ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 03 | March - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVALUATION OF DEGREE OF HAEMODYNAMIC STRESS ATTENUATION PRODUCED BY COMBINATION OF LIDOCAINE AND ESMOLOL VERSUS LIDOCAINE OR ESMOLOL ALONE DURING LARYNGOSCOPY AND INTUBATION

Anaesthesiology

Dr. S. Sekar	M.D, Associate professor of anaesthesiology, Government Virudhunagar medical college hospital, Virudhunagar
Dr. B. Velmurugan*	M.D DA, Associate professor of anaesthesiology, Government Sivagangai medical college hospital, Sivagangai *Corresponding Author
Dr. R Anitha	M.D, Assistant surgeon, Kattumanarkoil Government hospital

ABSTRACT

Direct laryngoscopy and endotracheal intubation frequently induces a cardiovascular stress response that is characterized by hypertension and tachycardia due to reflex sympathetic simulation and an increase in serum catecholamines. Study was planned to evaluate the safety and efficacy of esmolol and lidocaine in attenuating the cardiovascular stress responses to laryngoscopy and intubation and to assess whether combination of drugs is more effective than either drug alone. 90 Patients were randomly assigned by computer based randamozised number into three groups, esmolol group(group E), lidocaine group(group L) and combination group (group LE).In the operation theatre ,all the patients were secured with 18 G IV line and started on intravenous fluids. Standard monitors were attached. Pulse rate, Blood pressure and SpO2 were recorded continuously. All patients received premedication Inj. Glycopyrolate 0.2mg & Inj. Fentanyl 2mcg/kg. Induction was with Inj. Thiopentone sodium 5mg/kg and paralysed with Inj. Vecuronium 0.5mg/kg. Group E received normal saline 5ml 3 minutes prior & esmolol 2mg/kg made as 10ml 90 seconds prior to intubation. Group L received lidocaine 1.5mg/kg made into 5ml 3minutes prior & normal saline 10 ml 90seconds prior to intubation. Group LE received lidocaine 1mg/kg as 5ml 3minutes prior & esmolol 1mg/kg as 10ml 90 seconds prior to intubation. we can conclude that combination of esmolol and lidocaine is a safe & effective that can be used in patients undergoing general anaesthesia to attenuate the laryngoscopy responses to both intubation and extubation , thereby reducing the myocardial oxygen consumption and perioperative risk of myocardial ischemia.

KEYWORDS

Anaesthesia, Lidocaine, Esmolol, Intubation .

INTRODUCTION

Direct laryngoscopy and endotracheal intubation frequently induces a cardiovascular stress response that is characterized by hypertension and tachycardia due to reflex sympathetic simulation and an increase in serum catecholamines. The response is transient occurring 30 sec after intubation and lasting for less than 10 min. It may be hazardous in patients with hypertension, myocardial infarction, and other comorbidities. Various pharmacological approaches have been used to attenuate the pressure responses to laryngoscopy and tracheal intubation. The sympathoadrenal response to laryngoscopy result in an increase in cardiac workload which in turn may culminate in perioperative myocardial infarction and acute heart failure in susceptible patients. Perioperative myocardial infarction is one of the cause of postoperative morbidity and mortality due to hypertension and tachycardia. Control of the heart rate and blood pressure response to endotracheal intubation is essential in preventing adverse cardiovascular outcomes, as rate pressure product (RPP) acts as an indicator of oxygen demand by the heart at the onset of ischemia . The mechanical stimulation of four different areas of upper respiratory tract viz. nose, epipharynx, laryngopharynx and the tracheobronchial tree induces reflex cardiovascular responses . These stress responses are seen because of stimulation of epipharynx and laryngopharynx and least with tracheobronchial stimulation. The sensory afferents from the epipharynx and laryngopharynx are carried by glossopharyngeal nerve, while trigeminal and vagus nerves carry sensations from tracheobronchial tree. This results in enhanced neural activity in the cervical sympathetic afferent fibers. These afferent fibers activate vasomotor centre which ends in reflex cardiovascular responses in the form of tachycardia, hypertension and cardiac dysrrhythmias and laryngobronchial spasm. Laryngovagal stimulation causes bradycardia, laryngosympathetic stimulation leads to hypertension and tachycardia. Laryngospinal stimulation leads to hypotension and splanchnic reflexes. The aim is to protect the heart from noxious stimulation arising as a result of laryngoscopy and intubation. The normal patients usually tolerate this increased sympathetic response but patients having valvular heart disease, coronary artery disease, aortic aneurysms, recent myocardial infarction and cerebral aneurysms or intracranial hypertension require careful hemodynamic control during laryngoscopy, intubation, extubation, skin incision and surgical manipulations. The rise in heart rate, systolic and diastolic blood pressure, mean arterial pressure are highly undesirable in such patients.

AIM

To evaluate the safety and efficacy of esmolol and lidocaine in attenuating the cardiovascular stress responses to laryngoscopy and intubation and to assess whether combination of drugs is more effective than either drug alone.

METHODS AND MATERIALS

A double blinded prospective randomized study involving 3 study groups was planned and the institutional ethical committee approval for the study was obtained. The informed written consent was obtained from the patients participating in the study. Sample Size: In order to detect a 10% difference in heart rate and blood pressure, with beta error of 80% (0.8), the sample size was calculated as 30 in each group with a total of 90.

Based on inclusion and exclusion criteria, 90 patients who gave written consent were included in this study. Selected patients were divided randomly by computer based randomized number into into three groups – either to receive lignocaine 1.5 mg/kg (n=30) or esmolol 2mg/kg (n=30) or lignocaine 1mg/kg and esmolol 1mg/kg (n=30)

- DESIGN OF STUDY: Prospective Randomized double blinded Study

Inclusion Criteria

a) Elective surgeries under general anaesthesia
b) Both sexes
c) Age :18-45 years
d) ASA I& II

Exclusion Criteria

1. Patients with contraindications to beta blockers like bronchial asthma, COPD
2. Basal heart rate <60 bpm
3. Basal systolic blood pressure < 100 mmHg
4. Heart block ,any ECG abnormalities
5. Acute decompensated heart failure
6. Peripheral vascular disease
7. Patients on respiratory or cardiac medications
8. Patients with uncontrolled systemic illness
9. Patients with significant organ dysfunction
10. Patients with respiratory compromise
11. Patients with known allergies to local anaesthetics

METHODOLOGY

90 Patients were randomly assigned by computer based randamozised number into three groups, esmolol group(group E), lidocaine group(group L) and combination group (group LE).In the operation

theatre ,all the patients were secured with 18 G IV line and started on intravenous fluids. Standard monitors were attached. Pulse rate, Blood pressure and SpO2 were recorded continuously. All patients received premedication Inj. Glycopyrolate 0.2mg & Inj. Fentanyl 2mcg/kg. Induction was with Inj. Thiopentone sodium 5mg/kg and paralysed with Inj. Vecuronium 0.5mg/kg. Group E received normal saline 5ml 3 minutes prior & esmolol 2mg/kg made as 10ml 90 seconds prior to intubation. Group L received lidocaine 1.5mg/kg made into 5ml 3minutes prior & normal saline 10 ml 90seconds prior to intubation. Group LE received lidocaine 1mg/kg as 5ml 3minutes prior & esmolol 1mg/kg as 10ml 90 seconds prior to intubation.

PARAMETERS TO BE MONITORED

The Following Parameters Are Assessed

- Mean heart rate
- Systolic BP
- diastolic BP
- Mean arterial pressure
- Rate pressure product index

The recorded parameters were entered in master chart and compiled in Microsoft Excel.

STATISTICAL TOOLS TO BE APPLIED

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer by using SPSS 16 software.Using this software, 'p' values were calculated through One way ANOVA and chi square test for consolidated data to test the significance of difference between variables.

RESULTS

There were no significant differences between the groups with respect to age, preoperative heart rate & blood pressure. Males and females were almost evenly distributed between the two groups. After administration of the test drugs, all three groups had significant decrease of heart rate values (Group E 60.03 ± 5.33, Group L 72.15 ± 8.04, Group LE 71.10 ± 7.49) ($p<0.001$). Four patients of Group E developed bradycardia. (HR <60). Although near baseline values was observed in Group LE and Group L, Group L shows near baseline value until the 3rd minute but Group LE shows sustained decrease in heart rate values. After 30 minutes, the heart rates of all the three groups was statistically insignificant.

In all three Groups the systolic, diastolic, and thereby mean arterial blood pressure decreases progressively following induction and administration of the test drugs($p<0.001$). (For systolic blood pressure Group E 96.25 ± 11.3, Group L 124.83 ± 4.96, Group LE 115.27 ± 5.54) (For diastolic blood pressure Group E 60.03±5.33, Group L 82.93± 8.31, Group LE 72.03 ± 8.74) (For mean arterial pressure Group E 72.10 ± 4.98, Group L 96.90 ± 6.12, Group LE 86.44 ± 6.11) .Patients in Group E had significant decrease in systolic, diastolic and mean arterial blood pressure(less than 20% of baseline) before intubation. Near base line blood pressure values was observed in Group LE following intubation till the 30th minute($p<0.001$). While Group E shows sustained decrease in all the three blood pressure values after intubation till 5th minute. At the 15th and 30th minute the blood pressures of Group E was also near base line. Group L shows significant increase in all the three blood pressures till the 15th minute.After 30 minutes, the systolic blood pressure, diastolic blood pressure and mean arterial blood pressure of all the three groups was statistically insignificant. In Group LE rate pressure product, which is an indicator of myocardial oxygen consumption did not overshoot the baseline value during laryngoscopy and intubation. Whereas in Group E, rate pressure product was significantly below the baseline because of reduction in heart rate and blood pressure. Whereas in group L, rate pressure product was significantly high above baseline leading to increased myocardial oxygen consumption.

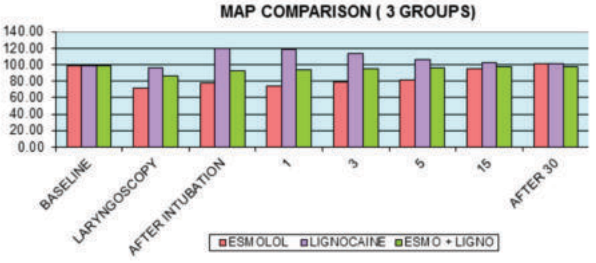

Figure No 1: Mean Arterial Pressure Comparision

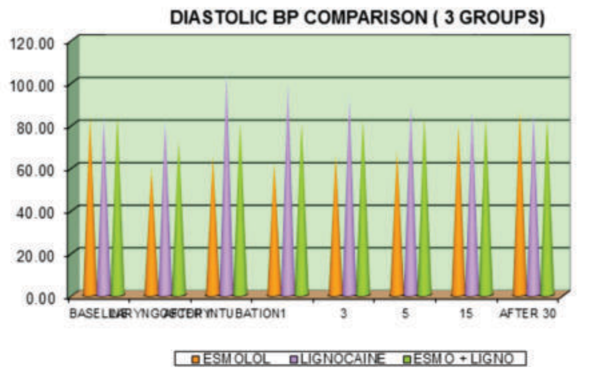

Figure No 2: Diastololic Blood Pressure Comparision

DISCUSSION & CONCLUSION

One of the most painful stimulation for a patient undergoing surgery under general anaesthesia is laryngoscopy and endotracheal tube insitu responses. This causes a major hemodynamic changes in the form of increasing heart rate and systolic blood pressure. This is usually tolerated by healthy young adult. But as age increases, changing vascular tone, existing co morbidities make it detrimental to the patient as these hemodynamic changes are usually met with increased oxygen demand, which if not met will lead to development of myocardial ischemia . Beta adrenergic receptor antagonist binds selectively to these receptors and interfere with the ability of catecholamines or other sympathomimetics to provoke responses on the heart and smooth muscles of the airway and blood vessels Lidocaine delays the rate of spontaneous phase 4 depolarization by preventing or diminishing the gradual decrease in potassium ion permeability that normally occurs during this phase. The effectiveness of lidocaine in suppressing haemodynamic stress response reflects its ability to decrease the rate of spontaneous phase 4 depolarization. Esmolol at a dose of 2mg/kg causes a greater fall in heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and rate pressure product well below the baseline. Incidence of hypotension and bradycardia were with this group. Lignocaine at a dose of 1.5 mg/kg reduces heart rate without much affecting other parameters like systolic blood pressure, diastolic blood pressure, mean arterial pressure and rate pressure product. Only the combination of drug lignocaine 1mg/kg and esmolol 1mg /kg maintained the haemodynamic parameters near the baseline during laryngoscopy . immediately after intubation , 1, 3 & 5 minutes after intubation. Christoph H. Kindler,et al. in this study concluded, esmolol and combination group is reliably effective in attenuating HR response to tracheal intubation whereas the lignocaine group does not affect the heart rate. Neither the esmolol nor that of lidocaine affected the Bp response. Only the combination of esmolol and lidocaine reduces the systolic blood pressure. Harbhej Singh et al. in his study concluded, Lidocaine and nitroglycerin were ineffective in controlling the acute hemodynamic response following laryngoscopy and intubation. Esmolol was significantly more effective than either lidocaine or nitroglycerin in controlling the HR response to laryngoscopy and intubation. Esmolol also was significantly more effective than lidocaine in minimizing the increase in MAP.M. Andrew Levitt et al. in his study concluded, Esmolol and lidocaine have similar efficacies to attenuate moderate hemodynamic response to intubation of patients with isolated head trauma. Sanjeev Singhet al. in his study concluded prophylactic therapy with esmolol is more effective and safe for attenuating cardiovascular responses to laryngoscopy and tracheal intubation compared to lidocaine in a black population.Hence from the above mentioned data in our study, we can conclude that combination of esmolol and lidocaine is a safe & effective that can be used in patients undergoing general anaesthesia to attenuate the laryngoscopy responses to both intubation and extubation , thereby reducing the myocardial oxygen consumption and perioperative risk of myocardial ischemia. Drawbacks of the study are small sample size which could preclude the identification of other confounding factors and also evaluation of possible adverse events which might be relatively infrequent.

REFERENCES

1. Kindler, C. H., Schumacher, P. G., Schneider, M. C., & Urwyler, A. (1996). Effects of intravenous lidocaine and/or esmolol on hemodynamic responses to laryngoscopy and intubation: A double-blind, controlled clinical trial. Journal of Clinical Anesthesia, 8(6), 491496. https://doi.org/10.1016/0952-8180(96)00109-2
2. Levitt, M. A., & Dresden, G. M. (2001). The efficacy of esmolol versus lidocaine to attenuate the hemodynamic response to intubation in isolated head trauma patients.

Academic Emergency Medicine, 8(1), 1924. https://doi.org/10.1111/j.1553-2712.2001.tb00541.x
3. Singh, H., Vichitvejpaisal, P., Gaines, G. Y., & White, P. F. (1995). Comparative effects of lidocaine, esmolol, and nitroglycerin in modifying the hemodynamic response to laryngoscopy and intubation. Journal of Clinical Anesthesia, 7(1), 58. https://doi.org/10.1016/0952-8180(94)00013-T
4. Singh, S., Laing, E., Ansah Owiredu, W. K., & Singh, A. (2013). Comparison of esmolol and lidocaine for attenuation of cardiovascular stress response to laryngoscopy and endotracheal intubation in a Ghanaian population. Anesthesia: Essays and Researches, 7(1), 83. https://doi.org/10.4103/0259-1162.114008
5. Tamaskar, A., Bhargava, S., Rao, M., Bhargava, S., & Singh, M. (2015). Effect of Esmolol hydrochloride on attenuation of stress response during laryngoscopy and intubation in ear , nose and throat (ENT) procedures, 3(11), 13701377.
6. Vucevic, M., Purdy, G. M., & Ellis, F. R. (1992). Esmolol hydrochloride for management of the cardiovascular stress responses to laryngoscopy and tracheal intubation. British Journal of Anaesthesia, 68(5), 529530. https://doi.org/10.1093/bja/68.5.529