Original Research Article

Comparative study of lignocaine nebulization with intravenous lignocaine for attenuation of hemodynamic response to laryngoscopy and endotracheal intubation

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Abstract

Background: Laryngoscopy and tracheal intubation provoke cardiovascular and autonomic responses through sympatho-adrenal stimulation that increases the myocardial oxygen demand, which may be detrimental in comorbid patients. Attenuation of these responses decreases the risk of these complications. Many methods have been employed to blunt these responses, most common being intravenous lignocaine; the present study was undertaken to evaluate and compare the effects of 2% of nebulised Lignocaine 2mg/kg with 2% of intravenous Lignocaine 2mg/kg to attenuate intubation response.
Keywords: Intubation response ,Sympatho-adrenal stimulation, Nebulised Lignocaine and Intravenous Lignocaine

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INTRODUCTION

Direct laryngoscopy and endotracheal intubation following induction of anaesthesia is almost always associated with hemodynamic changes due to reflex sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation.[1] This increased sympatho-adrenal activity could rise blood pressure, heart rate, myocardial oxygen demand, and arrhythmias.[5.] A temporary raise in blood pressure and heart rate may not have any consequence in normal individuals, but they are dangerous to patients with co-morbid conditions like hypertension, myocardial insufficiency, penetrating eye injuries, and raised intracranial tension. These reactions could lead to the development of pulmonary oedema[6,] myocardial insufficiency[7] and cerebrovascular accidents.[8]So, decreasing these harmful laryngoscopic reactions is the need of the hour in such patients. Attenuation of pressor responses could be possible either by deepening the plane of anaesthesia, [9] or by the use of drugs or by using advanced airwaydevices.[10] The most commonly used method is usage of intravenous lignocaine. Different studies previously evaluated the effects of lignocaine on the hemodynamic response of intubated patients. However, most of these studies tried to analyze the effect of IV lignocaine in comparison to other drugs. The current study was done to compare the effects of IV Lignocaine with nebulized Lignocaine before induction of anesthesia for the intubation response.

AIMS AND OBJECTIVES

1. To study and compare the effect of 2% intravenous lignocaine 2mg/kg with nebulization of 2% lignocaine 2mg/kg on hemodynamic responses to laryngoscopy and endotracheal intubation.

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2. To evaluate side effects associated with nebulized and IV lignocaine.

METHODOLOGY

This is a prospective comparative study, done on 90 patients belonging to ASA grade I and II in the age group of 18 to 45 years male and female patients scheduled for elective surgeries done under general anaesthesia.

Patients were randomized into three groups with the sample size of 30 each.

Group C (n=30) received no test drug, they serve as control group. Group I which includes 30 patients, received 2% Lignocaine 2mg/kg by slow intravenous route. Group N, which included 30 patients received 2% nebulization of Lignocaine in the dose of 2mg/kg body weight.

Inclusion criteria and exclusion criteria:

Patients in ASA grade 1 and 11

Age of the patients between 18 to 45

Exclusion Criteria:

1. Patients with COPD, stroke, angina, heart attacks, psychiatric illness, severe liver and renal disorders.
2. Patients with known hypersensitivity to Lignocaine or its preservatives Patients coming for emergency surgical procedure.
3. Patients who have not consented for the study.

Informed, written consent was taken after explaining the anaesthetic procedure in detail from each participant. Informed consent was given in patient understandable/local language. All the patients were given Tab. Diazepam 10mg as pre-medication to reduce anxiety and Tab. Ranitidine 150 mg was given before surgery to reduce gastric secretions. All patients came to the preoperative room half an hour before surgery. Basal heart rate, blood pressure readings, SpO2, cardiac rate and rhythm were monitored. The patient in group N were given nebulized 2% lignocaine in the dose of 2mg/kg body weight using a fitting face mask with CompAir Compressor Nebulizer NE-C28 model of OMRON healthcare, 10 min before induction of anesthesia. On operating table IV line was secures using 18G cannula. Patients were connected to non-invasive monitoring with electrocardiograph, pulse oximeter, and non-invasive BP machine. All patients were given Inj. Midazolam 1mg IV All patients were given 100% oxygen for 3 minutes. Patients in Group C are the control group who did not receive any test drug. Patients in Group I received 2% lignocaine in the dose of 2mg/kg body weight 90 sec before induction of anesthesia. Patient in group N were given nebulized 2% lignocaine 2mg/kg body weight 10 min before induction.

INDUCTION OF ANAESTHESIA:

Anaesthesia was induced using barbiturate Thiopentone sodium injection in the dose of 5mg/kg as 2.5 % solution. Endotracheal intubation was facilitated using succinylcholine in the dose of 1.5 mg/kg iv.

Laryngoscopy was done with Machintosh laryngoscope. Anaesthesia was maintained by 66% nitrous oxide, 33% of oxygen and Halothane. After the patients recovered from succinylcholine, neuromuscular blockade was maintained using non-depolarizing muscle relaxants like vecuronium. The following parameters were recorded:

- Heart rate in beats per minutes
- Systolic blood pressure in mm Hg
- Diastolic blood pressure in mm Hg
- Mean arterial pressure in mm Hg

Parameters were at baseline and at 2nd ,4 th,6th, 8th and 10th minutes after laryngoscopy and endotracheal intubation. After recording all the parameters, all patients received 0.2mg Glycopyrrolate by IV route and 3mcg/kg of opioid Fentanyl by IV route for analgesia. At the end of the procedure patients, reversal was done using Neostigmine in the dose of 0.05 mg/kg iv and Glycopyrrolate in the dose of 0.01 mg/kg IV.

RESULTS

Table 1: Mean heart rate comparison among 3 group

HR(bpm)	Group C	Group I	Group N
Basal (preintubation)	85.50± 10.30	86.13± 10.27	86.97± 11.24
Post intubation			
2 min	104.87± 14.73	103.53± 12.42	109.73± 15.34
4 min	95.80± 12.79	93.63± 13.34	100.8 ± 15.39
6 min	95.07± 10.85	93.60± 11.79	95.93± 14.81
8 min	94.57± 11.48	89.47± 10.17	92.30± 14.94
10min	91.33± 12.12	87.00± 7.72	91.60± 14.71

In the control group, the basal HR was 87.46+-6.44 bpm. Two minute after intubation, it was increased and it started declining from the 4th minute. Similarly In group N and I, the HR was increased after 2 minutes and later declined. Group N is showing significant statistical difference more than group I and group C at 4 minutes.

Table 2: Mean blood pressures of three groups

MAP	Group c	Group I	Group N
Basal (preintubation)	92.73± 9.85	91.70±9.40	93.63± 8.07
Post intubation			
2 min	116.60± 14.96	106.03± 14.67	114.67± 12.83
4 min	107.67± 12.64	96.60± 16.09	101.13 ± 13.71
6 min	105.27± 11.54	94.97± 13.28	98.90± 12.43
8 min±	101.43± 11.65	97.07± 12.46	98.03± 10.4
10min	100.57± 9.70	94.80± 10.14	99.20± 10.58

Statistical evaluation between the groups showed that the increase in MAP observed in control group was statistically highly significant when compared to increase in MAP in group I but not in group N. The increase in MAP in group C and group I were statistically highly significant compared to increase in MAP in group N ($p<0.001$).

Between group C and group N there was no statistical significance. Between group I and group N, the increase in MAP in group N was suggestively significant compared to increase in MAP in group I($p=0.053$).

Table 3: Mean saturation of oxygen in three groups

Spo2(%)	Group C	Group I	Group N	P value
Basal	98.13±0.51	98.57 ±0.57	98.43± 0.5	NS
Post intubation				
2min	100.00	100.00	100.00	NS
4 min	100.00	100.00	100.00	NS
6 min	100.00	100.00	100.00	NS
8 min	100.00	100.00	100.00	NS
10min	100.00	100.00	100.00	NS

NS: not significant

There were no significant changes among the patients in three groups.

DISCUSSION

The most important indications for attenuation of hemodynamic responses to laryngoscopy and endotracheal intubation, are in patients with Ischemic heart disease, Hypertension and in patients with intracranial aneurysms, even these transient changes can result in potentially deleterious effects like left ventricular failure,[6] pulmonary edema,[6] myocardial ischemia[7] and dysrhythmias[4] and cerebral haemorrhage[8]. Lignocaine has been successfully used to blunt the hemodynamic responses due to following properties; Suppression of airway reflexes[17], effectively prevents and treat laryngospasm[13], good cough suppressant[12], myocardial depressant, peripheral vasodilation and antiarrythmic properties[13].

HEART RATE CHANGES

The maximum rise in heart rate was noted at 2mins following intubation in all the three groups which concurs with most studies. The mean rise in heart rate was comparatively lesser in the intravenous group, but not statistically significant when compared to group C and group N. In the study by Sklar BZ[16] the least increase in heart rate are in nebulised group when compared to intravenous group as he had used higher dose of drug, which is seen in other studies where the nebulised group received higher dose of drug. There were no episodes of bradycardia in any of our study groups which was clinically significant.

BLOOD PRESSURE CHANGES

In our study, the control group the basal value of Systolic blood pressure, Diastolic blood pressure, and Mean arterial pressure was 121.26 mm Hg, 81.26 mm Hg, and 94.6 mm of Hg respectively. In our study the pressor response shows similarity with Mounir Abou- Madi *et al.*[11] as the dosage used by them was 1.5mg/kg when compared to 2mg/kg. In study conducted by Sklar BZ *et al.*,[11] the maximum rise in mean arterial pressure of 21.2 mm Hg noted with intravenous group and minimum with nebulized lignocaine of 120mg of 10.1mmHg which did not concur with our study as the pressor response was much better statistically significant in group I when compared with the group N. There were not much of significant changes in blood pressure in control and nebulised group in the current study as it can be attributed to the fact that a simple face mask was used for administration of nebulisation, lesser concentration of drug used and possibly wastage of drug during exhalation.

ECG CHANGES

In the current study we observed that sinus tachycardia was the most common ECG abnormality. One of the patients in the control group, patient posted for Laproscopic cholecystectomy, had 4 to 5 premature ventricular contractions (PVC) per minute on continuous

ECG monitoring immediately after intubation for a period of 5 minute, but the this arrhythmia is not linked to haemodynamic derangements. The patient was stable throughout the procedure. None of the patients, in any of the groups developed any ST-T changes.

There were no clinical or statistical changes that were seen with Oxygen saturation in any of the groups. The majority of the patients who were nebulized with lignocaine complained of taste disturbances after giving the drug which we considered as a minor side effect. There were no other adverse effects or hypersensitivity reactions reported to the lignocaine in our study.

CONCLUSION

The demographic parameters like Age, Sex, Weight, type of surgeries were comparable in all the groups in the current study. The maximum rise in heart rate was noted at 2 min following intubation in all the three groups. The maximum rise in Mean arterial blood pressure was noted at 2 min following intubation in all the three groups. In this study the maximum change in heart rate and blood pressure was noted in control group and minimum change in intravenous lignocaine group, though the rise in heart rate was similar in group C and group N. Intravenous lignocaine was effective in attenuating pressor response to laryngoscopy and endotracheal intubation. Nebulization of 2% lignocaine did not sufficiently blunt the haemodynamic response to laryngoscopy and endotracheal intubation, probably a higher concentration of the drug and a longer latency period would have been effective.

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