies for optimizing both short- and long-term outcomes.[2]Opioids have traditionally formed the cornerstone of postoperative pain management following major abdominal surgery because of their

potent analgesic efficacy[3]. However, opioid-based analgesia is associated with numerous dose-dependent adverse effects, including postoperative nausea and vomiting, respiratory depression, excessive sedation, constipation, urinary retention, pruritus, delayed gastrointestinal recovery, opioid-induced hyperalgesia, and the potential for persistent postoperative opioid use. These complications may delay recovery, impair early mobilization, prolong hospitalization, and increase healthcare utilization, thereby highlighting the need for effective opioid-sparing analgesic strategies.[4,5]

Multimodal analgesia has emerged as a key component of contemporary perioperative pain management by combining analgesic agents and techniques that act through different mechanisms along the nociceptive pathway. By simultaneously targeting peripheral and central pain pathways, multimodal analgesia provides additive or synergistic analgesic effects while reducing opioid requirements and minimizing opioid-related adverse events [6]. Common components of multimodal analgesia include acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), cyclooxygenase-2 inhibitors, gabapentinoids, ketamine, dexmedetomidine, intravenous lidocaine infusion, corticosteroids, local anesthetic wound infiltration, and regional anesthesia techniques such as epidural analgesia, transversus abdominis plane (TAP) block, quadratus lumborum block, and erector spinae plane block. The selection of these modalities is individualized according to patient characteristics, surgical procedure, and institutional practice.[6,7]

Substantial evidence from randomized controlled trials and systematic reviews has demonstrated that multimodal analgesic protocols provide superior postoperative pain relief, significantly reduce opioid consumption, decrease the incidence of opioid-related complications, facilitate earlier mobilization, promote faster return of bowel function, improve patient satisfaction, and shorten the duration of hospital stay compared with conventional opioid-centered analgesic regimens [8]. These benefits have led to the incorporation of multimodal analgesia as one of the fundamental pillars of Enhanced Recovery After Surgery (ERAS) pathways, which utilize evidence-based perioperative interventions to attenuate the surgical stress response, optimize physiological recovery, reduce postoperative complications, and improve overall clinical outcomes after major surgery.[9,10]Postoperative opioid consumption has increasingly become an important quality indicator of perioperative care because it reflects both the effectiveness of analgesic strategies and the degree of opioid exposure. Reducing perioperative opioid requirements has been associated with improved gastrointestinal recovery, lower rates of postoperative nausea and vomiting, fewer respiratory complications, earlier ambulation, enhanced patient-reported recovery, and decreased length of hospital stay. Consequently, postoperative recovery is now evaluated not only by pain intensity but also by functional recovery parameters, including early mobilization, restoration of bowel function, opioid-related adverse events, patient satisfaction, and overall quality of recovery.[11,12]Despite the growing body of evidence supporting multimodal analgesia, its implementation remains inconsistent across healthcare institutions, particularly in resource-limited settings[13,14]. Variations in institutional protocols, availability of regional anesthesia services, clinician preferences, patient characteristics, and surgical procedures contribute to heterogeneous analgesic practices and variable clinical outcomes. Moreover, data regarding the effectiveness of standardized multimodal analgesia protocols on postoperative opioid consumption and recovery following major abdominal surgery remain limited in many tertiary care centers, emphasizing the need for further clinical evaluation.[13,14]

Therefore, the present study was undertaken to evaluate the effect of a standardized multimodal analgesia protocol on postoperative opioid consumption and recovery after major abdominal surgery.

Materials and Methods

This prospective, randomized, comparative interventional study was conducted in the Department of Anaesthesiology of a tertiary care teaching hospital after obtaining approval from the Institutional Ethics Committee. The study was carried out over a period of 12 months, and written informed consent was obtained from all participants before enrolment.

Study Population: Adult patients aged 18–70 years with American Society of Anesthesiologists (ASA) physical status I–III who were scheduled to undergo elective major abdominal surgery under general anesthesia were included in the study. Patients with known allergy to study medications, chronic opioid use, severe hepatic or renal dysfunction, coagulation disorders, pregnancy, psychiatric illness, or inability to provide informed consent were excluded.

Randomization and Intervention: Eligible patients were randomly allocated into two equal groups using a computer-generated randomization sequence. The multimodal analgesia group received a standardized protocol comprising intravenous paracetamol, non-steroidal anti-inflammatory drugs (unless contraindicated), regional analgesic

techniques when indicated, and opioid analgesics as rescue medication. The control group received conventional opioid-based postoperative analgesia according to institutional practice.

Outcome Measures: The primary outcome was total postoperative opioid consumption during the first 24 hours. Secondary outcomes included postoperative pain scores, time to first rescue analgesia, incidence of opioid-related adverse effects, time to ambulation, return of bowel function, patient satisfaction, and length of hospital stay.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequency and percentage. Student's t-test and Chi-square test were used for comparisons as appropriate. A p-value <0.05 was considered statistically significant.

Results

A total of 120 patients were enrolled and completed the study, with 60 patients allocated to the multimodal analgesia group (Group M) and 60 patients to the conventional analgesia group (Group C). There were no protocol violations or losses to follow-up. Baseline demographic and perioperative characteristics were comparable between the two groups, confirming successful randomization and minimizing baseline confounding (Table 1).

Patients in the multimodal analgesia group demonstrated significantly improved postoperative analgesic outcomes compared with the conventional analgesia group (Table 2). Total 24-hour opioid consumption was significantly lower in Group M (14.8 ± 4.2 mg) than in Group C (27.3 ± 6.1 mg; p<0.001).

Similarly, the time to first rescue analgesia was significantly prolonged (10.8 ± 2.4 vs. 5.9 ± 1.8 hours; p<0.001), while the number of rescue analgesic doses required during the first 24 postoperative hours was markedly reduced in Group M (1.2 ± 0.6 vs. 2.6 ± 0.8; p<0.001) (Table 2).Postoperative pain intensity, assessed using the Numerical Rating Scale (NRS), was consistently lower in the multimodal analgesia group at every assessment time point (Table 3, Figure 1).

Mean NRS scores in Group M were significantly lower than those in Group C in the recovery room (3.2 ± 0.8 vs. 4.8 ± 1.0), at 6 hours (3.0 ± 0.7 vs. 4.5 ± 0.9), 12 hours (2.6 ± 0.8 vs. 3.9 ± 0.8), 24 hours (2.1 ± 0.7 vs. 3.2 ± 0.8), and 48 hours (1.5 ± 0.6 vs. 2.4 ± 0.7), with all differences reaching statistical significance (p<0.001).

Functional recovery was significantly accelerated among patients receiving multimodal analgesia (Table 4, Figure 2). Group M achieved earlier ambulation (14.6 ± 3.2 vs. 20.5 ± 4.1 hours), faster recovery of bowel sounds (19.8 ± 4.6 vs. 27.1 ± 5.3 hours), earlier initiation of oral intake (23.5 ± 5.2 vs. 31.6 ± 6.4 hours), and shorter hospital stay (5.2 ± 1.3 vs. 6.8 ± 1.6 days), with all comparisons demonstrating highly significant differences (p<0.001). Patient satisfaction scores were also significantly higher in Group M (9.1 ± 0.7) than in Group C (7.8 ± 0.9; p<0.001).

The incidence of opioid-related adverse effects was generally lower in the multimodal analgesia group (Table 5, Figure 3). Postoperative nausea and vomiting occurred in 13.3% of patients in Group M compared with 31.7% in Group C (p=0.016). Sedation was also significantly less frequent (6.7% vs. 21.7%; p=0.018), as were pruritus (3.3% vs. 13.3%; p=0.048) and postoperative ileus requiring treatment (3.3% vs. 16.7%; p=0.014). Although respiratory depression (1.7% vs. 8.3%) and urinary retention (5.0% vs. 15.0%) were numerically lower in Group M, these differences did not reach statistical significance (p=0.093 and p=0.071, respectively).Overall postoperative recovery was significantly superior in patients receiving multimodal analgesia (Table 6). The mean Quality of Recovery-15 (QoR-15) score was significantly higher in Group M than in Group C (131.8 ± 8.5 vs. 118.2 ± 10.3; p<0.001). Although fewer patients in the multimodal analgesia group required postoperative ICU admission (5.0% vs. 10.0%) or experienced readmission within 30 days (3.3% vs. 6.7%), these differences were not statistically significant (p=0.301 and p=0.401, respectively) (Table 6).

Table 1: Baseline Demographic and Perioperative Characteristics

Variable	Group M (n=60)	Group C (n=60)	p-value
Age (years), Mean ± SD	52.8 ± 11.4	53.6 ± 10.9	0.694
Male, n (%)	34 (56.7)	36 (60.0)	0.713
Female, n (%)	26 (43.3)	24 (40.0)	
BMI (kg/m²), Mean ± SD	25.4 ± 3.5	25.8 ± 3.2	0.518
ASA I, n (%)	16 (26.7)	15 (25.0)	0.963
ASA II, n (%)	31 (51.7)	32 (53.3)	
ASA III, n (%)	13 (21.6)	13 (21.7)	
Duration of surgery (min), Mean ± SD	152.6 ± 28.5	149.8 ± 30.2	0.602

Table 2: Comparison of Postoperative Analgesic Outcomes

Parameter	Group M	Group C	p-value
Total opioid consumption (24 h, mg morphine equivalent)	14.8 ± 4.2	27.3 ± 6.1	<0.001
Time to first rescue analgesia (hours)	10.8 ± 2.4	5.9 ± 1.8	<0.001
Rescue analgesic doses (24 h)	1.2 ± 0.6	2.6 ± 0.8	<0.001

Table 3: Postoperative Pain Scores (NRS)

Time after surgery	Group M	Group C	p-value
Recovery room	3.2 ± 0.8	4.8 ± 1.0	<0.001
6 hours	3.0 ± 0.7	4.5 ± 0.9	<0.001
12 hours	2.6 ± 0.8	3.9 ± 0.8	<0.001
24 hours	2.1 ± 0.7	3.2 ± 0.8	<0.001
48 hours	1.5 ± 0.6	2.4 ± 0.7	<0.001

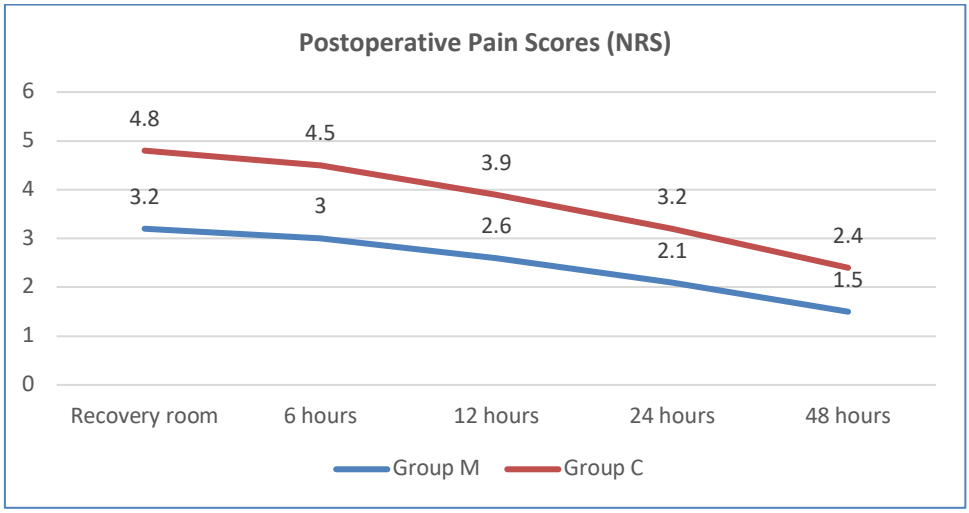

Figure 1: Postoperative Pain Scores (NRS)

Table 4: Functional Recovery Outcomes

Parameter	Group M	Group C	p-value
Time to first ambulation (hours)	14.6 ± 3.2	20.5 ± 4.1	<0.001
Time to bowel sound recovery (hours)	19.8 ± 4.6	27.1 ± 5.3	<0.001
Time to first oral intake (hours)	23.5 ± 5.2	31.6 ± 6.4	<0.001
Length of hospital stay (days)	5.2 ± 1.3	6.8 ± 1.6	<0.001
Patient satisfaction score (0–10)	9.1 ± 0.7	7.8 ± 0.9	<0.001

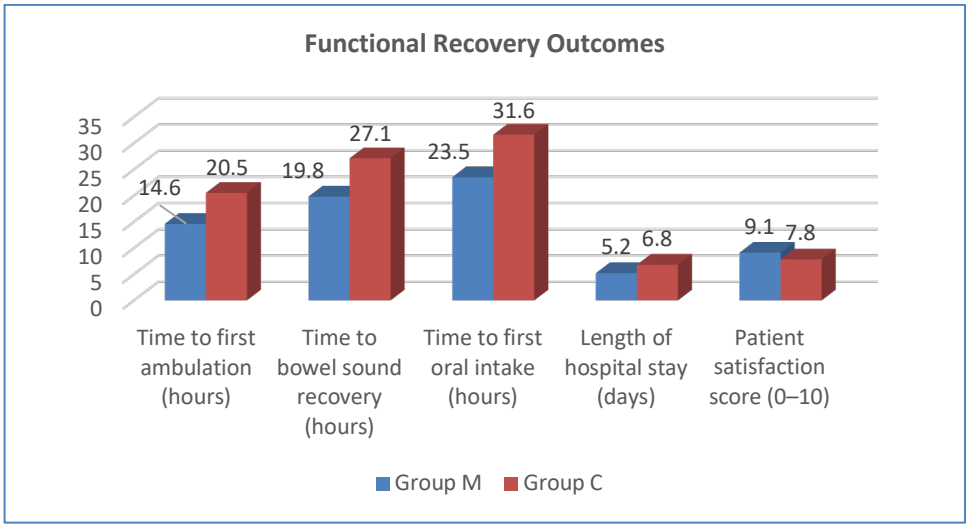

Figure 2: Functional Recovery Outcomes

Table 5. Postoperative Opioid-Related Adverse Effects

Adverse effect	Group M n (%)	Group C n (%)	p-value
Postoperative nausea and vomiting	8 (13.3)	19 (31.7)	0.016
Sedation	4 (6.7)	13 (21.7)	0.018
Respiratory depression	1 (1.7)	5 (8.3)	0.093
Urinary retention	3 (5.0)	9 (15.0)	0.071
Pruritus	2 (3.3)	8 (13.3)	0.048
Ileus requiring treatment	2 (3.3)	10 (16.7)	0.014

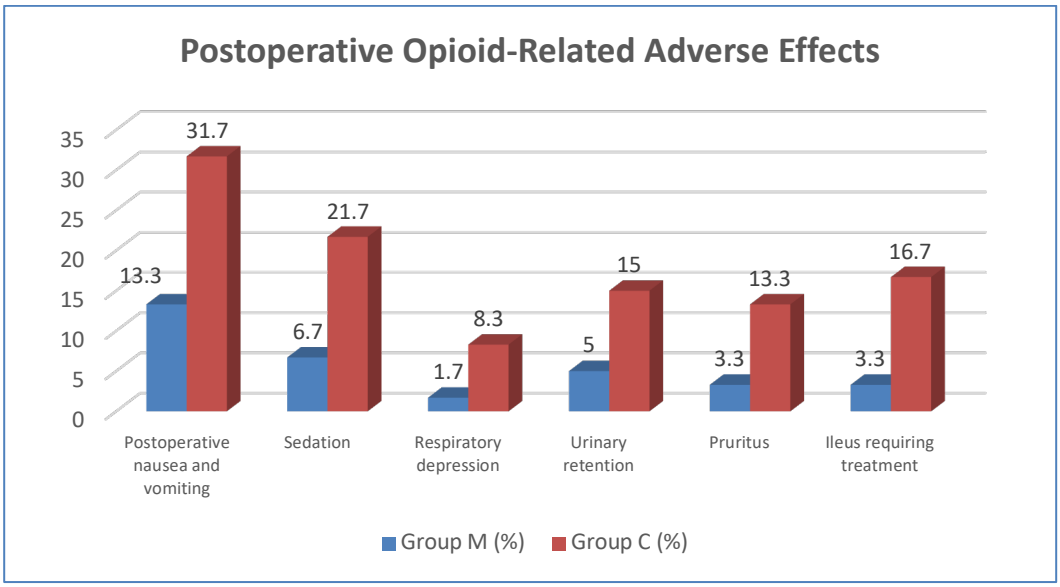

Figure 3: Postoperative Opioid-Related Adverse Effects

Table 6: Overall Recovery Outcomes

Outcome	Group M	Group C	p-value
Quality of recovery score (QoR-15)	131.8 ± 8.5	118.2 ± 10.3	<0.001
Patients requiring ICU stay, n (%)	3 (5.0)	6 (10.0)	0.301
Readmission within 30 days, n (%)	2 (3.3)	4 (6.7)	0.401

Discussion

The present randomized comparative study evaluated the effect of a standardized multimodal analgesia protocol on postoperative opioid consumption and recovery after major abdominal surgery. The findings demonstrated that patients managed with multimodal analgesia experienced significantly lower postoperative opioid consumption, lower postoperative pain scores, prolonged duration of analgesia, earlier ambulation, faster recovery of gastrointestinal function, shorter hospital stay, higher patient satisfaction, and fewer opioid-related adverse effects compared with those receiving conventional opioid-based analgesia. These findings support the growing evidence that multimodal analgesia is an integral component of Enhanced Recovery After Surgery (ERAS) pathways and contributes substantially to improved postoperative outcomes following major abdominal surgery.[13,14]The baseline demographic and perioperative characteristics, including age, sex distribution, body mass index, ASA physical status, and duration of surgery, were comparable between the two study groups, indicating successful randomization and minimizing the influence of baseline confounding variables. The mean age was 52.8 ± 11.4 years in the multimodal group and 53.6 ± 10.9 years in the conventional analgesia group (p=0.694), while the mean duration of surgery was 152.6 ± 28.5 and 149.8 ± 30.2 minutes, respectively (p=0.602). Similar baseline comparability has been reported in previous randomized studies evaluating multimodal analgesic strategies in abdominal surgery, allowing meaningful comparison of postoperative outcomes between treatment groups.[13,14]

The principal finding of the present study was the significant reduction in postoperative opioid consumption among patients receiving multimodal analgesia. Total opioid consumption during the first 24 postoperative hours was almost 46% lower in the multimodal group than in the conventional group (14.8 ± 4.2 vs. 27.3 ± 6.1 mg morphine equivalent; p<0.001). In addition, patients receiving multimodal analgesia experienced a significantly longer time to first rescue analgesia (10.8 ± 2.4 vs.

5.9 ± 1.8 hours; p<0.001) and required fewer rescue analgesic doses during the first postoperative day (1.2 ± 0.6 vs. 2.6 ± 0.8; p<0.001). These findings clearly demonstrate the opioid-sparing effect of multimodal analgesia. Chou et al. reported that combining analgesics with different mechanisms of action significantly reduces postoperative opioid requirements while improving analgesic efficacy compared with opioid monotherapy.[13] Similarly, Wick et al. emphasized that multimodal perioperative pain management reduces opioid exposure and enhances recovery in patients undergoing major surgical procedures.[14]

Furthermore, Ladha et al. demonstrated that implementation of multimodal analgesia across surgical populations was associated with a substantial reduction in perioperative opioid prescribing without compromising pain control.[16]Postoperative pain scores were consistently lower in the multimodal analgesia group throughout the postoperative period. Numerical Rating Scale scores remained significantly lower immediately after surgery as well as at 6, 12, 24, and 48 hours (all p<0.001). Patients in the multimodal group reported a recovery-room pain score of 3.2 ± 0.8 compared with 4.8 ± 1.0 in the conventional group, and this difference persisted until 48 hours (1.5 ± 0.6 vs. 2.4 ± 0.7). These findings indicate superior postoperative analgesia with multimodal pain management. Similar improvements in postoperative pain scores have been consistently demonstrated in systematic reviews and clinical guidelines, which recommend combining non-opioid analgesics with regional anesthesia techniques to optimize postoperative pain control while minimizing opioid exposure.[13,14]

An important observation of the present study was the improvement in functional recovery among patients receiving multimodal analgesia. Patients in the multimodal group achieved earlier ambulation (14.6 ± 3.2 vs. 20.5 ± 4.1 hours), earlier return of bowel sounds (19.8 ± 4.6 vs. 27.1 ± 5.3 hours), earlier initiation of oral intake (23.5 ± 5.2 vs. 31.6 ± 6.4 hours), and a significantly shorter hospital stay (5.2 ± 1.3 vs. 6.8 ± 1.6 days), with all differences reaching statistical significance (p<0.001).

Patient satisfaction scores were also significantly higher in the multimodal group (9.1 ± 0.7 vs. 7.8 ± 0.9; p<0.001). These findings suggest that improved pain control translated into earlier mobilization and enhanced postoperative recovery. Ljungqvist and colleagues identified effective multimodal analgesia as one of the principal determinants of successful ERAS implementation, facilitating early mobilization and recovery after major abdominal surgery.[17] Likewise, Gustafsson et al. demonstrated that adherence to ERAS protocols incorporating multimodal analgesia significantly shortens hospital stay and improves overall postoperative recovery.[18] Nelson et al. also concluded that multimodal perioperative care pathways contribute to faster recovery and improved surgical outcomes in colorectal and abdominal surgery.[19]The present study further demonstrated a significantly lower incidence of opioid-related adverse effects in patients managed with multimodal analgesia. Postoperative nausea and vomiting occurred in only 13.3% of patients in the multimodal group compared with 31.7% in the conventional group (p=0.016). Sedation was also significantly reduced (6.7% vs. 21.7%; p=0.018), while pruritus (3.3% vs. 13.3%; p=0.048) and postoperative ileus requiring treatment (3.3% vs. 16.7%; p=0.014) occurred less frequently among patients receiving multimodal analgesia. Although respiratory depression (1.7% vs. 8.3%; p=0.093) and urinary retention (5.0% vs. 15.0%; p=0.071) were numerically lower in the multimodal group, these differences did not achieve statistical significance, possibly because of the relatively low event rates. These findings are consistent with those of Oderda et al., who reported that opioid-related adverse events substantially increase hospital length of stay and healthcare costs.[15]

Similarly, Apfelbaum et al. identified opioid exposure as a major contributor to postoperative nausea, vomiting, sedation, and delayed recovery, emphasizing the importance of opioid-sparing analgesic strategies in modern perioperative care.[20]Quality of recovery was significantly better among patients receiving multimodal analgesia, as reflected by higher QoR-15 scores (131.8 ± 8.5 vs. 118.2 ± 10.3; p<0.001). Although ICU admission and 30-day readmission rates were numerically lower in the multimodal group, these differences were not statistically significant. The absence of statistical significance for these outcomes is likely related to the relatively small sample size and low incidence of these events rather than a lack of clinical benefit.

Conclusion

The present study demonstrated that implementation of a standardized multimodal analgesia protocol significantly reduced postoperative opioid consumption and postoperative pain compared with conventional opioid-based analgesia in patients undergoing major abdominal surgery. Multimodal analgesia also prolonged the duration of analgesia, facilitated earlier ambulation and gastrointestinal recovery, shortened hospital stay, improved patient satisfaction, and reduced opioid-related adverse effects. These findings support the incorporation of multimodal analgesia into routine perioperative

practice as an essential component of Enhanced Recovery After Surgery (ERAS) protocols to optimize postoperative recovery and improve overall patient outcomes.

Limitations

The present study was conducted at a single tertiary care center with a relatively modest sample size, which may limit the generalizability of the findings. Long-term outcomes such as the development of chronic postoperative pain and persistent opioid use were not evaluated. Additionally, differences in surgical procedures and individual patient characteristics may have influenced postoperative recovery despite standardized perioperative management.

References:

1. Kehlet H, Dahl JB. The value of "multimodal" or "balanced analgesia" in postoperative pain treatment. Anesth Analg. 1993;77(5):1048–56.
2. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey. Anesth Analg. 2003;97(2): 534–40.
3. Joshi GP, Ogunnaike BO. Consequences of inadequate postoperative pain relief. Anest hesiol Clin North Am. 2005;23(1):21–36.
4. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. J Pain Res. 2017;10:2287–98.
5. Sessler DI, Mascha E. Opioid-related adverse outcomes after surgery. Anesthesiology. 2019;131(2):347–58.
6. Kehlet H. Multimodal approach to control postoperative pain. Am J Surg. 1999;177(5):78S–81S.
7. Apfelbaum JL, Ashburn RD. Practice guidelines for acute pain management. Anesthesiology. 2012;116(2):248–73.
8. White PF. The role of non-opioid analgesics in pain management. Anesth Analg. 2005;101(5 Suppl):S5–S22.
9. Neal JM, Rathmell JR. Multimodal analgesia and patient outcomes. Reg Anesth Pain Med. 2010;35(2):175–85.
10. Ljungqvist O, Rhoads JE. Enhanced recovery after surgery: a review. JAMA Surg. 2017;152(3):292–8.
11. Mythen M, Grocott M. Perioperative medicine and ERAS implementation. Lancet. 2012;380(9847):1059–65.
12. Scott M, Mythen M. Multimodal strategies in perioperative care. Br J Anaesth. 2015;115(6):855–64.
13. Chou R, Gordon DB. Management of postoperative pain: clinical practice guideline. J Pain. 2016;17(2):131–57.
14. Wick EC, Ko CY. Multimodal analgesia improves perioperative outcomes. Ann Surg. 2017;265(4):695–701.
15. Oderda GM, Gan MS. Opioid-related adverse drug events. J Pain Palliat Care Pharmacother. 2013;27(1):62–70.
16. Ladha KS, Dexter F. Opioid-sparing effects of multimodal analgesia. Anesthesiology. 2016;124(3):590–600.
17. Ljungqvist O. ERAS and early mobilization. World J Surg. 2019;43(3):659–64.
18. Gustafsson UO, Fearon K. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. World J Surg. 2013;37(2):259–84.
19. Nelson G, Ljungqvist O. Enhanced recovery after surgery: current concepts. Clin Colon Rectal Surg. 2019;32(2):93–100.
20. Gan TJ. Risk factors for postoperative nausea and vomiting. Anesth Analg. 2006;102(6): 1884–98.