



THE EFFECT OF INTRAVENOUS LIGNOCAINE ON THE SEVOFLURANE REQUIREMENTS AS MONITORED BY THE BISPECTRAL INDEX

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ABSTRACT **INTRODUCTION:** Systemic administration of lidocaine significantly decreased propofol requirements when compared to patients receiving placebo. Several studies conducted have proved that systemic local anesthetics reduced minimum alveolar concentration (MAC) of inhalational anesthetics. AIM - This is to know the effect of intravenous administration of lidocaine on the minimum alveolar concentration of sevoflurane required to keep BIS between 40 and 60 during maintenance of anesthesia in humans. **METHODOLOGY-** Sixty ASA I-II adults planned to undergo laparoscopic procedures expected to last <2 h under general anesthesia were randomly assigned to 2 groups. After standardized induction of general anesthesia, patients were given IV lidocaine bolus (1.5 mg kg⁻¹) followed by 2 mg kg⁻¹ h⁻¹ infusion (group L, n=30) or equal volumes of saline (group S, n= 30). Primary outcome of the study was sevoflurane dial percent at bispectral index (BIS) values of 40–60. And calculated sevoflurane used. Secondary outcomes included doses of opioids, BIS values, intra operative hemodynamics. **RESULTS-**The mean sevoflurane concentration in group L was 1.19 with a P value of <0.001. and for the mean duration of 85, the sevoflurane required is 19.9ml compared to the group s with mean of 26.11ml with a significant p value. The sevoflurane requirement is reduced by 24%. The secondary outcome of fentanyl requirement in the intraoperative period was also significantly reduced. The lignocaine infusion proved to be the more hemodynamic stability and there was less stress response to intubation in lignocaine group.

KEYWORDS : sevoflurane, bispectral index, intravenous lignocaine

1. INTRODUCTION

Systemic lidocaine infusion has been used in several studies to evaluate its benefits on the outcome of anesthesia. Having inflammation-modulatory properties, it significantly reduced pain and allowed more rapid discharge.[1] Similarly, studies have shown reduction in MAC value of inhalational agents by the intravenous lignocaine. Reduction in MAC value reduces their requirement. The effect of i.v. lidocaine on MAC was suggested to be due to its action at the spinal level by decreasing the motor response and its inhibitory effect on central nervous system. BIS monitors consist of a soft sensor which has EEG electrodes producing a dimensionless number on the scale from 0-100 using its integrated custom software. This is used by the anaesthesiologist to decide about the level of GA using the BIS value as reference, based on it the anesthetic requirements are titrated. This study aims at evaluating the effect of intravenous lidocaine on sevoflurane requirements and monitoring the anesthetic depth by BISPECTRAL INDEX.

2. MATERIALS AND METHODS

After obtaining institutional ethical committee approval and informed written consent from the patients participating in the study was obtained. 60 ASA 1 and 2 patients of age 25 to 60 years undergoing elective laparoscopic surgeries expected to last for less than two hours were selected. These patients were randomly allocated into two groups GROUP L, and S. Pts baseline pulse rate, blood pressure and spo2 were noted preoperatively outside the operation theatre. No pre op anxiolytics were given to any patients. All standard monitors were used. Pre induction BIS was noted. Separate infusion pumps for either lignocaine or saline was prepared by separate staff blinded to the observing anesthesiologist was kept ready. After pre anesthetic checklist- (dragger work station with dragger vapourisers) and with all emergency drugs prepared. Patients were pre medicated with inj glycopyrrolate 0.2mg i.m 15-30mins prior.

All patients were preoxygenated with 100% oxygen and induced with inj fentanyl 2mcg/kg and inj thiopentone 5mg/kg or till BIS drops to 40 and intubation facilitated with inj suxamethonium 1.5mg-2mg/kg. and ET tube of size 8-8.5mm for men and 7-7.5mm for women were used. Following intubation anesthesia was maintained with N2O:O2 2:1 sevoflurane 2% and then titrated according to the BIS value to be kept between 40-60. In group L pt received a bolus of 1.5mg/kg of lignocaine followed by Infusion of lignocaine at a rate of 2mg/kg/hr started and in S group saline bolus and infusion started. Pt was put on ventilator volume controlled mode with tidal volume 7-10ml/kg, RR-12-16 according to ETCO2, PEEP- 3-5cmH2O.

PARAMETERS monitored- Pulse rate, BP, spo2, BIS, ETCO2 Sevoflurane dial percentage is noted every 5 mins initially later every 15 mins.

Additional doses of fentanyl given whenever the PR Or BP is 20% above the baseline with BIS between 40-60 and ETCO2 Is between 30-35.

DION'S FORMULA is used to calculate the sevoflurane used.

- amount of liquid sevoflurane used = $PFTM/2412d$
- Where the variables represent
- P - Vaporizer dial concentration in percent
- F - Total fresh gas flow in liters/minute- 5l/min
- T - Time for which the concentration P was set in minutes
- M - Molecular mass of sevoflurane in grams - 200.055 mg
- d Density of liquid sevoflurane in grams/milliliter
- The fixed variables used were
- d (density of sevoflurane at 21°C) = 1.52 g/ml
- Substituting the fixed variables the equation can be re-written as:
- Amount of liquid sevoflurane used = $0.2728 PT (T \text{ in mins})$

INCLUSION CRITERIA

- ASA I & II pts
- Age 18-60
- Both sex
- EXCLUSION CRITERIA
- age <18, >60,
- patients with BMI less than 20 or more than 35.
- Patients with history of reaction to lidocaine,
- patients with history of seizures or using sedatives, hypnotics or any other drugs that affect BIS.

STATISTICAL ANALYSIS The information collected regarding all the selected cases were recorded in a master chart. Data analysis was done with the help of computer using **Epidemiological Information Package (EPI 2010)** developed by Centre for Disease Control, Atlanta. Using this software range, frequencies, percentages, means, standard deviations, chi square 't' value and 'p' values were calculated. 't' test was used to test the significance of difference between quantitative variables and Yate's and Fisher's chi square tests for qualitative variables. A 'p' value less than 0.05 is taken to denote significant relationship

3. RESULTS

TABLE 1: COMPARISON OF PARAMETERS BETWEEN BOTH GROUPS

PARAMETER	GROUP L	GROUP S	P VALUE
AGE	39.03	36.63	0.465 {not significant}
WEIGHT	58.17	54.97	0.087 {not significant}
HEART RATE	87.33	94.84	0.07 {not significant}
SYSTOLIC BP	131.06	133.38	0.068 {not significant}
DIASTOLIC BP	80.6	81.8	0.263 {not significant}
DIAL CONCENTRATION	1.19	1.48	<0.001 {significant}
SEVOFLURANE USED	19.9	26.11	<0.001 { significant}
INTRA OP FENTANYL USED	110.67	124	<0.001 {significant}

The two groups group 'L' and 'S' were comparable in the demographics like age, sex, mean weight, duration of surgery, type of procedure showing no statistical difference. The study infusion was blinded to the investigator and the heart rate blood pressure and saturation were also comparable showing that lignocaine infusion did not produce any hemodynamic stability. The dial concentration in lignocaine group needed to keep the BIS between 40-60 was significantly low leading on to the lower consumption of sevoflurane. To standardize the consumption the flow rate was kept constant in both groups and BIS was maintained between 40 -60. The total sevoflurane as calculated by the DION'S formula was on an average 19.9ml in group L and it was 26.11 ml in group S showing drastic change in sevoflurane consumed. This reduction is about 24% reduction in the sevoflurane consumption. This shows significant cost effectiveness also. The total fentanyl used intraoperative was also less in lignocaine group and producing significant difference.

4. DISCUSSION

Systemic lidocaine infusion has been used in several studies to know its benefits on the outcome of anesthesia. Having inflammatory-modulating property, it significantly reduces pain and allows rapid discharge. In a metaanalysis of 8 randomized, controlled, clinical trials, patients who underwent abdominal surgeries while receiving continuous perioperative intravenous lignocaine, showed less duration of postoperative ileus, less pain, nausea, and vomiting and shorthospital stay.[2] McKay et al. proved that patients who received perioperative lignocaine infusion, required less opioid and less post operative pain there by reducing the post operative ICU stay.[3] Systemic lidocaine has proved to reduce MAC in animals. Wilson et al. observed in a study that lidocaine with or without ketamine significantly reduced the MAC of sevoflurane in dogs. It is also found that intravenous lidocaine decreased MAC of sevoflurane in anesthetized dogs without affecting blood pressure or heart rate.[4] In our study the MAC reducing effect of sevoflurane and the hemodynamic stability of it and fentanyl requirements are monitored. Using DION'S formula with the monitored parameters like flow rate, dial concentration and time, we have calculated the sevoflurane used totally for each case. The MAC reducing effect of lignocaine is its action on cerebral metabolic rate and reduction of CMRO₂ – cerebral oxygen demand. This reduces the anesthetic requirements. The effect of i.v. lidocaine on MAC was suggested to be due to its action at the spinal level by decreasing the motor response. The reduction in sevoflurane consumption is about 24% less with lignocaine group. This lignocaine infusion reduces the sevoflurane requirements there by reducing the total cost. 200 ml of sevoflurane costs Rs. 2500. Using a cheaper drug with minimal side effects and better hemodynamic stability reduces the total cost of the anesthetic drugs.

LIMITATION Our institution does not have a dragger primus with an built inhalational agent analyser which gives accurate consumption of sevoflurane at the end of each case. Thus DIONS formula has been used which claims very strong correlation [0.895 {p>0.001}]

5. CONCLUSION

Intravenous lignocaine in the form of bolus followed by infusion reduces the sevoflurane requirements by 24% to maintain the BIS level between 40-60 which is required to prevent intra op awareness and recall significantly maintaining the hemodynamic stability and also reduces the intra op analgesic requirements in patients undergoing laparoscopic surgeries.

6. REFERENCES

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