Comparison of Postoperative Analgesic Efficacy of Multimodal Analgesia Versus Opioid-Based Regimens in General Surgery Patients.

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Abstract

Background: A successful postoperative pain management is the key to an ideal recovery after surgery. Although the analgesia based on opioids has been the conventional method, it is limited by undesirable side effects and deprivation, among others. Conversely, multimodal analgesia involving a multimodal approach, where several pharmacological agents are used together, is a promising pain management approach with reduced rates of opioid consumption. The proposed study paper attempts to compare the effectiveness of multimodal analgesia to opioid-based regimens within general surgery patients.

Objectives: to compare the postoperative analgesic effect of multimodal analgesia against Opioid-based regimens on general surgery patients with specific reference to pain relief, opioid use, side effects, and post-surgery recovery.

Methodology: this prospective observational study done on 100 general surgical patients who underwent elective operations. A randomized assignment of patients to multimodal analgesia (comprising NSAIDs, acetaminophen, local anesthetics, and gabapentin) or opioid-based analgesia (including morphine or fentanyl) was used. The measurements of pain were done through the visual analog scale (VAS) during rest and during movement. The use of opioids was monitored, and any side effects like nausea, sedation, and constipation were noted. The measures used to measure functional recovery included admission time, length of hospitalization, and postoperative complications. The comparison between the two groups was done through statistical tests, which were t-tests and chi-square tests ($p < 0.05$).

Results: The multimodal analgesia group (n=50) had significantly lower pain scores at rest (VAS: 2.5 ± 1.3 vs. 4.1 ± 1.8, $p < 0.01$) and during movement (VAS: 3.1 ± 1.5 vs. 5.3 ± 2.2, $p < 0.01$) compared to the opioid group. Opioid consumption was reduced by 40% in the multimodal group (30 mg morphine equivalents vs. 50 mg, $p < 0.05$). The multimodal group also experienced fewer side effects, including nausea (10% vs. 24%, $p < 0.05$), sedation (8% vs. 22%, $p < 0.05$), and constipation (6% vs. 18%, $p < 0.05$). Furthermore, functional recovery was faster, with earlier ambulation (12.3 ± 3.5 hours vs. 17.4 ± 4.1 hours, $p < 0.01$) and shorter hospital stays (2.8 ± 0.7 days vs. 3.6 ± 1.1 days, $p < 0.01$).

Conclusion: Multimodal analgesia offered better pain management than opioid-based regimens and resulted in substantial opioid use and associated side effects. It was also shown to cause quicker

functional recovery, reduced hospitalization, and, therefore, was a more desirable mode of analgesia in general surgery patients.

Keywords: Postoperative pain, multimodal analgesia, opioid consumption, and general surgery.

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Introduction

Proper management of pain after surgery is an important part of the postoperative recovery. Poor pain management may result in various adverse consequences, such as slowed recovery, morbidity, excessive hospital stay, and patient discontent. Historically, opioids have been the foundational building block of postoperative analgesia, which is an effective analgesic against moderate to severe pain. Nevertheless, opioid-based treatment is also linked to several limitations, including such side effects as nausea, vomiting, sedation, constipation, respiratory depression, and even opioid dependency and abuse. These problems have influenced healthcare professionals to consider other pain-relieving measures [1,2]. Multimodal analgesia (MMA) is a new method that involves the integration of various pharmacological drugs and methods to reach various pain mechanisms to achieve good pain management with the minimum use of opioids. MMA is normally accompanied by nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, local anesthetics, gabapentin, and other medications such as N-methyl-D-aspartate (NMDA) antagonists or regional anesthesia procedures [3]. This combination method not only enhances pain management but also lowers intake and resultant side effects of opioids, a factor that has been found to result in expedited healing, patient satisfaction, and hospitalization [4]. A study on the efficacy of multimodal analgesia as compared to conventional opioid-based studies has gained a lot of momentum recently. Some studies have noted a better efficacy of MMA in decreasing pain rating, opioid use, and postsurgical complications [5]. These advantages are especially pronounced in the general surgery patients, as postoperative pain may differ according to the nature of the surgery and the conditions of the patients. Although opioids continue to be necessary in the treatment of severe pain, the increasing awareness of the dangers of opioid use has resulted in the rising use of the multimodal approach, especially in elective surgery [6]. The objective of the present study is to compare the effects of multimodal analgesia and opioid based regimens on the postoperative analgesic effects in general surgery patients [7]. We hypothesize that multimodal analgesia will be more effective in analgesia, result in less opioid use, and result in fewer side effects and complications than opioid-based analgesia [8]. These outcomes will be studied with the help of a prospective observational study that is regarded as the most effective method of assessing clinical interventions. Findings of the present study can be useful in providing evidence to enhance the management of postoperative pain and reduce the use of opioids in the recovery of surgical patients [9].

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Study Objectives

To compare the analgesic effect of multimodal analgesia and opioid-based analgesia in general surgery patients, in terms of pain relief, opioid intake, side effects, and recovery rate.

Materials and Methods

Study Design & Setting

The prospective observational study that was carried out at Department of surgery Lady Reading hospital Peshawar Khyber Pakhtunkhwa, Pakistan. From jan 2020 to june 2020.

Participants

The participants consisted of 100 adults who were electing to have general surgeries. Inclusion criteria were patients aged 18-70 years old, who had undergone surgery of the abdomen or orthopedic, and had no records of opioid dependency. Patients with known allergies to the drugs administered in the protocols, patients with severe renal or hepatic dysfunction, or contraindication to any of the drugs in the study were excluded.

Sample Size Calculation

The calculation of the sample size was dependent on a Confidence interval of 95% with a power of 80 and a moderate effect size (Cohen's d = 0.5). Based on these parameters, 50 patients in each group were found to be enough to achieve statistically significant differences in terms of pain scores, opioid use, and side effects, and an alpha value of 0.05.

Inclusion Criteria

Patients older than 18-70 years of age, elective general surgery, and informed consent.

Exclusion Criteria

Opioid addicts, patients with allergies to the learning drugs, extreme liver or kidney dysfunction, and contraindications to NSAIDs, gabapentin, or local anesthetics.

Diagnostic and Management Strategy

The postoperative pain was treated as per the designated groups, namely, multimodal analgesia (NSAIDs, acetaminophen, local anesthetics, gabapentin) and opioid-based analgesia (morphine or fentanyl). A Visual Analog Scale (VAS) was used to determine pain scores at rest and intensity during movement. The side effects were observed continuously.

Statistical Analysis

The SPSS software was used to analyze the data. Demographic and clinical variables were analyzed using descriptive statistics (mean, standard deviation). Comparison of pain scores and opioid consumption across groups was done using independent t-tests. To determine a difference in side

effects, chi-square tests were carried out. Any p-value below 0.05 was regarded as a statistical difference.

Ethical Approval

This study was conducted following approval from the institutional ethical review committee. All procedures adhered to the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants prior to inclusion. Confidentiality and anonymity of participant data were strictly maintained throughout the research process, ensuring ethical compliance.

Results

A total of 100 patients (mean age: 45.6 ± 12.3 years) participated in the study, with 50 patients in each group. The multimodal group reported significantly lower pain scores at rest (VAS: 2.5 ± 1.3 vs. 4.1 ± 1.8, $p < 0.01$) and during movement (VAS: 3.1 ± 1.5 vs. 5.3 ± 2.2, $p < 0.01$) compared to the opioid group. The total opioid consumption was significantly reduced in the multimodal group (30 mg morphine equivalents vs. 50 mg, $p < 0.05$). The multimodal group also exhibited fewer side effects: nausea (10% vs. 24%, $p < 0.05$), sedation (8% vs. 22%, $p < 0.05$), and constipation (6% vs. 18%, $p < 0.05$). Additionally, patients in the multimodal group experienced faster functional recovery, with earlier ambulation (12.3 ± 3.5 hours vs. 17.4 ± 4.1 hours, $p < 0.01$) and shorter hospital stays (2.8 ± 0.7 days vs. 3.6 ± 1.1 days, $p < 0.01$). The multimodal approach demonstrated a better overall profile, with lower opioid usage and quicker recovery.

Intervention Outcome

The multimodal analgesia plan has shown a tremendous role in controlling postoperative pain, opioid use, and minimizing side effects like nausea, sedation, and constipation. The use of multimodal analgesia was also proven to be effective as it resulted in faster functional recovery, earlier ambulation, and reduced hospitalization in patients.

Table 1: Demographic and Clinical Characteristics of Participants

Characteristic	Multimodal Group (n=50)	Opioid Group (n=50)	p-value
Age (years)	45.6 ± 12.3	46.2 ± 11.8	0.79
Gender (Male/Female)	25/25	28/22	0.67
BMI (kg/m²)	24.8 ± 3.2	25.1 ± 3.4	0.71
ASA Classification	I: 35, II: 15	I: 33, II: 17	0.56
Surgical Procedure	Abdominal: 30	Abdominal: 32	0.91
	Orthopedic: 20	Orthopedic: 18	

This table summarizes the demographic and clinical characteristics of the study participants, including age, gender, BMI, ASA classification, and the type of surgical procedure. There were no significant differences between the two groups in terms of baseline characteristics ($p > 0.05$).

Table 2: Pain Scores at Rest and During Movement

Group	Rest (VAS)	Movement (VAS)	p-value
Multimodal Group	2.5 ± 1.3	3.1 ± 1.5	<0.01
Opioid Group	4.1 ± 1.8	5.3 ± 2.2	<0.01

Table 2 presents the comparison of pain scores at rest and during movement between the multimodal and opioid groups. The multimodal group reported significantly lower pain scores at both rest and movement ($p < 0.01$), indicating superior pain control with multimodal analgesia.

Table 3: Opioid Consumption

Group	Total Opioid Consumption (mg morphine equivalents)	p-value
Multimodal Group	30 ± 12	<0.05
Opioid Group	50 ± 15	<0.05

This table compares the total opioid consumption (in mg morphine equivalents) between the two groups. The multimodal group required significantly less opioid medication compared to the opioid group, supporting the efficacy of multimodal analgesia in reducing opioid usage post-surgery ($p < 0.05$).

Table 4: Incidence of Side Effects

Side Effect	Multimodal Group (%)	Opioid Group (%)	p-value
Nausea	10	24	<0.05
Sedation	8	22	<0.05
Constipation	6	18	<0.05

Table 4 presents the incidence of common side effects (nausea, sedation, constipation) in both groups. The multimodal group had significantly fewer occurrences of these side effects, suggesting a better safety profile and tolerance compared to the opioid-based regimen ($p < 0.05$ for all comparisons).

Discussion

This prospective observational study demonstrated that multimodal analgesia (MMA) is superior to conventional opioid-based regimens in postoperative pain management, resulting in reduced opioid consumption and fewer adverse effects among patients undergoing general surgery [10]. These findings are consistent with emerging evidence supporting the superiority of multimodal

approaches over opioid-centric strategies, as consistently reported in the literature over the past five years [11].Effective pain control is a critical determinant of patient satisfaction and functional recovery following surgery. In the present study, patients receiving MMA exhibited significantly lower pain scores both at rest and during movement. These findings align with recent studies reporting markedly reduced Visual Analog Scale (VAS) scores in patients managed with combination analgesic regimens compared to opioid monotherapy [12]. The enhanced efficacy of MMA can be attributed to its ability to target multiple pain pathways, including nociceptive, inflammatory, and central sensitization mechanisms, whereas opioids primarily act on central μ-opioid receptors [13].A significant reduction in opioid consumption was also observed in the MMA group, supporting previous evidence demonstrating the opioid-sparing effects of regional anesthesia, nonsteroidal anti-inflammatory drugs (NSAIDs), and adjunctive agents in postoperative pain protocols [14]. This reduction is clinically important given the well-established risks associated with opioid use, including respiratory depression, constipation, nausea, and potential dependency. The approximately 40% reduction in opioid use observed in this study is consistent with findings from systematic reviews indicating that MMA effectively reduces cumulative opioid doses without compromising analgesic efficacy [15].Furthermore, the incidence of opioid-related adverse effects, such as nausea, sedation, and constipation, was significantly lower in the MMA group [16]. These side effects are commonly associated with opioid therapy and can hinder recovery by limiting mobility and oral intake. Similar reductions in opioid-related complications have been reported in patients undergoing major abdominal surgery managed with multimodal regimens [17]. Additionally, improved gastrointestinal and central nervous system outcomes among MMA recipients contribute to enhanced patient comfort and accelerated recovery [18].The broader benefits of MMA were also reflected in improved functional recovery outcomes, including earlier ambulation and shorter hospital stays. Early mobilization reduces the risk of postoperative complications such as deep vein thrombosis, pulmonary atelectasis, and muscle deconditioning. These findings are consistent with previous studies demonstrating reduced time to ambulation and length of hospital stay across various surgical populations receiving multimodal analgesia [19]. Moreover, these results align with multicenter observational studies linking structured MMA protocols with improved outcomes in Enhanced Recovery After Surgery (ERAS) programs, including optimized patient flow and reduced healthcare utilization [20].Despite the strong evidence supporting MMA, its implementation must consider contextual factors such as the type of surgery, patient comorbidities, and institutional pain management protocols. Clinical expertise is essential in selecting appropriate adjunctive agents to balance efficacy and safety [21]. For instance, NSAIDs should be used cautiously in patients with renal impairment, while gabapentin may cause excessive sedation in elderly individuals, underscoring the importance of individualized analgesic planning [22].In conclusion, the findings of this study are consistent with current evidence from the past five years, confirming that multimodal analgesia significantly improves postoperative pain control, reduces opioid requirements, and minimizes

associated adverse effects. These benefits collectively support the routine implementation of MMA as a standard postoperative pain management strategy in general surgical patients.

Limitations

The study has a number of weaknesses, such as the single-center design, which could restrict the applicability of the results. Also, the outcomes might be influenced by the differences in the demographics of patients and surgeries. The follow-up time was also small, and the chronic complications of multimodal analgesia and opioids have not been considered in this study.

Conclusion

Multimodal analgesia is a better analgesic regimen in controlling postoperative pain, decreasing the use of opioids, and decreasing the adverse effects of opioids over conventional opioid-based programs. The method reduces the length of stay in the hospital and improves functional recovery, which is why it should be implemented as a preferred method in general surgery as a safer and more effective way of managing postoperative pain.

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Final Approval of version: **All Mention**

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