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Research Article

Impact of Intraoperative Lidocaine Infusion on Recovery Profiles and Pain Scores in ERAS Protocol Patients

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ABSTRACT

Background: Optimizing postoperative recovery in abdominal surgery remains a clinical challenge, as traditional pain management often relies heavily on opioids which can delay bowel function and prolong hospital stays.

Objective: The overall objective of the research was to establish the effects of intraoperative intravenous lidocaine infusion on postoperative outcome in patients undergoing abdominal surgeries and having an Enhanced Recovery after Surgery (ERAS) regime. The second outcome involved finding its effectiveness regarding postoperative pain scale and opioid usage. Design and Setting of the study: It were a prospective randomized controlled trial and was conducted in the Department of Anesthesia, CMH/SKBZ Muzaffarabad from December 2024 to July 2025 and included 120 patients who were on abdominal surgical operations to be done under the care of ERAS.

Methodology: Pairing was done randomly to patients in the Lidocaine group (n=60), that consisted of patients who received the intraoperative intravenous lidocaine infusion of 1.5 mg/kg/h and the Control group (n=60) which involved patients who underwent standard anesthesia, but not lidocaine infusion. Standardized ERAS protocols including early mobilization and multimodal analgesia were undertaken in all the patients. Pain assessment was conducted by administering the Visual Analogue Scale (VAS) at 1, 6, 12, 24 and 48 hours narrating the operation. The parameters of recovery included time to extubation, time to Aldrete score of 9 or above, the first bowel movement, early mobilization, and length of stay.

Results: Lidocaine group scored significantly lower at all times during the post operation ($p < 0.01$), lesser 24-hours opioid use (18.6 +- 5.2 vs 28.9 + -7.4 mg, $p < 0.001$), earlier bowel movements (21.4 +- 6.3 vs 28.6 +- 7.1 hours, $p < 0.001$), and earlier mobility (6.8 +- 2.1 vs 9.2 There were

Conclusions: Intraoperative lidocaine infusion to enhance postoperative recovery and also reduce pain among patients undergoing ERAS is the safe and effective addition to the existing practice that involves abdominal surgery.

Keywords: Enhanced Recovery After Surgery, Multimodal Analgesia, Lidocaine Infusion and Analgesia.

INTRODUCTION

The new technique of the contemporary perioperative practice is the Enhanced Recovery after Surgery (ERAS) guidelines, which provide the focus on evidence-based and multidisciplinary methods of reducing the amount of stress in the surgical procedure, accelerating the recovery process, and improving the outcome of the patient. ERAS routes have been initially introduced in colorectal surgery and are currently being successfully done in other surgical disciplines, including general, gynecological, urological and orthopedic surgeries. The protocols comprise preoperative optimization and minimum invasive surgery methodology, routine anesthetic techniques, early mobilization, and pain management in postoperative period so as

to minimize hospital stay and postoperative complications [1], [2]. Perioperative pain management has been one of such factors, and one of the cornerstones of ERAS, where the likelihood of delayed mobilization, gastrointestinal recovery degradation, and prolonged stay in the hospital can be triggered by the ineffectiveness of analgesia.

Multimodal analgesia is one of the guidelines of ERAS protocols, and it is supposed to offer an effective pain control and help decrease the opioid consumption and undesirable effects of opioid. Postoperative nausea and vomiting, ileus, respiratory depression, sedation, and delayed recovery are some of the adverse effects associated with over use of opioids that are opposite to the objectives of ERAS pathways [3], [4]. ERAS is as such non-opioid agent, regional/systemic adjuvant that is suggested to provide balanced analgesia. They have introduced such agents as non-steroidal anti-inflammatory drugs, acetaminophen, local anesthesia procedures and intravenous infusion to reduce opioid requirements and enhance recovery outcomes [5]. The most recent promising adjunct in multimodal analgesia is Lidocaine Intravenous lidocaine since it has an analgesic, anti-inflammatory, and antihyperalgesic effects. The prevention of the appearance of ectopic neuronal discharge, inhibition of nociceptive messages passing, is due to the blocking of the voltage-gated sodium channels which becomes the main mechanism of action of lidocaine. In addition to this, the systemic lidocaine also regulates central sensitization and inflammatory mediator release, hence reducing the amount of postoperative pain and tissue inflammation [6]. Also, besides analgesia, intravenous lidocaine has been suggested to stimulate gastrointestinal motility, reduce postoperative ileus and earlier bowel-function recovery- which is particularly relevant in the ERAS procedures [7].

A number of clinical trials and meta-analyses examining the use of intraoperative lidocaine infusion in an array of surgical situations exist. It has been mentioned that lidocaine infusion is associated with decreased postoperative pain scores, reduced opioid consumption, earlier ambulation, and reduced hospital visit with regards to abdominal and colorectal surgeries [8]. The literature review conducted by Sun et al. has proven that perioperative lidocaine use significantly reduced pain levels and opioid requirements and improved recovery outcomes by enormous margins. Similarly, Kranke et al. have established that infusion of lidocaine reduced length of stay of patient who had abdominal surgery and time to first bowel movement. These findings are in alignment with the objectives of ERAS, and supplement the efficacy of the introduction of lidocaine infusion in the perioperative analgesics' strategies.

Despite these encouraging results, the results of the research are not quite balanced due to the variation of dosing schedules, infusion duration, type of surgical procedures and outcome indicators. Moreover, there are various studies on application of lidocaine infusion as an extrinsic component of the traditional ERAS and difficult to differentiate its effect on the ERAS using an organized system. Little data can be counted on in low- and middle-income countries because changes in the patient characteristics, surgery, and medical facilities may influence patients. Besides, the ERAS-specific parameters of recovery, namely time to mobilization, functional recovery and patient-reported pain score are not always found within the literature that is available [9]. Such gaps show that more studies are required to evaluate the impact of intraoperative infusion of lidocaine and within particular ERAS guidelines. Clinically-relevant information can be provided to direct anesthetic practice by evaluation of its effect on the postoperative pain scales and recovery pathways in a standardized ERAS environment [10].

Objective

To evaluate Effects of intraoperative lidocaine infusion on postoperative recovery profiles, the level of pain in patients under an Enhanced Recovery after Surgery (ERAS) program.

METHODOLOGY

This prospective randomized control trial was conducted in the Department of Anesthesiology of the CMH/SKBZ Muzaffarabad from December 2024 to July 2025 after the ethical approval from Institutional Review Committee. T The authors contrasted the results of intraoperative lidocaine infusion on the rate of postoperative recoveries and the level of pain in the patients treated based on an Enhanced Recovery after Surgery (ERAS) program. The research was conducted within the framework of ethical guidelines given in the Declaration of Helsinki. All the participants were informed and signed informed consent forms after being told about

the nature of the research and its processes, potential benefits and risks of the research.

The sample size was calculated using the formula of comparing two independent means and postoperative pain scores were considered to be the primary outcome variable. This was set to be 95 percent confidence and 80 percent power, which was relying on the previous research that had been conducted to establish the analgesic effect of intravenous lidocaine infusion. Calculated sample size was 120 patients, 60 patients were taken into consideration per group. A non-probability consecutive sample of the study period helped in recruiting the eligible patients.

Inclusion

Both male and female adult patients, aged between 18 65 years are included also patients of a physical state of American Society of Anesthesiologists (ASA) I or II along with those subjected to elective general anesthesia. And those who are signing informed consent.

Exclusion Criteria

Patients with Lidocaine -Known allergy / hypersensitivity, History of chronic hepatolithy/renal failure, Presence of either cardiac abnormality of conduction or arrhythmia are excluded. A person with power or authority is a ruler and he can influence people. The continuous use of analgesic or opioid medication, and a pregnant and breastfeeding female with a body mass index > 35 kg/m2 and those who are under emergency operation are excluded. The re-invention of open surgery out of minimally invasive surgery and patients who are unwilling to participate in the research are also excluded.

Data Collection

After obtaining approval from the Institutional Review Board, 120 patients were enrolled from the outpatient department. Written informed consent was obtained from all participants. The patients were randomly divided into two groups in line with the computer-generated randomization order. Group L (lidocaine group), and Group C (control group) were put through intra-operative IV lidocaine infusion and conventional anesthesia respectively. The allocation hiding was in the form of sealed opaque envelopes which were broken during anesthesia induction. The postoperative outcome assessors did not recognize group assignment. Group L consisted of intravenous Lidocaine bolus dose of 1.5mg/kg which was administered right after the induction of anesthesia and 1.5mg/kg/hr was maintained continuously during intraoperative period until skin was sewn. The same volume of normal saline was administered to group C. All of them were put under standardized general anesthesia concerning the propofol induction, the inhalation agents as sustaining agents as well as the non-depolarizing neuromuscular blockers based on the need.

Statistical Analysis

Data were analyzed with the SPSS version 25. The quantitative variables were expressed in terms of mean and standard deviation but the qualitative variables were expressed in terms of frequencies and percentages. The independent samples t-tests were used to compare continuous variables and chi-square was used to compare categorical variables. The p-value was taken to be 0.05.

RESULTS

The study included 120 patients having an elective abdominal surgery and the ERAS was applied, and the mean age of the patients was 52.8 +- 10.3 years; i.e. there were middle-aged people (between 28 and 75). The sampling was 57.5 per cent (n = 69) male and 42.5 per cent (n = 51) female. The mean BMI was 26.9 4.1 kg/ m 2 and this made most of the respondents to be overweight. Of such patients, 62.5% (n=75) had a comorbidity (i.e., hypertension or dyslipidemia) in the past. These patients were randomly grouped into two groups (Lidocaine and Control group) in which the Lidocaine group (n = 60) was intraoperatively infused with Lidocaine at the rate of 1.5mg/kg/h and the Control group (n = 60) was given the normal anesthesia. The demographics, ASA classification, and preoperative pain scores of the two groups were close (p > 0.05).

Table 1. Baseline Demographic and Clinical Characteristics (n = 120)

Variable	Mean ± SD / n (%)	Minimum	Maximum
Age (years)	52.8 ± 10.3	28	75
Male gender	69 (57.5%)	1	1
Female gender	51 (42.5%)	1	1
BMI (kg/m²)	26.9 ± 4.1	19.8	36.5

Hypertension	40 (33.3%)	1	1
Dyslipidemia	35 (29.2%)	1	1
ASA I-II	88 (73.3%)	1	1
ASA III	32 (26.7%)	1	1
Preoperative VAS score	3.2 ± 1.1	1	6

The mean minutes of time spent on surgery were 145.6 (32.7) in Lidocaine and 147.3 (29.5) in Control (p = 0.72). Mean intraoperative opioid intake in the Lidocaine group (95.2 +- 21.5 mugetd fentanyl) versus the Control group (138.5 +- 28.7 mg/kg fentanyl, p < 0.001) showed a lower level in the former. The means of the intraoperative parameters of hemodynamic, including heart rate and mean arterial pressure, did not differ significantly (p > 0.05).

Table 2. Intraoperative Data (n = 120)

Variable	Lidocaine Group (n=60)	Control Group (n=60)	p-value
Surgery duration (min)	145.6 ± 32.7	147.3 ± 29.5	0.72
Intraoperative opioid (µg)	95.2 ± 21.5	138.5 ± 28.7	<0.001
Mean HR (bpm)	78.4 ± 11.2	79.6 ± 10.7	0.53
Mean MAP (mmHg)	82.3 ± 9.6	83.1 ± 10.1	0.61

There were much shorter recovery times in Lidocaine. The mean difference in ventilatory time in the control groups was 8.2 and 11.4 minutes (p = 0.001). The time that it took to achieve Aldrete score 9 or above in Lidocaine and 20.720.7 minutes in Control was 14.514.5 or 20.720.7 minutes (p < 0.001). Pain at different points of time following surgery was established using the VAS scale. This was confirmed (p < 0.001) at 1 hour between the Lidocaine (2.8 standard deviation 1.2) and the controls (4.3 standard deviation 1.5) in means of VAS. The 6 hours and 24 hours scores were 3.1141.4 and 2.911.1 and 3.815 respectively (p = 0.001 and 0.002 respectively).

Table 3. Postoperative VAS Scores (n = 120)

Timepoint (hours)	Lidocaine Group (n=60)	Control Group (n=60)	p-value
1	2.8 ± 1.2	4.3 ± 1.5	<0.001
6	3.1 ± 1.4	4.6 ± 1.6	<0.001
12	3.0 ± 1.2	4.2 ± 1.4	<0.001
24	2.9 ± 1.1	3.8 ± 1.5	0.002
48	2.2 ± 0.9	2.8 ± 1.1	0.018

Accordingly, the Lidocaine (18.6 + 5.2mg morphine equivalents) versus Control (28.9 + 7.4mg, p < 0.001) reported a considerable decrease in the total opioid consumption during the postoperative phase (more than 24 hours). The Lidocaine group and controls were compared on the time to first bowel movement (21.4 to 28.6 hours, p < 0.001). The Lidocaine group also had a significant reduction in mean hospital stay (3.65 +- 1.17 days) as compared to the Control group (4.75 +- 1.54 days, p < 0.001). Cases of nausea and vomiting were lower in the Lidocaine compared to Control (15.0% n= 9) p=0.032.

Table 4. Postoperative Recovery Metrics (n = 120)

Parameter	Lidocaine Group (n=60)	Control Group (n=60)	P-Value
Time to first bowel movement (hrs)	21.4 ± 6.3	28.6 ± 7.1	<0.001
Length of hospital stay (days)	3.6 ± 1.2	4.7 ± 1.5	<0.001
PONV incidence (%)	15.0% (9)	31.7% (19)	0.032
Early mobilization (hrs)	6.8 ± 2.1	9.2 ± 3.0	<0.001

DISCUSSION

The paper researches that intraoperative intravenous infusion of lidocaine is a useful intervention, which positively influences the outcome of the postoperative recovery and reduces the extent of pain experienced by people undergoing elective abdominal surgery as a program in ERAS. The findings are directly connected to the study objective aimed at finding out the impact of lidocaine on recovery and as a secondary objective finding the postoperative analgesic outcomes [11]. Patients that were exposed to lidocaine had lower VAS scores at all postoperative time points, less opioid use, earlier bowel restoration, earlier mobilization, and reduced hospital stay compared to the control group. Such outcomes suggest the opportunities of lidocaine to be used as an effective adjunct in multimodal analgesia in the ERAS pathways [12]. This reduction in the postoperative pain is explained by the fact that systemic lidocaine possesses the anti-inflammatory and analgesic effects as it was already known. The modulation of the central and peripheral pain pathways and the decrease of postoperative opioids are the effects of Lidocaine, which is anti-hyperalgesic and opioid-sparing. The 24-hour opioid intake of the lidocaine group in this study also differed significantly with that of controls, which implies that the reducing effect of opioid exposure in this study was clinically significant [13]. This effect works to improve patient comfort besides minimizing side effects of opioids such as nausea, vomiting and constipation of the bowel. Actually, the rate of postoperative nausea and vomiting was significantly lower in the lidocaine group, which again is an indicator of the clinical benefit of reduced opioid dependence. The other advantages of recovery were also better recovery outcomes including a faster bowel resumption and early mobilization in the lidocaine group [14]. The mean time to first bowel movement increased by over 7 hours and patients moved earlier in the postoperative period which was a testament that functional recovery was hastened. These findings are specific to the ERAS guidelines where the most important aspects of improved patient outcomes are early gastrointestinal recovery and mobilization. In addition, the impact of optimized analgesia, early mobilization, and the number of less complications is also cumulative in the shortened length of stay of the hospital in the lidocaine group [15].

This study had good intraoperative lidocaine safety in terms of infusion. The percentage of patients who only went through short-term hypotension without cardiac or neurological issues was relatively low, though. The previous evidence can support this claim, as intravenous lidocaine in the appropriate range of dosage can be safely utilized in patients with abdominal surgeries [16]. These results suggest that one could add lidocaine to the ERAS pathways without any side effects to the patients and it is a simple and cheap intervention to assist in recovery [17]. Overall, the results prove the significance of systemic lidocaine as a significant component of multimodal analgesia as a component of enhanced recovery programs. Lidocaine infusion can assist in patient and institutional outcomes by improving postoperative pain management, reducing the use of opioid, and increasing functional recovery [18]. The article demonstrates that lidocaine is not only effective but is also easy to administer in a daily perioperative practice based on the principles of the ERAS that implies to reduce the burden of the surgery, enhance analgesia, and provide early recovery [19]. In conclusion, intraoperative intravenous lidocaine infusion is a significantly superior intervention that can be adopted to improve the recovery profile and decrease postoperative pain in patients of ERAS protocols undergoing an abdominal surgery. The integration of the perioperative care is a feasible method of enhancing the patient outcome and reducing the incidence of opioid dependence and hospitalization that is a secure and effective method of managing the surgical recovery [20].

CONCLUSION

The study has established that intravenous lidocaine infusion in the intraoperative period has a strong recovery impact and pain relief in the post-abdominal surgery patients in an ERAS program. The patients undergoing Lidocaine surgery had reduced opioid requirements in the operating room, a reduced pain score in each of the postoperative stages, a decreased bowel-recovery duration, sooner discharge, and diminished hospital stay. Intervention has been well-tolerated, and there were no severe adverse events that were reported with mild cases of hypotension. The implication of these findings is that they would directly respond to the study objective and aim of determining the effects of lidocaine on recovery profiles and pain management. The clinical results are a

testament to the fact that the multimodal analgesia application, which is in the form of intraoperative lidocaine infusion, can serve to speed up the postoperative outcome and enhance the patient results in general. Therefore, the use of lidocaine infusion is an effective, convenient, and safe perioperative adjunct, which reinforced the fact that it is a useful supplement to the enhanced recovery used in the intervention of patients undergoing abdominal surgeries.

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