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COMPARISON OF ESMOLOL, LABETALOL AND LIGNOCAINE FOR ATTENUATION OF SYMPATHOMIMETIC RESPONSES TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION

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Abstract

INTRODUCTION: In some individual's suffering from hypertension, coronary artery disease, cerebrovascular disease, myocardial infarction and thyrotoxicosis, these hemodynamic stress responses can turn into life-threatening conditions like left ventricular failure, myocardial ischemia, cerebral hemorrhage, and ruptured cerebral aneurysm. Different drugs like lidocaine, vasodilator agents inhibiting sympathoadrenal response, α-and β-adrenergic blockers, and opioids can be administered prior to tracheal intubation to prevent hemodynamic responses. But higher dose of lignocaine may lead to hypotension, bradycardia, and hypoxia in patients. Due to various effect of these drugs on hemodynamic changes in patients this study was carried out to evaluate the effects of IV esmolol, lignocaine, and labetalol for attenuation of hemodynamic response to laryngoscopy and intubation.

MATERIAL AND METHODS: A total of 90 consecutive patients were included in the study and were grouped in to, lignocaine group, labetalol and esmolol group containing 30 patients each. Age group 21–65 years of either sex or American Society of Anesthesiologists (ASA) Grade I or II scheduled for various general surgical procedures under endotracheal anesthesia were included in this study. Patients excluded were pregnant and lactating women, morbid obesity, and hypertension.

RESULTS: Mean Age in Group 1, group2 and group 3 was 40.38 ± 7.25, 43.8 ± 9.24 and 42.56 ± 8.71 respectively while weight was 62.41 ± 7.32, 63.63 ± 8.11 and 60.74 ± 6.92 respectively. There were 17 male and 13 female in group 1, 19 male and 11 female in group 2 and 16 male and 14 female in group 3. Attenuation of blood pressure was more in labetalol group. Reduction of heart rate in labetalol group was significant. It is seen that Labetalol was more effective at attenuation of diastolic blood pressure among all drugs. Mean arterial pressure was not much reduced lignocaine and esmolol group as compared to labetalol.

CONCLUSION: Haemodynamic alterations are usually observed during laryngoscopy and endotracheal intubation. In our study it was found that as labetalol is a safe and effective drug, for attenuation of sympathomimetic response.

INTRODUCTION

Rigid laryngoscopy and tracheal intubation is still the gold standard in airway management. Hemodynamic changes due are due to sympthoadrenal discharge caused by epipharyngeal and parapharyngeal stimulations[i] which manifest as hypertension, tachycardia, and increase in serum catecholamine and this response is transient occurring 30 seconds after intubation and lasting for less than 10 minutes [ii]. In some individuals suffering from hypertension, coronary artery disease, cerebrovascular disease, myocardial infarction and thyrotoxicosis, these hemodynamic stress responses can turn into life-threatening conditions like left ventricular failure, myocardial ischemia, cerebral hemorrhage, and ruptured cerebral aneurysm [iii],[iv].

Different drugs like lidocaine, vasodilator agents inhibiting sympathoadrenal response, α-and β-adrenergic blockers, and opioids can be administered prior to tracheal intubation to prevent hemodynamic responses[v]. Esmolol is an ultrashort-acting β1 cardio selective β blocking agent with a short half-life of about 9 minutes and this agent is used to reduce the increase in heart rate and blood pressure in response to tracheal intubation[vi]. Labetalol has good response in attenuating the response to laryngoscopy and intubation and also in preventing preoperative cardiovascular event[vii].

Intravenous (IV) lignocaine has showed good result. The mechanism of IV local lignocaine appears to result from an increased threshold for airway stimulation and central inhibition of sympathetic transmission. But higher dose of lignocaine may lead to hypotension, bradycardia, and hypoxia in patients,[viii].

Due to various effect of these drugs on hemodynamic changes in patients this study was carried out to evaluate the effects of IV esmolol, lignocaine, and labetalol for attenuation of hemodynamic response to laryngoscopy and intubation.

MATERIAL AND METHODS

Present study was carried out in the Department of Anaesthesiology at Venkateshwara Institute of Medical Science, Gajraula. A total of 90 consecutive patients were included in the study and were grouped in to, lignocaine group, labetalol and esmolol group containing 30 patients each. Age group 21–65 years of either sex or American Society of Anesthesiologists (ASA) Grade I or II scheduled for various general surgical procedures under endotracheal anesthesia were included in this study. Patients excluded were pregnant and lactating women, morbid obesity, and hypertension.

Patients completeclinical history, airway assessment, systemic examination along with routine blood investigations, chest X-ray, and electrocardiogram (ECG) was carried out. All patients were given 500 ml ringer lactate before starting induction. Blood pressure monitor, pulse oxymeter, 5 leads ECG were connected and basal pulse rate, systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean blood pressure (MBP) were measured and recorded.

Before intubation study drug was given 5 min over 60 s. doses of study drug was esmololHCl 0.5 mg/kg body weight diluted to 10 ml with 0.9% saline was given IV 5 min before intubation over 60 s, labetalol HCl 0.25 mg/kg body weight diluted to 10 ml with 0.9% saline was given IV 5 min before intubation over 60 s and Injection lignocaine HCl 1 mg/kg body weight diluted to 10 ml with 0.9% saline was given IV 5 min before intubation over 60 s.

Readings of hemodynamic parameters were taken before starting study drug and was taken as basal value (BV) and then during laryngoscopy & endotracheal intubation (DL). Three more readings were taken at 1min, 5 min and 10 min of intubation.

Statistical analysis was carried out using SPSS software. Data were presented as mean + standard deviation. Demographic data were analysed for study.

RESULTS

A total of 90 patients were included in the study and randomly divided into 3 groups of 30 patients each Grroup1: lignocaine, Group 2: Labetolol and group 3: Esmolol. Mean Age in Group 1, group2 and group 3 was 40.38 ± 7.25, 43.8 ± 9.24 and 42.56 ± 8.71 respectively while weight was 62.41 ± 7.32, 63.63 ± 8.11 and 60.74 ± 6.92 respectively.

Table 1: Demographic variables in groups

	Group 1 (lignocaine)	Group2 (Labetalol)	Group 3 (Esmolol)
Parameters	Group 1	Group 2	Group 3
Age	40.38 ± 7.25	43.8 ± 9.24	42.56 ± 8.71
Weight	62.41 ± 7.32	63.63 ± 8.11	60.74 ± 6.92

Table 2: Distribution according to gender

Sex	Group 1	Group 2	Group 3	p - value
Male	17	19	16	0.72
Female	13	11	14	

There were 17 male and 13 female in group 1, 19 male and 11 female in group 2 and 16 male and 14 female in group 3. These results were statistically insignificant.

Table 3: Comparison of mean systolic blood pressure in different groups

	Group 1	Group 2	Group 3
Basal value	123.03 ± 6.91	121.94 ± 7.13	120.67 ± 7.01
During laryngoscopy	138.26 ± 12.96	127.64 ± 10.04	132.79 ± 9.68
AI 1	136.57 ± 10.98	124.31 ± 9.17	130.52 ± 8.79
AI 5	134.66 ± 10.25	121.14 ± 6.93	128.16 ± 6.04
AI 10	132.98 ± 11.23	120.06 ± 8.21	126.94 ± 7.19

p - value		
Group 1 vs Group 2	**Group 2 vs Group 3**	**Group 3 vs Group 1**
0.55	0.55	0.19
0.0008	0.0691	0.0477
<0.0001	0.0096	0.0219
<0.0001	0.0001	0.0041
<0.0001	0.016	0.001

In the study groups it is observed that there was statistically significant difference between Lignocaine, labetalol and esmolol after intubation. Attenuation of blood pressure was more in labetalol group.

Table 4: Comparision of mean heart rate in different groups

Recording time	Mean ± SD		
	Group 1	**Group 2**	**Group 3**
Basal value	98.20 ± 10.98	97.69 ± 8.02	97.12 ± 9.87
During laryngoscopy	110.87 ± 9.15	102.87 ± 8.13	109.01 ± 9.34
1 min After intubation	110.03 ± 10.51	100.64 ± 7.84	107.38 ± 8.13
5 min After intubation	104.69 ± 10.72	97.38 ± 6.77	102.9 ± 4.01
1o min After intubation	100.87 ± 8.69	97.54 ± 6.98	100.1 ± 5.99

p - value		
Group 1 vs Group 2	**Group 2 vs Group 3**	**Group 3 vs Group 1**
0.8379	0.6901	0.8069
0.0007	0.0087	0.4391
0.0002	0.0018	0.2792
0.0025	0.0003	0.3952
0.1072	0.1328	0.6909

Among all groups in present study it is found that there was statistically significant difference between Lignocaine, labetalol and esmolol after intubation. Reduction of heart rate in labetalol group was significant.

Table 5: Comparison of mean diastolic blood pressure

Recording time	Mean ± SD		
	Group 1	**Group 2**	**Group 3**
Basal value	80.01 ± 5.71	77.92 ± 3.05	77.25 ± 6.84
During laryngoscopy	93.23 ± 11.63	87.24 ± 8.11	88.46 ± 10.53
AI 1	90.88 ± 12.27	84.92 ± 6.21	87.15 ± 8.24
AI 5	88.17 ± 11.93	84.10 ± 7.03	86.42 ± 6.02
AI 10	86.91 ± 10.35	82.37 ± 9.29	85.66 ± 7.78

p - value		
Group 1 vs Group 2	**Group 2 vs Group 3**	**Group 3 vs Group 1**
0.0823	0.626	0.0951
0.0242	0.617	0.1012
0.0209	0.2413	0.1722
0.1129	0.1751	0.4761
0.079	0.1424	0.599

In present study it is seen that Labetalol was more effective at attenuation of diastolic blood pressure among all drugs.

Table 6: Comparision of mean arterial pressure among different groups

Recording time	Mean ± SD		
	Group 1	**Group 2**	**Group 3**
Basal value	94.65 ± 6.02	93.98 ± 3.84	93.16 ± 5.54
During laryngoscopy	108.77 ± 10.14	101.21 ± 7.77	104.14 ± 8.91
AI 1	107.12 ± 10.59	97.56 ± 6.02	101.98 ± 8.24
AI 5	103.78 ± 11.24	96.31 ± 7.41	100.54 ± 5.11
AI 10	102.22 ± 10.28	95.43 ± 8.21	100.16 ± 7.09

p - value		
Group 1 vs Group 2	**Group 2 vs Group 3**	**Group 3 vs Group 1**
0.6092	0.5079	0.3226
0.002	0.1799	0.06
0.0001	0.021	0.0403
0.0036	0.0152	0.156
0.0064	0.0202	0.37

It is observed that mean arterial pressure was not muchreduced lignocaine and esmolol group as compared to labetalol.

DISCUSSION

Laryngeal and tracheal tissues stimulus causes increase in sympathetic and sympathoadrenal reflex activity[ix]. Lidocaine, vasodilator agents inhibiting sympathoadrenal response, α and β adrenergic blockers, and opioids can be administered prior to tracheal intubation in order to prevent haemodynamic responses[4]. Authors have reporedt the circulatory response to laryngeal and tracheal stimulation in anaesthetized man as tachycardia and increase in arterial blood pressure[x].

In our study baseline parameters were matched in all three groups and didn't show any significant difference after intubation. No significant difference was observed in baseline systolic blood pressure and heart rate.

Our study showed that esmolol, given 5 min before intubation is significantly less effective attenuation of heart rate as compared to labetalol group. In a study by Gupta S et al[xi]. esmolol 2 mg/kg as a bolus dose proved to be effective in attenuating increases in heart rate.

In our study it is observed that there was statistically significant difference between Lignocaine, labetalol and esmolol after intubation. Attenuation of systolic blood pressure was more in labetalol group in concordance to a study where the change in mean SBP was most effectively attenuated by labetalol followed by esmolol, whereas lignocaine showed least attenuation effect among the three study drugs[xii].

Among all groups in present study it is found that there was statistically significant difference between Lignocaine, labetalol and esmolol after intubation. Reduction of heart rate in labetalol group was significant. In a study by Kumar A et.al. it was noted that there was no statistically significant difference between labetalol and esmolol group at different time intervals[xiii].

In present study it is seen that Labetalol was more effective at attenuation of diastolic blood pressure among all drugs. It is observed that mean arterial pressure was not much reduced lignocaine and esmolol group as compared to labetalol. In a study by Kewalramani *et al*., it was observed on comparison of labatelol with dexmedetomidine, that dexmedetomidine better attenuated the sympathomimetic responses to endotracheal intubation and labetalol had maintained the stability of the blood pressure, heart rate response was not attenuated better during laryngoscopy and intubation[xiv].

CONCLUSION:

Haemodynamic alterations are usually observed during laryngoscopy and endotracheal intubation. In our study it was found that as compared to esmolol and lignocaine, labetalol is an safe and effective drug, for attenuation of sympathomimetic response.

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