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A Randomized Study of Esmolol to Attenuate The Hemodynamic Stress Response During Laryngoscopy And Endotracheal Intubation.

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ABSTRACT
INTRODUCTION: *Laryngoscopy and tracheal intubation are noxious stimuli that evoke transient but marked sympathetic response manifesting as an increase in the heart rate, blood pressure, intraocular and intracranial pressure. These changes are seen maximum immediately after intubation and last for 5 to 10 minutes.[1] Topical or intravenous (I.V.) lidocaine, opioids, inhaled anesthetics, vasodilators, calcium channel blockers or adrenergic blockers have been used successfully for decreasing the hemodynamic response to laryngoscopy.*
AIM AND OBJECTIVES: *This study was done to compare the various doses of IV Esmolol in attenuating the haemodynamic stress response to laryngoscopy and endotracheal intubation.*
MATERIALS AND METHODS: *90 ASA I and II patients undergoing elective surgical procedure under general anaesthesia with endotracheal intubation were included in our present study. Patients belonging to age group 22-53 years of both the sexes were included. It is prospective double blind randomized study. The study was approved by the Ethical Committee and was randomly grouped into three groups. Group A (Esmolol 5 mg/kg) 20 patients were given Esmolol 0.5 mg/kg IV 2 minutes before the intubation. Group B (Esmolol 1.0 mg/kg)–20 Patients were given Esmolol 1 mg/kg IV 2 minutes before intubation. Group C (Esmolol 1.5 mg/kg) 20 patients were given Esmolol 1.5 mg/kg IV 2 minutes before intubation.*
STATISTICAL ANALYSIS: *Heart rate, systolic Blood pressure, Diastolic pressure and mean arterial pressure were recorded using MS Excel software and analyzed using STATA software for determining the statistical significance. ANOVA test was used to determine the significance among three groups. Student's 't' test was used to compare the three groups in mean values of various parameters. The P value taken for signification is <0.05.*
RESULTS: *The dose of Esmolol 1.5 mg/kg (Group C) to be more effective in attenuating the haemodynamic responses during laryngoscopy and ET intubation with no major adverse effects when compared to 0.5 and 1.0 mg/kg.*
CONCLUSION: *On taking into consideration the criteria which we chose to study the haemodynamic changes expected, we found that the dose of Esmolol 1.5 mg/kg (Group C) to be effective in attenuating the haemodynamic responses during laryngoscopy and endotracheal intubation with no major adverse effects of Esmolol.*
KEY WORDS: *Intubation, Esmolol, Heart rate*

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I. Introduction

Laryngoscopy and tracheal intubation are noxious stimuli that evoke transient but marked sympathetic response manifesting as an increase in the heart rate, blood pressure, intraocular and intracranial pressure. These changes are seen maximum immediately after intubation and last for 5 to 10 minutes.1 Topical or intravenous (I.V.) lidocaine, opioids, inhaled anesthetics, vasodilators, calcium channel blockers or adrenergic blockers have been used successfully for decreasing the hemodynamic response to laryngoscopy.[2-7] Esmolol is a

water soluble, rapid onset, ultra-short-acting, selective β adrenergic receptor antagonist with proven efficacy to provide hemodynamic stability during laryngoscopy and tracheal intubation.2 It has a half-life of nine minutes.

Esmolol is an ultra-short acting β-1 adrenergic blocker. It has predominant effect on β-receptors and possesses no significant membrane stabilizing activity. It has rapid onset and a short duration of action.

The aim of this study is to do a randomized study of Esmolol to attenuate the hemodynamic stress response during laryngoscopy and endotracheal intubation.

II. Materials And Methods

Sixty ASA I and ASA II patients undergoing elective surgical procedure under general anaesthesia with endotracheal intubation were included in this study after obtaining clearance from institute ethical committee and written informed consent from the patient.

Inclusion criteria:

- Age group 22-53 years,
- Undergoing General anesthesia with endotracheal intubation.
- ASA I and II.

Exclusion Criteria:

- Known allergy or contraindication to Esmolol
- Anticipated difficult airway cases,
- Patients on beta blockers,
- Full stomach patients,
- Emergency cases,
- Prior known case of Hypertension,
- Diabetes,
- Ischemic heart diseases.

Randomization was done using lottery method. Three groups were made with Group A (Esmolol 0.5 mg/kg), Group B (Esmolol 1.0 mg/kg) Group C (Esmolol 1.5 mg/kg). All the patients were admitted and they underwent relevant investigations. Preoperatively written informed consent was obtained from the patient. Complete Blood Count, Bleeding time, Clotting time, Blood Urea and Creatinine, blood sugar, Serum creatinine and electrolytes, X ray Chest, Electrocardiogram. Other relevant investigations were obtained on the basis of the condition of the patient. Anesthesia induction was standardized with the following protocol: Night before surgery, Tab Diazepam 10 mg and Tab Ranitidine 150 mg orally was administered. On the day of surgery All the patients were pre-medicated with Inj. Glycopyrrolate 4µg/kg body weight, intramuscularly 45 minutes before surgery. Monitors were connected after shifting to operation theatre with NIBP, ECG, SpO2. Intravenous line was secured using 18G cannula. Basal pulse rate and blood pressure were recorded. Pre oxygenation was done using 100% Oxygen for 3 minutes. Inj. Fentanyl 2µg/kg iv given three minute prior to induction. Esmolol was taken in a 20 ml syringe and diluted to 20 ml and given as bolus over 15-20 seconds two minutes before intubation. One minute later anesthesia was induced with 2.5% Inj. Thiopentone sodium 5mg/kg intravenously and Inj. Succinylcholine 1.5mg/kg IV given. After satisfying muscle relaxation, the patient was intubated with appropriate size endotracheal tube after doing a proper laryngoscopy within 10-15 seconds. Conditions were prolongation of laryngoscopy time due to difficult intubation, these patients were excluded from the study. Endotracheal tube was secured after confirming bilateral air entry. Heart Rate, Systolic blood pressure, Diastolic blood pressure and Mean arterial pressures were recorded during administration of the study drug, during induction, during intubation, after intubation and following for about 7 minutes after laryngoscopy and intubation for every minute.

III. Results

All the three groups were comparable in relation to age sex and body mass index. Heart rate, Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure. All recorded data were analyzed using SPSS software for determining the statistical significance. ANOVA test was used to determine the significance among three groups. Student's t test was used to compare the two groups on mean values of various parameters. The p-value taken for significance is <0.05. The increase in **Heart rate** in the groups A, B, C were 18%, 12% and 5% respectively. The increase in **Systolic blood pressure** in the groups A, B, C were 32%, 24%, 18% respectively. The increase in **Diastolic Blood pressure** in the groups A, B, C were 27%, 22%,16% respectively. The increase in **Mean arterial pressure** in the groups A, B, C were 29%, 22%,16% respectively.

Variable	Group A	Group B	Group C
Mean arterial pressure	30%	21%	17%
Heart rate	17%	13%	5%
Systolic blood pressure	30%	25%	18%
Diastolic blood pressure	26%	23%	17%

Table 1: Comparison of Variables on the Three Groups

Fig 1 Heart rate:

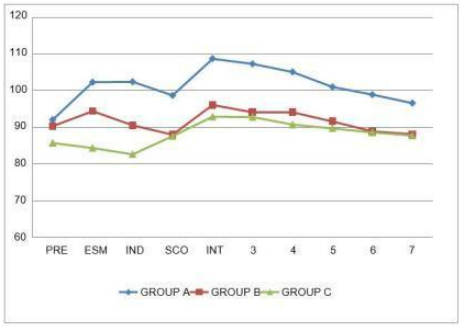


Fig 2 Systolic Blood Pressure:

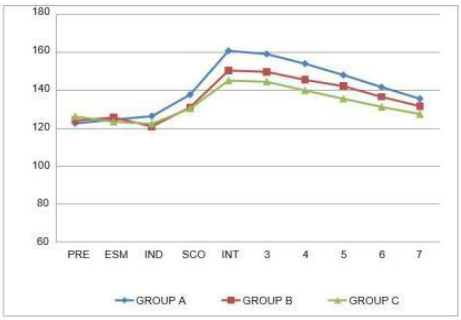


Fig 3 Diastolic Blood Pressure:

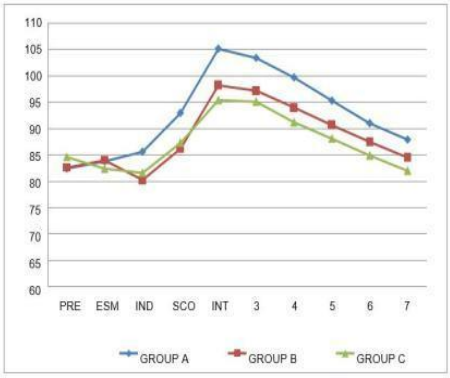
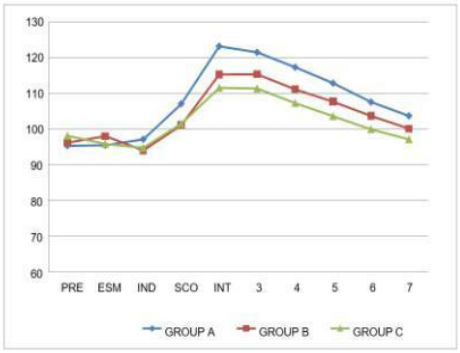


Fig 4 Mean Blood Pressure



IV. Discussion

Vucovic M et al[1], Ebert TJ and Bernstein JS[2], who found that pressor response to laryngoscopy was significantly less marked in patients given Esmolol 2 minutes before intubation which was similar to our timing of drug administration. In our study also we took 2 minute as the time for administering Esmolol prior to laryngoscopy and intubation. Sheppard et al[3], Miller D.R et al[4], Ganbatz C.L et al[5] and Sharma et al[6] compared different bolus dose of Esmolol and concluded that attenuation of intubation response is adequate following 100mg of Esmolol. In our study we found that esmolol 1.5mg/kg is more effective in attenuation of intubation response than esmolol 0.5mg/kg and 1mg/kg. Sharma S, Ghania A[7] also concluded adequate hemodynamic control was obtained with the administration of Esmolol bolus 2mg/kg. In our study it was Esmolol 1.5 mg/kg IV bolus was effective and safe in blunting the response. Wang L et al[8] concluded that 1.2 mg/kg bolus of Esmolol was effective and safe. We also used Esmolol in the range of 0.5 mg/kg to 1.5 mg/kg, which were also safe. Analysis of the length of our study showed that Esmolol 1.5 mg/kg was most effective in attenuating the heart rate response to laryngoscopy and intubation. Also, Esmolol 1.5 mg/kg was effective in attenuating the blood pressure increase accompanying laryngoscopy and intubation.

V. Conclusion

On taking into consideration the criteria which we chose to study the haemodynamic changes expected, we found that the dose of Esmolol 1.5 mg/kg (Group C) to be effective in attenuating the haemodynamic responses during laryngoscopy and endotracheal intubation with no major adverse effects of Esmolol.

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