DOI: https://doi.org/10.53350/pjmhs2023172184

ORIGINAL ARTICLE

Effect of Intravenous Lignocaine vs Placebo on Hemodynamic Responses during Direct Laryngoscopy

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ABSTRACT

Aim: To determine the effect of placebo vs intravenous lignocaine pre-intubation on hemodynamic responses during direct laryngoscopy.
Study design: Randomized control trial
Place and duration of study: Department of Anaesthesia, Indus Hospital, Karachi from 1st March 2017 to 31st August 2017.
Methodology: One hundred and twenty patients were included and divided into two groups. In one group, lignocaine arm (1.5mg/kg I/V lignocaine) was given while placebo arm was given (6ml normal saline pre-intubation) in group two. In both groups after arrival at the operation theatre, base-line parameters like the heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure was measured non-and later hemodynamic assessment was done before giving lignocaine, prior and post intubation and after 3,5 and 10 minutes of intubation.
Results: Fifty six (46.15%) were male while 64 (53.85%) were females. No patients were found to have asthma, COPD, ischemic heart disease, TB, CHF, Cushing syndrome, phenochromcytoma, and drug allergy. No significant association was found between the two groups when comparing the gender, BMI, comorbids, ASA grade and Mallampati grade. The systolic blood pressure at 3,5 and 10 minutes was significant in the two groups, while diastolic was not significantly associated. The pulse rate at3 and 10 minutes was found to have a significant association while at 5 minutes was insignificant. MAP showed no significant association between the two groups.
Conclusion: Hemodynamic stability is only affected in terms of systolic blood pressure, while other parameters are not significantly affected.
Keywords: Lignocaine, Hymodynamic changes, Laryngoscopy

INTRODUCTION

Anaesthesia is an important part of surgery.[1] It enables patients to undergo an operation safely without experiencing distress and pain. General anaesthesia, which renders patients totally unconscious, prevents them from moving during the operation. During the period of unconsciousness, the maintained of airway is of utmost importance along with administering anaesthetic drugs or gases to the patient to keep him or her unconscious throughout the operation. Various drugs are used for the purpose of unconsciousness which if not properly controlled/maintained leads to paralysis of skeletal muscles[2].

Airways manipulation including endotracheal intubation and laryngoscopy often time leads to increased blood pressure and elevated heart rate.[1-3] It only lasts for shorter period of time but it can also causes fatal consequences and serious complications in patients. These conditions are associated with underlying health condition of the patient. Common symptoms and responses which are observed in endotracheal intubation is tachycardia and hypertension[1].

The mechanism of hemodynamic response to laryngoscopy and orotracheal intubation is proposed to be by somato-viseral reflexes. Stimulation of proprioceptors at the base of the tongue during laryngoscopy induces impulse dependent increases of systemic blood pressure, heart rate and plasma catecholamine concentrations. New approaches have been adopted to rectify endotracheal intubation and laryngoscopy responses. These include use of different intubation devices or administering various drugs such as, beta blockers, vasodilators, opioids and Local anesthetics (lignocaine) to blunt the response[4-7].

Lignocaine is a well-known drug which is given to patients with prophylaxis and ventricular dysarrthmias especially in patients of myocardial infractions. Metabolic pathway which is adopted by lignocaine is oxidative dealkyalysation in liver. It is mainly employed to numb tissues for the treatment of ventricular tachycardia. Sometime it is also given in combination with epinephrine to make the numbness effect last longer lidocaine diffuses across the cuff in a time and concentration-dependent manner and influence the local tracheal receptors to induce local anesthesia and ultimately reduce the tube discomfort[4]. This vasodilatory effect of lidocaine is also mediated by the release of nitric oxide from vascular endothelium[5].

Received on 11-10-2022
Accepted on 27-01-2023

Lidocaine can diminish hemodynamic response after tracheal intubation by several mechanisms: Inhibiting sodium influx in the neuronal cell membrane and inhibiting signal conduction[3] decreasing the sensitivity to the heart muscle to electrical pulses[4], direct cardiac depression and peripheral vasodilatation properties.

In 2015, Jain et al[8] conducted a study in India to determine the efficacy of IV-infusion of lignocaine on hemodynamic responses in comparison to placebo. It showed that hemodynamic responses were reduced in lignocaine group in comparison to placebo post intubation at 3, 5 and 10min.

MATERIALS AND METHODS

This randomized control trial was conducted at Department of Anesthesia, The Indus Hospital, Karachi from 1st March 2017 to 31st August 2017. A total 120 (60 per group) were enrolled. They were divided in two groups; group one was given 1.5mg/kg IV lignocaine before intubation and group two was given 6 ml normal saline. In both groups after arrival at the operation theatre, base-line parameters like the heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure was measured non-invasively by electronic non-invasive blood pressure monitor. Age group of the study participants was 20-60years and both genders were present in the study. Patient having any disease related to airway obstruction/difficulty were excluded from this study. 0.025mg/kg of midazolam was given to all study participants. Patients were induced with 2mg/kg of IV propofol and intubated with 0.5 mg/kg of atracurium. Anesthesia was also maintained with inhalation agent and oxygen along with muscle relaxant in step down manner. Inhalation agent and atracurium was stopped at the end of the surgery. Hemodynamic assessment was done by monitoring pulse rate systolic, diastolic and mean arterial pressure. Pulse rate systolic and diastolic BP were recorded immediately before giving the bolus of IV lignocaine, prior to induction and intubation, post-induction, after tracheal intubation and subsequently at 3, 5, 10 mins after intubation.

Data was entered and analyzed using SPSS version 21. Shapiro Wilkin's test was applied to assess the normality of all the quantitative variables age, height, weight BMI, BP, PR, MAP and duration of surgery. To assess significant difference in mean hemodynamic responses (BP, PR and MAP) post- intubation between both the groups independent sample t-test/Mann-Whitney u test was applied as appropriate. P-value <0.05 was considered significant. Effect modifiers like age BMI, duration of surgery, ASA grade, Mallampatti grade, and gender through stratification post-

stratification independent sample t-test was applied. P-value less than equal to 0.05 was taken as significant.

RESULTS

There were 56(46.15%) males 64(53.85%) females.56% of patients had BMI between 17-25 years while median age was 37 years.1.71%patients had DM, 5.98% had hypertension while 0.85% had renal disease. No of the patients were found to have asthma, COPD, ischemic heart disease, TB, CHF, Cushing syndrome, phenochromcytoma, and drug allergy (Table 1).

Table 1: Demographics of patients (n=120)

Variable	No. (%)
Age in years (Median IQR)	37 (28 - 47)
Gender	
Male	56 (46.15%)
Female	64 (53.85%)
Body mass index	
<17	10 (7.69%)
17-25	66 (56.41%)
25-30	44 (35.9%)
Diabetes mellitus	
No	118 (98.29%)
Yes	2 (1.71%)
Hypertension	
No	113 (94.02%)
Yes	7 (5.98%)
Renal disease	
No	119 (99.15%)
Yes	1 (0.85%)

No significant association was found between the two groups when comparing the gender, BMI, comorbids, ASA grade and Mallampati grade (Table 2). Table 3 shows the change in hemodynamic status at 3, 5 and 10 minutes and compares the two groups. The systolic blood pressure at 3, 5 and 10 minutes was significant in the two groups, while diastolic was not significantly associated. The pulse rate at3 and 10 minutes was found to have a significant association while at 5 minutes was insignificant. MAP showed no significant association between the two groups (Tables 2, 3).

Table 2: Characteristics of study participants within study groups

Variable	Lignocaine Group (n=60)	Placebo Group (n=60)	P value
Gender			
Male	27 (45%)	29 (48.3%)	0.775†
Female	33 (55%)	31 (51.7%)	
Body mass index			
<17	7 (11.7%)	3 (5%)	0.150ǂ
17-25	29 (48.3%)	37 (61.7%)	
25-30	24 (40%)	20 (33.3)	
Diabetes mellitus			
No	59 (98.3%)	59 (98.3%)	1.000ǂ
Yes	1 (1.7%)	1 (1.7%)	
Hypertension			
No	56 (93.3%)	57 (95%)	0.717ǂ
Yes	4 (6.7%)	3 (5%)	
Renal disease			
No	60 (100%)	59 (98.3%)	1.000ǂ
Yes	-	1 (1.7%)	
ASA grade			
1	55 (91.6%)	58 (96.7%)	0.272ǂ
2	5 (8.4%)	2 (3.3%)	
Mallampati grade			
1	58 (96.7%)	54 (90%)	0.272ǂ
2	2 (3.3%)	6 (10%)	

*P-value<0.05, **P-value<0.0001, †Pearson Chi square test, ǂFisher's Exact test

Table 3: Change in hemodynamics at time 3 mins, 5mins and 10 mins between study groups

Variable	Lignocaine Group (n=60)			Placebo Group (n=60)			P value
	Mean±SD	Min-Max	Median (IQR)	Mean±SD	Min-Max	Median (IQR)	
Age in Year	37.56±11.29	20–61	37 (26-47)	38.77±11.9	20 - 60	37.5 (30-49.5)	0.585ǂ
BMI	22.87±4.32	14.6–30	24 (19.15-25.96)	23.11±3.74	15 - 30	22.5 (20.5-26.2)	0.690†
Systolic blood pressure							
Pre-induction	133 ± 12.04	94–163	136 (126-139)	136.86±12.52	108 - 164	138 (131 - 146)	0.075†
3 min after intubation	119.53±14.74	63–148	117 (113-126.25)	126.46±15.5	94 - 159	126 (116 - 141)	0.018*†
5 min after intubation	117.24±13.99	89-147	117 (105-126)	123.31±15.85	92 - 156	124 (110 - 136)	0.030*†
10 min after intubation	114.98±15.88	73-146	113.5 (105-128.25)	124.88±15.32	81 - 148	126 (113 - 137)	0.001*†
Diastolic blood pressure							
Pre-induction	76.78±10.77	53 - 108	79 (66 - 83.25)	76.41±11.05	54 - 108	79 (64 - 85)	0.855ǂ
3 min after intubation	71.67±11.75	42 - 96	71 (63.75 - 79)	73.76±10.4	56 - 96	72 (64 - 81)	0.311ǂ
5 min after intubation	73.26±8.69	53 - 94	73 (66 - 81)	75.17±11.47	52 - 98	77 (64 - 84)	0.312ǂ
10 min after intubation	73.55±11.66	43 - 92	76 (64 - 82.25)	75.27± 1.71	42 - 96	77 (66 - 86)	0.428ǂ
Pulse rate							
Pre-induction	92.36±15.08	71 - 164	91 (81.75 - 96)	91.9±14.11	59 - 132	91 (84 - 101)	0.636†
3 min after intubation	84.79±10.57	61 - 108	85 (77 - 92)	90.46±13.99	52 - 126	89 (82 - 97)	0.015*†
5 min after intubation	84.47±11.69	54 - 126	86 (76.75 - 92)	87.71±14.21	61 - 122	87 (76 - 96)	0.153†
10 min after intubation	82.1±12.95	59 - 133	81 (72.75 - 88.25)	88.24±13.58	59 - 113	92 (79 - 96)	0.003*†
MAP							
Pre-induction	89.56±9.77	64 - 117	89 (84 - 93)	91.68±12.7	57 - 123	92 (83 - 97)	0.188†
3 min after intubation	84.21±10.8	59 - 113	82 (77.5 - 91)	87.76±14.8	59 - 129	89 (79 - 96)	0.142ǂ
5 min after intubation	83.72±10.98	59 - 122	83 (78 - 90)	84.41±12.47	61 - 119	83 (76 - 93)	0.919†
10 min after intubation	83.82±11.35	59 - 113	86 (76 - 91)	86.07±13.42	58 - 113	87 (79 - 94)	0.333ǂ

*P-value<0.05, **P-value<0.0001, †Mann-Whitney U test, ǂ Independent sample t test

DISCUSSION

The stress response to endotracheal intubation and laryngoscopy immediately activates the sympathetic nervous which is the main center for the maintenance of hemodynamic functions. It reduces the oxygen supply to the muscles of heart by vasoconstriction of coronary artery. Both types of anaesthetic agents including intravenous and inhalational have no significant difference in stress response. Endotracheal intubation and laryngoscopy cause some unusual changes in hemodynamic functions of the body by controlling sympathetic nervous system activation[9].

Underlying health condition and overall health of the patient is another important factor which needs to take into consideration before planning anesthesia type and dosage. Immunocompromised patients who are already suffering from severe diseases are at increased risk of developing arterial hypertension, intracranial pressure and myocardial ischemia that could even further worsen the chances of life threatening consequences. To date, various techniques and approaches has been used to attenuate and reverse these cardiovascular responses of the body[10,11]. Lignocaine has showed some incredible results on the attenuation of stress responses. It even showed best results in endotracheal intubation and laryngoscopy. Lidocaine is a drug which is routinely used to reduce pain especially during cardiovascular surgeries[12,13]. Lidocaine in combination with esmolol is not proved to be effective in lowering blood pressure and in normalization of heart rate[14].

Vasoactive drugs required in larger doses in lowering of blood pressure and it also failed to prevent tachycardia during intubation and laryngoscopy.[15] Vasoactive drugs itself cause

cerebral hypertension which on one hand cause tachycardia and on the other hand, worse the condition of patient who have left ventricular dysfunction. These type of results limit the practical utility of medicines[16].

Another study has reported the comparative study between lignocaine and other potent drug. It showed that tachycardia was noticed in almost 75% of the patients.[9] Results of this study is different from our finding. In present study, patients with any other related factor that can affect cardiovascular system were excluded from this study for better evaluation of the results. Lignocaine can be proved to be a promising drug in specific case patients including hypertensive, older aged patients, pregnant females, cardiac patients and those having contra-indication to other drugs.

CONCLUSION

The hemodynamic stability is only affected in terms of systolic blood pressure, while other parameters are not significantly affected. Intravenous lidocaine prior intubation attenuates systolic blood pressure after intubation laryngoscopy. However, this method is not proving effective to prevent changes in diastolic pressure, pulse rate and MAP in patients of all age groups compared to placebo.

Conflict of interest: Nothing to declare

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