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Attenuation of hypertensive response with esmolol and labetalol in low doses in orotrachealintubation: A comparative study

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ABSTRACT

Background: The golden standard is rigid laryngoscopy and tracheal intubation in airway management. **Aim:** To study efficacy in stress response prevention on laryngoscopy and intubation and to study hemodynamic parameters intraoperatively. **Materials and Methods:** This study was a prospective, randomised, double blinded study which was conducted .**Results:** In both the study groups had similar demographicpro file. During laryngoscopy and intubation, esmolol and labetalol showed rise in heart rate, systolic blood pressure and RPP, whereas the values for MAP and DBP was not statistically significant difference. **Conclusion:** Labetalol is more effective when compared to esmolol in attenuating the sympathomimetic effect of laryngoscopy and intubation in lower doses.

Keywords: Attenuation, Intubation, Laryngoscopy.

Introduction

In airway management, the golden standard is rigid laryngoscopy and tracheal intubation, even though the new airway devices are available in recent years[1].The serious challenges posed by changes of hemodynamic conditions are cardiovascular diseases like hypertension, coronary artery disease, vascular aneurysms. In these patients, sudden changes of hemodynamics may lead to left ventricular failure and myocardial ischemia[2]. Intracranial tumors or cerebral hematomas with decreased intracranial compliance and increased intracranial pressure may collapse[3]. The reflex phenomenon of cardiovascular response to laryngoscopy and intubation with afferent stimuli carried by glossopharyngeal nerve. Norepinephrine causes elevation of blood pressure and epinephrine causes heart rate change[4].

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The role of beta blockers with bradycardia, antihypertensive, antiarrythmic and antiischemic properties in preventing cardiovascular stress response to intubation[5].In patients with co-morbidities, these reflex changes of hemodynamicsare exaggerated and detrimental. To stop the pressor response, many pharmacological attempts were made. Opioids like sodium nitroprusside, fentanyl, alfentanil, nitroglycerine, calcium channel blockers like verapamil, diltiazem, adrenergic blockers like clonidine , volatile inhalational agents, lignocaine intravenously are widely used. In decreasing stress response, intravenous esmolol and labetalol given before operation has shown to be effective. Esmolol has a rapid onset, short duration of action and it is a cardio-selective β1 blocker agent. In cardiac patients, it causes depressor effect on myocardium. In higher doses, Labetalol is an α and β blocker is useful in preventing perioperative undesirable events of cardiovascular thus, resulting in hypotension and bradycardia. This study is a prospective, randomized, double blinded, comparative study of low esmolol versus low labetalol and this study aimed to study efficacy in stress response prevention on laryngoscopy and intubation and to study hemodynamic parameters intraoperatively.

Materials and methods

This study was a prospective, randomised, double blinded study which was conducted in patients undergoing elective surgeries under general anaesthesia. This study was conducted on 50 ASA I patients of either sex undergoing elective surgeries under general anaesthesia. ASA I and 2 patients of either sex between age group of 20-55 years were included in the study. The exclusion criteria was patients who had extremes of age, or who were asthmatic, COPD patients, baseline bradycardia, heart block or who were on beta blockers. Sequentially numbered opaque sealed envelope was used for blinding. Patients were divided into two groups namely group E (Esmolol) and Group L (Labetalol) respectively. Peripheral line was secured with 18 G veinflon after confirming nil per oral status and informed consent was taken from all patients. Intravenous fluid Ringers lactate was started. Blood pressure monitor, electrocardiography and pulse oximeter were connected. Group E received 0.5 mg/kg diluted with 0.9% saline to 10 ml intravenously 3 mins prior to intubation. Group L received 0.25 mg/kg diluted with 0.9% saline to 10 ml intravenously 3 mins prior to intubation. Another anaesthetist was also blinded to the study and the heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), rate pressure product (RPP) was measured preinduction, at induction and at 1,3,5,10 mins post induction. Statistical methods such as mean, standard deviation, paired students 't'test . <0.05 P value was considered significant and <0.01 p value was considered highly significant.

Results

Table 1: Demographic profile, duration of surgery, intubation time

Parameters	Group E(Mean±SD)	Group L(Mean±SD)	P value
Age(Years)	32±5.9	32.5±4.28	0.7589
Weight(Kg)	53.22±2.14	54.12±2.74	0.8741
Height (cms)	160.99±2.22	160.88±1.49	0.7854
Sex (M/F)	13/12	13/12	1
Duration of surgery	94.21±8.64 mins	95.99±7.54 mins	0.8413
Intubation time	10.45±1.44 secs	11±1.74 secs	0.6547

P <0.05value was considered significant *

All demographic parameters are insignificant on comparision between 2 groups.

Table 2: Pulse rate

Pulse rate	Group E(min)	Group L(min)	P value
Pre-induction	84.58±8.22	84.11±12.69	0.852
At incubation	107.37±10.4	96.57±8.22	<0.001*
Post intubation			
1 min	108.98±7.84	99.25±11.47	<0.001*
3 mins	96.82±8.44	90.54±10.74	0.022*
5 mins	92.47±11.64	84.57±10.88	0.014*
10 mins	90.55±10.44	75.97±7.05	<0.001*

P <0.05value was considered significant *

Heart rate is significant difference at the time of intubation and also post intubation.

Table 3: Systolic blood Pressure

Systolic Blood Pressure	Group E(min)	Group L(min)	P value
Pre-induction	122.87±8.98	125.88±9.74	0.076
At incubation	155.21±9.99	141.27±11.99	0.006*
Post intubation			
1 min	157.11±12.77	140.04±6.57	<0.001*
3 mins	136.21±13.87	124.87±14.89	0.002*
5 mins	125.99±8.57	117.89±8.45	0.017*
10 mins	120.88±4.89	111.66±0.69	0.004*

P <0.05value was considered significant *

Systolic blood pressure is significant difference at the time of intubation and also post intubation.

Table 3: Diastolic blood Pressure

Diastolic Blood Pressure	Group E(min)	Group L(min)	P value
Pre-induction	78.17±5.71	80.79±4.98	0.247
At incubation	99.58±5.87	101.45±1.87	0.524
Post intubation			
1 min	95.24±2.54	96.04±3.55	0.217
3 mins	86.54±4..89	88.88±1.47	0.196
5 mins	83.56±47.65	83.98±8.88	0.013*
10 mins	77.11±5.45	78.64±1.27	0.933

P <0.05value was considered significant *
Diastolic blood pressure is significant difference at 5 mins of post intubation.

Table 4: Mean Arterial Pressure

Mean Arterial Pressure	Group E(min)	Group L(min)	P value
Pre-induction	92.38±4.89	95.58±6.21	0.090
At incubation	116.59±3.87	115.87±1.18	0.300
Post intubation			
1 min	115.58±5.74	110.65±5.98	0.041
3 mins	103.23±5.04	100.54±5.79	0.249
5 mins	96.57±2.07	93.67±4.89	0.222
10 mins	92.58±2.84	91.24±4.69	0.114

P <0.05value was considered significant *
Mean Arterial Pressure is not significant any of the periods.

Table 5: Rate Pressure Product

Rate Pressure Product	Group E(min)	Group L(min)	P value
Pre-induction	10150±1489	10428±1778	0.528
At incubation	16528±1239	13694±2089	<0.001
Post intubation			
1 min	17258±3158	13256±1489	<0.001
3 mins	13798±2.141	11358±1787	0.005
5 mins	11852±2147	10789±2014	0.001
10 mins	11478±1897	8945±1789	<0.001

P <0.05value was considered significant *
Rate pressure product is significant in all periods of induction except in ppreinduction.

Discussion

In the present study, during laryngoscopy and intubation, esmolol and labetalol showed rise in heart rate, systolic blood pressure and Rate pressure product so Labetalol is more effective when compared to esmolol in attenuating the sympathomimetic effect of laryngoscopy and intubation in lower doses. Many studies conducted showed same as study done by Suruchi Ambasta et al;[6]it was observed that both the study groups had similar demographic profile. Statistical calculations were done by Instatversion3.10. The study data were analyzed using statistical methods of mean, standard deviation. Esmolol (0.5mg/kg), labetalol (0.25mg/kg) significantly attenuated the rise in heart rate, systolic blood pressure, and RPP during laryngoscopy and intubation. However, the difference was not statistically significant among the values for DBP and MAP. B.Sowbhagya Lakshmi et al;[7] observed that esmolol and labetalol significantly attenuated HR, SBP, DBP during laryngoscopy and intubation ,compared to placebo. Dr. Arti Rathore et al;[8]carried out a study on100healthy adult patients(ASA I and II) undergoing elective surgery under general anaesthesia. The patients were randomly allocated into 4groups of 25 each i.e. A(control),B,C and D receiving ,50mgs,100mgs, 150mgs of esmolol hydrochloride intravenously 2 minutes before intubation. The pulserate, systolic blood pressure, ECG were recorded continuously after giving preanaesthetic

medication till seven minutes after intubation. The study showed that all the doses were effective in blunting the pulse rate response but only the150 mgs proved effective significantly in blunting the blood pressure response. The rate pressure product, a measure of cardiac consumption was also found to be significantly lower in groups C, D.Bon Sebastian et al;[9]observed that groups were well matched for their demographic data. There was a statistically significant difference ($P< 0.05$) between dexmedetomidine and normal saline in heart rate, systolic, diastolic and mean arterial pressures at all time points after tracheal intubation with dexmedetomidine 0.75 μg/kg being most effective. Sedation scores were more with dexmedetomidine. None of the patients had any adverse effects such as hypotension, bradycardia, respiratory depression and fall in oxygen saturation. Sulaiman S et al;[10]observed that the dexmedetomidine group had a better control of hemodynamics during laryngoscopy and endotracheal intubation. Dexmedetomidine at a dose of 0.5 mcg/kg as 10-min infusion was administered prior to induction of general anaesthesia attenuates the sympathetic response to laryngoscopy and intubation in patients undergoing myocardial revascularization. Koju RB et al;[11] observed that there was an increase in systolic blood pressure, diastolic blood pressure, heart rate were significantly lower ($p<0.05$) in esmol group when compared to lidocaine and placebo group but there was no statistical significance ($P>0.05$) between control and lidocaine group after laryngoscopy and intubation.

Conclusion

Labetalol is more effective when compared to esmolol in attenuating the sympathomimetic effect of laryngoscopy and intubation in lower doses.

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