ORIGINAL RESEARCH

Comparison of low doses of intravenous esmolol, labetalol and lignocaine for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation: An observational study

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ABSTRACT

Background: To compare low doses of intravenous esmolol, labetalol and lignocaine for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation. **Materials & Methods:** Seventy patients of ASA physical status I or II were enrolled. Complete demographic and clinical details of all the patients was obtained. Patients were be randomly allocated into the following groups containing twenty-five patients each:Group receiving esmolol (Group A), Group receiving labetalol (Group B) and Group receiving lignocaine (Group C). Laryngoscopy and endotracheal intubation with appropriately sized tube was done. Readings of hemodynamic parameters were taken at different time intervals. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** While comparing the hemodynamic response at different time intervals, significant results were obtained. Hence; Labetalol was accompanied by minimal attenuation of haemodynamic response in comparison to esmolol and Lignocaine.

Conclusion: Haemodynamic alterations are usually observed during laryngoscopy and endotracheal intubation. Labetalol is an effective and safe drug to be used for attenuation of sympathomimetic responses to endotracheal intubation.

Key words: Esmolol, Labetalol, Lignocaine

INTRODUCTION

Endotracheal intubation is an essential skill to secure a patient's airway as well as provide oxygenation and ventilation. Endotracheal intubation is the process by which a tube is inserted into the trachea. Proficiency at intubation is a requirement for practitioners whose practices put them in an environment in which advanced cardiac life support, pediatric/neonatal advanced life support, and advanced trauma life support skills are used on a regular basis and in which advanced backup (an anesthesia care provider) is not rapidly accessible.[1- 3]

The goal of endotracheal intubation in the emergency setting is to secure the patient's airway and obtain first-pass success. Endotracheal intubation, may cause different hemodynamic responses. Significant tachycardia and hypertension can occur with endotracheal intubation under general anaesthesia. The magnitude of cardiovascular response is directly related to the force and duration of laryngoscopy. Laryngoscopy and tracheal intubation like awful stimuli producing pronounced sympathetic response is manifested as tachycardia and hypertension.[4, 5]

Numerous pharmacological strategies have been formulated to lessen the extent of hemodynamic response to laryngoscopy, including high doses of opioids, local anaesthetics and vasodilating drugs like nitroglycerine. Esmolol is an ultra short-acting intravenous cardioselective beta-antagonist. Labetalol is a combined alpha- and beta-adrenoceptor blocking agent for oral and intravenous use in the treatment of hypertension. Lignocaine is widely used as a local anaesthetic and antiarrhythmic drug.[6- 8]Hence; the present study was conducted for evaluating and comparing low doses of intravenous esmolol, labetalol and lignocaine for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation.

MATERIALS & METHODS

The present study was conducted for evaluating and comparing low doses of intravenous esmolol, labetalol and lignocaine for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation. Fifty patients of ASA physical status I or II were enrolled. Complete demographic and clinical details of all the patients was obtained. Patients were be randomly allocated into the following groups containing twenty-five patients each:

Group receiving esmolol (Group A)
Group receiving labetalol (Group B)
Group receiving lignocaine (Group C)

Laryngoscopy and endotracheal intubation with appropriately sized tube was done. Readings of hemodynamic parameters were taken at different time intervals. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. ANOVA and chi-square test were used for evaluation of level of significance.

RESULTS

The age of the patients in all the three groups varied from 18 to 60 years. Mean age of the patients of group A, Group B and Group C was 42.3 years, 43.1 years and 41.8 years respectively. The difference in the mean age in all the three groups was statistically non-significant (p value = 0.212), hence the three groups were comparable with respect to age distribution. Among the patients of group A, mean SBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation 123.10, 129.81, 132.62, 130.44, 130.71, 127.36, 127.12 and 127.28 respectively. Among the patients of group B, mean SBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 123.47, 125.99, 122.13, 120.13, 121.37, 121.74, 123.12 and 118.12 respectively. Among the patients of group C, mean SBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 122.75, 135.35, 136.12, 136.74, 135.81, 134.98, 133.46 and 132.74 respectively. While comparing the SBP at different time intervals, significant results were obtained. Hence; Labetalol was accompanied by minimal attenuation of SBP in comparison to esmolol and Lignocaine. Among the patients of group A, mean DBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 82.45, 80.12, 79.75, 78.38, 77.76, 74.37, 77.95 and 77.16 respectively. Among the patients of group B, mean DBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 81.46, 92.13, 87.46, 89.42, 88.71, 87.29, 86.12 and 85.94 respectively. Among the patients of group C, mean DBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 81.13, 86.23, 95.74, 96.28, 97.65, 97.77, 85.65 and 84.76 respectively. While comparing the DBP at different time intervals, significant results were obtained. Hence; Labetalol was accompanied by minimal attenuation of DBP in comparison to esmolol and Lignocaine.Among the patients of groupA, mean heart rate baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 95.12, 108.12, 109.84, 106.46, 103.38, 101.42, 99.75 and 97.38respectively. Among the patients of group B, mean heart rate at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation98.13, 101.84, 98.34, 97.46, 96.38, 96.46, 93.29 and 96.12respectively. Among the patients of group C, mean heart rate at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 97.36, 113.39, 112.46, 111.82, 109.12, 107.23, 105.13 and 96.74respectively. While comparing the heart rate at different time intervals, significant results were obtained. Hence; Labetalol was accompanied by minimal attenuation of heart rate in comparison to esmolol and Lignocain.

Table 1: Mean Systolic Blood Pressure (mm Hg)

Time interval	Group A	Group B	Group C	p-value
Baseline	123.10	123.47	122.75	0.12
Immediately after surgery	129.81	125.99	135.35	0.00*
Immediately after intubation	132.62	122.13	136.12	0.00*
One min after intubation	130.44	120.13	136.74	0.00*
Three mins after intubation	130.71	121.37	135.81	0.00*
Five mins after intubation	127.36	121.74	134.98	0.00*
7 mins after intubation	127.12	123.12	133.46	0.00*
10 mins after intubation	127.28	118.12	132.74	0.00*

*One way ANOVA

Table 2: Mean Diastolic Blood Pressure (mm Hg)

Time interval	Group A	Group B	Group C	p-value
Baseline	82.45	81.46	81.13	0.75
Immediately after surgery	80.12	92.13	86.23	0.00*
Immediately after intubation	79.75	87.46	95.74	0.00*
One min after intubation	78.38	89.42	96.28	0.00*
Three mins after intubation	77.76	88.71	97.65	0.00*
Five mins after intubation	74.37	87.29	97.77	0.00*
7 mins after intubation	77.95	86.12	85.65	0.00*
10 mins after intubation	77.16	85.94	84.76	0.00*

*One way ANOVA

Table 3: Heart rate

Time interval	Group A	Group B	Group C	p-value
Baseline	95.12	98.13	97.36	0.75
Immediately after surgery	108.12	101.84	113.39	0.00*
Immediately after intubation	109.84	98.34	112.46	0.00*
One min after intubation	106.46	97.46	111.82	0.00*
Three mins after intubation	103.38	96.38	109.12	0.00*
Five mins after intubation	101.42	96.46	107.23	0.00*
7 mins after intubation	99.75	93.29	105.13	0.00*
10 mins after intubation	97.38	96.12	96.74	0.00*

*One way ANOVA

DISCUSSION

Direct laryngoscopy and endotracheal intubation frequently induce a cardiovascular stress response manifesting as hypertension, tachycardia, and increase in serum catecholamine. These reflex hemodynamic changes are better tolerated in health, but they are greatly exaggerated and detrimental in patients with comorbidities. In susceptible individuals, these hemodynamic stress responses can evoke life-threatening conditions such as left ventricular failure, myocardial ischemia, cerebral hemorrhage, and ruptured cerebral aneurysm etc. Overall timeframe of laryngoscopy and intubation, the type of instruments used, the anesthetic medication employed, and the degree of anesthesia are all variables that impact the severity of cardiovascular alterations.[9- 11]

The age of the patients in all the three groups varied from 18 to 60 years. Mean age of the patients of group A, Group B and Group C was 42.3 years, 43.1 years and 41.8 years respectively. The difference in the mean age in all the three groups was statistically non-significant (p value = 0.212), hence the three groups were comparable with respect to age distribution. Among the patients of group A, mean SBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation 123.10, 129.81, 132.62, 130.44, 130.71, 127.36, 127.12 and 127.28 respectively. Among the patients of group B, mean SBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 123.47, 125.99, 122.13, 120.13, 121.37, 121.74, 123.12 and 118.12 respectively. Among the patients of group C, mean SBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 122.75, 135.35, 136.12, 136.74, 135.81, 134.98, 133.46 and 132.74 respectively. While comparing the SBP at different time intervals, significant results were obtained. Hence; Labetalol was accompanied by minimal attenuation of SBP in comparison to esmolol and Lignocaine. Among the patients of group A, mean DBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 82.45, 80.12, 79.75, 78.38, 77.76, 74.37, 77.95 and 77.16 respectively. Among the patients of group B, mean DBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 81.46, 92.13, 87.46, 89.42, 88.71, 87.29, 86.12 and 85.94 respectively. Among the patients of group C, mean DBP at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 81.13, 86.23, 95.74, 96.28, 97.65, 97.77, 85.65 and 84.76 respectively. While comparing the DBP at different time intervals, significant results were

obtained. Hence; Labetalol was accompanied by minimal attenuation of DBP in comparison to esmolol and Lignocaine.Kumar A et al, authors evaluated the effects of IV esmolol, lignocaine, and labetalol for attenuation of hemodynamic response to laryngoscopy and intubation. A total of 90 consecutive patients were included in the study and were grouped in to, lignocaine group, labetalol (Group 1) and esmolol group (Group 2) containing 30 patients each. 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. Haemodynamic alterations are usually observed during laryngoscopy and endotracheal intubation. In their study it was found that as labetalol is a safe and effective drug, for attenuation of sympathomimetic response.[11]

Among the patients of groupA, mean heart rate baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 95.12, 108.12, 109.84, 106.46, 103.38, 101.42, 99.75 and 97.38respectively. Among the patients of group B, mean heart rate at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation98.13, 101.84, 98.34, 97.46, 96.38, 96.46, 93.29 and 96.12respectively. Among the patients of group C, mean heart rate at baseline, immediately after surgery, immediately after intubation, one min after intubation, three mins after intubation, five mins after intubation, 7 mins after intubation and10 mins after intubation was 97.36, 113.39, 112.46, 111.82, 109.12, 107.23, 105.13 and 96.74respectively. While comparing the heart rate at different time intervals, significant results were obtained. Hence; Labetalol was accompanied by minimal attenuation of heart rate in comparison to esmolol and Lignocaine.In a previous study conducted by Kirankumar H et al, authors evaluated the effects of IV esmolol, lignocaine, and labetalol for attenuation of hemodynamic response to laryngoscopy and intubation. A total of 90 consecutive patients were included in the study and were grouped in to, lignocaine group (Group 1), labetalol (Group 2) and esmolol group (Group 3) containing 30 patients each. 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. Haemodynamic alterations are usually observed during laryngoscopy and endotracheal intubation. In their study it was found that as labetalol is a safe and effective drug, for attenuation of sympathomimetic response.[12]

CONCLUSION

Haemodynamic alterations are usually observed during laryngoscopy and endotracheal intubation. Labetalol is an effective and safe drug to be used for attenuation of sympathomimetic responses to endotracheal intubation.

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