International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Attenuation of Haemodynamic Responses to Laryngoscopy and Endotracheal Intubation using Esmolol and Lignocaine - A Comparative Study

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Abstract: ***Background: Aim: To compare the efficacy of Esmolol Hcl& Lignocaine Hcl in attenuation of hemodynamic response to Laryngoscopy and Endotracheal Intubation. Materials & Methodology: A randomized, prospective, double-blind study in which 60 patients of ASA grade I or II aged between 20–60 years was conducted. Lignocaine Hcl 1 mg/kg and Esmolol Hcl 0.5 mg/kg were compared in attenuating the haemodynamic response to laryngoscopy and tracheal intubation in elective surgery under general anaesthesia. Patients were divided into two groups Group L(Lignocaine): patients receive injection Lignocaine, 1 mg/kg IV bolus diluted to 10 ml with 0.9% saline. Group E(Esmolol): patients receives injection Esmolol 0.5 mg/kg IV bolus diluted to 10 ml with 0.9% saline. All the selected patients are subjected to the same anaesthesia technique. HR, SBP, DBP and MAP were recorded before intubation, and then during intubation 0 minute, 1 min, 3 min, 5 min of intubation. Results: Systolic, Diastolic & Mean Arterial Pressures increased significantly in lignocaine group whereas it was attenuated more effectively in Esmolol group (p<0.05). Conclusion: Esmolol is more effective than lignocaine in attenuating the haemodynamic response to laryngoscopy and tracheal intubation.***

Keywords: Esmolol, Lignocaine, haemodynamic response, General anaesthesia.

1. Introduction

Despite the development of new airway devices, Direct laryngoscopy and tracheal intubation remain the gold standard in airway management. The hemodynamic changes stemming from airway instrumentation are due to sympathoadrenal discharge caused by epipharyngeal and para pharyngeal stimulations resulting in an increase in heart rate (HR), blood pressure, intraocular, and intracranial pressure and cardiac arrhythmias. These effects are deleterious in susceptible individuals leading to acute heart failure perioperative myocardial ischemia, and cerebrovascular accidents. This Response peaks at 1-2 minutes and returns to normal within 5-10 minutes. Numerous systemic, as well as topical agents, were used to minimise these unwanted hemodynamic responses due to laryngoscopy and intubation. The pharmacological methods aimed at efferent and afferent or both limbs of response, examples: inhalational agents[1], lignocaine[2], opioids[3], sodium nitroprusside[4], NTG [5], CCB'S[6], and adrenergic blockers[7].

2. Aim of the Study

To compare the efficacy of Esmolol Hcl & Lignocaine Hcl in attenuation of hemodynamic response to Laryngoscopy and Endotracheal Intubation

3. Materials & methods

A randomized, prospective, double-blind study in which 60 patients of ASA grade I or II aged between 20–60 years was conducted. Lignocaine 1 mg/kg and Esmolol 0.5 mg/kg were compared in attenuating the haemodynamic response to laryngoscopy and tracheal intubation in elective surgery under general anaesthesia.

Group L (Lignocaine): patients receives injection Lignocaine, 1 mg/kg IV bolus diluted to 10 ml with 0.9% saline.

Group E(Esmolol) : patients receives injection Esmolol 0.5 mg/kg IV bolus diluted to 10 ml with 0.9% saline.

Inclusion Criteria:
Either sex, ASA grade I & II, Age 20-60 yrs and Elective surgeries under general anaesthesia.

Exclusion Criteria:
Patients with known difficult airways, Patients with bronchial asthma, Patients on beta-blockers, Patients with a full stomach, pregnant women, emergency cases, conditions in whom duration of intubation lasts greater than 20 seconds.

All the patients were admitted and assessed as per the routine pre-anaesthetic check-up protocol. After taking informed written consent, all patients were given preoperative night sedation with tablet metoclopramide 10 mg and tablet Alprax 0.25mgorally and were kept nil per oral since midnight day before surgery.

After shifting the patients to the operating room, baseline values are recorded, and IV access secured with 18G cannula. Pre-oxygenation did with 100% oxygen for 3 minutes. Premedication with injection ondansetron 4 mg, pantoprazole 40 mg, glycopyrrolate 0.2mg and midazolam 1 mg. The study drug was given as a bolus over 60 seconds before 3 min of intubation, and later anaesthesia was induced with 2.5% injection Thiopentone sodium 5mg/kg IV, and

vecuronium bromide 0.12mg/kg was given for muscle relaxation. Patients are then ventilated with a mask with 40% oxygen+ N2O (60%)+ sevoflurane and vitals are re-recorded.

After intubation patients were maintained with sevoflurane (1%) + N2O (60%) + O2 (40%) and controlled mechanical ventilation. The time after endotracheal intubation was '0' minute.SBP, DBP, MAP and HR are recorded at 0min, 1min, 3min & 5min time intervals after the endotracheal intubation.

At the end of the surgery, the residual neuromuscular blockade antagonised with intravenous neostigmine 0.05mg/kg, and glycopyrrolate 10µ/kg and extubation done after fulfilling the' extubation' criteria.

4. Statistical Analysis

Heart rate (HR), Systolic blood pressure(SBP), Diastolic blood pressure (DBP), mean arterial pressure(MAP) are recorded and analysed. All r data were entered using MS Excel software and analysed using SPSS software for determining statistical significance. The study data analysed using statistical methods of mean, standard deviation and p-value <0.05 is taken as significant.

5. Result

Analysis of patient's results revealed no statistical differences in the demographic characteristics of the two groups (Tab-I and 2).

Table 1

Variable	Group	MEAN	SD	p-value
Age	Group L	42.80	10.84	0.405
	Group E	40.60	9.44	

Table 2

Variable	Group	Mean	SD	p-value
Weight	Group L	65.52	8.44	0.19
	Group E	68.70	10.43	

The pre-induction and before laryngoscopy values of pulse rate (PR) were comparable between two groups with no statistically significant difference (p>0.05). (Tab -III) There was a statistically significant difference in PR0, 1min,3min and 5min between esmolol and lignocaine group (p<0.05) and the PR were significantly less in the esmolol group throughout the study time compared to lignocaine.

Table 3

Variable	Group L		Group E		P-value
	Mean	SD	Mean	SD	
BASAL PR	95.36	11.03	98.72	15.81	0.343
PRE LARY PR	90.10	12.60	94.50	11.07	0.156
PR0	97.82	10.78	103.6	10.29	0.037
PR1	99.88	10.09	107.04	15.67	0.039
PR3	92.06	9.88	103.02	14.78	0.001
PR5	87.58	12.08	100.74	12.06	0.0001

The pre-induction and before laryngoscopy values of SBP were comparable between two groups with no significant differences (Tab-IV(p>0.05)). SBP increased in lignocaine group compared to the esmolol group at all times with statistical significance(p<0.05).

Table-4

Variable	Group L		Group E		P-value
	Mean	SD	Mean	SD	
SBP BASAL	132.60	10.94	130.76	10.44	0.50
PRE LARY SBP	124..24	12.75	120.78	15.03	0.34
SBP0	126.58	10.58	134.88	10.61	0.003
SBP1	129.90	15.71	138.78	10.71	0.002
SBP3	120.18	13.56	135.92	12.05	.0001
SBP5	115.78	10.07	129.02	11.40	0.0001

The pre-induction and pre-laryngoscopy values of DBP were comparable between groups with no significant differences (Tab-V) (p>0.05). DBP remains lower in the esmolol group compared to lignocaine group with statistical significance (p<0.05) throughout the study.

Table 5

Variable	Group L		Group E		P-value
	Mean	SD	Mean	SD	
Baseline DBP	84.85	7.79	84.69	9.91	0.94
PRE LARY DBP	80.66	9.01	78.32	7.36	.027
DBP0	82.8	8.06	87.62	10.95	0.05
DBP1	85.70	9.85	91.24	7.89	0.019
DBP3	79.64	6.41	84.08	9.55	.038
DBP5	76.56	9.10	80.68	6.48	.048

The pre-induction and pre laryngoscopy values of MAP were comparable between groups with no significant differences(p>0.05) (Tab-V). MAP at 0min,1min,3min and 5min is significant(p<0.05) and MAP remains lower in the esmolol group compared to lignocaine group with statistical significance (p<0.05) throughout the study.

Table 6

Variable	Group L		Group E		P-value
	Mean	SD	Mean	SD	
Baseline MAP	104.26	14.25	103.7	9.80	0.85
PRE LARY MAP	98.70	10.07	95.68	8.53	0.21
MAP0	102.86	9.84	108.34	9.32	0.03
MAP1	105.48	13.37	112.06	6.49	0.018
MAP3	96.80	10.68	104.86	10.22	.004
MAP5	90.48	9.86	100.02	9.57	.0003

6. Discussion

Many adjuncts were used to attenuate the sympathetic response associated with laryngoscopy and intubation, particularly in high-risk patients. Beta-blockers are compared with fentanyl[3], nitroprusside[4], nitroglycerine[5], Calcium channel blockers[6]. In this study, we compared esmolol[8-12](Cardioselective beta-blocker) and lignocaine[15-16].

Esmolol hydrochloride is ultra-short acting, β1 selective adrenergic receptor blocker with a distribution half-life of 2

min and elimination life-life of 9 min. Esmolol appears quite suitable for short procedures like tracheal intubation and ECT. Lignocaine suppresses irritable foci in the heart and brain because of its stabilizing effect on the cell membrane. Lignocaine is an effective local anaesthetic and has been successfully used for infiltration, nerve blocks, epidural and subarachnoid blocks, and topical anaesthesia.
Also used as an anti-arrhythmic for suppression of premature ventricular complexes and VT following acute MI

In the present study, the hemodynamic response to laryngoscopy and intubation are studied for 5 mins after intubation, as this is the average period for which hemodynamic changes are believed to last.

There was a statistical difference ($p<0.05$) between esmolol and lignocaine in pulse rate, and esmolol had a highly significant better effect than lignocaine in controlling pulse rate during the study.

7. Conclusion

Esmolol in doses of (0.5mg/kg) is a better agent than Lignocaine(1mg/kg) in attenuation of sympathetic response to direct laryngoscopy and endotracheal intubation.

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