Section: Anaesthesiology

Original Research Article

MULTIMODAL ANALGESIA STRATEGIES IN MAJOR ONCOLOGICAL SURGERIES: REDUCING OPIOID DEPENDENCE AND IMPROVING RECOVERY

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ABSTRACT

Background: Major oncological surgeries are associated with significant postoperative pain, traditionally managed using opioid-based analgesia. Excessive opioid use is associated with adverse effects such as respiratory depression, postoperative nausea and vomiting, delayed mobilization, prolonged hospital stays, and risk of prolonged opioid use. Multimodal analgesia (MMA) has emerged as an effective opioid-sparing strategy that combines different analgesic modalities to improve pain control and enhance postoperative recovery. **Aim:** To evaluate the effectiveness of multimodal analgesia strategies in reducing opioid dependence and improving postoperative recovery among patients undergoing major oncological surgeries.

Materials and Methods: This prospective observational study was conducted in the Department of Anaesthesiology at Government Dindigul Medical College from February 2025 to February 2026. A total of 100 patients aged between 50- and 70-years undergoing elective major oncological surgeries were included in the study. Patients received multimodal analgesia protocols comprising intravenous paracetamol, non-steroidal anti-inflammatory drugs, regional anesthesia techniques, local anesthetic infiltration, and limited opioid administration. Postoperative pain was assessed using the Visual Analog Scale (VAS). Total opioid consumption, time to ambulation, return of bowel function, duration of hospital stays, and opioid-related complications were recorded and analyzed.

Results: The study demonstrated effective postoperative pain control with reduced opioid requirement among patients receiving multimodal analgesia. Mean VAS pain scores progressively decreased during the postoperative period. Early ambulation, faster recovery of bowel function, and reduced duration of hospital stay were observed. Opioid-related complications such as nausea, vomiting, sedation, and respiratory depression were observed at low rates.

Conclusion: Multimodal analgesia is an effective opioid-sparing strategy in major oncological surgeries. It was associated with reduced postoperative opioid consumption, minimizes opioid-related adverse effects, and improves postoperative recovery outcomes. Incorporation of multimodal analgesia into perioperative care protocols may enhance patient recovery and overall surgical outcomes.

Keywords: Multimodal analgesia, opioid-sparing anesthesia, oncological surgery, postoperative pain, enhanced recovery after surgery, ERAS.

INTRODUCTION

Major oncological surgeries are commonly associated with significant postoperative pain due to extensive tissue dissection, prolonged operative duration, and inflammatory response.[1,2] Effective postoperative pain management plays a crucial role in improving patient comfort, reducing perioperative stress response, facilitating early mobilization, and enhancing overall recovery.[3] Traditionally, opioid

analgesics have been the cornerstone of perioperative pain management in cancer surgeries because of their potent analgesic properties. However, excessive perioperative opioid use is associated with several adverse effects including respiratory depression, postoperative nausea and vomiting (PONV), sedation, constipation, urinary retention, delayed ambulation, prolonged hospital stays, and increased risk of prolonged opioid use.[4,5]

In recent years, concerns regarding opioid-related complications and the global opioid crisis have led to growing interest in opioid-sparing analgesic techniques.[6] Persistent opioid use following surgery has become a major healthcare concern, particularly among elderly patients undergoing major surgical procedures. Cancer patients are especially vulnerable due to repeated exposure to analgesics during perioperative and postoperative periods.[7] Therefore, strategies aimed at minimizing opioid consumption while maintaining adequate analgesia have gained increasing importance in perioperative care.

Multimodal analgesia (MMA) is an evidence-based approach that utilizes a combination of analgesic medications and regional anesthesia techniques acting through different mechanisms to provide superior pain relief while reducing opioid requirements.[8] Components of multimodal analgesia commonly include paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs), local anesthetic infiltration, epidural analgesia, peripheral nerve blocks, ketamine, and gabapentinoids.[9] By targeting multiple pain pathways simultaneously, multimodal analgesia improves analgesic efficacy and minimizes opioid-related adverse effects.[10]

Enhanced Recovery After Surgery (ERAS) protocols strongly recommend multimodal analgesia as a key component for optimizing perioperative outcomes.[11] Studies have demonstrated that multimodal analgesia contributes to better pain control, earlier ambulation, faster return of bowel function, shorter hospital stay, improved patient satisfaction, and reduced healthcare costs.[12,13] In oncological surgeries, where postoperative recovery significantly influences quality of life and continuation of cancer treatment, effective opioid-sparing pain management strategies are particularly valuable.[14]

Despite increasing evidence supporting multimodal analgesia, limited observational data are available regarding its effectiveness in major oncological surgeries in tertiary care government institutions in South India. Hence, the present study was undertaken at Government Dindigul Medical College to evaluate the effectiveness of multimodal analgesia strategies in reducing postoperative opioid consumption and improving postoperative recovery among patients undergoing major oncological surgeries.[15]

Aim of the Study

To evaluate the effectiveness of multimodal analgesia strategies in reducing postoperative opioid dependence and improving recovery outcomes among patients undergoing major oncological surgeries at Government Dindigul Medical College.

Objectives

Primary Objective

The primary objective of the present study was to evaluate the effectiveness of multimodal analgesia strategies in reducing postoperative opioid consumption among patients undergoing major oncological surgeries at Government Dindigul Medical College. The study aimed to determine whether the use of combined analgesic modalities could provide adequate postoperative pain relief while minimizing the requirement for opioid analgesics and thereby reducing opioid-related adverse effects and dependence.

Secondary Objectives

The secondary objectives of the study were to assess postoperative pain intensity using the Visual Analog Scale (VAS) at various postoperative intervals and to evaluate recovery parameters including time to first ambulation, initiation of oral feeding, return of bowel function, and duration of hospital stay. The study also aimed to determine the incidence of opioid-related complications such as postoperative nausea and vomiting, sedation, respiratory depression, and postoperative ileus. In addition, patient satisfaction regarding postoperative pain management was assessed to evaluate the overall effectiveness of multimodal analgesia in enhancing postoperative recovery among patients undergoing major oncological surgeries.

MATERIALS AND METHODS

Study Design

This study was designed as a prospective observational study.

Study Setting

The study was conducted in the Department of Anaesthesiology at Government Dindigul Medical College, Tamil Nadu.

Study Period

The study was carried out over a period of one year from February 2025 to February 2026.

Study Population

Patients undergoing elective major oncological surgeries under general anesthesia were included in the study.

Sample Size

The sample size for the present study consisted of 100 patients undergoing major oncological surgeries at Government Dindigul Medical College during the study period from February 2025 to February 2026. Patients fulfilling the inclusion criteria were selected by consecutive sampling method. The sample size was considered adequate to evaluate the effectiveness of multimodal analgesia strategies in reducing postoperative opioid consumption and improving postoperative recovery outcomes.

Inclusion Criteria

1. Patients aged between 50 and 70 years.
2. Patients undergoing elective major oncological surgeries under general anesthesia.

3. Patients belonging to American Society of Anesthesiologists (ASA) physical status I, II, and III.
4. Patients willing to participate in the study and provide written informed consent.
5. Patients receiving multimodal analgesia as part of perioperative pain management.

Exclusion Criteria

1. Patients with a history of chronic opioid use or opioid dependence.
2. Patients with severe hepatic dysfunction or renal impairment.
3. Patients with known allergy or contraindication to the study medications used in multimodal analgesia.
4. Patients with significant psychiatric illness or cognitive impairment interfering with pain assessment.
5. Patients undergoing emergency oncological surgeries.
6. Patients with ASA physical status IV and above.

Preoperative Assessment

All patients included in the study underwent a detailed preoperative evaluation prior to surgery. A comprehensive medical history was obtained, including details regarding existing comorbid illnesses, previous surgical procedures, history of analgesic or opioid use, and any known drug allergies. General physical examination and systemic examination were performed for all patients.

Routine preoperative investigations including complete blood count, renal function tests, liver function tests, blood sugar levels, serum electrolytes, electrocardiogram (ECG), and chest radiography were carried out as per institutional protocol. Additional investigations were performed whenever clinically indicated.

Airway assessment and anesthetic risk evaluation were conducted for all patients. The American Society of Anesthesiologists (ASA) physical status classification was assigned accordingly. Baseline vital parameters including heart rate, blood pressure, respiratory rate, and oxygen saturation were recorded.

Patients were explained about the Visual Analog Scale (VAS) for postoperative pain assessment during the preoperative visit. The multimodal analgesia protocol planned for postoperative pain management was also explained, and written informed consent was obtained prior to surgery.

Anaesthetic and Analgesic Protocol

All patients included in the study received standardized general anesthesia for major oncological surgeries under strict intraoperative monitoring. Upon arrival in the operating room, baseline vital parameters including heart rate, blood pressure, respiratory rate, oxygen saturation, and electrocardiography (ECG) were recorded. Standard monitoring consisting of pulse oximetry, non-invasive blood pressure (NIBP), ECG, and capnography was instituted for all patients throughout the surgical procedure.

Premedication was administered according to institutional protocol. General anesthesia was induced using intravenous anesthetic agents, and endotracheal intubation was facilitated with appropriate muscle relaxants. Anesthesia was maintained using inhalational anesthetic agents with controlled ventilation. Intraoperative hemodynamic stability was maintained throughout the procedure.

A multimodal analgesia strategy was employed in all patients to provide effective postoperative pain relief while minimizing opioid consumption. The analgesic regimen included intravenous paracetamol 1 g administered perioperatively and continued postoperatively at regular intervals. Non-steroidal anti-inflammatory drugs (NSAIDs) were administered unless contraindicated.

Regional anesthesia techniques such as epidural analgesia or transverse abdominis plane (TAP) block were performed whenever appropriate depending on the type of oncological surgery and patient suitability. Local anesthetic wound infiltration was also administered at the surgical site before wound closure whenever feasible.

Opioids were administered in minimal effective doses during the intraoperative and postoperative periods. Rescue opioid analgesics were provided only when patients experienced inadequate pain relief or when the Visual Analog Scale (VAS) score exceeded acceptable limits.

Postoperatively, all patients continued to receive multimodal analgesia and were monitored closely for pain control, opioid requirement, hemodynamic stability, and opioid-related adverse effects such as postoperative nausea and vomiting, sedation, respiratory depression, and postoperative ileus.

Postoperative Assessment

All patients were assessed postoperatively to evaluate the effectiveness of multimodal analgesia in reducing opioid requirement and improving recovery following major oncological surgeries. Patients were monitored in the postoperative recovery room and subsequently in the surgical ward as per institutional protocol.

Assessment of Postoperative Pain

Postoperative pain intensity was assessed using the Visual Analog Scale (VAS), where:

- 0 indicated no pain
- 10 indicated worst imaginable pain

VAS scores were recorded at the following postoperative intervals:

- 2 hours
- 6 hours
- 12 hours
- 24 hours
- 48 hours

Rescue opioid analgesics were administered whenever the VAS score exceeded acceptable levels.

Assessment of Opioid Consumption

Total postoperative opioid consumption during the hospital stay was recorded for each patient and documented for analysis.

Assessment of Recovery Parameters

The following postoperative recovery parameters were evaluated:

- Time to first ambulation
- Time to initiation of oral feeding
- Return of bowel function
- Duration of hospital stay

Assessment of Opioid-related Adverse Effects

Patients were monitored for opioid-related complications including:

- Postoperative nausea and vomiting (PONV)
- Sedation
- Respiratory depression
- Urinary retention
- Postoperative ileus

Patient Satisfaction Assessment

Patient satisfaction regarding postoperative pain management was assessed at the time of discharge using a standardized satisfaction assessment scale.

Documentation and Monitoring

All postoperative observations, pain scores, recovery parameters, opioid requirements, and adverse events were documented systematically for statistical analysis.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25. Continuous variables such as age, Visual Analog Scale (VAS) scores, opioid consumption, time to ambulation, and duration of hospital stay were expressed as mean ± standard deviation (SD), while categorical variables such as gender distribution and incidence of opioid-related adverse effects were expressed as frequencies and percentages. Statistical analysis was performed using Student's t-test for comparison of continuous variables and Chi-square test for comparison of categorical variables wherever appropriate. A p-value of less than 0.05 was considered statistically significant. The analyzed data were presented in the form of tables and charts wherever necessary.

Ethical Consideration

The study was conducted after obtaining approval from the Institutional Ethics Committee of Government Dindigul Medical College, Tamil Nadu. Written informed consent was obtained from all patients prior to participation in the study. Confidentiality of patient information was strictly maintained throughout the study period.

RESULTS

A total of 100 patients undergoing major oncological surgeries were included in the study. All patients received multimodal analgesia as part of perioperative pain management. The demographic profile, postoperative pain scores, opioid consumption, recovery parameters, and opioid-related adverse effects were assessed and analyzed.

Demographic Characteristics

A total of 100 patients undergoing major oncological surgeries were included in the study. The demographic profile of the study participants was analyzed based on age and gender distribution. The majority of patients belonged to the age group of 56–60 years, and male patients constituted a higher proportion of the study population compared to female patients. The demographic characteristics of the study participants are presented in Table 1 and Table 2.

Table 1: Age Distribution of Study Participants

Age Group (Years)	Number of Patients	Percentage (%)
50–55	28	28
56–60	32	32
61–65	24	24
66–70	16	16
Total	100	100

Note: The majority of patients included in the study belonged to the age group of 56–60 years (32%), followed by 50–55 years (28%). Patients aged 66–70 years constituted the least proportion of the study population (16%).

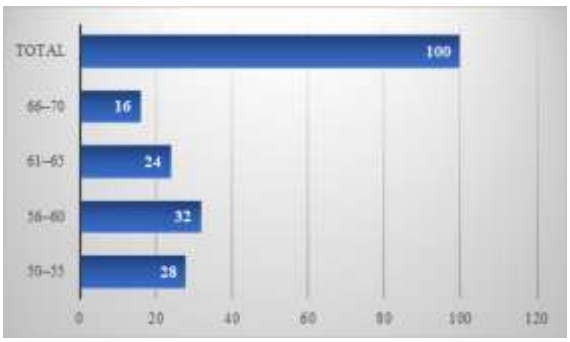

Figure 1: Age Distribution of Study Participants

Note: The majority of study participants belonged to the age group of 56–60 years (32%), followed by 50–55 years (28%). Patients aged 66–70 years constituted the least proportion of the study population (16%).

Table 2: Gender Distribution of Study Participants

Gender	Number of Patients	Percentage (%)
Male	58	58
Female	42	42
Total	100	100

Note: Male patients constituted the majority of the study population with 58%, while female patients accounted for 42% of the total participants included in the study.

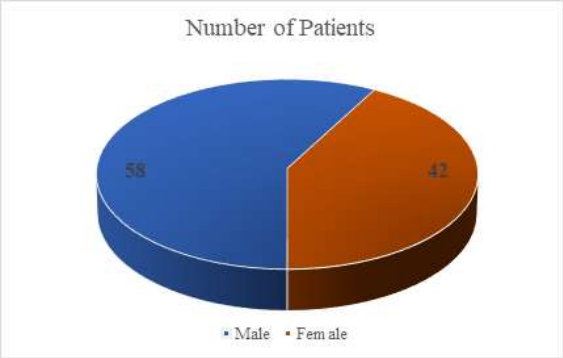

Figure 2: Gender Distribution of Study Participants

Note: Male patients constituted the majority of the study population with 58%, while female patients accounted for 42% of the total study participants

Postoperative Pain Assessment

Postoperative pain intensity was assessed using the Visual Analog Scale (VAS) at different postoperative intervals. The mean VAS scores showed a gradual reduction over time, indicating effective postoperative pain control with the multimodal analgesia protocol. Lower pain scores observed during the later postoperative period reflected improved analgesic efficacy and reduced dependence on opioid analgesics.

Table 3: Mean Postoperative VAS Scores

Postoperative Interval	Mean VAS Score
2 Hours	4.8
6 Hours	4.1
12 Hours	3.5
24 Hours	2.9
48 Hours	2.1

Note: The mean postoperative VAS score progressively decreased from 4.8 at 2 hours to 2.1 at 48 hours postoperatively, demonstrating adequate pain control and effectiveness of multimodal analgesia in reducing postoperative pain following major oncological surgeries.

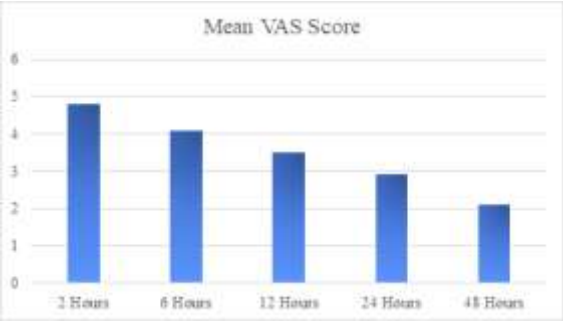

Figure 3: Mean Postoperative VAS Scores at Different Postoperative Intervals

Note: The mean postoperative VAS scores showed a gradual decline from 4.8 at 2 hours to 2.1 at 48 hours postoperatively, indicating effective postoperative pain control and reduced opioid requirement with the use of multimodal analgesia in major oncological surgeries.

Postoperative Opioid Requirement

Postoperative opioid consumption was assessed in all patients included in the study. The majority of patients required only minimal opioid supplementation following surgery, indicating the effectiveness of the multimodal analgesia protocol in reducing opioid dependence. Only a small proportion of patients required higher opioid doses for adequate pain control.

Table 4: Postoperative Opioid Requirement

Opioid Requirement	Number of Patients	Percentage (%)
Minimal	68	68
Moderate	24	24
High	8	8
Total	100	100

Note: Most patients (68%) required minimal postoperative opioid analgesia, while only 8% of patients required high opioid supplementation, demonstrating the opioid-sparing effect of multimodal analgesia in major oncological surgeries.

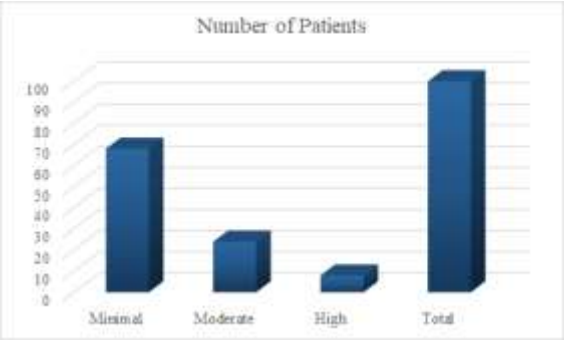

Figure 4: Postoperative Opioid Requirement Among Study Participants

Note: The majority of patients (68%) required only minimal postoperative opioid supplementation, while only 8% required high opioid doses, demonstrating the opioid-sparing effect of multimodal analgesia following major oncological surgeries.

Recovery Parameters

Postoperative recovery parameters were evaluated in all patients to assess the effectiveness of multimodal analgesia in enhancing recovery following major oncological surgeries. Early ambulation, timely initiation of oral feeding, faster return of bowel function, and shorter duration of hospital stay were observed among the study participants.

Table 5: Postoperative Recovery Parameters

Recovery Parameter	Mean Duration
Time to First Ambulation	18 Hours
Time to Oral Feeding	20 Hours
Return of Bowel Function	26 Hours
Duration of Hospital Stay	6.2 Days

Note: Patients receiving multimodal analgesia demonstrated early postoperative recovery with earlier ambulation, faster return of bowel function, and reduced duration of hospital stay following major oncological surgeries.

Opioid-related Adverse Effects

Opioid-related adverse effects were assessed in all patients during the postoperative period. The incidence of complications was comparatively low among patients who received multimodal analgesia. Postoperative nausea and vomiting were the most frequently observed adverse effect, whereas respiratory depression was observed in only a small proportion of patients, indicating the opioid-sparing benefit of multimodal analgesia.

Table 6: Opioid-related Adverse Effects

Opioid-related Adverse Effects	Number of Patients	Percentage (%)
Postoperative Nausea and Vomiting (PONV)	14	14
Sedation	10	10
Respiratory Depression	2	2
Postoperative Ileus	4	4

Note: The incidence of opioid-related adverse effects was comparatively low among the study participants, suggesting that multimodal analgesia effectively reduced opioid-associated complications following major oncological surgeries**.**

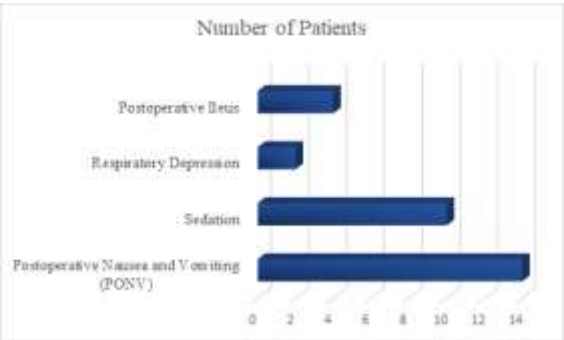

Figure 6: Opioid-related Adverse Effects Among Study Participants

Note: Postoperative nausea and vomiting was the most commonly observed opioid-related adverse effect (14%), followed by sedation (10%). Respiratory depression was observed in only 2% of patients, indicating reduced opioid-related complications with multimodal analgesia.

Patient Satisfaction

Patient satisfaction regarding postoperative pain management was assessed at the time of discharge using a standardized satisfaction assessment scale. The majority of patients reported satisfactory pain relief and expressed good overall satisfaction with the multimodal analgesia protocol. Effective postoperative pain control, reduced opioid requirement, and early recovery contributed significantly to higher patient satisfaction levels following major oncological surgeries.

Table 7: Patient Satisfaction Regarding Pain Management

Patient Satisfaction Level	Number of Patients	Percentage (%)
Excellent	52	52
Good	34	34
Satisfactory	10	10
Poor	4	4
Total	100	100

Note: Most patients reported excellent or good satisfaction with postoperative pain management, indicating the effectiveness of multimodal analgesia in improving patient comfort and recovery following major oncological surgeries.

DISCUSSION

Effective postoperative pain management remains a major challenge in patients undergoing major oncological surgeries due to the extensive surgical trauma and inflammatory response associated with these procedures.[1,2] Traditionally, opioids have been widely used for perioperative pain control; however, opioid-based analgesia is associated with several adverse effects including respiratory depression, postoperative nausea and vomiting, sedation, delayed mobilization, prolonged hospital stay, and risk of prolonged opioid use.[3,4] In recent years, multimodal analgesia has gained increasing importance as an opioid-sparing strategy aimed at improving postoperative recovery and minimizing opioid-related complications.[5,6]

The present prospective observational study evaluated the effectiveness of multimodal analgesia in reducing postoperative opioid requirement and improving recovery among patients undergoing major oncological surgeries at Government Dindigul Medical College. In this study, postoperative pain scores showed a progressive decline during the postoperative period, indicating effective pain control with the multimodal analgesia protocol. The mean VAS score decreased from 4.8 at 2 hours postoperatively to 2.1 at 48 hours, demonstrating satisfactory analgesic efficacy.

The findings of the present study are consistent with previous studies that have demonstrated the effectiveness of multimodal analgesia in improving postoperative pain control and reducing opioid consumption.[7,8] Kehlet and Dahl reported that multimodal analgesia targeting different pain pathways provides superior analgesia with fewer opioid-related adverse effects compared to opioid-centered pain management.[1] Similarly, ERAS protocols strongly recommend multimodal analgesia as a key component for enhanced postoperative recovery.[9,15]

In the present study, the majority of patients (68%) required only minimal postoperative opioid supplementation, while only 8% required higher opioid doses. This finding highlights the opioid-sparing effect of multimodal analgesia. The combined use of paracetamol, NSAIDs, regional anesthesia techniques, and local anesthetic infiltration contributed significantly to reduced opioid requirement. Similar findings have been reported in previous studies where multimodal analgesia was associated with lower opioid consumption and improved postoperative outcomes.[10,11]

Early postoperative recovery observed in the present study further supports the benefits of multimodal analgesia. Patients demonstrated earlier ambulation, faster initiation of oral feeding, quicker return of bowel function, and shorter hospital stay. Effective pain relief without excessive opioid administration facilitates mobilization and recovery, which are essential components of Enhanced Recovery After Surgery (ERAS) protocols.[12] Early recovery also contributes to reduced postoperative morbidity and improved patient satisfaction.[13]

The incidence of opioid-related adverse effects in the present study was comparatively low. Postoperative nausea and vomiting were observed in 14% of patients, sedation in 10%, respiratory depression in only 2%, and postoperative ileus in 4% of patients. Reduced opioid exposure likely contributed to the lower incidence of these complications. These findings are in agreement with previous studies demonstrating that multimodal analgesia reduces opioid-related adverse effects and improves overall postoperative safety.[14]

Patient satisfaction regarding postoperative pain management was high in the present study, with most patients reporting excellent or good satisfaction. Adequate pain control, reduced discomfort, and enhanced recovery significantly contributed to positive patient experiences following surgery.[5]

Although the present study demonstrated favorable outcomes, certain limitations should be considered. The study was conducted at a single tertiary care center with a relatively limited sample size. Additionally, long-term follow-up regarding chronic postoperative pain and persistent opioid use was not assessed. Further multicentric studies with larger sample sizes and long-term follow-up are recommended to validate the findings.

Overall, the present study demonstrates that multimodal analgesia is an effective opioid-sparing strategy in major oncological surgeries. It provides adequate postoperative pain relief, reduces opioid consumption, minimizes opioid-related complications, enhances postoperative recovery, and improves patient satisfaction.[15]

CONCLUSION

The present study concludes that multimodal analgesia is an effective and safe opioid-sparing strategy for postoperative pain management in patients undergoing major oncological surgeries. The use of combined analgesic modalities provided adequate postoperative pain relief, was associated with reduced opioid consumption, minimized opioid-related adverse effects, and enhanced postoperative recovery. Patients demonstrated earlier ambulation, faster return of bowel function, shorter hospital stay, and higher satisfaction with pain management. Therefore, incorporation of multimodal analgesia into routine perioperative care and Enhanced Recovery After Surgery (ERAS) protocols can

improve overall surgical outcomes and quality of postoperative recovery in oncological patients.

Limitations

The present study has certain limitations. The study was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability of the findings. Different types of oncological surgeries with varying pain intensities were included, which could have influenced postoperative pain assessment and recovery outcomes. In addition, long-term follow-up regarding chronic postoperative pain and persistent opioid dependence was not evaluated. Further multicentric studies with larger sample sizes and extended follow-up are recommended to validate the findings of the present study.

REFERENCES

1. Kehlet H, Dahl JB. Anaesthesia, surgery, and challenges in postoperative recovery. Lancet. 2003;362(9399):1921–1928.
2. Wick EC, Grant MC, Wu CL. Postoperative multimodal analgesia pain management with nonopioid analgesics and techniques. JAMA Surg. 2017;152(7):691–697.
3. Chou R, Gordon DB, de Leon-Casasola OA, et al. Management of postoperative pain: A clinical practice guideline. J Pain. 2016;17(2):131–157.
4. Buvanendran A, Kroin JS. Multimodal analgesia for controlling acute postoperative pain. Curr Opin Anaesthesiol. 2009;22(5):588–593.
5. Gan TJ. Poorly controlled postoperative pain: Prevalence, consequences, and prevention. J Pain Res. 2017;10:2287–2298.
6. Lavand'homme P. Transition from acute to chronic pain after surgery. Pain. 2017;158(Suppl 1):S50–S54.
7. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg. 2008;248(2):189–198.
8. Thapa P, Euasobhon P. Chronic postsurgical pain: Current evidence for prevention and management. Korean J Pain. 2018;31(3):155–173.
9. Joshi GP, Kehlet H. Enhanced recovery pathways: Looking into the future. Anesth Analg. 2019;128(1):5–7.
10. Memtsoudis SG, Poeran J, Cozowicz C, et al. The impact of peripheral nerve blocks on perioperative outcome in hip and knee arthroplasty. Anesthesiology. 2019;131(5):1093–1105.
11. Beverly A, Kaye AD, Ljungqvist O, Urman RD. Essential elements of multimodal analgesia in enhanced recovery after surgery protocols. Anesthesiol Clin. 2017;35(2):e115–e143.
12. Schwenk ES, Mariano ER. Designing the ideal perioperative pain management plan starts with multimodal analgesia. Korean J Anesthesiol. 2018;71(5):345–352.
13. Wu CL, Raja SN. Treatment of acute postoperative pain. Lancet. 2011;377(9784):2215–2225.
14. Helander EM, Menard BL, Harmon CM, et al. Multimodal analgesia, current concepts, and acute pain considerations. Curr Pain Headache Rep. 2017;21(1):3.
15. Ljungqvist O, Scott M, Fearon KC. Enhanced recovery after surgery: A review. JAMA Surg. 2017;152(3):292–298.