ORIGINAL ARTICLE

Comparison of Esmolol and Lignocaine for Atttenuation of Cardiovascular Stress response to Laryngoscopy and Endotracheal Intubation

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Abstract

Direct laryngoscopy and endotracheal intubation frequently induces a cardiovascular stress response due to reflex symbathetic stimulation. This response may be hazardous in patients with Hypertension, Coronary artery disease, Myocardial disease, cerebrovascular disease. Numerous agents have therefore been utilized to blunt this response. The present study was undertaken in view of above mentioned facts, to compare effectiveness of intravenous esmolol and lignocaine in suppressing the cardiovascular stress response. Patients were divided in to three groups of 20 patients each. Group-C did not receive any drug under study. Group-L received lignocaine and Group-E received esmolol three minutes before intubation. All the groups were observed for changes in haemodynamic parameters i.e. heart rate (HR) systolic and diastolic blood pressure every minute after intubation till 5 minutes post intubation. It was found that patients given esmolol had better attenuation of stress response to laryngoscopy and intubation than patients given lignocaine.

KeyWords

Endotracheal Intubation, Cadiovascular stress response, Lignocaine, Esmolol

Introduction

Direct laryngoscopy and endotracheal intubation frequently induces a cardiovascular stress response characterized by hypertension and tachycardia due to reflex sympathetic simulation. The response is transient occurring 30 seconds after intubation and lasting for less than 10 minutes (1). It may be well tolerated in healthy people, but may be hazardous in patients with hypertension, coronary artery disease, cerebrovascular disease, myocardial infarction and thyrotoxicosis (2). Numerous agents like opiods, calcium channel blockers, Blockers, magnesium sulphate and local anaesthetics etc. have been used to blunt it (3,4,5).Several studies have looked at the efficacy of intravenous lignocaine as an agent to blunt the haemodynamic response to laryngoscopy and intubation (6,7). Abou-Madi *et al*(8) found intravenous lignocaine(1.5mg/kg) 3 minutes before laryngoscopy as the optimal dose for attenuating the 'response.However Miller *et al* (9) found no benefit of intravenous lignocaine (1.5 mg/kg) administered 1, 2 or 3 minutes before laryngoscopy. Out of the various blockers esmolol is an attractive option because of its cardioselectivity and ultra short duration of action (9 minutes) (10). Hence,the present study was undertaken to compare the effectiveness of intravenous esmolol and lignocaine for attenuation of stress response to laryngoscopy and endotracheal Intubation.

Material and Method

60 ASA Grade I & II patients of either sex in the age group of 20-40 years for elective non cardiac surgery were included in the study. *Exclusion Criteria*- Heart rate <70/mt., basal systolic BP<100mm Hg, H/o of asthma, cardiac disease & presence of heart block. Preanaesthetic preparation - Patients were fasted overnight and sedated with tablet alprazolam 0.25mg orally at bed time. On the day of surgery Inj. Glycopyrolate 0.2 mg I/m and Inj. Tramadol 1mg/kg body weight I/m given

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half hr before surgery.Patients were randomly allocated to 3 groups of 20 each using permuted block randomization. ***Group-C:*** Patients did not receive any of the drugs.***Group-L:***Patients were administered preservative free intravenous lignocaine (1.5mg/ kg of 2% soln) 3minutes before intubation.***Group-E:***Patients received intravenous esmolol (1.5mg/kg of 1%/ soln) 3mintes before intubation.

Anesthetic Technique:-On the operation table intravenous line was started and ECG, NIBP& SPO2 monitors were applied. Baseline parameters i.e. heart rate(HR), systolic blood pressure (SBP),and diastolic blood pressure (DBP) were noted before administration of drugs. After preoxygenation for 3 minutes; precalculated doses of lignocaine and esmolol were given intravenously slowly in group L and E respectively. Patients were induced with interavenous Injection of thiopentone sodium (5mg/kg) one minute after receiving lignocaine or esmolol. This was followed by interavenous Succinylcholine (1.5mg/kg) to facilitate intubation. Total duration of laryngoscopy was noted.Patients whose total duration of laryngoscopy was more than 30 seconds were excluded from the study. Anesthesia was maintained with O2+ N2O+ Halothane + Inj Pancuronium. At the end of surgery patients were reversed with intravenous Injection of Neostigmine 0.05mg/kg and Glycopyrolate 0.01mg/kg and extubated. Parameters like heart rate , systolic blood pressure & diasystolic blood pressure were noted at 1minute interval upto 5minute after intubation and then at 5 minute interval.

Statistical Analysis

The data was analysed using Microsoft Excel, and SPSS 10.0 for windows. Haemodynamic variables were represented by mean ± SD. Statistical significance in mean difference was assessed by the use of One way analysis of variance. Tukey's HSD was applied to evaluate inter group comparisons. A p value of < .05 was considered as statistically significant.

Results

All 3 groups were comparable in demographic profile and baseline blood pressure and heart rate values (*Table-1*). Immediately after intubation and further on there was statistically insignificant (p>0.05) increase in heart rate in group-C as compared to group-L but difference was statistically significant when compared to group E and the difference remained significant till 2 minutes after intubation. Inter group comparison of group - L and group - E shows a greater attenuation of heart rate response in group - E which is significant till 1 minutes post intubation (*Table II*).

After intubation the attenuation of increase in Systolic blood pressure in group - E was statistically significant as compared to group - C and then it remained significant till 1 min after intubation. The increase in Systolic blood pressure in group - L was also statistically significant as compared to group - E and it remained significant till 2 min. after Intubation (*Table III*).Similarly after intubation there was statistically significant (P<0.001)attenuation of Diastolic blood pressure in group - E as compared to other groups and remained attenuated till 2 minutes after intubation, however the attenuation in group - L was statistically insignificant as compared to group- C (*as shown in Table IV*).

Disscussion

The precise mechanism which leads to the haemodynamic response to laryngoscopy and intubation probably involves intense sympathetic discharges caused by stimulation of epipharynx and laryngopharynx (1). Hassan (11) concluded that during laryngoscopy and endotracheal intubation placing of tube through the cords and inflating the cuff in infraglottic region contributes significantly to sympathoadrenal response caused by supraglotic stimulation. Age may be an important factor influencing cardiovascular response to tracheal intubation. Ismail (12) observed exaggerated increase in Systolic blood pressure following laryngoscopy and intubation in elderly and middle aged patients as compared to young. This may be due to variation in balance between

Table.1 Demographic and Baseline Haemodynamic Characteristics

Demographic & Haemodynamic Characteristics (Mean±SD)	Group C (n =20)	Group E (n = 20)	Group L (n = 20)	
Age (yrs.)	30.8 ± 7.1	32.8 ± 6.6	31.55 ± 5.3	N.S
Weight (Kg)	53.9 ± 7.2	53.3 ± 8.5	55.5 ± 5.1	N.S
Male: Female*	1:3	1:3	1:2.3	N.S
HR/ minute	80.09 ± 6.05	79.45 ± 5.77	79.35 ± 6.10	N.S
MAP mm Hg	93.9 ± 5.9	94.5 ± 5.1	94.7 ± 6.2	N.S
Systolic BP mm Hg	125.05 ±7.8	125.4 ± 7.4	126.75 ± 8.9	N.S
Diastolic BP mm Hg	78.35 ± 4.9	77.85 ± 5.5	78.75 ±5.9	N.S

*ANOVA & Chi square test**

Table.2 Changes in Heart rate (HR) at Varying Time Interval After Intubation

Time	Group C Mean ± SD	Group E Mean ± SD	Group L Mean ± SD	Statistical * Inference	Inter group** Comparison
0 Minute	120 ± 9.58	98.45 ± 6.6	118. ± 6.70	F 59.04 p =.001 H.S	gpC Vs gpE p =.000 H.S gpE Vs gp L p =.0001 H.S gpL Vs gp C N.S
1 Minute	111.65 ± 12.74	95.2 ± 4.7	104 ± 8.1	F 16.27 p =.000 H.S	gpC Vs gpE p = .000 H.S gpE Vs gpL p = .005 H.S gpL Vs gpC N.S
2Minutes	101.2 ± 13.9	92.1 ± 4.4	97.95 ± 7.8	F 4.60 p = .014 Significant (S)	gpC Vs gpE p = .011 S gpE Vs gpL N.S gpL Vs gpC N.S

ANOVA Followed by Tukey's HSD test Changes in HR were insignificant after two minutes of intubation

Table.3 Changes in Systolic BP at Varying Time Interval After Intubation

Time	Group C (Mean ± SD)	Group E (Mean ± SD)	Group L (Mean ± SD)	Statistical * Inference	Inter group** Comparison
0 Minute	167.9 ± 9.58	148.3 ±10.21	167.8 ±13.29	F 14.55 p =.000 H.S	gpC VsgpE p =.000 H.S gpE Vs gp L p =.000 H.S gpL Vs gp C N.S
1 Minute	153.6 ± 15.39	141.45± 8.88	158 ± 12.05	F 10.31 p =.00 H.S	gpC Vs gpE p = .008 H.S gpE Vs gpL p = .000 H.S gpL Vs gpC N.S
2Minutes	140.25 ± 17.4	136.15 ±10.00	147.25 ±12.048	F 3.44 p = .039 Significant (S)	gpC Vs gpE N. S gpE Vs gpL p = .032 S gpL Vs gpC N.S

ANOVA Followed by Tukey's HSD test Changes in Systolic BP Were insignificant after two minutes of intubation

Table.4 Changes in Diastolic BP atVarying Time Interval After Intubation

Time	Group C (Mean ± SD)	Group E (Mean ± SD)	Group L (Mean ± SD)	Statistical * Inference	Inter group** Comparison
0 Minute	113.3 ± 8.60	102.55 ±8.97	112.55 ± 8.98	F 14.55 p =.000 H.S	gpC VsgpE p =.000 H.S gpE Vs gp L p =.000 H.S gpL Vs gp C N.S
1 Minute	105.6 ± 9.12	94.7 ± 5.51	103.95 ± 5.48	F 10.31 p =.00 H.S	gpC Vs gpE p = .008 H.S gpE Vs gpL p = .000 H.S gpL Vs gpC N.S
2Minutes	92.4 ± 13.48	90.75 ± 5.98	99.35 ±19.05	F 3.44 p = .039 S	gpC Vs gpE p = .046 S gpE Vs gpL p = .032 S gpL Vs gpC N.S

ANOVA Followed by Tukey's HSD test Changes in Distolic BP Were insignificant after two minutes of intubation

sympathetic and parasympathetic outflow or receptor hypersensitivity.Various drugs and techniques have been utilized to blunt the hemodynamic response. Blocking drugs minimize the increase in heart rate and blood pressure by attenuating positive chronotropic and ionotropic effects of the increase in adrenergic activity. Esmolol possesses several properties which makes it a valuable agent to obtund the cardiovascular response. Firstly it is a cardio selective agent. Secondly, it has ultra short duration of action (9minutes) and finally, significant drug interaction with commonly used anesthetics have not been reported (13). However no consensus has been reached regarding the optimum dose and timing of its delivery (14). In our study we found that heart rate increase in patients receiving esmolol was statistically attenuated as compared to other 2 groups. ($p<0.001$) for a maximum duration of 2 minutes after intubation, though there was statistically significant increase in heart rate in all 3 groups ($P<0.05$) as compared to baseline levels. This is consistent with finding the Korpinen *et al* (15) and Shroff *et al* (16). Lignocaine has also been a popular agent for attenuating circulatory responses associated with intubation. The various properties of lignocaine that makes it suitable for attenuation of stress response are analgesia, antiarrythmic effect, rapid onset, short duration and suppression of laryngeal reflexes Badrinath *et al* (17). This is not consistent

with our study where group-L patients showed lesser attenuation of hemodynamic variables as compared to group-E and statistically insignificant attenuation of response as compared to group-C.

Our results match with that of Shree *et al* (6). Our failure to detect any effect of lignocaine on stress response could be due to the fact that we performed the study in patients without heart disease while Denliger (18) and Stoelting (7) included patients with heart disease and reported a favorable response. Similarly there was less increase of systolic blood pressure and Diastolic blood pressure in group -E as compared to other groups and the rise remained attenuated till maximum of 2 minutes after intubation. Helfman (3) concluded that esmolol provided consistent and reliable protection against increase in heart rate & Systolic blood pressure as compared to lignocaine. Several studies have shown that there is increased incidence of Myocardial infarction when intraoperative heart rate are >110 /min (19). In our study none of the patients in group - E showed heart rate >110/min.Our findings are consistent with that of Shroff (20) , Miller and Martinaeu (21) who have claimed optimal results while using lesser doses of esmolol (i.e. 1.5mg/kg) as compared to 3mg/kg. They observed adverse effects like hypotension during induction with succinylcholine. This was the basis for using smaller dose of esmolol in our study. None of our patients developed side effects.

Conclusion

Intravenous lignocaine (1.5 mg/kg) given 3 min before intubation is not very effective in attenuating hemodynamic response to laryngoscopy and intubation, while esmolol (1.5 mg/kg) as a bolus attenuates the response more effectively, without any deleterious effects.

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