

Original Research Paper

Anaesthesiology

Comparison of esmolol versus combination of esmolol and fentanyl in preventing cardiovascular stress response to intubation.

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ABSTRACT	Professor and nead of the department of andestnesia 1) PURPOSE OF STUDY:- Laryngoscopy and intubation causes physiological changes like hypertension , tachycardia, which are well tolerated by healthy individuals but not by the patients of coronary artey disease, hypertension, valvular heart disease. Drugs to prevent such responses like metoprolol, calcium channel blockers ,labetalol, gabapentin ,lignocaine were not found fully satisfactorywe decided to study the effects of esmolol alone and the combination of esmolol and fentanyl to prevent the intubation responses. 2) METHODS OF STUDY:- Prospective randomised double blind clinical study on 60 asa grade I/II patients gp 1 inj. Esmolol 2mg/kg iv 5 min prior to induction gp 2 inj.esmolol 2mg/kg and inj.fentanyl 2µg/kg iv 5 min prior to induction 3) MAIN FINDINGS AND RESULTS:- Statistically significant differences were found after induction in following parameters:- • Diastolic blood pressure at 0, 1, 2, 5 min post intubation (p<.0001 p<.0001 p<.0001 p=.0002, • Systolic blood pressure at 0, 1, 2, 510 min post intubation (p<.0001 p<.0001 p<.0011 p=.0110 p=.0377) • Heart rate between 2 groups at 1, 2 min post intubation (p=.0152 p=0040) demographically no significant difference was found in both groups post op. Nausea vomiting group 1(6%) group 2(10%) 4) CONCLUSION: Systolic blood pressure, diastolic blood pressure, mean arterial pressure ,heart rate are better controlled by combination of or gronole and foramy than exercide Japon <	
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KEYWORDS

INTUBATION RESPONSE, TACHYCARDIA, HYPERTENSION, ESMOLOL, FENTANYL

INTRODUCTION:-

Laryngoscopy and intubation violate the patients protective airway reflexes and lead to physiological changes involving various systems of body. A number of responses occur including hypertension, tachycardia ,arrhythmias(King BD et al 1951). These cardiovascular responses may have serious consequences ,including myocardial ischemia, dysrhythmias, pulmonary edema, sudden left ventricle failure, cerebrovascular haemorrhage and at times even cardiac arrest(Bruder N et al).

The magnitude of such responses depend in some part on individual patients, but may be influenced by depth of anaesthesia(king BD et al)and presence or absence of other adjuvant drugs eg.analgesics. These changes are tolerated quite well by healthy patients but not those suffering from coronary artery disease, hypertension, valvular heart disease,stroke.

With this background we planned to conduct a clinical study to evaluate the effectiveness of I.V esmolol 2mg/kg versus combination of I.V esmolol and I.V fentanyl 2µ g/kg single bolus dose given 5 minutes prior to induction in attenuating hemodynamic stress response to laryngoscopy and endotracheal intubation in ASA grade I/II patients undergoing abdominal surgeries under general anaesthesia.

Materials and Methods:-

The prospective randomised double blind clinical study

was conducted in anaesthesiology department ,at tertiary care hospital after ethical committee clearance and obtaining written informed valid consent on 60 cases who were scheduled for abdominal surgery under general anaesthesia. After computer generated randomisation patients were assigned into group I: 30 patients receiving inj. Esmolol 2mg/kg and group II: 30 patients receiving Inj. esmolol 2mg/kg and Inj. Fentanyl 2 µg/kg 5 minutes prior to intubation.

Patients with ASA grade I/II between 20-45 years of age group.weight being 50-70kg were included in the study. all paediatric and geriatric patients, known asthmatic and chronic obstructive pulmonary disease patients, patients with known drug allergy. Patients having baseline bradycardia or heart block and hypertension were excluded from the study.

Study medication:-

Heart rate and blood pressure were measured and ECG lead II and V5 observed.

Premedication given with Inj.midazolam .02mg/kg 5 minutes prior to induction along with study drugs.

Inj Esmolol2mg/kg will be given to group I and Inj.esmolol 2 mg/ kg along with inj.fentanyl 2 μ g/kg to group II 5 minutes prior to induction.

Patient preoxygenated with 100% oxygen.

Induction with inj. Thiopentone sodium 5mg/kg in 15 seconds and inj. Suxamethonium hydrochloride 2mg/kg.

Laryngoscopy followed by intubation done.

Patient maintained on O2+N2O +Halothane+Inj atracurium.

Demographic data:-

In our study both the groups were comparable with respect to demographic data , gender distribution and ASA class distribution surgical procedures , duration of surgery , and no statistically significant difference was observed on group comparison.

Time required for intubation:-

It was comparable in both the groups.

Evaluation of parameters:-

Comparison of baseline haemodynamics parameters:-

Baseline heart rate , systolic blood pressure , diastolic blood pressure , mean arterial pressure in both the groups were comparable.

Comparison of heart rate:-

Heart rate was evaluated 5, 10 minutes before induction, during intubation, 1, 2, 5, 10, 30, 60 minutes post intubation and compared with respective baseline values.

Comparison of systolic blood pressure:-

Systolic blood pressure was evaluated 5, 10 minutes before induction and immediately after induction ,during intubation, 1, 2, 5, 10, 30, 60 minutes post intubation and compared with baseline values.

Comparison of diastolic blood pressure:-

Diastolic blood pressure was measured 5, 10 minutes before induction, immediately after induction, during intubation, 1, 2, 5, 10, 30, 60 minutes post intubation and compared with baseline diastolic blood pressure.

Comparison of mean arterial pressure

Mean arterial pressure was measured 5, 10 minutes before induction, immediately after induction, during intubation and 1, 2, 5, 10, 30, 60 minutes post intubation and compared with baseline values.

Post operative adverse effects:- comparison between two groups for post operative nausea and vomiting.

Statistical analysis:-

The parameters were analysed using student's paired t-test with two tailed distribution. Unpaired t-test with two tailed distribution was used as a test of significance when comparing the two groups at various time points.

Results:-

In group I at 05 and 10 minutes post intubation the heart rate was significantly lower than the baseline 82.47 ± 7.47 Vs 85.47 ± 6.86 (P value <.0001)

In group II at 02, 05, 10 minutes post intubation the heart rate was significantly lower than the baseline 81.40 ± 6.00 Vs 85.27 ± 6.40 (P-< .0001), 79.13 ±6.09 Vs 85.27 ± 6.40 (P -<.0001) 77.50 ±5.87 Vs 85.27 ± 6.40 (P <.0001)

Heart rate was better controlled by combination of esmolol and fentanyl than esmolol alone with statistically significant difference at 01 and 02 minutes post intubation (P value being .0152 and .0040)



In group I at 02, 05, 10 minutes post intubation, the systolic blood pressure was found significantly lower than the baseline 122.0 ± 8.25 Vs 122.9 ± 7.58 , (P value <.0001) 113.3 ± 7.78 Vs 122.9 ± 7.58 (p value <.0001) 105.6 ± 7.53 Vs 122.9 ± 7.58 (p value <.0001) value <.0001)

In group II at 01, 02, 05, 10 minutes post intubation the systolic blood pressure were significantly lower than the baseline..120.4 \pm 11.21 Vs 121.8 \pm 7.29 (p <.0001) 117.1 \pm 7.75 Vs 121.8 \pm 7.29 (p <.0001) 111.5 \pm 8.14 Vs 121.8 \pm 7.29 (p <.0001), 102.6 \pm 8.05 Vs 121.8 \pm 7.29 (p <.0001).

Systolic blood pressure was better controlled by combination of Esmolol and fentanyl than esmolol alone with statistically significant difference at 0, 1, and 02 minutes post intubation.(P value being .0016, .0007, .0211 respectively).



In group I diastolic blood pressure at 05, 10 minutes post intubation was significantly lower than the baseline 71.97 ± 3.70 Vs 74.13 ± 4.69 (p value <.0001), 66.27 ± 3.89 Vs 74.13 ± 4.69 (p value <.0001)

In group II at 02 ,05, 10 minutes post intubation diastolic blood pressure was significantly lower than baseline 72.33 ± 4.44 Vs 73.97 ± 3.24 (p value <.0001) 68.03 ± 4.03 Vs 73.97 ± 3.24 (p value <.0001) 64.03 ± 4.13 Vs 73.97 ± 3.24 (p value <.0001)

Diastolic blood pressure was better controlled by combination of esmolol and fentanyl than esmolol alone with statistically significant difference immediately after induction at 00, 01, 02 and 05 minutes post intubation.(P value being- <.0001, <.0001, <.0001, <.0001, .0002 respectively)



In group I at 5 and 10 minutes post intubation Mean arterial pressure was significantly lower than the baseline 85.70 ± 4.45 Vs 90.27 ± 4.59 (p value <.0001) 79.43 ± 3.87 Vs 90.27 ± 4.59 (p value <.0001)

In group II at 02, 05, 10 minutes post intubation mean arterial pressure was significantly lower than the baseline 87.23 ± 4.86 Vs 88.30 ± 4.19 (p value <.0001) 82.60 ± 4.68 Vs 88.30 ± 4.19 (p value <.0001) p value <.0001) 77.03\pm4.81 Vs 88.30 ± 4.19 (p value <.0001).

Mean arterial pressure was better controlled by combination of esmolol and fentanyl than esmolol alone, with statistically significant difference immediately after induction at 00, 01, 02 05 and 10 minutes post intubation (P value being <.0001, <.0001, <.0001, =.0110, =.0377 respectively).



Post operative nausea and vomiting was found in 10% of the samle size in group II and 6.67% in group I.

Discussion:-

laryngoscopy and intubation are known to cause increase in arterial pressure, heart rate, and may be associated with dysrhythmias. The response is variable and significant.

The changes are well tolerated by healthy individuals. However these changes may be fatal in patients with hypertension, coronary artery disease, stroke or intracranial lesions which may have grave sequel like myocardial ischaemia, dysrhythmias, pulmonary edema, sudden left ventricular failure, cerebrovascular haemorrhages, and at times even cardiac arrest.

Deep anaesthesia, topical anaesthesia, opiods like fentanyl, alfentanyl, remifentanyl, calcium channel blockers, nitroglycerine, clonidine, gabapentin, beta blockers like esmolol, landiolol metoprolol, labetalol etc. Have been tried but none of them can consistently and effectively attenuate these adverse responses, nor are they free from complications.

Cardiovascular stress response to laryngoscopy and intubation is mediated by rise in catecholamines. Therefore sympathoadrenergic drugs having bradycardiac, hypotensive, anti-ischaemic and anti-arrhythmic action found effective in controlling cardiovascular stress response to laryngosopy and intubation.

Anaesthetist have employed multitude of regimens to block the afferent and efferent limbs responsible for the hemodynamic responses to intubation of trachea. Fentanyl in a dose greater than or equal to 5µg/kg has been reported to be effective but such dose may lead to excessive sedation, apnoea, and chest wall rigidity preoperatively and to nausea, vomiting, and respiratory depression postoperatively. While agents such as esmolol avoids these complications. We postulated that fentanyl modulation of nociceptive input and esmolol blockade of adrenergic receptors should enable their combination to provide effective blunting of response to intubation ,while minimizing the undesirable effects of larger doses of each agent alone.

With this background we planned to conduct a prospective, randomised, double blind, comparative clinical study to evaluate the effectiveness of intravenous esmolol 2µg/kg versus combination of esmolol 2µg/kg and intravenous fentanyl 2µg/kg single bolus dose given 5 minutes prior to induction in attenuating hemodynamic stress response to laryngoscopy and endotracheal intubation in ASA grade I/II patients undergoing abdominal surgeries under general anaesthesia.

We used $2\mu g/kg$ of fentanyl intravenously 5 minutes before induction; considering its peak action being at 5 minutes after its administration.

Patients in our study were induced with thiopentone sodium 5mg/kg and suxamethonium hydrochloride 2mg/kg as it does not affect the pressor response to intubation while other inducing agent(like propofol and ketamine) affect the same.

Heart rate, systolic, diastolic and mean arterial pressure recorded 10 minutes, 5minutes before induction, immediately after induction, during intubation(0 minutes) and 01,02,05 and 10 minutes post intubation readings were taken to know hemodynamic status. Also, 30 and 60 minutes post intubation readings were taken to know the hemodynamic status. King BD et al (1951) observed the onset of pressor response within 5 to 15 seconds of elevating the epiglottis during laryngoscopy and returning at the end of 5 minutes. Bruder N et al(1992) observed that the response lasts for 5 to 10 minutes. Hence we monitored the parameters till 10 minutes after intubation.

The cardiovascular response to the act of tracheal intubation is a reflex phenomenon with the afferent stimuli carried over both glossopharyngeal and vagal pathways. Such stimuli activate suprasegmental and hypothalamic sympathetic centres to cause peripheral sympathoadrenal response with release of adrenaline and noradrenaline(Brustein et al 1950). Esmolol and fentanyl do not decrease the release of catecholamine but attenuate responses of elevated catecholamines following laryngoscopy and intubation.

Surgery was started after 10 minutes of intubation so further values were not considered in relation to cardiovascular stress response to intubation.30 minutes and 60 minutes post intubation reading in group I were -1.39% and 14.74% and in group II were -4.82% and -16.69; showed heart rate being significantly lower than baseline indicating controlled hemodynamic status.

In our study there was no significant difference in systolic blood pressure 5 minutes before induction and immediately after induction in both groups.the percentage change in systolic blood pressure with respect to baseline in esmolol group was -0.81% and for esmolol and fentanyl group was -0.68% at 5 minutes before induction (p= 0.5803). Immediately after induction it was -8.36% in esmolol group and -9.61% in group II which was statistically not significant. After intubation in esmolol group it was 7.98% and in group II 3.34% which was statistically significant. Bruder N et al(1991) stated a marked cardiovascular response to laryngoscopy and intubation without any preventive medication. Thus in our study both groups significantly attenuated the increase in systolic blood pressure during intubation; but group II was significantly more effective than esmolol alone at 00 minute and 01 minute post intubation.

There was no significant difference in diastolic blood pressure 5 minutes before induction in both groups. The percentage change in diastolic blood pressure with respect to baseline in group I was .72% and for group II was -0.14% at 5 minutes before induction which was statistically not significant. Immediately after induction it was -7.28% in group I and -13.79% in group II which was statistically significant. After intubation in group I it was 17.31% and in group II it was 6.80% which was statistically significant.

There was no significant difference in mean arterial pressure 5 minutes before induction in both the groups. The percentage change in mean arterial pressure with respect to baseline in group I was -1.65% and for group II was -0.05% at 5minutes before induction which was statistically not significant. Immediately after induction it was -7.77% in group I and -11.68% in group II which was statistically significant. After intubation in group I itwas 13.08% and in group II it was 7.17% which was statistically significant.

Rate pressure product was also calculated at intubation and in both the groups and it was 12169±1320 (mean ± SD) in group I versus 11439±906.9 in group II which was statistically significant. At 1 minute post intubation it was 11880±1437 in group II which was statistically significant.

In our study two patients in group I and three patients in group II developed post operative nausea and vomiting. Due to less sample size and low incidence it could not be commented that whatever the incidence of nausea and vomiting was due to study drugs or due to anaesthetic agents.

Conclusions:- In our study we conclude that combination of esmolol and fentanyl blunts the cardiovascular stress response more effectively than esmolol alone.

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