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EFFICACY OF INTRAVENOUS LIGNOCAINE VERSUS TOPICAL LIGNOCAINE IN ATTENUATION OF HAEMODYNAMIC SURGE DURING LARYNGOSCOPY AND INTUBATION IN PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA - A SINGLE BLIND RANDOMIZED CONTROL STUDY

Anesthesiology

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ABSTRACT

The present study was undertaken to evaluate the efficacy of intravenous lignocaine versus topical lignocaine for attenuating haemodynamic response during laryngoscopy and intubation in patients undergoing surgery under general anaesthesia. This single blind randomized control study was done on sixty patients of either sex aged between 18 to 55 years, of American Society of Anesthesiologists (ASA) status class I undergoing elective surgery under general anesthesia with endotracheal intubation. Patients were randomly allocated into two groups (group A and group B). Group A and Group B received intravenous preservative free lignocaine hydrochloride 2% 2 mg/kg and topical (nebulized) lignocaine hydrochloride 4% at 2mg/kg. Heart rate, systolic, diastolic and mean blood pressure was documented before administering premedication (T0), at time of intubation (TI) and 1 min (T-1), 2 min (T-2) & 5 min (T- 5) after intubation. Attenuation in the HR , SBP, DBP, MBP were found statistically significant ($P<0.05$) in group B in comparison to the group A. So, to conclude, topical lignocaine 4% blunts haemodynamic response to laryngoscopy and intubation better than intravenous lignocaine 2% when other confounding factors are eliminated.

KEYWORDS

haemodynamic stress response, intubation surge, laryngoscopy, lignocaine

INTRODUCTION

Laryngoscopy and endotracheal intubation, the mainstay of general anaesthesia, has harmful effect on haemodynamics with rise of heart rate (HR), blood pressure, intra cranial pressure (ICP), intra ocular pressure (IOP) which starts within 5 sec, reaches a peak in 1–2 min, and returns to baseline within 5 min after intubation. [1, 2] Even laryngoscopy alone has similar effect which may prove fatal in elderly, patients with IHD, hypertension, pheochromocytoma, fixed output disease, congenital cyanotic heart disease, with other intracranial and intra cardiac pathology.[3,4]

Hence, effective attenuation of intubation surge is of utmost importance in modern anaesthesiology and wide range of drugs and their routes have been tried for this, ranging from lignocaine, opioids, α agonist, beta blocker, calcium channel blocker, nitroglycerin, gabapentin, pregabalin, magnesium sulphate to ivabradine [5, 6,7,8,9,10,11,12,13,14,15,16].

This study was carried out to evaluate the efficacy of intravenous lignocaine versus topical lignocaine to attenuate such haemodynamic response.

MATERIALS AND METHODS

After obtaining Institutional Ethics Committee approval, total seventy two (72) patients, aged 18 to 55 years, ASA I, Mallampati score- I or II, body weight 40-70 kg, scheduled to undergo elective surgery under general anaesthesia were assessed for this study. Any patient with ASA≥II, i.e, with diabetes mellitus, hypertension, other cardiovascular, hepatic and renal diseases, respiratory infections, respiratory diseases including hypersensitive airway along with anticipated difficult airway, obesity, Mallampati score-III and IV, history of allergy to local anesthetics was excluded.

After applying inclusion and exclusion criteria, sixty patients were considered for study. Informed consent was obtained from them for participating in the study. Two groups were created with 30 patients each by randomization with sealed envelope. Group A - received i.v preservative free 2% lignocaine 2mg/kg and group B - received nebulized 4% lignocaine 2mg/kg.

At pre-operative check-up, routine informed risk consent was obtained. Fasting for 6 hours before surgery was instructed. All patients received tab alprazolam 0.5mg on the night before surgery and inj. Ranitidine 50 mg, inj. glycopyrrolate (4mcg/kg body weight) and inj. ondansetron (0.15 mg/kg body weight), in the waiting area, 30 min before induction. Baseline HR, SBP, DBP and MBP was documented before administering premedication. After entering the operation theatre, all essential monitors were attached, and patients in group A received oxygen via face mask while group B patients received nebulization with 4% lignocaine 2 mg/ kg with oxygen 12 lit/min, by the nebulization mask for 10 min. After 10 min, preoxygenation started in both groups. Then patients in group A received 2% lignocaine i.v 2mg/kg 3 min prior to intubation whereas group B patients were already nebulized. Laryngoscopy and intubation was done by a single expert anaesthesiologist, and time for it was maintained within 15 sec. Patient required more than one attempt for intubation was planned to be excluded.

After pre-oxygenation with 100% oxygen for 5 minutes, induction and intubation was facilitated by propofol (2 mg/kg) and succinylcholine (1.5 mg/kg). Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure(DBP), and mean blood pressure (MBP) were recorded and compared at the following time points - before administering premedication as baseline (T0), at the time of intubation (TI), and 1min (T-1), 2 min (T-2) & 5 min (T – 5) after intubation. Anaesthesia was maintained with 60 per cent nitrous oxide in oxygen along with isoflurane immediately after intubation. Inj. Fentanyl (2µg/kg) was administered 5 min after intubation.

STATISTICAL ANALYSIS:

Data was entered in MS Excel and analyzed by SPSS Version 16.0 or later, IBM, Chicago USA.

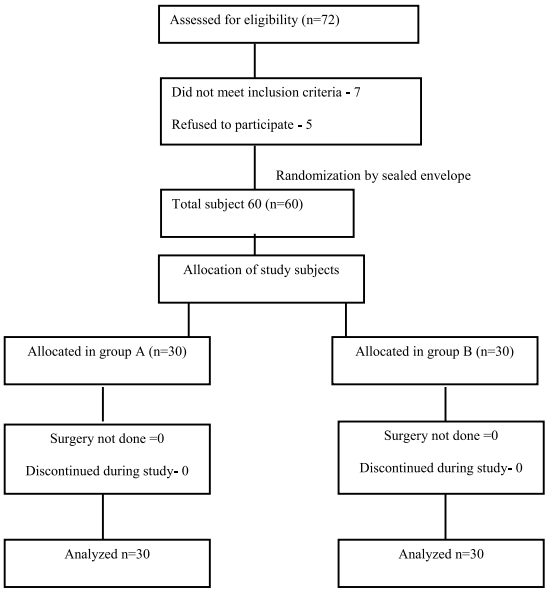
Unpaired independent t-test has been used for testing hypothesis about difference of arithmetic means between the 2 groups. Chi-square and Mann-Whitney U tests were used for comparing distribution of sex and mallampati classification among the participants of two groups respectively.

All data were expressed as mean ± SD.

RESULTS

Figure 1 shows study algorithm. Total 72 patients were screened initially. After fulfilling the inclusion criteria and excluded by exclusion criteria, total sixty patients were studied and none of them was discontinued during study.

Figure 1: Study Algorithm



Patients in both group A and group B had comparable demographic characteristics when age, sex, height, weight, Mallampati classification and duration of laryngoscopyy and intubation were compared (Table 1).

Table 1: Comparison of demographic characteristics of group A and group B

Demographic variables	Group A	Group B	P value
Age (years)	37.43±6.06	38.76± 4.02	0.321
Sex (M/F)	12/18	17/13	0.301
Height (cm)	158.47±7.8	159.13±6.7	0.724
Weight (kg)	65.60±4.80	63.3±6.92	0.164
Mallampati (I/II)	23/7	22/8	0.767
Duration of laryngoscopy (sec)	13.77±1.04	13.57±1.13	0.473

Demographic characteristics were comparable in both the groups with respect to age, sex, height(cm), weight (kg), Mallampati score(I/II) and duration of laryngoscopy (sec) [Table 1].

Table 2: Comparison of heart rate (HR) between group A and group B at specific time points (mean ± SD).

HR Specific time points	**Group A** (MeanSD)	**Group B** (MeanSD)	**P Value**
T0	84.805.08	83.533.48	0.378
T I	75.84.43	74.42.86	0.141
T – 1	82.074.83	80.033.35	0.062
T – 2	79.804.43	76.303.32	0.001
T - 5	77.804.43	72.303.29	0.000

Table 2 shows heart rate at specific time points (mean± SD). *Denotes statistically significant differences. Data were collected at following specific time points: T0 - baseline, TI - intubation, T-2 = 2 min after intubation, T-5 = 5 min after intubation. Statistically significant HR attenuation was observed in group B at T-2 & T-5 though no difference found in T0, TI and T-1 (P value <0.05).

Table 3: Comparison of SBP at specific time points.

SBP Specific time points	**Group A** (MeanSD)	**Group B** (MeanSD)	**P Value**
T0	133.73.86	133.54.26	0.850
T I	119.83.86	119.64.26	0.849
T – 1	129.14.06	125.74.17	0.002
T – 2	126.43.94	121.74.4	0.000
T - 5	121.14.06	117.24.16	0.000

Table 3 shows systolic blood pressure at specific time points (mean± SD). *Denotes statistically significant differences. Data were collected at following specific time points: T0 - baseline, TI - intubation, T-2 = 2 min after intubation, T-5 = 5 min after intubation. Statistically significant attenuation of SBP was observed in group B than that of group A (P value <0.05) in T-1, T- 2, T- 5.

Table 4: Comparison of diastolic blood pressure (DBP) between group A and group B at different points of time.

DBP Specific time points	**Group A** (MeanSD)	**Group B** (MeanSD)	**P Value**
T0	79.462.96	79.363.80	0.910
T I	70.52.9	713.29	0.539
T – 1	77.832.05	76.272.85	* 0.017
T – 2	75.772.02	72.003.29	* 0.000
T - 5	73.732.76	70.533.17	* 0.000

Table 4 shows diastolic blood pressure (DBP) at specific time points (mean± SD). *Denotes statistically significant differences. Data were collected at following specific time points: T0 - baseline, TI - intubation, T-2 = 2 min after intubation, T-5 = 5 min after intubation. DBP was comparable in T0 and TI. Statistically significant DBP attenuation was observed in group B at T-1, T-2 and T-5, P 0.017, 0.000 and 0.000 respectively.

Table 5: Comparison of Mean blood pressure (MBP) at specific time points

MBP Specific time points	**Group A** (MeanSD)	**Group B** (MeanSD)	**P Value**
T0	98.302.0	98.533.0	0.719
T I	86.922.35	87.233.0	0.593
T – 1	94.902.0	92.832.49	* 0.001
T – 2	92.702.0	88.502.62	* 0.000
T - 5	89.102.0	86.002.31	* 0.000

Table 5 shows mean blood pressure (MBP) at specific time points (mean± SD). *Denotes statistically significant differences. Data were collected at following specific time points: T0 - baseline, TI - intubation, T-2 = 2 min after intubation, T-5 = 5 min after intubation. No difference in MBP was found at T0 and TI. Statistically significant MBP attenuation was recorded at T-1, T-2 and T- 5 (P <0.05).

DISCUSSION

This single blind randomized control study was conducted on total sixty patients to evaluate the efficacy of intravenous lignocaine and nebulized lignocaine for attenuating haemodynamic stress responses to laryngoscopy and intubation.

Laryngoscopy and intubation, mainstay of general anaesthesia, has harmful effect on patient's haemodynamics by increase in HR, BP, and also intracranial and intraocular pressure. These effects may prove fatal for elderly, patients with hypertension, pheochromocytoma, ischaemic heart disease, patients with fixed output state, congenital cyanotic heart disease, or with intracardiac, intra abdominal or intra cranial pathology. This response also depends on induction agent and other co administered drugs used, type and duration of procedure, depth of anaesthesia, presence of hypoxia, hypercarbia and acidosis.

Though various drugs are studied for blunting the response, being one of the very commonly available local anaesthetic, lignocaine is studied here. Both i.v and topical lignocaine is known to perfectly blunt the upper airway reflex and eventually the haemodynamic stress response to intubation [5, 17]. So, in this context, this study was planned to compare the efficacy of lignocaine when administered by two different routes, to attenuate this response.

In spite of decrease in heart rate variation to stress response, elderly patients shown marked fluctuations in haemodynamics [18]. Therefore, patients with an optimal age range of 18-55 years were selected for this study.

Severity of response depends on number of attempts and time taken for laryngoscopy and intubation irrespective of blunting premedication. So, anticipated difficult airway cases including those with Mallampati classification III and IV were excluded. All laryngoscopy and intubation was done by one single expert anaesthesiologist to eliminate confounding factors related to laryngoscopy time and attempts.

Patient with any co morbidities, like hypertension controlled by antihypertensives may create a false impression of blunted response, hence excluded. Patients on α agonist, β blocker, calcium channel blocker, β2 agonist excluded for the same reason. Patients with liver and kidney diseases was not included as lignocaine is metabolized by

liver and excreted via kidney. Patients with altered sensorium, diabetic patients with probable autonomic neuropathy were also excluded.

Both groups were comparable by demographic characteristics i.e, age, sex, height (cm), weight (kg), Mallampati classification and duration of laryngoscopy and intubation and baseline heart rate, systolic, diastolic and mean blood pressures. Group A received i.v lignocaine 3 min intubation while group B patients received nebulized lignocaine 4% over 10 min with high flow oxygen just after entering the operation theatre. Inj. fentanyl i.v 2 µg/kg was administered after obtaining last study data (5 min after intubation).

Overall blunting of stress response was observed in both groups, though it was found better in group B. No statistically significant difference found in HR 1 min after intubation though significant difference was observed 2min and 5 min after intubation. But SBP, DBP and MBP showed significant difference at 1min, 2min and 5 min after intubation.

The effects of aerosolized and or i.v lignocaine on circulatory response to direct laryngoscopy was compared by one study [3]. Total forty unpremedicated patients were randomly divided into four groups. Group 1 received aerosolized and IV saline, group 2 received aerosolized saline with i.v lidocaine, group 3 received aerosolized lidocaine with i.v saline, and group 4, aerosolized and i.v lidocaine. Heart rate and systolic, diastolic, and mean blood pressures were recorded at 1-minute intervals from 0 to 11 minutes. There were no differences among the four treatment groups contradictory to present study findings, where SBP,DBP and MBP decreased over time in both groups and statistically significant decrease was observed at 1, 2 & 5 minutes post intubation in group B, i.e, topical lignocaine group. Though increase in HR was attenuated throughout the observation period, it was significant in 2 and 5 min after intubation.

In another study, i.v lignocaine at 1.5 mg/kg attenuates increase in HR and ABP only when given 3 min before intubation and offers no protection to post intubation surge if given at 1, 2 or 5 min before intubation [19].

The results are consistent with one previous study where lignocaine was compared with 0.9% normal saline inhalation in attenuation of haemodynamic surge and found to have significant effect at 1minute, 3 minutes and 5 minutes post intubation [20].

Present study showed better attenuation of intubation surge in group B, i.e lignocaine nebulisation group. Though lignocaine via intravenous route can be used for effectively blunting the surge by administering just 3 min before intubation, due to high hepatic first pass metabolism, the bio availability is less [21]. And, though there is around 75% wastage of drugs during nebulization, only 25% drug is available, topical administration via nebulization seems safer and better route of administrating lignocaine for effective blunting of intubation surge [22].

LIMITATIONS

There were some limitations of this study. Firstly, more effective topicalization of upper airway to blunt the airway reflexes could have been done with an atomizer which was not used here. Secondly, it was a single blind study. Double blind study is required for better conclusion. Thirdly, preparation time for both groups was not compared in this study, though it was found to be more for group B patients.

CONCLUSION

So, to conclude, topical lignocaine 4% through nebulization is more effective than intravenous lignocaine 2% for attenuating intubation surge following laryngoscopy and intubation.

Conflict of interest – None
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Ethical approval- this study was approved by institutional ethics committee

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