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To Compare and Evaluate the Efficacy of Esmolol and Labetalol in Attenuating Pressor Response to Laryngoscopy & Tracheal Intubation during General Anesthesia

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Abstract: ***Background: Laryngoscopy and endotracheal intubation are associated with increased sympathomimetic response. Aim: To compare and evaluate the efficiency of Esmolol and Labetalol in attenuating the haemodynamic response to Direct laryngoscopy and endotracheal intubation. Materials & Methods: It is a Prospective, randomised, double-blind study in 50 patients of ASA grade I or II aged between 20–60 years of either sex who were scheduled for elective surgeries under general anaesthesia and divided into two groups (each group containing 25 patients). Group L(Labetalol) : patients received injection Labetalol , 0.25 mg/kg IV bolus diluted to 10 ml with 0.9% saline. Group E(Esmolol) : patients received 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 And Conclusion: In lower doses, Labetalol provides better protection than Esmolol in attenuating the sympathomimetic response to laryngoscopy and intubation***

Keywords: Esmolol, Labetalol, Pressor 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 evaluate and compare the efficacy of Esmolol and Labetalol in attenuating the of haemodynamic response to Direct Laryngoscopy and tracheal intubation.

3. Materials & methods

After obtaining approval from institutional ethical committee and informed consent from patients this Prospective, randomised, double-blind study was conducted in 50 patients of ASA physical status I or II aged between 20–60 years of either sex who were scheduled for elective surgeries under general anaesthesia are divided into two groups (each group containing 25 patients).

Group I: LAB group: Here, patients receive injection Labetalol 0.25 mg/kg IV bolus diluted to 10 ml with 0.9% saline.

Group II: ESM group: Here, patients receive 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 done with 100% oxygen for 3 minutes. Pre medication 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 5 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 50% oxygen+ N2O (50%)+ 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	36.80	9.84	0.55
	Group E	38.60	11.44	

Table 2

Variable	Group	Mean	SD	P-value
Weight	Group L	62.56	10.44	0.44
	Group E	60.40	9.46	

The pre-induction, before laryngoscopy and During Intubation(PR0) 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 PR at 1min,3min and 5min between esmolol and labetalol group (p<0.05) and the PR were significantly less in the labetalol group throughout the study time compared to esmolol.

Table 3

Variable	Group L		Group E		P-value
	Mean	SD	Mean	SD	
Basal PR	93.32	13.33	96.72	17.91	0.450
Pre lary PR	88.00	12.40	92.36	13.27	0.235
PR0	99.32	12.68	101.6	14.29	0.553
PR1	95.88	11.89	107.24	18.37	**0.01**
PR3	88.60	9.28	103.72	17.00	**0.0003**
PR5	87.28	10.68	100.64	16.48	**0.0014**

The pre-induction, before laryngoscopy and During Intubation (SBP0) values of SBP were comparable between two groups with no significant differences (Tab-IV (p>0.05)). SBP increased in esmolol group compared to the labetalol group at all times with statistical significance (p<0.05).

Table 4

Variable	Group L		Group E		P-value
	Mean	SD	Mean	SD	
Basal SBP	130.40	13.04	133.56	9.94	0.34
Pre lary SBP	118.24	14.15	121.68	10.33	0.33
SBP0	128.48	12.28	132.68	9.71	0.18
SBP1	125.80	18.51	139.80	13.71	**0.003**
SBP3	117.88	15.06	127.92	13.45	**.016**
SBP5	110.28	14.67	125.32	14.70	**0.0007**

The pre-induction, pre-laryngoscopy and During Intubation (DBP0) values of DBP were comparable between groups with no significant differences (Tab-V) (p>0.05). DBP remains lower in the labetalol group compared to esmolol 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	81.96	6.47	84.96	8.91	.179
Pre lary DBP	71.76	9.81	77.08	6.06	.025
DBP0	79.8	8.36	83.72	8.05	0.09
DBP1	81.60	12.55	89.20	7.39	**0.012**
DBP3	74.84	10.41	81.88	6.85	**.006**
DBP5	72.56	9.15	79.68	6.88	**.003**

The pre-induction and During Intubation(MAP0) values of MAP were comparable between groups with no significant differences(p>0.05) (Tab-V). MAP before laryngoscopy and at 1min,3min and 5min is significant(p<0.05) and MAP remains lower in labetalol group compared to esmolol 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	101.08	11.25	101.24	9.00	.95
Pre lary MAP	86.20	11.37	93.28	6.43	0.009
MAP0	95.44	7.54	99.44	7.02	0.05
MAP1	101.40	13.37	109.96	8.59	**0.009**
MAP3	89.28	12.40	97.36	8.02	**.008**
MAP5	83.80	9.76	92.72	8.28	**.001**

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]. However, studies comparing esmolol [8-12](Cardioselective beta-blocker) and labetalol[15-18] (Non-selective adrenergic blocker) are lacking.

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. Labetalol is both α and β receptor blocking agent with predominant β-adrenergic receptor blocking actions (α and the β blockade ratio is 1:7 for IV and 1:3 for oral administration). The onset of action of Intravenous labetalol is 5 minutes.

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 labetalol in pulse rate, and Labetalol had a highly significant better effect than esmolol in controlling pulse rate during the study.

Labetalol attenuated the increase in SBP significantly throughout the study period as compared to esmolol groups ($p<0.05$). Labetalol group attenuated the rise in DBP more significantly than esmolol. Labetalol group has significantly less MAP compared with Esmolol group and the haemodynamic variables remains consistently low in labetalol group throughout the study.

7. Conclusion

Labetalol in doses of (0.25mg/kg) is a better agent than esmolol (0.5mg/kg) in attenuation of sympathetic response to direct laryngoscopy and endotracheal intubation.

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