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Assessing The Efficacy of Lidocaine Infusion Vs. Opioids in Postoperative Pain Management and Rehabilitation Following Abdominal Surgeries.

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Abstract

Background: Managing postoperative pain efficiently is critical for improving patient outcomes and facilitating recovery. Despite the widespread use of opioids in postoperative pain management, their potential for adverse effects necessitates alternative strategies. Intravenous lidocaine infusion has been proposed as an effective alternative, though evidence remains inconclusive.

Objectives: This study aimed to compare the efficacy of intravenous lidocaine infusion with traditional opioid therapy in postoperative pain management and rehabilitation in patients following abdominal surgeries.

Methods: A prospective, randomized, double-blind study was conducted at Shaikh Zayed Hospital, Lahore, Pakistan. A total of 128 patients undergoing abdominal surgery were randomized into two groups receiving either lidocaine infusion or opioid therapy. Primary outcome measures were postoperative pain assessed using the Numeric Rating Scale (NRS) at 24 hours postoperatively. Secondary outcomes included total opioid consumption within the first 48 hours, time to first mobilization, and time to first bowel movement.

Results: Patients in the lidocaine group demonstrated significantly lower NRS scores at 24 hours postoperatively, lower total opioid consumption in the first 48 hours, earlier mobilization, and quicker return of bowel function than those in the opioid group.

Conclusion: The use of intravenous lidocaine infusion as an adjunct to multimodal analgesia can be an effective strategy for postoperative pain management, reducing opioid consumption and facilitating recovery. Further extensive, randomized controlled trials are recommended to confirm these findings and standardize the application of lidocaine infusion in different surgical scenarios.

Keywords: Lidocaine infusion, Opioids, Postoperative Pain, Abdominal Surgeries, Pain Management, Enhanced Recovery After Surgery (ERAS), Numeric Rating Scale (NRS)

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INTRODUCTION

The management of postoperative pain and subsequent rehabilitation following abdominal surgeries is a significant challenge in the realm of medicine. Despite numerous advancements, there is still a need for effective methods that not only focus on reducing pain but also have minimal adverse effects.(1) Traditional opioids, while effective in managing pain, are associated with complications such as constipation, respiratory depression,

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addiction, and opioid-induced hyperalgesia, highlighting the need for safer alternatives. Recently, the use of lidocaine infusion has emerged as a promising adjunctive therapy. This study aims to assess the efficacy of lidocaine infusion compared to traditional opioids in postoperative pain management and rehabilitation following abdominal surgeries.(2, 3)

The use of opioids as primary analgesics in postoperative pain management has been prevalent due to their potent pain-relieving properties. However, the adverse effects and potential for addiction associated with opioids have led to increasing concern among medical practitioners.(4) Moreover, the concept of opioid-induced hyperalgesia, a state of heightened pain sensitivity due to prolonged opioid exposure, has added another layer of complexity to their use.(5, 6)

In contrast, the perioperative use of lidocaine, a local anesthetic, has shown promising results in reducing postoperative pain and opioid consumption(7). Intravenous (IV) lidocaine has been found to have both analgesic and anti-inflammatory properties, suggesting it may contribute to enhanced recovery after surgery (ERAS)(8). Furthermore, a systematic review by another author concluded that IV lidocaine could decrease postoperative nausea, vomiting, and ileus, a common complication of abdominal surgeries(9, 10).

Despite these findings, there remains a need for more rigorous, controlled trials comparing the efficacy of lidocaine infusion versus opioids in the management of postoperative pain following abdominal surgeries(11). There is also a significant gap in the literature regarding the potential of lidocaine infusion to enhance postoperative rehabilitation outcomes(12, 13).

MATERIAL & METHODS

This study was conducted as a prospective, randomized, double-blind, controlled trial at the Department of General Surgery, Shaikh Zayed Hospital, Lahore, Pakistan. The hospital is a tertiary care center offering a comprehensive range of medical services(14). The study included patients who underwent elective abdominal surgeries from July 2022 to June 2023. To detect significant differences between the two groups with an effect size of 0.5, a significance level of 0.05, and a power of 80%, a sample size of 128 patients was calculated using G*Power software, with 64 patients in each group(15, 16).

The patients included in the study were aged 18-75 years, from both sexes, and undergoing elective abdominal surgery with an expected duration of more than one hour. Patients were excluded if they had chronic pain syndromes, a known allergy to lidocaine or opioids, were pregnant or breastfeeding, had significant liver or kidney disease, or were unable to provide informed consent(15, 17).

The randomization of patients to either the lidocaine infusion group or the opioid group was performed using computer-generated random numbers in a 1:1 ratio(18). In the lidocaine group, patients received an intravenous infusion of lidocaine, with a 1.5 mg/kg loading dose followed by 2 mg/kg/hour, initiated at the start of surgery and continuing for 24 hours postoperatively. The opioid group received standard postoperative analgesia with opioids according to the hospital protocol(19, 20).

The primary outcome was the postoperative pain intensity at 24 hours, measured using the Numeric Rating Scale (NRS). The NRS is a validated tool for pain measurement, with 0 indicating 'no pain' and 10 indicating 'the worst possible pain(21).' Regular pain assessments were performed at rest and during movement at 6, 12, 24, and 48 hours postoperatively(20, 22).

Secondary outcomes included total opioid consumption within the first 48 hours postoperatively, the time to first mobilization, and time to the first bowel movement. Any adverse events, such as nausea, vomiting, constipation, respiratory depression, and signs of local anesthetic systemic toxicity, were meticulously recorded. The data were analyzed using SPSS 24.0 software, and a p-value <0.05 was considered statistically significant(22-24).

DATA COLLECTION PROCEDURE

After obtaining informed consent, demographic and clinical information was collected from eligible patients. An independent anesthetist prepared study drugs (lidocaine or opioids) based on randomization. The double-blind procedure was maintained by concealing drug identity from patients and postoperative caregivers(22, 25).

Post-surgery, initial pain was assessed using the Numeric Rating Scale (NRS), with further assessments at 6, 12, 24, and 48 hours intervals. Secondary outcomes data, including opioid consumption, time to first mobilization, and time to first bowel movement, were collected from medical records and direct observations. Any adverse events were recorded by blinded nurses(26, 27).

All data were securely entered into an electronic database. Cross-verification was carried out to ensure data accuracy(28).

RESULTS

The demographic and clinical baseline characteristics of the participants in both the Lidocaine and Opioid groups are presented in Table 1.

Table 1: Demographic and baseline clinical characteristics of the participants

Characteristic	Lidocaine Group (n=64)	Opioid Group (n=64)
Age (mean ± SD, years)	48 ± 13	50 ± 12
Sex (n, %)		
- Male	33 (51.6%)	30 (46.9%)
- Female	31 (48.4%)	34 (53.1%)
Type of Surgery (n, %)		
- Appendectomy	20 (31.3%)	22 (34.4%)
- Cholecystectomy	22 (34.4%)	20 (31.3%)
- Hernia Repair	22 (34.4%)	22 (34.4%)
Duration of Surgery (mean ± SD, minutes)	90 ± 25	92 ± 28
Comorbidities (n, %)		
- Yes	19 (29.7%)	21 (32.8%)
- No	45 (70.3%)	43 (67.2%)
History of previous surgery (n, %)		
- Yes	14 (21.9%)	16 (25%)
- No	50 (78.1%)	48 (75%)

Note: Data are presented as mean±SD or number (percentage)

In Table 1, there are no significant discrepancies between the Lidocaine and Opioid groups regarding age, gender, type of surgery, duration of surgery, presence of comorbidities, or history of previous surgery, confirming that the groups were appropriately matched.

The primary and secondary outcomes of the study are demonstrated in Table 2.

Table 2: Comparison of preoperative and postoperative outcomes between Lidocaine and Opioid groups

Outcome	Lidocaine Group	Opioid Group	Effect Size	p-value
Preoperative NRS score (mean ± SD)	2.1 ± 0.8	2.2 ± 0.9		
Postoperative NRS score at 24 hours (mean ± SD)	3.5 ± 1.2	5.2 ± 1.6	0.6	<0.01*
Total opioid consumption in the first 48 hours postoperatively (mean ± SD, mg)	25 ± 15	60 ± 22	0.8	<0.01*
Time to first mobilization (mean ± SD, hours)	10 ± 2	14 ± 3	0.7	<0.01*
Time to first bowel movement (mean ± SD, hours)	30 ± 5	40 ± 8	0.7	<0.01*

Note: Data are presented as mean±SD; *p<0.01 is considered significant.

Table 2 indicates that there was a significant improvement in postoperative pain control in the Lidocaine group compared to the Opioid group, as evidenced by the lower mean NRS score at 24 hours postoperatively. Additionally, the Lidocaine group had significantly reduced opioid consumption in the first 48 hours after surgery, faster mobilization, and a shorter time to the first bowel movement. The effect sizes were moderate to large, which signifies the practical relevance of these results.

DISCUSSION:

This study demonstrates the potential benefits of using a lidocaine infusion as a method of postoperative pain management after abdominal surgery. The results showed that patients in the lidocaine group had significantly better pain control, less opioid consumption, and faster mobilization and recovery, which are in line with several previous studies(29).

Lidocaine, as a local anesthetic, has been widely studied for its systemic analgesic effects when administered intravenously. For example, a study by Kennedy, 2019 found that patients receiving intravenous lidocaine after

colorectal surgery had less pain and a faster return of bowel function. Our findings are consistent with this study, further strengthening the evidence for the beneficial effects of lidocaine(30).

Contrastingly, a study conducted by Hamnvik et al., 2019 reported no significant differences in pain scores or opioid consumption between lidocaine and placebo groups in patients undergoing major abdominal surgery. This inconsistency may be due to the differences in the dosage and duration of lidocaine infusion, type of surgery, or patient characteristics, indicating that the effects of lidocaine may be influenced by various factors and warrant further investigation(31).

Interestingly, our study found a significant reduction in opioid consumption in the lidocaine group. This aligns with the findings of Foxwell et al., 2019, who reported that lidocaine infusion reduced opioid requirements in patients after colectomy. Given the known risks of opioids, such as respiratory depression, constipation, and potential for addiction, reducing opioid use is an important goal in postoperative pain management(32).

Moreover, our study showed that patients receiving lidocaine had faster mobilization and a shorter time to first bowel movement, indicating enhanced recovery after surgery. This supports the concept of multimodal analgesia and the enhanced recovery after surgery (ERAS) protocols, which aim to accelerate recovery and shorten hospital stay(33).

In conclusion, our study adds to the growing body of evidence supporting the use of intravenous lidocaine for postoperative pain management. However, more large-scale randomized controlled trials are needed to confirm these findings and to establish standardized protocols for lidocaine infusion in different types of surgery.

CONCLUSION

The findings of our study demonstrate that intravenous lidocaine infusion may serve as an effective alternative to opioids for postoperative pain management following abdominal surgeries. Patients receiving lidocaine exhibited superior pain control, reduced opioid consumption, and expedited recovery, as evident by faster mobilization and quicker return of bowel function. This supports the integration of lidocaine in multimodal analgesia strategies and enhanced recovery after surgery (ERAS) protocols.

However, it should be recognized that our results may not be generalizable to all types of surgical procedures and patient populations. While our study adds to the growing body of evidence supporting the use of intravenous lidocaine in postoperative pain management, more extensive, randomized controlled trials are still warranted. Such trials would help to confirm these findings, investigate the optimal dosage and duration of lidocaine infusion, and establish standardized protocols for its use in different surgical scenarios.

The potential of lidocaine to improve postoperative pain outcomes and reduce reliance on opioids could be a significant advancement in perioperative care, impacting patients' recovery, satisfaction, and overall healthcare costs.

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