

Comparison of attenuating effects of Lignocaine on Hemodynamic response to laryngoscopy and Intubation with Etomidate induction for Coronary Artery Bypass Graft surgery

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ABSTRACT

Introduction: Direct laryngoscopy and intubation is invariably associated with hemodynamic changes which may be hazardous to patient especially if they have cardiac morbidity. Lignocaine is regularly used to attenuate these changes although the evidence supporting its use is not well established. This study aims to find the attenuating effects of Lignocaine on Hemodynamic response to laryngoscopy and Intubation with etomidate induction for Coronary Artery Bypass Graft surgery (CABG) surgery.

Methods: The study prospective, observational, comparative study where total 104 patients undergoing CABG were randomized in two groups, lignocaine was given in one group, the other received normal saline. In this double blinded randomized comparative observational study etomidate induction was performed. Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP) and mean blood pressure (MBP) collected at 0, 1, 3, 5, and 10 minutes of intubation.

Results: There was no significant difference between the demographic profile between two groups. Our results showed no significant differences between baseline, SBP, DBP and MBP at 1,3,5 and 10 minutes after laryngoscopy and endotracheal intubation. Baseline HR, at 1,3,5 and 10 minutes after laryngoscopy and endotracheal intubation were also not significantly different between the two groups.

Conclusions: Lignocaine has no attenuating effect on hemodynamic response to laryngoscopy and Intubation with Etomidate induction for CABG surgery.

Keywords: Lignocaine, Etomidate induction, Hemodynamic responses

INTRODUCTION

Direct laryngoscopy and intubation are invariably associated with hemodynamic changes due to reflex sympathetic stimulation.¹ These reflex hemodynamic changes are better tolerated in healthy patients, however in patients with comorbidities the response is significant and may be hazardous.²

Transitory hypertension and tachycardia may be hazardous to those with hypertension, myocardial insufficiency and cerebrovascular diseases. The laryngoscopy reactions in such individuals may predispose to pulmonary edema³, myocardial insufficiency⁴ and cerebrovascular accidents.⁵

The risk of arrhythmias associated with tracheal intubation is significantly reduced with pre-induction administration of local anesthetics (Lignocaine) compared to placebo.⁶ Pharmacological interventions also reduced the risk of myocardial ischemia. However, the evidences that support their use have been with anesthetic induction agent those decreasing the blood pressure and pulse rate such as propofol and thiopentone. Etomidate is well known to have minimal effect on hemodynamics and is preferable over propofol for inducing patient with risk of hemodynamic instability.⁷ However, they are not effective in attenuating the response to laryngoscopy and endotracheal intubation. This study aims to find

the attenuating effects of lignocaine on hemodynamic response to laryngoscopy and intubation with etomidate induction for CABG surgery.

METHODS

The study is prospective, observational, comparative study conducted from July 2018 to January 2020 at Manmohan Cardiothoracic Vascular and Transplant Center, Maharajung Medical Campus, Tribhuvan University. Institutional Review Committee review committee of the Institute of Medicine approved this study on June 26, 2018, Ref: 416(6-11)2/074/075. Patients undergoing CABG were enrolled in the study. Patients with predicted difficult airway, presence of high grade AV block, 3rd degree block or on pacemaker, hemodynamically unstable patient requiring inotrope or IABP, patients posted for emergency surgery and patients with history of drug allergy to study drugs were excluded. Total 104 patients undergoing CABG were enrolled in the study. Out of the total patients 83 were male and 21 were female. Randomization was being done by sealed envelope method using computer generated random table. Blinding was done by preparing the study drugs by anesthesia nurse who had not had any part in the study. The drugs were prepared in clear 5 ml syringe. The study group (Group A) was given Lignocaine 1.5 mg/kg intravenously (diluted to 5 ml with WFI). The control group (Group B) was given Normal Saline. For both the groups Induction was with Etomidate 0.3 mg/kg. Fentanyl was given 2mcg/kg and Muscle relaxant was Vecuronium 0.12 mg/kg. The study drug was given at 2 minutes of muscle relaxant. Laryngoscopy was done after 3 minutes of the muscle relaxant. Intubation was performed and was considered as 0 minute. Maintenance was with Isoflurane 1.5 % and ventilation in volume control mode with tidal volume 5ml/kg, rate 12/min and PEEP 5 cm of H₂O. Monitoring and intervention was done as per protocol up to 10 minutes. Data were collected at 0, 1, 3, 5, and 10 minutes of intubation in the performa.

No safety concern regarding patient arose as the research was conducted with standard operating procedures. The study drugs have been used regularly and frequently for patient undergoing surgery under general anesthesia without increasing the complication rates. The patient would receive the study drug even when not participating in the study as they are integral part of the usual institutional practice and international standards.

Written informed consent was taken before the start of the study. Raw data was collected in preformed datasheet. Raw data was entered in Microsoft excel spreadsheet. Tables and graphs were being made from the excel spreadsheet. Statistical Software SPSS was used for statistical calculation.

Statistical test as per data type was used. (Chi square

test to compare categorical data; student t test, ANOVA to compare mean etc.). Expert statistician was consulted to verify the appropriateness of the statistical test and calculations used. The value of $p < 0.05$ was considered as statistically significant. Selection bias was avoided by randomly selecting patient for both group from same population. The population selection was determined by surgical team who were unrelated to the study. Channeling bias was avoided by randomization. Interviewer bias, recall bias was avoided as data collected were prospective and quantitative data. Chronology bias was avoided as it is a prospective study. Transfer bias was avoided as study did not involve follow-up. Performance bias was minimized by selecting patient from same population. Confounders were avoided using randomization and study design. Observer bias was avoided as quantitative measurement from automated monitor was recorded.

RESULTS

There was no significant difference between the demographic profile between two groups as shown in the Table 1. There were no significant differences between two groups regarding ASA physical status, comorbid conditions like Hypertension, Diabetes mellitus, thyroid disorders. Regarding number of vessels involved and ejection fraction also there was no significant differences between the two groups. We had taken baseline systolic blood pressure, baseline diastolic blood pressure and baseline mean blood pressure. Our results showed no significant differences between the two groups as shown in the Table 2. Likewise, we measured the SBP, DBP and MBP at 1, 3, 5 and 10 minutes after laryngoscopy and endotracheal intubation. The results showed no significant differences between the two groups. We also had measured the baseline heart rate and HR at 1, 3, 5, and 10 minutes after laryngoscopy and endotracheal intubation. The results showed absence of significant differences between two groups. During the study, some cases required GTN for hypertensive response as per our protocol and some required phenylephrine for hypotensive episodes. The results were not significantly different the two groups as shown in the table 2.

Table 1. Distribution of demographic data, comorbidities, medications, ASA physical status and ECHO findings between the two study groups.

	Total	Lignocaine	Control	p-value
Age (in years)	58.53±11.56 (37,82)	58.38±11.28 (37,82)	58.67±11.93 (38,82)	0.89
Weight (in Kg)	62.09±9.68 (40,84)	61.11±9.73 (40,84)	63.08±9.62 (45,83)	0.3
Sex	T 104 M 83 F 21	T 52 M 40 F 12	T 52 M 43 F 9	0.62
ASA PS	104	II 44,III 5,IV 3	II 44,III 6, IV 2	0.86
HTN	38	16 (30.77%)	22 (42.31%)	0.42
Anti-hypertensive	47	22 (42.31%)	25 (48.08%)	0.55
Anti-arrhythmic /rate controlling drugs	15	8 (15.38 %)	7 (13.46%)	0.78
DM	37	20 (38.46%)	17 (32.69%)	0.54
Thyroid	7	4	3	1
Carotid	5	2	3	1
EF (in %)	104	<30 =1,30-40 =4,40-50 =8,>50=39	<30 =1,30-40 =3,40-50 =6,>50 =42	0.91
LMD	17	7 (13.76%)	10 (19.23%)	0.43

ASA PS –American Society of Anesthesiologist and Physical Status, HTN-Hypertension, DM-Diabetes Mellitus, EF-Ejection Fraction, LMD- Left Main Disease

Table 2. Hemodynamic changes (Mean ± SD) during the study. Interventions during the study.

		Lignocaine	Control	p-value
SBP (in mm of Hg)	BL	119.05±22.84	118.88±25.20	0.97
	1	156.61±28.08	152.57±32.27	0.49
	3	146.13±26.75	143.30±28.58	0.60
	5	135.88±25.78	127.13±26.78	0.09
	10	112.40±19.95	105.30±21.85	0.08
DBP (in mm of Hg)	BL	71.88±24.52	70.42±24.42	0.76
	1	90.19±28.88	86.57±30.30	0.53
	3	85.92±26.6	81.59±26.90	0.41
	5	81.75±24.8	73.38±23.17	0.07
	10	69±21.00	62.69±19.85	0.11
MBP (in mm of Hg)	BL	87.57±23.70	85.53±23.33	0.65
	1	111.96±27.91	108.21±29.85	0.50
	3	105.67±25.85	101.80±26.13	0.45
	5	99.38±23.96	90.90±23.01	0.06
	10	83.11±19.42	76.57±18.89	0.08
HR (beats/min)	BL	78.78±15.41	78.51±15.87	0.65
	1	103.25±19.63	100.5±19.82	0.50
	3	96.86±19.12	95.90±19.41	0.45
	5	91.61±17.79	86.98±16.84	0.06

	10	77.36±16.6	73.75±14.65	0.08
Atropine needed		0	0	0.37
GTN needed		5	8	1
Phenylephrine needed		2	3	0.59
Arrhythmia		7	9	1

BL-Baseline, GTN -Glyceryl Trinitrate

DISCUSSION

Endotracheal intubation is a source of airway stimulation that results in a sympathetic response which causes an increase in heart rate and blood pressure.¹ These hemodynamic changes can be particularly detrimental in patients with preexisting cardiovascular comorbidities.² The hemodynamic response to endotracheal intubation can be blunted by using drugs like Lignocaine.⁶ Etomidate is known to have minimal hemodynamic effects during induction of anesthesia.⁷ This makes etomidate a favorable choice in patients undergoing CABG. The present study was designed in order to compare attenuating effects of lignocaine on hemodynamic response to laryngoscopy and intubation with etomidate induction in comparison to etomidate alone for CABG surgery.

The results of our study showed no significant changes in the hemodynamic parameters in the two groups. Both groups had a rise in heart rate and blood pressure from baseline after laryngoscopy and intubation. SBP was increased at 1, 3 and 5 minutes in both groups, and was lower than the baseline at 10 minutes in both groups. DBP was increased at 1 and 3 minutes in both groups. DBP was also increased at 5 minutes in lidocaine group but was near baseline levels in etomidate only group. At 10 minutes, DBP was at baseline levels in the lidocaine group and was lower than baseline in the etomidate only group. MBP was also increased at 1, 3 and 5 minutes in both groups, and was lower than the baseline at 10 minutes in both groups. Heart rate was also increased at 1, 3 and 5 minutes in both groups, and was lower than the baseline at 10 minutes in both groups. The need for GTN or phenylephrine after induction and intubation was lower in the lignocaine group but was not statistically significant. Incidence of arrhythmias was also lower in the lignocaine group but was statistically insignificant.

Many studies have shown the effectiveness of IV lidocaine to suppress the hemodynamic and coughing responses to laryngoscopy and intubation. Yukioka et al.⁸ compared 0.5, 1.0, 1.5, and 2.0 mg/kg doses to suppress cough reflex and found 2 mg/kg given 1 to 5 minutes before intubation to be the most effective. Splinter et al. compared the effectiveness of lignocaine and Fentanyl in blocking the pressor response and found that lignocaine group had lower incidence of arrhythmias as well as hypotension. Tam et al. found that IV lignocaine given 3 minutes prior

to intubation to suppress increase in heart rate and blood pressure was effective.. Hassini et al. compared the effectiveness of fentanyl and fentanyl + lidocaine in reducing hemodynamic responses to tracheal intubation and found that fentanyl + lidocaine was more effective than fentanyl alone.

However, these studies were done with sodium thiopentone or propofol and in relatively healthy patients. Our study included patients undergoing CABG who had more comorbidities and are more likely to be hemodynamically labile. Thus etomidate was used as the induction agent owing to its safer hemodynamic profile. Mahjoubifard et al. compared dexmedetomidine, lidocaine, and Fentanyl in attenuation of hemodynamic response of laryngoscopy and intubation in patients undergoing cardiac surgery.¹¹ Etomidate was used for induction of anesthesia. All 3 drugs were effective in preventing tachycardia and hypertension. However, dexmedetomidine caused bradycardia and hypotension. Lignocaine resulted in increase in MAP in the 1st minute. Fentanyl was found to be more effective in patients undergoing cardiac surgery. In our study, patients in both groups received Fentanyl. Additional lignocaine did not seem to add benefit in suppressing the blunting of hemodynamic response to induction using Fentanyl, etomidate and muscle relaxant.

The study can be limited by many factors. Institutional practice may be different in different institute. We were not able to control the myriads of drugs the patients were regularly taking but their effect was minimized by study design. Very sick patient (hemodynamically unstable) and relatively healthy (not needing CABG) were not included.

CONCLUSIONS

Our study showed that lignocaine has no attenuating effect on hemodynamic response to laryngoscopy and intubation with etomidate induction for CABG surgery.

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