

Effect of Intravenous Lignocaine Infusion on Post-Operative Analgesia in Laparoscopic Procedures

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ABSTRACT

Objective: To see the effect of intravenous lignocaine infusion on post-operative analgesia in patients who had laparoscopic procedures.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Anesthesia, Combined Military Hospital, Bahawalpur Pakistan, from Jan to Sep 2022.

Methodology: One hundred and forty adult patients of 20-50 years with ASA class 1-2 who were planned for elective laparoscopic cholecystectomy were included, with 70 being allotted to each group. Group-A patients were given IV lignocaine while Group-B patients were given IV normal saline. Patients were observed for postoperative pain at 30 and 60 minutes after surgery by visual analogue score (VAS).

Results: Out of 140 patients, there were 41(29.28%) males and 99(70.7%) females. Heart rate rose to 100.07+9.60 bpm in Group-A from a basal rate of 73.57+3.83 bpm vs 112.41+9.22 bpm from a basal rate of 72.37+3.92 bpm in Group-B. VAS score at 300 and 60 minutes postoperatively was significantly higher in Group-B compared to Group-A ($p=0.001$ and 0.001 respectively).

Conclusion: We conclude that IV lignocaine infusion reduces postoperative pain leading to early recovery of patients. It also attenuates the hemodynamic response of body during intubation and extubation by stabilizing heart rate and mean arterial pressure.

Keywords: Lignocaine, Laparoscopic Surgery, Postoperative Pain.

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INTRODUCTION

Postoperative pain is due to nociceptors, which are activated by tissue damage during surgery, resulting in emotional and hemodynamic response in patients. Proper pain management postoperatively reduces hospital stay and costs, decreases morbidity and results in better surgical outcome.¹ As reported in literature, more than 50% patients undergoing any type of surgery may experience moderate to severe pain postoperatively.² Laparoscopic procedures have got many advantages over traditional open surgical procedures like less postoperative pain, shorter hospital stay and early recovery.^{3,4}

Effective postoperative analgesia is the key factor which determines patient's recovery and rehabilitation.⁵ Effective perioperative pain management and early regaining of gastrointestinal functions postoperatively are important for enhanced recovery after surgery (ERAS) and for patient's wellbeing after

abdominal surgeries. Epidural analgesia with local anesthetic drugs is used to reduce pain after abdominal surgeries leading to early mobilization and better gastrointestinal function.⁶ However, its risk to benefit ratio is questionable in laparoscopic abdominal procedures as it requires expert hands and regular postoperative monitoring.⁷ Opioids, which are usually employed in pain management, have got adverse effects like respiratory depression, GI symptoms like nausea, vomiting, and ileus, urinary retention and immune changes.⁸ Lignocaine, a local anesthetic, can be employed as it has got analgesic, antihyperalgesic and anti-inflammatory properties which attenuate the inflammatory response of body generated after surgery. Different studies support the use of intravenous lignocaine during laparoscopic surgery which effectively reduces the postoperative pain in patients, and better gastrointestinal functions outcome and decreases hemodynamic response to surgery.^{9,10}

In this study, we evaluated the use of IV lignocaine infusion in patients who had any laparoscopic cholecystectomy in reducing postoperative pain

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and the effectiveness of IV lignocaine in attenuating hemodynamic response to surgery.

METHODOLOGY

This quasi-experimental study was conducted in Department of Anesthesia, Combined Military Hospital, Bahawalpur Pakistan, from Jan to Sep 2022. The study was conducted after getting approval of Hospital Ethical Committee (EC-15-2022).

Inclusion Criteria: Adult patient of either gender, aged between 20-50 years, with ASA class I and II who were planned to undergo elective laparoscopic cholecystectomy were included.

Exclusion Criteria: Patients with known comorbidities, COPD, history of renal or respiratory problems, emergency surgeries, those undergoing surgery due to any sort of malignancy, and those whose procedures were converted to open or if the surgery time exceeds 3 hours of duration were excluded.

Sample size was calculated using WHO calculator taking confidence interval 95%, margin of error 5%, mean post-operative pain using visual analogue score (VAS) at 30 mins of intubation being 1.32 in saline group and 0.38 in IV lignocaine group.¹¹ The estimated sample size came out to be 140 patients.

Non-probability consecutive sampling technique was used to include the patients, and informed consent was obtained. Initially, 150 patients were included, after which 3 patients were removed as there was suspicion of malignancy in their investigations preoperatively. Seven patients were removed from study because their operative time exceeded 3 hours. We finally included 140 patients. Seventy were allocated to each of two groups, Group-A (IV lignocaine) and Group-B (IV normal saline) by lottery method. (Figure).

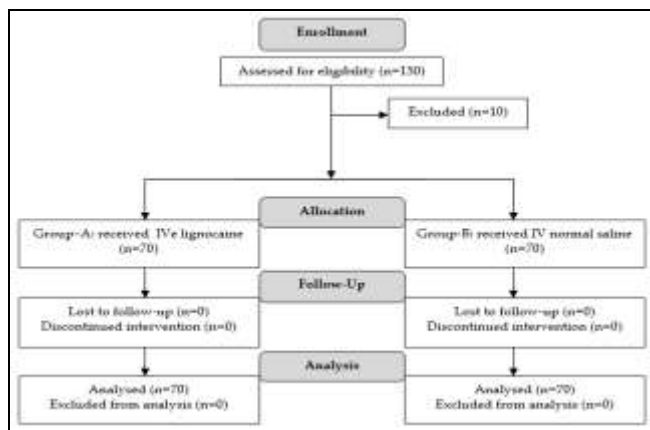


Figure-1: Patient Flow Diagram (n=140)

All patients were operated upon by a consultant surgeon, and were given general anesthesia by a consultant anesthesiologist. They were briefed about visual analogue score (VAS) and report any sedation, pruritis, lightheadedness, nausea and vomiting postoperatively. Group-A patients were given IV infusion of lignocaine diluted in normal saline to 1% was started at a rate of 1.5mg/kg/hour after 10 minutes of induction and was continued till 60 minutes postoperatively, while in Group-B an IV infusion of 0.9% normal saline peri-operatively till 60 minutes postoperatively. Total duration of infusion was limited to 180 mins to avoid lignocaine toxicity. All patients were given paracetamol injection postoperatively for analgesia if a pain score >4 was reported. If patients still complained of pain, injection ketorolac was given. Intra operatively patients were observed for any changes in heart rate (HR), mean arterial pressure (MAP) and blood pressure (BP). Post graduate trainees were asked to observe and record pain by using VAS on a preformed proforma after 30 mins in and at end of 1st hour postoperatively.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 26, by computing frequency and percentages for categorical variables while mean and standard deviation were calculated for numerical data. Chi square test and Fischer exact test was applied to calculate the *p*-value for qualitative variables. Independent samples t test and Mann-Whitney U test was applied for numerical data. The significance level was set at *p*≤0.05.

RESULTS

Out of 140 individuals, there were 41(29.28%) males and 99(70.7%) females. Mean age of patients in lignocaine group (Group-A) was 41.50±7.23 years and mean age in normal saline group (Group-B) was 42.91±6.40 years. Mean operative time in Group-A was 104.85±31.74 mins while in Group-B mean operative time was 103.71±32.68 mins. Seventy-five (53.5%) patients included were of ASA-I and 65(46.5%) patients belong to ASA-II. All demographics of patients are mentioned in Table-I.

Heart rate of the patients was observed at 1 min and 5 min after intubation and extubation. It was seen that heart rate rose to 100.07±9.60 bpm in Group-A from a basal rate of 73.57±3.83 bpm, while in Group-B, it rose to 112.41±9.22 bpm from a basal rate of 72.37±3.92 bpm after 1 min of intubation, which was statistically significant (*p*=0.001). Similarly, heart rate showed more variation in Group-B as compared to

Group-A at 5 minutes after intubation and extubation. The comparison of heart rate in both groups at different times after intubation and extubation with their *p*-values is mentioned in Table-II.

Table-I: Demographics Characteristics of Patients (n=140)

Variable	(Group-A) n=70	(Group-B) n=70
Age (years) Mean±SD	41.50±7.23	42.91±6.40
Gender	Males	19(27.1%)
	Females	51(72.9%)
ASA	I	42(60.0%)
	II	33(47.1%)
Mean operative time (minutes) Mean±SD	104.85±31.74	103.71±32.68

Table-II: Comparison of Heart Rate in across Groups (n=140)

Variable	Group-A n=70 Mean±SD	Group-B n=70 Mean±SD	<i>p</i> -value	
Heart rate	Baseline HR	73.57±3.83	72.37±3.92	0.07
	1 min after intubation	100.07±9.64	112.41±9.22	0.01
	5 min after intubation	84.14±7.36	95.07±7.44	0.02
	1 min after extubation	99.98±9.08	108.60±8.35	0.009
	5 min after extubation	84.12±7.81	91.64±8.46	0.009

Similarly, mean arterial pressure (MAP) of patients was observed at 1 minute and 5 minutes after intubation and extubation. It was seen that MAP rose to 110.64±7.21 mmHg in Group-A from a basal rate of 84.01±4.83 mmHg, while in Group-B, MAP rose to 120.71±10.22 mmHg from a basal rate of 85.04±4.69 mmHg after 1 min of intubation, which was statistically significant (*p*<0.001). MAP showed more variation in Group-B compared to Group-A at 5 minutes after intubation and extubation. The comparison of MAP in both groups at different times after intubation and extubation with their *p*-values is mentioned in Table-III.

Table-III: Comparison of Mean Arterial Pressure across Groups (n=140)

Variable	Group-A n=70 Mean±SD	Group-B n=70 Mean±SD	<i>p</i> -value	
Mean Arterial pressure (MAP)	Baseline MAP	84.01±4.83	85.04±4.69	0.2
	1 min after intubation	110.64±7.21	120.71±10.22	0.01
	5 min after intubation	89.81±7.37	96.14±8.63	0.02
	1 min after extubation	110.82±7.40	118.28±11.73	0.00
	5 min after extubation	87.92±6.45	95.50±9.38	0.00

Visual Analogue Scale (VAS) score was checked at 30 and 60 minutes after surgery. It was seen that mean VAS score at 30 minutes postoperatively was higher in Group-B compared to lignocaine Group-A, i.e. 1.72±0.65 vs 1.20±0.40 (*p*<0.001). Similarly, at 60

minutes, Group-B patients experienced more pain as compare to Group-A, i.e. 3.55±1.25 vs 1.87±0.67, which was statistically significant (*p*<0.001). Comparison of visual analogue pain score in both groups is mentioned in Table-IV.

Table-IV: Comparison of Visual Analogue Pain Score across Groups (n=140)

Variable	Group-A n=70 Median (IQR)	Group-B n=70 Median (IQR)	<i>p</i> -value	
Visual analogue Score	30 mins after surgery	1 (0.00)	2 (1.00)	0.001
	60 mins after surgery	2 (1.00)	3 (1.00)	0.001

DISCUSSION

In the past few decades, although much advancement in field of medicine has occurred but acute postoperative pain is still poorly understood. Recent studies have shown that postoperative pain managed with opioids can progress to chronic pain through complex mechanisms by altering the sensitization of the pain receptors.¹² Lignocaine is an amide local anesthetic drug which acts by blocking voltage-gated sodium channels in neurons consequently blocking synaptic transmission.¹³ A study by Liu *et al.*, reported that IV lignocaine is effective in reducing herpes zoster pain and improves general mood of patients.¹⁴ A study by Dunn *et al.*, reported that IV lignocaine has got superior efficacy over opioids in improving postoperative pain in patients who were undergoing different type of surgeries.¹⁵

In our study HR and MAP has significant rise from basal level in normal saline group compared to lignocaine group which shows that lignocaine attenuates the hemodynamic response of body at the time of intubation and extubation. A study by TK *et al.*, showed that MAP and HR has significant rise in patients in which normal saline infusion was given as compare to patients of lignocaine group.¹¹ Similarly, two different studies also reported similar results that HR and MAP were more consistent in patients of IV lignocaine infusion as compare to control group.^{16,17} Wang *et al.*, showed in their study that in patients of lignocaine infusion HR and MAP was lower and more stable as compare to patients of normal saline group which is consistent to our results.¹⁸

In our study, mean pain VAS score at 30 min postoperatively was higher in saline group compared to lignocaine group, Similarly, at 60 minutes saline group patients experienced more pain as compared to

lignocaine group. TK *et al.*, showed that mean VAS score at 30 in lignocaine group was 0.38±0.49 while in normal saline group it was 1.32±0.54 which is comparable to our results. Similarly, VAS score at 60 min in lignocaine group was 1.17±0.66 while in normal saline group it was 4.38±0.55 which is comparable to our results.¹¹

Tauzin-Fin P *et al.*, stated in their study a VAS score of 1.5±0.9 vs. 4.3±1.2 in lignocaine group as compared to placebo group on first post-operative day which is consistent to our results.¹⁹ Similarly, two different studies also reported similar results as ours and stated that patients of lignocaine group experience less pain as compared to control group, and showed less requirement of postoperative analgesia as compare to control group.^{1,18} Dai *et al.*, reported in their randomized control trial that IV lignocaine enhances patient's recovery, postoperative comfort, and decreases hospital stay in line with ERAS concepts.²⁰ Another study showed that lignocaine reduces postoperative pain and induces early return of GI functions, allowing the discharge of patients at least 1 day earlier.¹⁹

LIMITATIONS OF STUDY

The limitation of this study is that patients were not followed after 1 hour postoperatively and no adverse effects of administered drug were seen with other factors like hospital stay, return to work and pain free period were seen which may be added in the upcoming studies.

CONCLUSION

We conclude that Intravenous lignocaine infusion reduces postoperative pain and the requirement of analgesia postoperatively, leading to early recovery of patients. It also attenuates the hemodynamic response of body during intubation and extubation by stabilizing heart rate and mean arterial pressure.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MZA & NF: Data acquisition, data analysis, critical review, approval of the final version to be published.

SHMW & NTB: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

KAK & NA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Intravenous Lignocaine Infusion

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