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"A CLINICAL COMPARATIVE STUDY OF ATTENUATION OF HAEMODYNAMIC RESPONSES TO LARYNGOSCOPY AND INTUBATION WITH INTRAVENOUS ESMOLOL OR INTRAVENOUS NITROGLYCERIN IN PATIENTS POSTED FOR SURGERY UNDER GENERAL ANAESTHESIA".

Anaesthesiology

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ABSTRACT

Aim:A prospective,randomized, double-blind,placebo-control study was carried out to compare intravenous Esmolol and intravenous Nitroglycerin for attenuation of haemodynamic changes during laryngoscopy and intubation in patients posted for surgery under general anaesthesia.

Material and Methods: The study was conducted on 90 patients of either sex divided in three groups (30 patients in each group),aged between 15-60 years. In Group C: 50 ml iv infusion of normal saline,Group E:100 micrograms/Kg/ml iv Esmolol infusion and Group N: 0.5 micrograms/Kg/ml iv Nitroglycerin infusion,(both drugs diluted to 50 ml) was given.Infusion in each group was started 5 minutes before induction and continued 5 minutes after intubation.Heart rate,systolic blood pressure,diastolic blood pressure,mean arterial pressure were recorded at 1,3,5 and 10 minutes post intubation and compared among groups.

Results: Esmolol showed highly significant($p<0.001$) fall in heart rate at all time points post intubation. Decrease in SBP,DBP and MAP was more in Nitroglycerin group.

Conclusion: We concluded that Esmolol was more effective in controlling the heamodynamic changes during laryngoscopy and intubation ,since no tachycardia was observed with Esmolol.

KEYWORDS

Esmolol,Nitroglycerin,Haemodynamic responses,Laryngoscopy

INTRODUCTION

Laryngoscopy and intubation leads to rise of heart rate and blood pressure for short period[1]. The haemodynamic changes occured due to sympatho-adrenal activity leading to increase in plasma catecholamines[2]. Haemodynamic response to laryngoscopy and intubation was first described by Reid and Brace in 1940[3].Several drugs have been evaluated to blunt the haemodynamic changes to intubation and laryngoscopy[4,5].

Laryngoscopy and intubation stimulates the receptors in epipharynx and laryngopharynx causing reflex cardiovascular responses which can cause deleterious and sometimes life-threatning effects. Esmolol, an ultra short acting beta -1 blocker has been used in single dose of 0.5mg/kg to blunt cardiovascular response to intubation. Rapid onset, short duration of action[6] (3-4 minutes), short half life (9-10 minutes)makes it suitable for prevention of laryngoscopic responses.

Nitroglycerin attenuate these stress responses by its metabolic product nitric oxide, responsible for vasodilation by activating guanylyl cyclase, leading to increased production of cGMP which causes reduction in release of intracellular calcium and finally vascular smooth muscle relaxation.It acts on venous capacitance vessels and large coronary artery to produce peripheral pooling of blood and decreases cardiac ventricular wall tension.[7,8] due to reduction in venous return, stroke volume and cardiac output, thereby causing hypotension.

MATERIAL AND METHODS

After approval from ethical committee,the study was conducted at Swaroop Rani Nehru Hospital(associated with Moti Lal Nehru Medical College,Prayagraj)over a period of one year.

INCLUSION CRITERIA-Patients giving valid,informed and written consent,aged between 15-60 years,ASA grade Ⅰ/Ⅱ ,not having any co-morbidities and undergoing elective surgeries.

EXCLUSION CRITERIA-Patient refusal,ASA grades Ⅲ or above,having any co-morbidities,pregnancy and obesity.

GROUP ALLOCATION: Patients were randomly allocated and divided into three groups(30 patients in each group) using computer generated random number table.

Group C (Control) - 50 ml normal saline intravenous infusion 5 minutes before induction and continued 5 minutes after intubation[9]

Group E (Esmolol) -100 micrograms/kg/minute intravenous infusion (diluted to 50 ml) 5 minutes before induction and continued 5 minutes after intubation[9]

Group N (Nitroglycerin)- 0.5 micrograms/kg/minute intravenous infusion (diluted to 50 ml) 5 minutes before induction and continued 5 minutes after intubation[9].

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Pre anesthetic evaluation and investigations were done for each patient.

All patients were kept nil per orally from midnight prior to the day of surgery and were received Tablets Ranitidine 150 mg and Alprazolam 0.5 mg in the midnight.

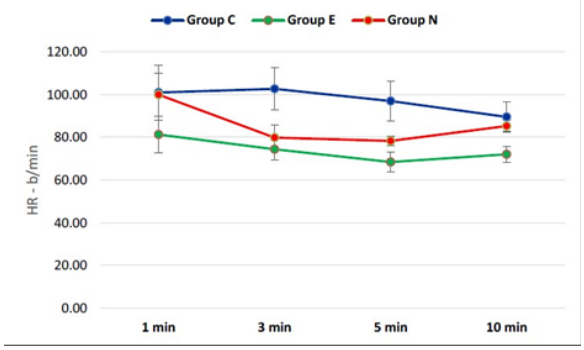
In the pre-operative room two intravenous lines were secured- one for the fluids and drugs and other for study drug.In the operation theatre patients were connected to a non-invasive blood pressure monitoring, ECG and pulse oximeter and systolic, diastolic and mean blood pressures were recorded. The infusion of study drug was started 5 minutes before induction.

Pre oxygenation was done with 100% oxygen for 3 minutes and induction done with intravenous Propofol (2.5 mg /kg)after which intravenous Succinylcholine (2mg/kg) was given, laryngoscopy (duration 15 seconds) and intubation was done.Endotracheal tube was fixed and the patients were put on controlled ventilation,loading dose of intravenous Vecuronium Bromide (0.1mg/kg) was given. Maintainence done by Nitrous oxide: Oxygen=66:33% with intermittent doses of Vecuronium (0.02mg/kg). Antisialogogues and analgesics were avoided. During the study period of 10 minutes following intubation, no stimulus(surgical incision or any drug)was given. Pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure was recorded at 1, 3, 5 and 10 minutes after intubation and infusion was stopped 5 minutes after intubation. Patients were also observed for any adverse effects. At the end of surgery patients were reversed with intravenous Neostigmine (0.05mg/kg) and Glycopyrrolate (0.01mg/kg)and extubated after

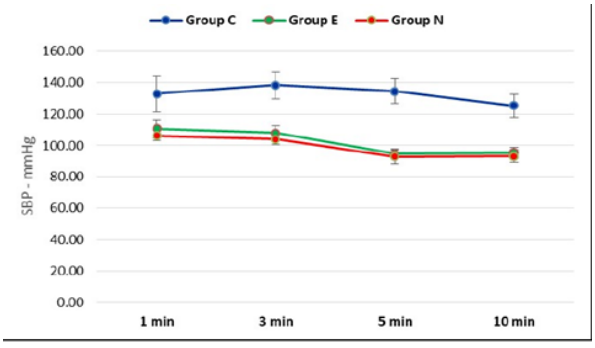
complete clinical recovery and were shifted to post-operative room.

OBSERVATION AND RESULTS

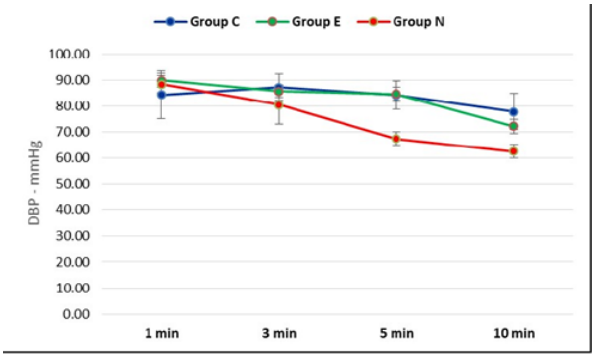
There was no significant difference in age,sex,weight and height of patients among groups.



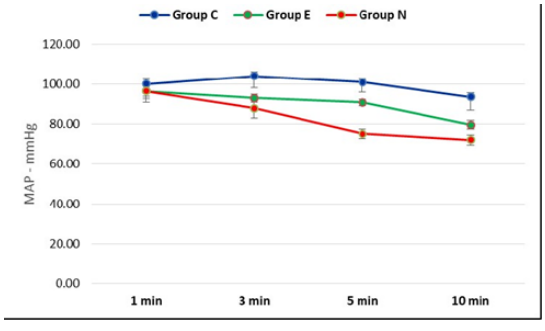
Graph 1-Comparison of mean heart rate



Graph 2-Comparison of mean SBP



Graph 3 -Comparison of mean DBP



Graph 4-Comparison of mean MAP

DISCUSSION

Laryngoscopy and tracheal intubation is one of the main causes of hemodynamic instability. Transient hemodynamic changes may not be of any clinical importance in healthy patients but these changes are undesirable in patients with coronary artery disease ,myocardial insufficiency, hypertension or cerebrovascular disease[10]. **Kayhan Z** and **Aldemir D**[11] showed that the response to laryngoscopy and intubation was associated with rise in plasma catecholamines concentration.

Our study was undertaken to comparatively evaluate the relative effectiveness and safety of two drugs, Esmolol and Nitroglycerin, in attenuating the pressor responses to laryngoscopy and intubaton because of their rapid onset, short duration of action and rapid elimination and termination of action on discontinuation of infusion.

Esmolol group showed significant fall in heart rate at 1 minute after intubation which was below baseline value. At 3,5 and 10 minutes also, significant decrease was noticed in mean heart rate which was below baseline value. These findings were in accordance to the study by **Koju RB and Dongal Y**[12]. The heart rate was significantly low as compared to N group throughtout the study period due to beta -adrenergic blocking effect of Esmolol.

In N group heart rate increased 1 minute after intubation which was maximum. At 3 and 5 minutes heart rate fall down below pre-intubation value and again there was reflex increase in heart rate at 10 minutes which was equal to baseline value. It was due to the fact that during a continuous infusion Nitroglycerin causes a reflexive phenomenon which is the baroreceptor mediated response secondary to hypotension. **Soma Chakraborty et al**[13]have reported similar results with Nitroglycerin infusion at 1 minute post intubation however reflex tachycardia was noticed by them at 5 minutes.

The initial systolic blood pressure was comparable among groups. In N group fall in systolic blood pressure was noticed 1 minute after intubation and significant decrease in SBP was observed at 3 and 5 minutes. Our observation was similar to **Soma Chakraborty et al**[13] at 5 minutes. **Fassoulaki et al**[14] reported no increase in SBP immediately after intubation and there was significant decrease at 3 and 5 minutes which was similar to our observation.

In our study fall in SBP in E group occur at 1,3 and 5 minutes, which was similar to the findings of **SomaChakraborty et al**[13] at 3 and 5 minutes. Reduction in SBP by Nitroglycerin is due to its venodilatory action while Esmolol causes decrease in SBP by reduction in cardiac output by negative chronotropism.

In N group significant rise in diastolic blood pressure was noticed at 1 and 3 minutes after intubation by **Soma Chakraborty et al**[13]. The DBP decreased below pre-intubation value at 5 minute. Our observation was similar to the result of above mentioned authors at 1 minute and 5 minutes after intubation .Also decrease in DBP below baseline was observed by us at 5 and 10 minutes post intubation.

In group E DBP increased following intubation at 1 minute before returning below pre-intubation value at 10 minute in our study. Rise in DBP was significant at 1 minute after intubation. **Soma Chakraborty et al**[13] reported significant rise in DBP at 1 minute and significant decrease at 5 minutes after intubation, these findings were confirmed in our study at 1 minute time point.

In N group mean arterial pressure increased after intubation and was significant at 1 minute. Then MAP started decreasing below the pre-induction value at 3 and 5 minutes following intubation. **Soma Chakraborty et al**[13]observed significant increase in MAP in N group at 1 and 3 minutes after intubation and significant fall was noticed by them at 5 minutes post- intubation. Our result was confirmed in this study at 1 and 5 minutes post intubation. **Gupta et al**[9] noticed that rise in MAP was significant at 3 minutes after intubation but in our study the significant increase occur at 1 minute post intubation and at 3 minutes it falled down below baseline value.

In E group the increase in MAP was maximum at 1 minute post intubation. At 3 minutes the value was near to pre- intubation MAP and at 5 minutes it was below pre-intubation value. The rise in MAP was statistically significant at 1 minute and this finding was confirmed by **Soma Chakraborty et al**[13] and significant decrease at 5 minutes was confirmed by **Singh et al**[10]**.**

No adverse effects were seen in our study related to Esmolol but we encountered episode of consistent tachycardia in two patients belonging to group N throughout the whole observation period and also beyond the study period intraoperatively.

Our study has shown that Esmolol is more effective than Nitroglycerin in attenuation of hemodynamic response to laryngoscopy and intubation.

CONCLUSION

To conclude, both drugs were effective in attenuation of cardiovascular changes during laryngoscopy and intubation,however Esmolol is better than Nitroglycerin since no tachycardia was observed with Esmolol.

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