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Effect Of Intraoperative Lidocaine Infusion On Postoperative Pain

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Abstract:
Background*:*
Increased interest in the use of nonopioid analgesic adjuncts has been sparked by worries about opioid hazards in the postoperative period. Intravenous lidocaine, an amide local anaesthetic, has been investigated for its impact on postoperative pain and recovery, but when used inappropriately and wrongly, it can be lethal and has been. The risk-benefit ratio of intravenous lidocaine varies depending on the type of surgery and patient factors such as comorbidity. This drug has not been tested for its analgesic efficacy in our part of country so, we decided to conduct a study to evaluate its analgesic efficacy.
Materials and Methods*: In this prospective randomised controlled study, 60 patients of ASA physical status I and II belonging to age group of 16-60 years undergoing general anesthesia were randomly allocated into 2 groups of 30 patients each, Group A (preservative free lignocaine 2% (Xylocard2%) 1.5 mg per kg IV bolus) and Group B (Saline bolus). The duration of postoperative analgesia, side-effects and haemodynamic parameters were compared between the groups.*
Results*: The mean age in both the groups was 42.9 years, mean weight was 63.6 in Lidocaine group and 65.1 kg in control group. after 20 minutes of induction, the heart rate in Lidocaine group was significantly lower than the control group (p=<0.05). The mean SBP, DBP, MAP and VAS was lower in Lidocaine group immediately after extubation and from 30 minutes to 8 hours postoperatively as compared to control group (p <0.05). The mean sedation score in lidocaine group was 1.97 post intubation and 2.3 at 24 hours. In control group the mean sedation score was 1.8 and at 24 hours it was 2.*
Conclusion: *In our research iv lignocaine 1.5 mg/kg infusion plays an important role, lowers pain scores and reduces need for rescue analgesia. It has emerged as a pain reliever with no side effects that boosts recovery, early defecation, walking ability, shortened hospital stay.*
Key Word: *Lidocaine, Lignociane, Rescue analgesia, Anesthesia*

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I. Introduction

Pain is defined as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" by the International Association for the Study of Pain. Among the side effects of opioid analgesics are drowsiness, respiratory depression, constipation, nausea, vomiting, and urine retention. In the benzomorphan class of opioids, pentazocine is a synthetically produced prototypical mixed agonist-antagonist narcotic (opioid analgesic) medication used to treat mild to moderate pain. In order to treat postoperative pain, patients can employ opioids, NSAIDs, local anaesthetics, and transdermal, parenteral, neuraxial, and oral methods. Increased interest in the use of nonopioid analgesic adjuncts has been sparked by worries about opioid hazards in the postoperative period1. One medication that may be of interest is IV lidocaine, which can be given intraoperatively and/or postoperatively to lessen postoperative pain and enhance other results. Intravenous lidocaine, an amide local anaesthetic, has been investigated[2] for its impact on postoperative pain and recovery, but when used inappropriately and wrongly, it can be lethal and has been. The risk-benefit ratio of intravenous lidocaine varies depending on the type of surgery and patient factors such as comorbidity (including pre-existing chronic pain). Perioperative lidocaine infusion reduces postoperative ileus by an average of 8 days and reduces the incidence of postoperative nausea and vomiting (PONV) by 10–20%[3]. Intravenous lidocaine is an inexpensive, easily available local anaesthetic. This drug has not been tested for its analgesic efficacy in our part of country so, we decided to conduct a study to evaluate its analgesic efficacy. Lidocaine, also known as Xylocaine and lignocaine, was created in the first part of the 20th century and was given the US Food and Drug Administration's approval to be used on people in 1948[1,2]. Clinical use of intravenous lidocaine infusions for postoperative analgesia began in 1958[3]. Further investigations[4,5] validated the postoperative analgesic and anti hyperalgesic benefits of intravenous lidocaine.

II. Material And Methods

This prospective randomized interventional study was carried out on patients of Department of anaesthesiology, Katihar Medical College and hospital, Katihar, Bihar from March 2021 to March 2022. A total 60 adult subjects (both male and females) of aged ≥ 18, years were enrolled for in this study.

Study Design: Prospective randomized interventional study

Study Location: At Department of anaesthesiology, Katihar Medical College and hospital, Katihar, Bihar.

Study Duration: March 2021 to March 2022.

Sample size: 60 patients.

Subjects & selection method: 60 Patient were randomly allocated in two Group (Group-A and Group-B) using a computer-generated sequence. Sequence allocation concealment will be done using sealed opaque envelope technique.

Group A–received preservative free lignocaine 2% (Xylocard2%) 1.5 mg per kg IV bolus (made to a volume 0f 6ml with normal saline) administered over a period of 10 mins and thereafter an infusion at a rate of 1.5mg per kg per hour prediluted in normal saline made to a volume of 6ml per hour.
Group B- received 6ml normal saline as bolus over 10mins, followed by 6ml per hour infusion.

Inclusion criteria:
Patient posted for surgery

1. Age Group 18-60 years of Male and Female
2. ASA Grade I & II

Exclusion criteria:

1. Emergency surgeries
2. Patient allergic to any study drugs
3. The use of steroids or the presence of confirmed primary or secondary adrenal insufficiency.
4. Presence of low blood pressure.
5. Patient suffering from epilepsy, COPD, and other co-morbid disorders.

Procedure methodology

Pre-anaesthetic examination was done with particular attention to the pulse rate. Blood pressures (systolic, diastolic and mean) recordings.

Apart from general physical and systemic examination, routine investigations, blood urea, serum creatinine, serum electrolytes, ECG and X- Ray chest were performed in all patients.

Upon arrival in the operation theatre, IV-line access was secured and lactate Ringer's infusion was started.

Monitoring included non-invasive blood pressure monitoring, Electrocardiogram and pulse oximeter.

Heart rate (HR), SYSTOLIC BLOOD PRESSURE (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were recorded every minute for first three minutes, thereafter every 5 minutes till the completion of surgery.

For three minutes, preoxygenation were performed with 100% oxygen.

Depending on group assignment, either, Group A (preservative free lignocaine 2% (Xylocard2%) 1.5 mg per kg IV bolus) and Group B (Saline bolus) was used to induce anaesthesia. Eye lash reflex loss was thought to be the final stage.

Prior to surgery, patients were informed to rate their discomfort during injections using the VAS scale. Myoclonus was also graded as well as its existence.

Endotracheal intubation was facilitated with inj. Vecuronium (0.1mg/kg body weight) after three minutes interval by same anaesthesiologist. The rate of breathing was kept under control at 12 to 14 cycles per minute, and the tidal volume was maintained at 8 ml/kg every breath. To keep the patient asleep, a 70:30 mixture of nitrous oxide & oxygen with 1% isoflurane was used. Vecuronium was given as needed at regular intervals.

Neostigmine 0.05 mg/kg and Glycopyrrolate 0.01 mg/kg were administered intravenously to reverse the residual neuromuscular block. Tracheal extubation was to follow after the patient had achieved adequate spontaneous tidal volume breathing and spontaneous eye opening. Vomiting and nausea after surgery were monitored for 24 hours in the patient.

Statistical analysis

The statistical analysis was performed using SPSS version 20.

To evaluate the significance of a difference between continuous data, an unpaired t test was used.

The format for continuous data was Mean+-standard deviation. Number and percentage were used to present categorical data. The significance of the difference between groups of categorical data was used to determine the chi square or fisher exact test.

III. Result

All 60 patients with ASA physical status I/II involved in the study who satisfied all inclusion criteria were randomly separated into two groups in the Department of Anaesthesiology, Katihar Medical College & Hospital, Katihar , Bihar. All the patients completed the study without any exclusion. The collected data were analyzed. The following observations are as follows:

Table no 1

	Group	N	Mean	Std. Deviation	p-value
Age (Years)	Lidocaine	30	42.867	10.3615	.981
	Control	30	42.933	11.5935	
Weight (Kg)	Lidocaine	30	63.633	8.6043	.459
	Control	30	65.133	6.8769	
Duration of Surgery (minutes)	Lidocaine	30	67.333	4.4978	.597
	Control	30	68.000	5.1862	

Table 1: Comparison of baseline characteristics of study participants

The mean age, weight and duration of surgery of patients in both the groups was comparable. The mean age in both the groups was 42.9 years, mean weight was 63.6 in Lidocaine group and 65.1 kg in control group. The mean duration of surgery was 67 minutes and 68 minutes in Lidocaine and control group respectively. Both the groups had equal number of male and female study participants. ASA grade 1 was in 21 patients in both the groups and ASA grade 2 was found in 9 patients.

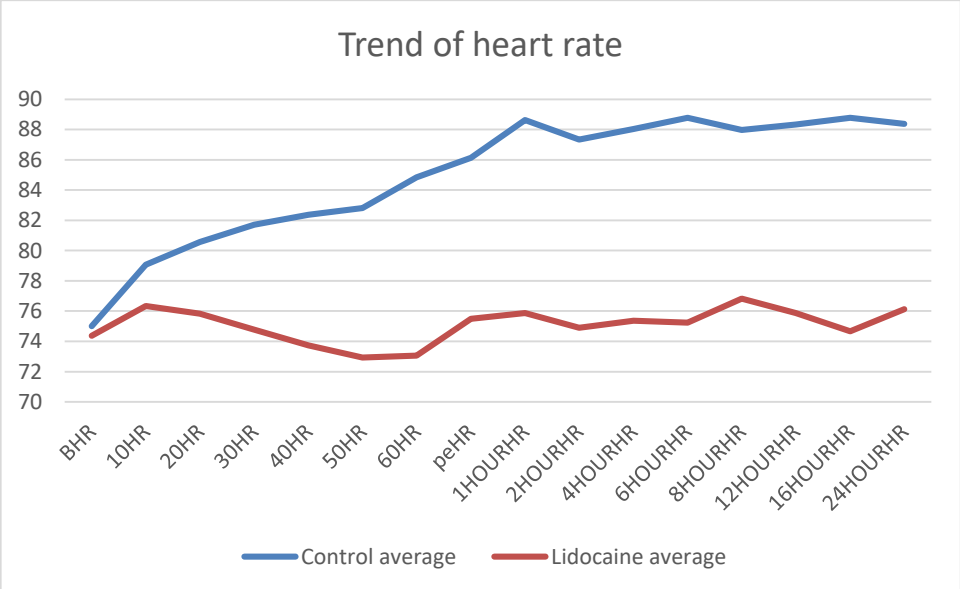

Figure 1: Line diagram showing trend of heart rate (mean) in both groups over 24 hours.

The heart rate in both the groups was within physiological range during the study. However, after 20 minutes of induction, the heart rate in Lidocaine group was significantly lower than the control group (p=<0.05 (Figure 1).

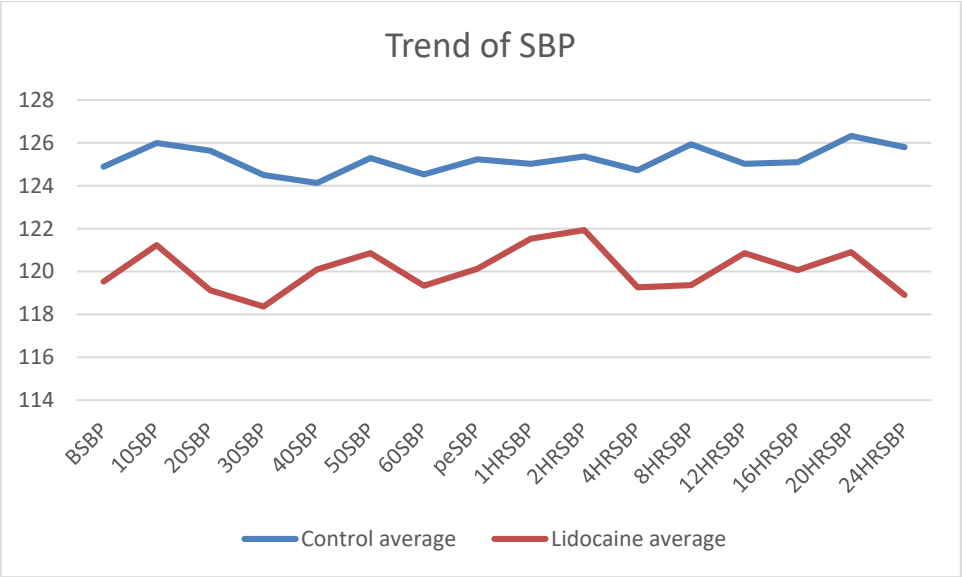

Figure 2: Line diagram showing trend of Systolic blood pressure (mean) in both groups over 2 hours.

The systolic blood pressure was lower in Lidocaine group as compared to control group during the study period (p-value <0.05). However, it was within physiological limits in both the groups always. (Figure 2).

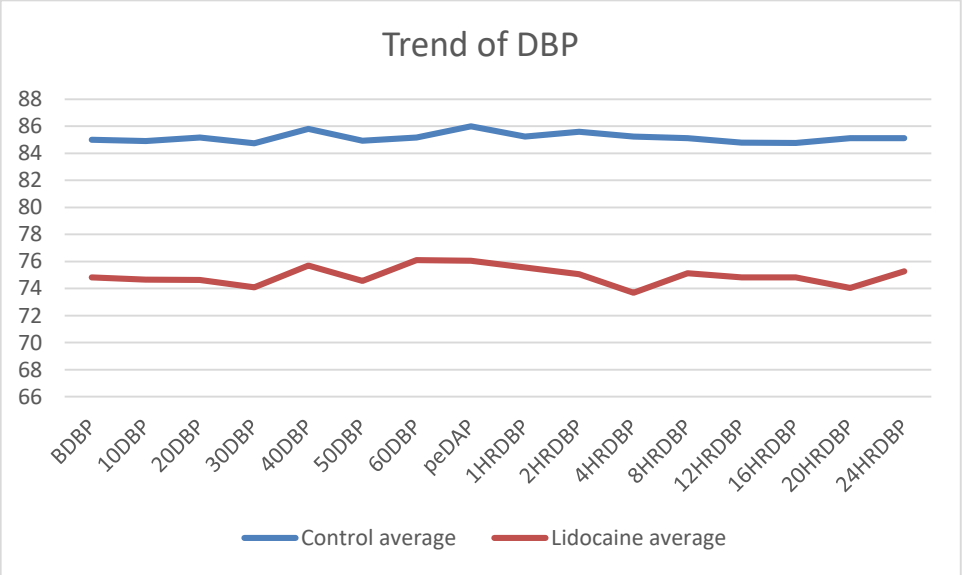

Figure 3: Line diagram showing trend of Diastolic blood pressure (mean) in both groups over 2 hours.

The diastolic blood pressure was within physiological limits throughout the study period. However, diastolic blood pressure in etomidate group was statistically lower than Propofol group at 15 minutes and 30 minute (Figure 3).

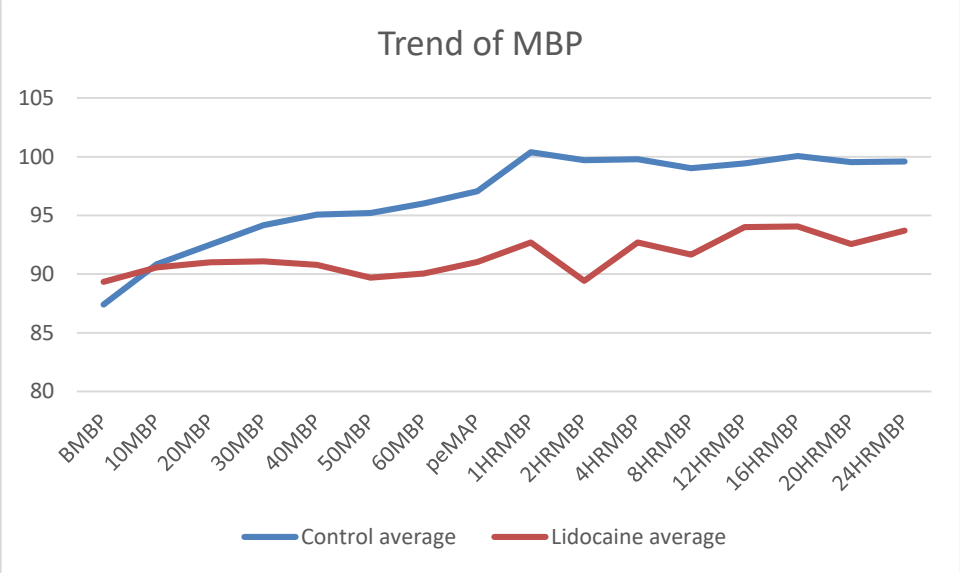

Figure 4: Line diagram showing trend of mean arterial blood pressure (mean) in both groups over 2 hours.

The diastolic blood pressure was lower in Lidocaine group as compared to control group during the study period (p-value <0.05). However, it was within physiological limits in both the groups always (Figure 4).

Table 3: Comparison of Visual Analogue Scale during surgery and postoperatively in both the groups

Visual Analogue Scale	Group	N	Mean	Std. Deviation	p-value
Post extubation	Lidocaine	30	.53	.776	.000
	Control	30	1.53	1.106	
15 min	Lidocaine	30	1.37	1.066	.560
	Control	30	1.53	1.137	
30 min	Lidocaine	30	.60	1.037	.001
	Control	30	1.77	1.431	
1 hr	Lidocaine	30	.533	.6814	.000
	Control	30	2.267	1.4840	
2 hr	Lidocaine	30	.833	.8743	.000
	Control	30	2.233	1.4308	
4 hr	Lidocaine	30	1.500	1.5256	.001
	Control	30	2.767	1.2229	
6 hr	Lidocaine	30	1.867	1.6132	.016
	Control	30	2.767	1.1651	
8 hr	Lidocaine	30	2.03	1.450	.021
	Control	30	2.83	1.147	
12 hr	Lidocaine	30	2.00	1.390	.695
	Control	30	2.13	1.224	
24 hr	Lidocaine	30	2.23	1.431	.843
	Control	30	2.17	1.147	

The mean VAS was lower in Lidocaine group immediately after extubation and from 30 minutes to 8 hours postoperatively as compared to control group (p <0.05).

Table 3: Comparison of Sedation score during surgery and postoperatively in both the groups

Sedation score	Group	N	Mean	Std. Deviation	p-value
Post extubation	Lidocaine	30	1.97	1.400	.647
	Control	30	1.80	1.402	
1 hr	Lidocaine	30	2.10	1.382	.365
	Control	30	1.77	1.447	
2 hr	Lidocaine	30	1.57	1.648	.552
	Control	30	1.80	1.357	
4 hr	Lidocaine	30	2.23	1.570	.356
	Control	30	1.87	1.478	
8 hr	Lidocaine	30	1.77	1.524	.212
	Control	30	2.23	1.331	

12 hr	Lidocaine	30	1.80	1.357	.224
	Control	30	2.23	1.375	
24 hr	Lidocaine	30	2.30	1.661	.452
	Control	30	2.00	1.393	

The mean sedation score in lidocaine group was 1.97 post intubation and 2.3 at 24 hours. In control group the mean sedation score was 1.8 and at 24 hours it was 2. There was no statistically significant difference in mean sedation scores of both the groups.

Table 4: Comparison of rescue analgesia required in both the groups

Opioid dose required	Group	N	Mean	Std. Deviation	p-value
Dose (mg)	Lidocaine	30	4.00	7.812	.000
	Control	30	16.50	14.393	

The dose of rescue analgesia was higher in control group as compared to lidocaine group.

Table 5: Comparison of times of rescue analgesia requirement in both the groups

Rescue Analgesia Requirement	None	Once	Twice	Thrice	p-value
Control Group	10	9	9	2	0.03
Lidocaine Group	18	10	2	0	

The number of times rescue analgesia was required was higher in control group as compared to lidocaine group.

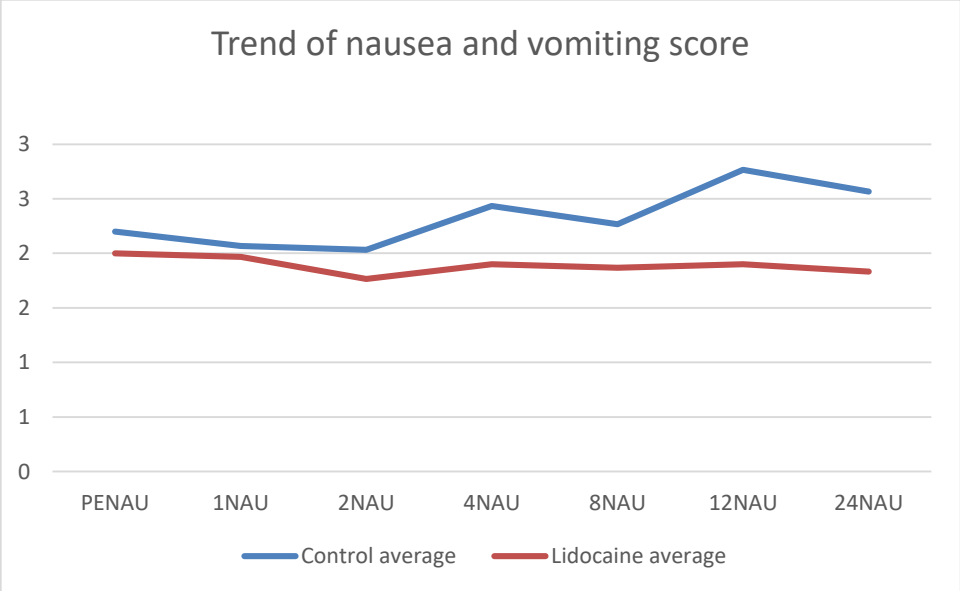

Figure 5: Bar diagram comparing Nausea and Vomiting score in both groups

The nausea and vomiting score was less among lidocaine group as compared to control group during post extubation period, and 2-8 hours postoperatively ($p<0.05$).

IV. Discussion

This study was a prospective, randomized, double blind, comparative, hospital-based interventional study done at Department of Anaesthesia, Katihar Medical College involving 60 participants divided into 2 groups on the basis of intervention provided. The first group of 30 patients received preservative free lignocaine 2% (Xylocard2%) and second group received saline. Vitals, pain, sedation, nausea, vomiting, etc, were assessed through structured questionnaire and valid marking schemes. The mean age, weight and duration of surgery of patients in both the groups was comparable. The mean age in both the groups was 42.9 years, mean weight was 63.6 in Lidocaine group and 65.1 kg in control group. The mean duration of surgery was 67 minutes and 68 minutes in Lidocaine and control group respectively. Both the groups had equal number of male and female study participants. ASA grade 1 was in 21 patients in both the groups and ASA grade 2 was found in 9 patients. The

mean systolic, diastolic and mean arterial pressure was lower in lidocaine group as compared to saline group. Similarly, the mean VAS score and nausea, vomiting scores were statistically lower in lidocaine group. The mean sedation score was however, statistically similar in both the study groups. Higher dosage of rescue analgesia was required in saline group as compared to lidocaine group and higher times of dose administration was also done. The vitals were within physiological range throughout the study in both the study groups. Previous studies results have been compared with our results and age, weight have been found to have matched. The vitals like heart rate, SBP, DBP and MBP have been found to be decreased in lidocaine group as compared to saline. Moreover, return of bowel function is seen earlier in lidocaine group. The VAS score at post extubation and end of 24 hours is found to be significantly less in lidocaine group with respect to saline group.

The age group varied from 27.6 (Rehman et al[6]) to 58 years in study by Tauzin Fin P et al[7], most of the study have taken age around 40 years including ours. Grady P et al[8] had shorter surgery durations (less than an hour), our study had mean duration of surgery of an hour, Dennis PB et al[9] and Tauzin Fin P et al[7] had surgery duration of more than 2 hours.

Many investigations have observed that lignocaine can moderate hemodynamic alterations, with identical outcomes following intubation and following extubation[10,11]. Contrarily, a small number of additional investigations have similarly shown no evidence of lignocaine's considerable attenuating effect on the hemodynamic parameters[12]. These occurrences can be related to lignocaine's effects on arteriolar vasodilation, autonomic response downregulation, cough suppressant activity, deepening of general anaesthesia, and cough suppression[15].The heart rate, SBP, DBP, MBP was lower in lidocaine group as compared to control group in our study which was concurrent with findings of other studies as well[13,14,9].

Different rescue analgesia have been used in different studies. In our study, pentazocine was used. Investigation into and interest in perioperative IV local anaesthetic infusion have persisted since 1951, when Keats et al[16] first identified a beneficial analgesic impact on postoperative pain. When IV lidocaine infusions are added to general anaesthetics, perioperative discomfort is reduced, according to a 2010 systematic analysis of numerous research[17].

Individual patient stress, bowel preparations, surgical penetration into the peritoneum, and physical bowel manipulation can all change bowel function after surgery. Via a variety of ways, intravenous lidocaine lessens postoperative intestinal problems. In populations undergoing open abdominal, urologic, and orthopaedic surgery, perioperative lidocaine infusion has been studied. Laparoscopic procedures, however, have not received much attention from studies.

V. Limitations of our study

To better comprehend the function of lignocaine, a larger sample size and the inclusion of major gastrointestinal procedures would be advantageous. The distribution of the hospital stay is likely to be skewed and influenced by regional elements, including culture and practice. It is not possible to apply the findings of this study to other contexts, such as orthopaedic surgery or big open abdominal procedures. The need for an inhalational agent or overall cost reductions during surgery were not investigated. Although blood serum levels at comparable doses were noted in the literature study, they were not explored. Our study only lasted 24 hours; however, the effect may continue to be felt over longer periods of time.

VI. Conclusion

In our research iv lignocaine 1.5 mg/kg infusion plays an important role, lowers pain scores and reduces need for rescue. It has merged as a pain reliever with no side effects that boosts recovery early defecation, walking ability, shortened hospital stay. Perioperative benefits of iv lignocaine as prophylactic analgesia especially good choice for multimodal analgesia when there are restrictions on the use of local anesthesia (contraindications, refusal or failure) or opioids.

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