

Effect of Multimodal Analgesia on Postoperative Recovery and Length of Hospital Stay in Patients Undergoing Abdominal Surgery

Dr. Mohammed Thanoon Hamed Al-dulaimi ¹

Abstract: Background: To improve recovery and minimize complications, the management of postoperative pain is a critical issue in abdominal surgery. Multimodal analgesia has been advanced as being a better alternative to the traditional opioid-based regimens.

Aim: To determine the impact of multimodal analgesia on the postoperative recovery and hospitalization among patients who underwent abdominal surgery.

Methods: A comparative study was a prospective study carried out in one year at the Medical Research Teaching Hospital. Two groups of adult patients (70 in multimodal analgesia and 70 in conventional opioid-based analgesia) were selected to carry out the elective abdominal surgery. Visual Analog Scale (VAS) was used to measure postoperative pain at 6, 12 and 24 hours. Other outcomes were opioid use, mobilization time, hospital stay and postoperative complications. The SPSS version 28 was used to analyze the data, and the value of statistical significance was determined as $p < 0.05$.

Findings: Multimodal group demonstrated a significant low score of pain at every time point than the conventional group ($p < 0.001$). Opioid consumption was significantly reduced (12.4 ± 5.1 mg vs 24.7 ± 8.3 mg, $p < 0.001$), and earlier mobilization was achieved (10.5 ± 3.2 vs 16.8 ± 4.5 hours, $p < 0.001$). The duration of hospital stay was much less in the multimodal group (3.4 ± 1.2 vs 5.2 ± 1.8 days, $p < 0.001$). Also, the rate of nausea and vomiting was much lower ($p < 0.01$).

Conclusion: Multimodal analgesia is an effective strategy to enhance postoperative outcome through the enhancement of pain management, decrease in opioid consumption, faster ambulation, and hospitalization. It should be implemented routine as it is expected to improve patient outcomes during abdominal surgery.

Keywords: Multimodal analgesia; Postoperative pain; ERAS; Recovery

¹ Anesthesiologist and Intensive Care Specialist Medical Research Teaching Hospital, Mosul, Iraq

1. Introduction

Postoperative pain is a major clinical issue that occurs after abdominal surgery and it is linked to delayed patient recovery, extended hospitalization, high morbidity and low patient satisfaction (1,2). Poor pain

management may affect the ability to perform early mobility, slow gastrointestinal healing as well as predispose to post-operative issues such as pulmonary dysfunction and thromboembolic events (3). Historically, opioid analgesia has been the basis of postoperative pain treatment, but opioid consumption is often linked with the following side effects: nausea, vomiting, respiratory depression, sedation, and slow recovery (4,5).

Multimodal analgesia has become a promising approach it tries to maximize the management of postoperative pain in the last few years. The method implies the application of a set of analgesic agents and techniques that affect various pain pathways, thus improving analgesic effect and reducing the use of opioid and side effects (6). The most frequent agents of multimodal analgesia are nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, regional anesthesia modalities, and adjunctive agents, which are used together with or in place of opioids (7).

A number of studies have shown that multimodal analgesia is effective in controlling pain better than traditional opioid-based regimens, which result in better functional recovery and faster mobilization (8,9). Moreover, the use of multimodal analgesia plans is one of the central aspects of the enhanced recovery after surgery (ERAS) pathways, which also focus on minimizing surgical stress, recovery, and reducing hospital length of stay (10).

In spite of the increasing evidence in favor of multimodal analgesia, it is not widely applied in the actual clinical practice, especially in areas with limited resources. The differences in the analgesic regimens, the absence of unified guidelines, and the fear of drug interactions or side effects can restrict its usage (11). Furthermore, additional clinical research is required to test the efficacy of multimodal analgesia to enhance the outcomes of the postoperative period in various surgery groups.

Thus, the proposed study will assess how multimodal analgesia can improve postoperative outcomes and hospital stay in patients having an abdominal surgery to enable evidence-based recommendations on the best way to manage pain and improve patient outcomes (12).

2. Patients and Methods

This was a planned prospective comparative study that was to be carried out during a time span of eleven months from February 2025 to January 2026 at the Medical Research Teaching Hospital. The objective of the study was to determine the impact of multimodal analgesia on postoperative outcome and the duration of stay in the hospital in patients who had undergone an abdominal surgery.

One hundred forty adult patients were recruited and divided into two equal groups ($n = 70$) multimodal analgesia group and conventional analgesia group ($n = 70$). The sample size was calculated by using the previous researches which proved the existence of significant variations in the postoperative pain scores and hospital stay with a confidence level of 95% and statistical power of 80.

The inclusion criteria were patients aged 18 years to 70 years of age, American Society of Anesthesiologists (ASA) physical status of I-III and elective abdominal surgery under general anesthesia. Patients having known allergies to study drugs, chronic opioid use, severe hepatic or renal dysfunction, cognitive conditions, and the inability to rate the pain with the help of the Visual Analog Scale (VAS) were excluded.

The multimodal analgesia group patients were administered a standardized analgesic program of intravenous paracetamol (1g every 8 hours), nonsteroidal anti-inflammatory medication (e.g. diclofenac 75 mg every 12 hours) and reduced-dose opioid (e.g. morphine as needed). Conversely, the patients in the traditional group had the analgesia (morphine) based on opioids and as it is a standard practice in hospitals.

Standard monitoring such as heart rate, blood pressure, oxygen saturation, respiratory rate was implemented on all patients in the perioperative period. The Visual Analog Scale (VAS) was used to measure the postoperative pain at preset time points (6, 12, and 24 hours after the operation).

Postoperative pain scores (VAS) and length of hospital stay (days) were the main study outcomes. The secondary outcomes were: time to first mobilization, total opioid intake, and postoperative complication incidents: nausea, vomiting, and respiratory depression.

A structured data collection sheet was used to collect data which was analyzed with IBM SPSS version 28. The mean plus standard deviation were used to express continuous variables and independent samples t-test was applied to compare or contrast them, whereas frequencies and percentages expressed categorical variables and the chi-square test was used. The p-value that was less than 0.05 was treated as significant.

Nineveh Health Directorate gave its ethical approval. All the participants signed informed consent in writing after they were informed about the study goals and procedures. Anonymity and confidentiality were observed in the study as per the Declaration of Helsinki.

3. Results

Table 3.1: Demographic Characteristics of the Study Participants (N = 140)

Variable	Multimodal Group (n=70)	Conventional Group (n=70)	P-value
Age (years) Mean $\pm$ SD	45.2 $\pm$ 11.6	46.7 $\pm$ 12.1	0.482
Gender (Male) n (%)	38 (54.3%)	40 (57.1%)	0.739
BMI (kg/m ²) Mean $\pm$ SD	28.1 $\pm$ 4.7	28.6 $\pm$ 5.0	0.621
ASA I n (%)	25 (35.7%)	23 (32.9%)	0.812
ASA II n (%)	32 (45.7%)	34 (48.6%)	
ASA III n (%)	13 (18.6%)	13 (18.5%)	

The two groups were compared in terms of demographic and clinical characteristics that showed that no statistically significant differences existed between them ($p > 0.05$), which predetermined the similarity of the baseline.

Table 3.2: Postoperative Pain Scores (VAS)

Time Interval	Multimodal Group Mean $\pm$ SD	Conventional Group Mean $\pm$ SD	P-value
6 hours	3.2 $\pm$ 1.1	5.8 $\pm$ 1.6	<0.001
12 hours	2.8 $\pm$ 1.0	4.9 $\pm$ 1.4	<0.001
24 hours	2.1 $\pm$ 0.9	3.7 $\pm$ 1.2	<0.001

Multimodal group had lower pain scores at all the time points of postoperative period ($p < 0.001$), which is indicative of better analgesic activity.

Table 3.3: Length of Hospital Stay (days)

Variable	Multimodal Group	Conventional Group	P-value
Length of stay Mean $\pm$ SD	3.4 $\pm$ 1.2	5.2 $\pm$ 1.8	<0.001

Enhanced recovery was observed in patients who received multimodal analgesia because the length of stay in the hospital was reduced by a significant margin ($p < 0.001$) when compared with the conventional one.

Table 3.4: Time to First Mobilization (hours)

Variable	Multimodal Group	Conventional Group	P-value
Time (hours) Mean $\pm$ SD	10.5 $\pm$ 3.2	16.8 $\pm$ 4.5	<0.001

The multimodal group mobilized earlier than the conventional group ($p < 0.001$), which implies that the former would recover quicker.

Table 3.5: Total Opioid Consumption (mg Morphine Equivalent)

Variable	Multimodal Group	Conventional Group	P-value
Opioid consumption Mean $\pm$ SD	12.4 $\pm$ 5.1	24.7 $\pm$ 8.3	<0.001

The number of opioids taken was also lower in the multimodal group ($p < 0.001$) and this proves the opioid-sparing nature of multimodal analgesia.

Table 3.6: Postoperative Complications

Complication	Multimodal Group	Conventional Group	P-value
Nausea	10 (14.3%)	26 (37.1%)	0.002
Vomiting	6 (8.6%)	20 (28.6%)	0.003
Respiratory depression	1 (1.4%)	5 (7.1%)	0.092

The nausea and vomiting rate occurred much less in the multimodal group ($p < 0.01$), whereas there was no statistically significant difference in respiratory depression..

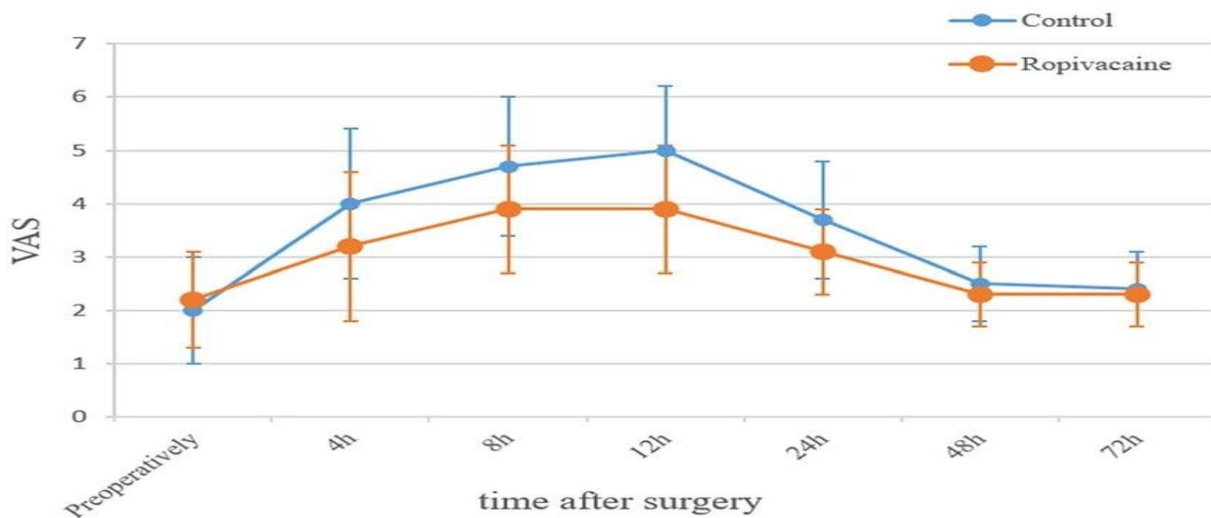
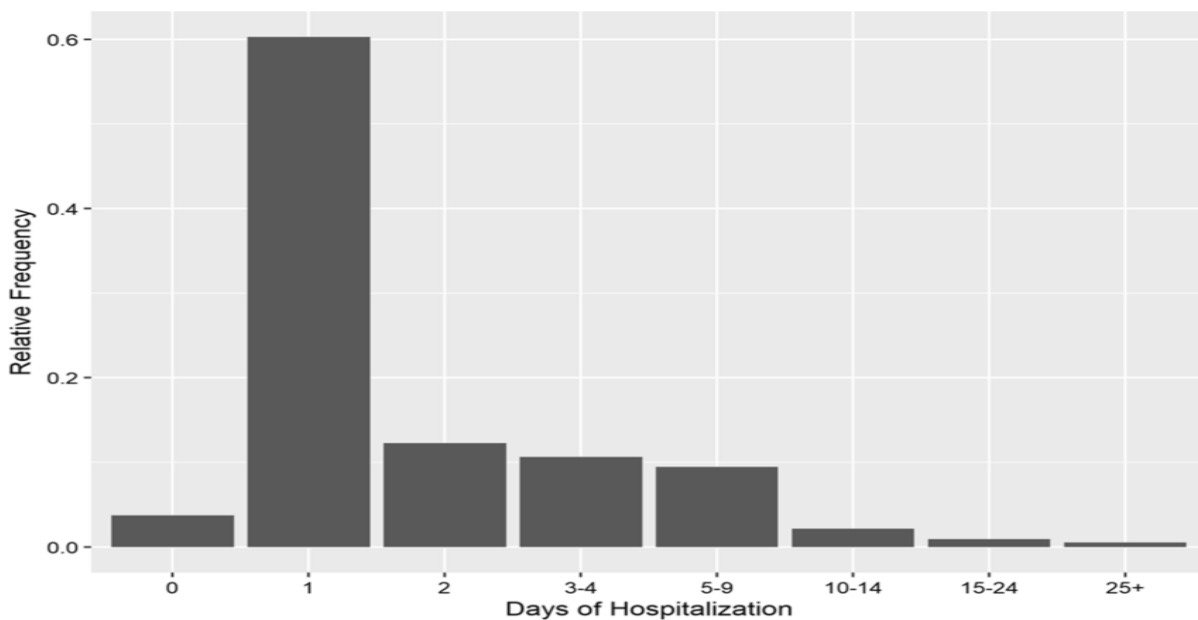
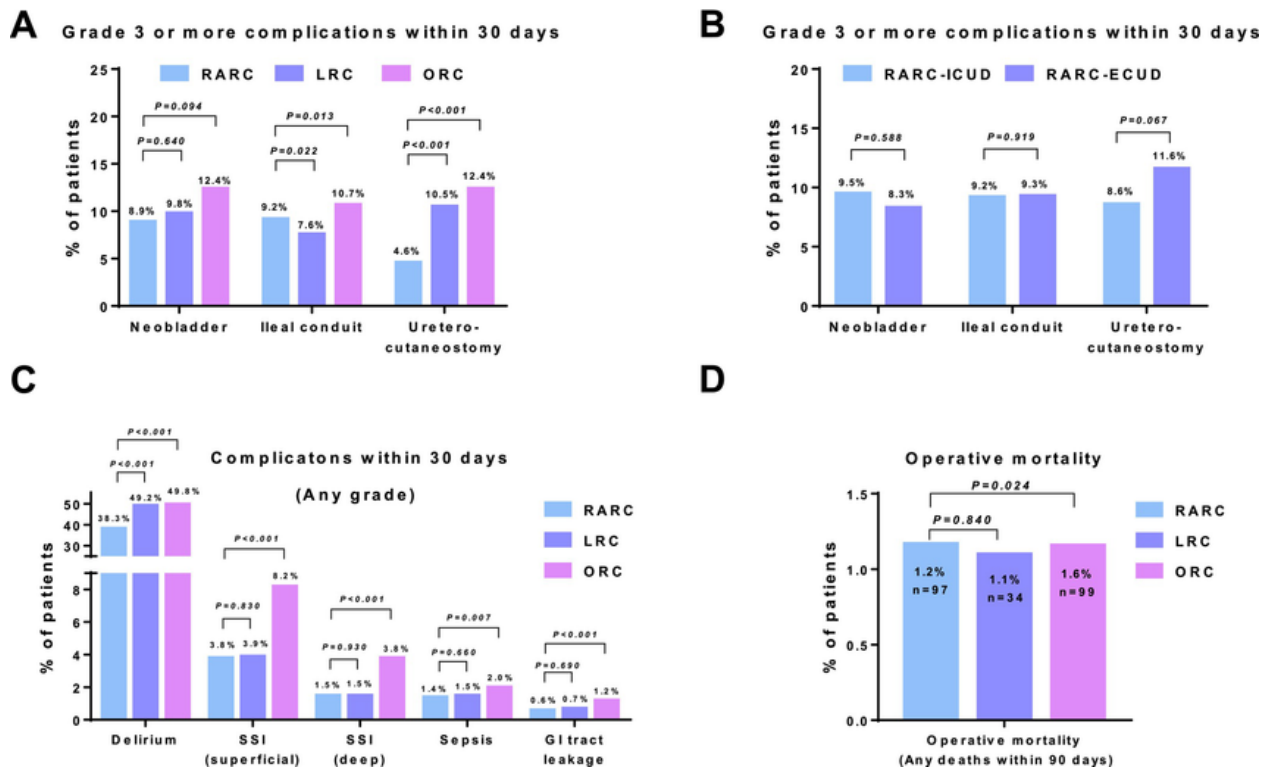
**Figure 1 Pain Scores (VAS) Over Time**

Figure 2 Length of Hospital Stay**Figure 3 Complications**

4. Discussion

This conclusion is supported by the results of the current investigation that indicate multimodal analgesia has a significant effect on the postoperative outcome in patients that have undergone abdominal surgery in comparison with the traditional opioid-based analgesia. In particular, the multimodal analgesia was linked to lower levels of postoperative pain, a decrease in opioid intake, earlier mobility, reduced hospitalization, and decrease in opioid-related complications. These results are in line with the recent literature that multimodal analgesia is an essential part of enhanced recovery after surgery (ERAS) guidelines (13,14).

The multimodal group had significantly lower scores regarding postoperative pain (VAS) at all postoperative time intervals than the conventional group ($p < 0.001$). The finding is consistent with the current literature showing that the analgesic agents with varying mechanisms of action are better at controlling pain than the single-modality opioid therapy. The systematic review by Chou et al. (13) showed that multimodal analgesia is a significant intervention that enhances the postoperative pain rates and reduces the use of opioids. In the same manner, Wick et al. (14) also found that multimodal approaches have been linked with improved pain management and recovery profile.

The current research also demonstrated a significant decrease in opioid use in the multimodal group which validates the effect of opioid-sparingness of this modality. The clinical significance of this finding is that the adverse effects associated with opioids are still a primary issue in perioperative care. Oderda et al. (15) discovered that the events of opioid use are linked to a long length of stay and high cost of healthcare. Moreover, Ladha et al. (16) showed that multimodal analgesia can be used to reduce the rate of perioperative opioid use resulting in better patient safety and complication reduction.

The current study showed that the multimodal group was significantly higher in terms of early mobilization. Earlier ambulation of the patients is also a key aspect of minimizing postoperative

complications since effective pain management will allow them to walk sooner. Ljungqvist et al. (17) also pointed out that early mobilization is a major component of ERAS pathways and it is heavily influenced by sufficient analgesia. Moreover, there is an increased recovery protocol with multimodal analgesia that has demonstrated acceleration in functional recovery and less morbidity (18).

Patients who got multimodal analgesia had a substantial decrease in length of stay. This observation is in accordance with the findings of other studies that have shown that effective pain management leads to reduced hospital stay and efficiency of care. According to Gustafsson et al. (18), multimodal analgesia and ERAS protocols have a significant effect on the reduction of hospital stay in patients undergoing abdominal surgery. On the same note, Nelson et al. (19) emphasized that multimodal analgesia is an important approach that enhances the outcome of surgery and enables patients to leave hospital in the near future.

In terms of postoperative complications, this research reported much lower rates of nausea and vomiting in the multimodal group, which is explained by the decrease in opioid use. Apfelbaum et al. (20) listed opioids as a key cause of postoperative nausea and vomiting and the decrease in their use correlates with a better patient experience and recovery. Even though the respiratory depression was less common in the multimodal group, the difference was not found to be statistically significant, which may be explained by the comparatively low prevalence of such complication.

Regardless of these benefits, multimodal analgesia is not being used in all clinical environments in a consistent manner. It may be impeded by barriers of a lack of standardized protocols, limited resources and variability in clinician practice. However, this research with the help of the recent evidence supports the inclusion of multimodal analgesia into routine perioperative practice as it can improve patient outcomes and increase recovery (13,18).

5. Conclusion

Multimodal analgesia is much better than opioid based analgesia in terms of pain control, reduced opioid use, sooner mobilization, less hospitalization, and less opioid complications. These results support the importance of multimodal analgesia as an important part of the improved recovery mechanisms in abdominal surgeries. It should be highly encouraged in its routine practice in the perioperative care to maximize patient recovery and enhance clinical outcomes.

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