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Effect of Perioperative Intravenous Infusion of Lignocaine on Haemodynamic Responses to Intubation, Extubation and Post-Operative Analgesia

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ABSTRACT

Background: Intravenous bolus dose of lignocaine is generally used to reduce haemodynamic changes associated with intubation and extubation. Whereas lignocaine intravenous infusion has been used for post- operative analgesia.
Aims and Objectives: To evaluate the effect of peri-operative intravenous infusion of lignocaine on hemodynamic responses to intubation, extubation and post-operative analgesia. **Materials and Methods:**80 patients undergoing elective laparoscopic cholecystectomy were included in our study and they were randomly divided into two groups, Group A and B of 40 each. Group A patients received 6 ml normal saline as bolus over 10 minutes followed by 6 ml/hour infusion, whereas in Group B, patients received preservative free 2% lignocaine 1.5 mg/kg IV bolus (made to a volume of 6 ml with normal saline) administered over a period of 10 minutes and thereafter an infusion at a rate of 1.5 mg/kg/hour (pre- diluted in normal saline made to a volume of 6 ml/hour. $P < 0.05$ was considered as significant. **Results:** Group B patients showed significantly longer mean pain- free post- operative period and also a less rise in pulse rate and mean arterial pressure compared to the Group A ($P < 0.05$) during intubation and extubation. **Conclusion:** Lignocaine infusion can successfully avert the change of haemodynamics resulting from intubation and extubation.

Keywords: Analgesia, Extubation, Haemodynamics, Intubation, Lignocaine.

Introduction

Tracheal intubation and succeeding extubation causes haemodynamic changes like rise in pulse rate, arterial blood pressure, arrhythmia, and rise of intracranial and intraocular pressure[1].To control these changes many drugs have been prescribed like lignocaine, esmolol, alfentanil and fentany[1-3].In tracheal intubation and extubation, bolus administration of lignocaine is extremely effectual, which has been used to minimise haemodynamic changes. Anaesthetists usually use intravenous infusion of lignocaine in perioperative period to control postoperative pain. Even though laparoscopic cholecystectomy is a minimally invasive surgery, a lot of patients still experience moderate to severe pain after operation. In such patients, lignocaine can help to decrease pain[4-6].

We carried out our study to examine whether the intravenous injection of lignocaine in perioperative period followed by the intravenous infusion of lignocaine during operation may lessen haemodynamic changes at tracheal intubation and extubation and also whether this relieves postoperative pain after elective laparoscopic cholecystectomy.

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Materials and Methods

We carried our study in 80 patients undergoing elective laparoscopic cholecystectomy from December 2015 to November 2016, after obtaining institutional ethical committee approval. Consent was obtained from all the

patients. Initially 96 patients were enrolled in the study. 16 patients were excluded as they did not meet the inclusion criteria. 80 patients were divided randomly into two groups of 40 each.

We followed the methodology used by **Jain** et al (**2015**).

Group A patients (n=40): Received 6 ml normal saline as bolus over 10 minutes, followed by 6 ml/hour infusion and

Group B patients (n=40): Received preservative free 2% lignocaine 1.5 mg/kg IV bolus (made to a volume of 6 ml with normal saline) administered over a period of 10 minutes and thereafter an infusion at a rate of 1.5 mg/kg/hour (pre- diluted in normal saline made to a volume of 6 ml/hour.

Inclusion Criteria

1. Patients undergoing elective laparoscopic cholecystectomy,
2. Patients without any history of malignancies,
3. Patients not allergic to the study drugs.

Exclusion Criteria

1. Patients with cardio- respiratory problems
2. Patients with renal, hepatic or endocrine disease,
3. Whenever the surgical procedure necessitated the conversion of laparoscopic to open cholecystectomy,
4. Whenever the surgical time exceeded 180 minutes.

All the subjects were informed about Numeric pain Rating Scale (NRS), with 0 as 'no pain' and 10 as 'worst imaginable pain'. The patients were asked to inform about any post- operative symptoms like light headedness, metallic taste, sedation, nausea and vomiting.

A team consisted of a surgeon and anaesthetist carried out surgeries. Keeping in mind about the potential lignocaine toxicity, the maximum time of infusion was kept to 180 minutes. All the patients were pre- medicated with injection midazolam 0.025 mg/kg IV, injection ketorolac 0.5 mg/kg intramuscular (IM) (maximum of 30 mg) and injection ondansetron 0.1 mg/kg IV. Patients were induced with 2 mg/kg of IV propofol and relaxed with 0.1 mg/kg of vecuronium bromide and trachea intubated. Anaesthesia was maintained with a mixture of 40% oxygen and 60 % nitrous oxide and an infusion of propofol in step down manner. The propofol infusion and nitrous oxide were stopped at the conclusion of the surgery. After reversal of residual neuromuscular blockade with a mixture of neostigmine and glycopyrrolate, patient's trachea was extubated.

Then the patients were shifted to the recovery room. The numeric pain scale was recorded every 15 minutes in the initial first hour and then every 2 hour or whenever patient complained of pain.

Haemodynamic changes were assessed using Pulse Rate (PR) and Mean Arterial Pressure (MAP) while post- operative analgesia was assessed by recording pain- free period. Any other complications were recorded. PR, systolic and diastolic BP were notedimmediately prior to starting lignocaine infusion, prior to induction of anaesthesia, post- induction, after tracheal intubation, and subsequently at 3, 5, 10 minutes after intubation. Likewise, they were also recorded immediately prior to the administration of reversal agent, post- extubation, and subsequently at 3, 5, 10 minutes after tracheal extubation. Pain- free period (NRS <4) was taken as period from the conclusion of surgery to the first requirement of injection ketorolac. The records of patients were reviewed at the end of 24 hour to note the total amount of ketorolac and pentazocine injections administered.

The data was analysed by SPSS for windows (version 17) statistical package (SPSS Inc., Chicago, IL). The data were expressed as mean ± standard deviation (SD).

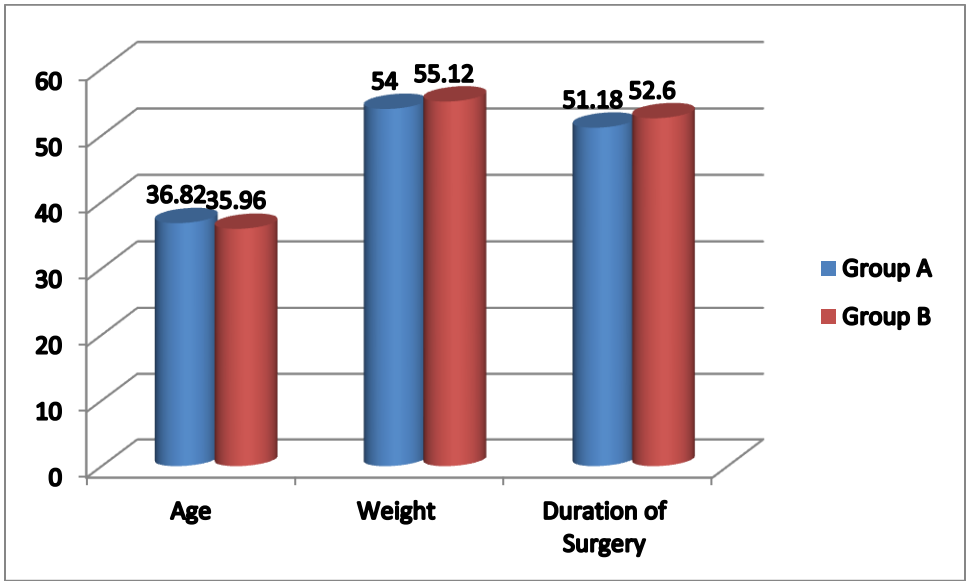
Results

Mean age, weight, and duration of surgery in Group A (34.53 years, 51.77 kg, and 53.37 min, respectively) were comparable to Group B (34.97 years, 53.90 kg, and 54.80 min, respectively) [Table 1 and Graph 1].

Table 1: Demographics of patients in both groups

Variables	Group A	Group B	P value
Age (years)	36.82±9.51	35.96±10.92	0.7082
Weight (Kg)	54.00±10.11	55.12±9.01	0.6024
Duration of Surgery (Minutes)	51.18±8.27	52.60±9.32	0.4732

Graph 1: Demographics of patients in both groups



Haemodynamic parameters increased significantly in both the groups, but was significantly less in group B than Group A. In the same way, during extubation, both PR and MAP increased significantly in both the groups when compared to the immediate pre- reversal values within the same group. However, the increase in values of both the parameters in Group B was significantly less compared to those in Group A [Tables 2 and 3].

Table 2: Changes in Pulse rate of both groups

Time of Observation	Group A (Minutes)	Group B (Minutes)	P value
Before infusion of drug	89.91±14.67	83.40±13.39	<0.0001*
Before induction	89.19±11.09	83.93±12.89	0.054
Post-induction	88.12±9.30	81.68±11.34	0.0069*
Post-intubation immediate	112.48±12.31	101.24±11.58	<0.0001*
Post-intubation 3 minutes	92.64±12.35	84.27±12.31	<0.0001*
Post-intubation 5 minutes	91.89±21.85	81.98±11.37	<0.0001*
Post-intubation 10 minutes	84.25±13.68	78.91±10.93	0.0574
Prior to reversal	89.68±11.56	82.86±13.68	<0.0001*
Post-extubation immediate	114.64±15.98	105.92±11.25	0.0061
Post- extubation 3 minutes	98.64±13.57	94.96±11.96	0.2020
Post-extubation 5 minutes	93.12±13.83	91.45±10.89	0.5502
Post-extubation 10 minutes	86.89±13.68	82.56±11.86	0.1344

* - Statistically Significant

Table 3: Changes in MAP of both groups

Time of Observation	Group A (Minutes)	Group B (Minutes)	P value
Before infusion of drug	96.81±7.69	93.24±6.81	<0.0001*
Before induction	95.68±6.85	92.43±6.13	<0.0001*
Post-induction	78.26±8.01	81.91±8.23	<0.0001*
Post-intubation immediate	121.42±10.25	109.61±4.52	<0.0001*
Post-intubation 3 minutes	104.95±7.94	95.47±6.28	<0.0001*
Post-intubation 5 minutes	102.78±6.89	93.84±6.62	<0.0001*

Post-intubation 10 minutes	95.87±7.79	94.29±5.74	0.3049
Prior to reversal	104.68±6.14	94.99±5.98	<0.0001*
Post-extubation immediate	121.42±10.34	109.93±6.03	<0.0001*
Post- extubation 3 minutes	108.12±6.87	98.96±5.18	<0.0001*
Post-extubation 5 minutes	102.23±8.17	98.13±6.32	0.0141
Post-extubation 10 minutes	98.87±6.23	97.01±7.93	0.247

* - Statistically Significant

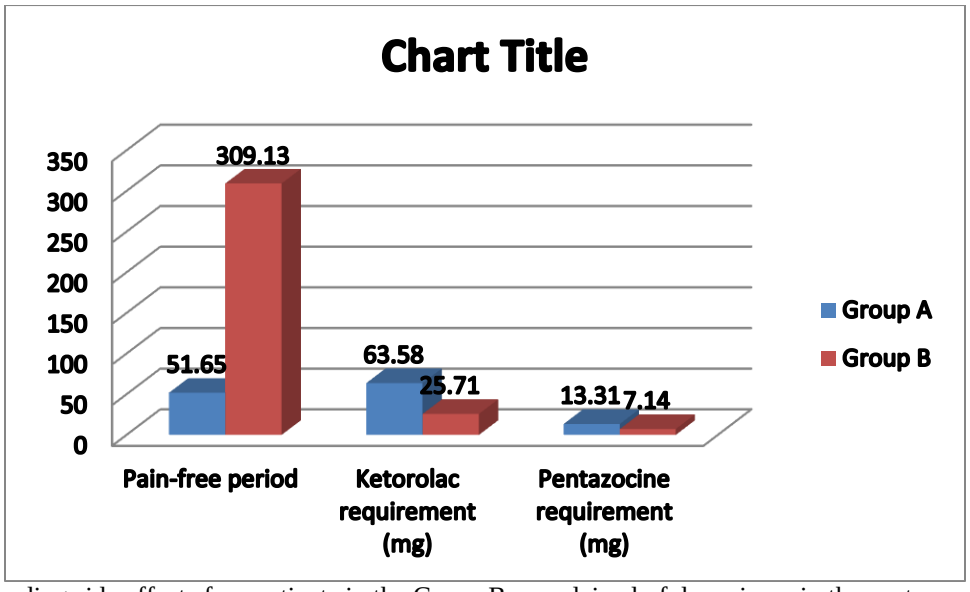
The mean pain- free period was less than an hour in Group A, while it was approximately 5 hours in Group B. In the post- operative period, the need of injection ketorolac was 63.58 mg in Group A and 25.71 mg in Group B in 24 hour. Whereas the need of pentazocine, as a rescue analgesic, was 13.31 mg in Group A and 7.14 mg in Group B [Table 4 and Graph 2].

Table 4: Comparison of analgesic requirement of both the groups in 24 hours

Parameter	Group A	Group B	P value
Pain-free period (NRS <4) (minutes)	51.65±98.65	309.13±356.28	<0.0001*
Ketorolac requirement (mg)	63.58±16.97	25.71 ±15.86	<0.0001*
Pentazocine requirement (mg)	13.31±9.12	7.14 ±6.96	<0.0001*

NRS – Numeric pain rating scale

Graph 2: Comparison of analgesic requirement of both the groups in 24 hour



Regarding side effects four patients in the Group B complained of drowsiness in the post- operative period lasting between 12 and 15 minutes.

Discussion

Studies have shown that lignocaine effectively controls haemodynamic changes during tracheal intubation and extubation and also provides post- operative analgesia. Hence, we carried out this study to ascertain the beneficial effects of lignocaine by evaluating the effect of peri-operative intravenous infusion of lignocaine on hemodynamic responses to intubation, extubation and post-operative analgesia[2-4].

We included only those patients who underwent laparoscopic cholecystectomy, to prevent any disparity

in intensity of haemodynamic changes and post- operative pain. We included only female patients to avoid any gender based bias[1,3].

For all the patients, lignocaine dosage was fixed and the total duration was restricted to 180 minutes to avoid lignocaine toxicity. The dosage given by us was similar to studies by Koppert et al and Groudine et al[7,8].

We found significantly less rise in PR and MAP in Group B patients when compared to patients in Group A. Our findings are in accordance with Reiz et al and Wilson et al[9,10]. Whereas Kindler et al[11]reported significant effect of lignocaine on PR alone and Wilson et al on MAP alone[10]. According to them, the attenuating effect of lignocaine might be due to its action of arteriolar vasodilatation and increasing the depth of general anaesthesia. On the other hand Feng et al [12] and Lin et al[13]did not find any significant attenuating effect of lignocaine on hemodynamic parameters.

We also found that during tracheal extubation there was significantly less rise in PR and MAP in the Group B patients than Group A. Our findings are similar to Nishina et al and Bidwai et al[14,15].According to them, the attenuating effect of lignocaine might be due to its cough suppressant activity, which could increase BP and PR at the time of extubation due to tracheal irritation. Nishina et al[14] and Mikawa et al[16] found similar effects on hemodynamic changes with diltiazem and combination of lignocaine with verapamil respectively.

We found pain- free interval and analgesic requirement in the first 24 hour post- operatively was significantly less in the Group B than Group A. Our findings are similar to Wu et al and Koppert et al[7]. Whereas Kaba et al[17]and Groudine et al[8] didn't find any significant analgesic effect of lignocaine infusion. Studies have shown that lignocaine According to McCarthy et al IV lignocaine infusion in the peri- operative period is safe and results in lower pain scores, reduced post- operative analgesic requirement and decreased intraoperative anaesthetic requirement[19] According to them the effects of lignocaine might be due to suppression of neuronal excitability in dorsal horn neurons, depression of spike activity, amplitude, and conduction time in both myelinated A and unmyelinated C fibres and also due to decrease in neural response to post- operative pain by blockade or inhibition of nerve conduction.

We analyzed the analgesic action of IV lignocaine only upto 24 hour post- operatively and found it to be significant. Whereas Wu et al [18] and Groudine et al[8]analyzed the analgesic action of IV lignocaine from 2 to 48 hours post- operatively. Koppert et al [7] analyzed analgesic effect only on 2nd and 3rd postoperative day. This variation in time may be due factors like the type of surgery and the amount of tissue trauma involved.

We found 4 patients complained of excessive drowsiness in the post- operative period, as was reported by Koppert et al[7] and Lee et al[4].We suggest further such studies with a larger sample and including more parameters like time of hospital stay, early ambulation, and total cost effectiveness for the patient and also on other surgical procedures.

Conclusion

We carried our study in patients undergoing laparoscopic cholecystectomy by adminstering lignocaine 1.5 mg/kg bolus followed by 1.5 mg/kg/hour infusion and found a less rise in PR and MAP during the peri- intubation and peri- extubation period. We also found an increase in duration of pain- free period and reduction of the requirement of analgesic in the post- operative period.

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