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Comparison of the efficacy of esmolol and labetalol, in low doses, for attenuation of sympathomimetic response to laryngoscopy and intubation.

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A B S T R A C T

Objective: The present study compared the efficacy of esmolol and labetalol, in low doses, for attenuation of sympathomimetic response to laryngoscopy and intubation.
Design: Prospective, randomized, double-blinded study.
Setting: Operation room.
Patients and Methods: 60 ASA physical status I and II adult patients, aged 18-45 years undergoing elective surgical procedures, requiring general anesthesia and endotracheal intubation.
Interventions: Patients were allocated to any of the two groups (30 each)-
Group E (esmolol) 0.5 mg/kg diluted with 0.9% saline to 10 ml i.v.
Group L (labetalol) 0.25 mg/kg diluted with 0.9% saline to 10 ml i.v.
5 min prior to intubation. All the patients were subjected to the same standard anesthetic technique.
Measurements: Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded prior to induction, at time of intubation and 1, 3, 5,7, 10, 20, 30,40min after intubation. Mean arterial pressure (MAP) and rate pressure product (RPP) were calculated. Abnormal ECG changes were also recorded.
Results Esmolol (0.5 mg/kg), labetalol (0.25 mg/kg) significantly attenuated the rise in heart rate, systolic blood pressure, and RPP during laryngoscopy and intubation.
Conclusion: In lower doses Esmolol and Labetalol both effectively blunts the hemodynamic response to endotracheal intubation in patients undergoing surgical procedures under general anesthesia and can be safely used at induction of general anesthesia. We found that labetalol attenuate the pressor response to laryngoscopy and intubation more than esmolol.

Key words: *Labetalol, esmolol, sympathomimetic, response, intubation*

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

INTRODUCTION

Laryngoscopy and intubation are mandatory for most of the patients udergoing surgery under general anaesthesia. Despite the emergence of new airway devices in recent years,rigid laryngoscopy and tracheal intubation still remains the gold standard in airway management.

Endotracheal intubation is an integral part of the anaesthesiologist's contribution to patient care. It becomes an essential component of general anaesthesia. It maintains the patency of upper airway, helps in ventilation , reduces the risk of aspiation,delivers the inhalational anaesthetic agents.

The placement of an endotracheal tube in the trachea is an extremely noxious stimulus. In response to this stimulation, there is a significant rise in catecholamine levels . This results in a rise in heart rate, systolic blood pressure, diastolic blood pressure,intraocular,intracranial pressure and potential for cardiac arrhythmias . These responses to endotracheal tube placement are known as the cardiovascular response or pressor response to endotracheal intubation (**Wycoff, 1960)** . The arterial hypertention is due to increase in cardiac output rather than increase in SVR and is associated with the transient rise in CVP.

Many methods have been suggested to attenuate these responses e.g. premedicating the patient with drugs that tend to block the response to laryngoscopy and intubation, with the use of antihypertensive drugs increasing concentration of volatile anaesthetic agents during mask ventilation before intubation. But deep level of anaesthesia may not be tolerated by many patients. So drugs that tend to block the responses to laryngoscopy and intubation or antihypertensive drugs are preferred.

Beta blockers with negative chronotropic, antihypertensive, antiarrhythmic and antiischaemic properties have been advocated. These agents are more effective in preventing the changes in heart rate than the blood pressure.

Thus, a number of drugs to prevent the pressor response to laryngoscopy and intubation have been recommended and used; however only a few pharmacological approaches have been found satisfactory.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

Esmolol is a potent ultrashort acting cardioselective β_1-adrenoreceptor competitive antagonist. Its effect in lowering blood pressure is less in comparison to heart rate[19,20] . It also obtunds the cardiac response to exercise and other stimulation in which sympathetic tone is increased as during intubation. **Labetalol** is a unique parenteral and oral antihypertensive drug that exhibits selective α1- and nonselective β1- and β2-adrenergic antagonist effects. During intubation, labetalol significantly suppressed a rise in heart rate and mean blood pressure.

Labetalol would blunt hemodynamic response to laryngoscopy and intubation and desflurane induced hemodynamic responses used for rapid induction and recovery when used >1 MAC desflurane can cause hypertention and tachycardia by sympathetic activation, labetalol attenuate these effects[30].

An injection of labetalol (0.25 mg/kg) to block cardiovascular reaction during endotracheal intubation, produced no hypotension and bradycardia during 10 minutes after intubation **(Singh SP, Quadir A et al 2010)** ..

The present study was designed to compare the effect of labetalol and Esmolol on sympathomimetic response to laryngoscopy and endotracheal intubation in normotensive patients undergoing surgeries under general anaesthesia.

Subjects & Selection Method:

The study was conducted in the department of anesthesiology, NIMS Medical College and Research, Jaipur after due permission from the institutional ethical committee and review board and taking written informed consent from the patients. This double blind randomized comparative study was carried out on 60 ASA grade 1 & 2 patients aged 18 to 45 years, weight 40 to 65 scheduled for elective surgical procedures under general anesthesia. Each patient was thoroughly examined for clinical parameters and investigations.

Study Design:

Prospective, randomised, double blind clinical study.

Sample size: 60 patients.

INCLUSION CRITERIA

- Patient Scheduled for elective surgery under general anesthesia.
- Age group-18-45year.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

- Weight-40-65 kg.
- ASA physical status I-II.

EXCLUSION CRITERIA

- Patients with anaemia (Hb<10 gm. %).
- Patients having liver diseases, renal diseases, pulmonary diseases and cardiac disease. Patients on β-blockers. (ASA grade III or above).
- Patients fitting in the criteria of difficult intubation (Mallampati Grade 3 and 4).
- More than two attempts at intubation.
- Patients in whom total duration of laryngoscopy and intubation more than 90 seconds and one time laryngoscopy and intubation more than 15 seconds.
- Patients unwilling to give consent for proposed study.
- Patients with BMI>25.

Definitions :-

1) Hypotension is defined as SBP<25% of baseline value or 90 mm/ of Hg, whichever is lower;

2) Hypertension is defined as SBP>25% of baseline value or 150mm of Hg whichever is higher;

3) Tachycardia is defined as HR> 25% of baseline value;

4) Bradycardia is defined as HR< 60 beats / minute;

5) An arrhythmia is defined as any ventricular or supraventricular premature beat or any rhythm other than sinus.

Then, the patients were randomly divided in 2 groups of 30 each according to drug used. Randomization was done according to chit and box method. The two groups were-

GROUP	DRUG USED	CONCENTRATION
A	Esmolol	0.5mg /kg(10ml total volume)
B	Labetalol	0.25mg/kg(10ml total volume)

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

On arrival in the operation theatre, patient's body weight, Baseline parameters [Spo_2, ECG, PR, SBP, DBP] were recorded. Mean arterial blood pressure (MAP) was calculated . The RPP which is an index of myocardial oxygen demand was derived arithmetically in each case later, by the formula; RPP = HR x SAP All the patients were premedicated by giving inj. midazolam 0.05 mg/kg i.v. inj. glycopyrrolate 0.005mg/kg I.V. Parameters were recorded and then study drug given.

Test drug (Esmolol /labetalol) was commenced in a double blind fashion. Both drugs were given slowly before intubation.

Induction- induction of anesthesia was done with inj. thiopentone 5mg/kg b.w slowly within 1min. Followed by Muscle relaxation was provided by inj. Atracurium 0.5mg/kg loading dose. Patient was ventilated with 100% oxygen for 3 min. Hemodynamic parameters were recorded just before intubation (5 min. after the study drug).

Intubation- was done with cuffed endotracheal tube of appropriate size after direct laryngoscopy by an experienced anesthesiologist who was blinded to the groups. Tube position was checked by auscultation of chest and fixed.

Mentinence-was done with 40% O_2+ 60% N_2O+ 0.4 Vol.% isofluorane by using closed circuit and inj. Atracurium 0.1mg/kg subsequent dose.

Monitoring- was continued and Hemodynamic parameters (pulse rate, ecg, systolic blood pressure, diastolic blood pressure, mean blood pressure, spo2) and any side effect were recorded at 1min.,3min.,5min.,7min.,10min., 20min. and 30 min after intubation.

Statistical analysis– All the data were entered on Excel sheet M.S.Office Excel-2010 and analyzed statistically using SPSS Statistical software (ver.18.0.0) and XL- Stat.

All the quantitative data were summarized in the form of Mean ± SD. The difference within groups using paired T-test. All the qualitative data were summarized in the form of proportions. The differences between proportions were analyzed using Chi square test. The levels of significance and α - error were kept 95% and 5% respectively, for all statistical analyses.

P values <0.05 were considered as Significant (S) and P value > 0.05 as statistically Non Significant (NS).

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

OBSERVATIONS AND RESULTS

The patients in the three groups were comparable with respect to age, weight, sex, and duration of surgery or anesthesia

Age Distribution-

Table 1

Age Distribution of Patients

Age Group	E Group		L Group	
	No. of patients	%	No. of patients	%
20-25	19	63	12	40
26-35	7	24	18	60
36-45	4	13	0	0

Table 2

Weight Distribution of Patients

Weight (kg)	E Group		L Group	
	No. of patients	%	No. of patients	%
40-49	3	10	3	10
50-59	20	67	19	63
60-65	7	23	8	27

ASA Grading-

Table 3

ASA Grade of Patients

ASA Grade	E Group		L Group	
	No. of patients	%	No. of patients	%
1	25	84	25	84
2	5	16	5	16

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

BMI (body mass index) Distribution-

Table 4

BMI Distribution of Patients

BMI Group	E Group		L Group	
	No. of patients	%	No. of patients	%
18.5 - 19.0	1	3	1	3
19.1 - 21.0	6	20	5	17
21.1 - 23.0	12	40	15	50
23.1 - 25.0	11	37	9	30

Mean Baseline Variables:-

Table 5

Comparison of Mean Baseline Variables in the two groups

	Baseline PR	Baseline SBP	Baseline DBP	Baseline MAP	Baseline RPP	Baseline Spo_2
E Group	94.4 ± 13.43	123.2 ± 5.6	82.5 ± 4.59	96.0 ± 4.09	11623.67 ± 1646.87	98.8 ± 0.81
L Group	91.7 ± 10.72	123.33 ± 7.92	80.1 ± 4.76	94.5 ± 5.14	11334.67 ± 1680.39	98.9 ± 0.76
P value	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Significance	NS	NS	NS	NS	NS	NS

It was observed that mean baseline variables were similar in both groups and no statistically significant difference was present.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

Trends in intraoperative parameters :-

PULSE RATE :-

Table no. 6

Comparison of Mean ± S.D. of Pulse Rate at various intervals between both the study Groups (Esmolol V/S Labetalol)

Observation Time	E group	L group	P value
	Mean ± S.D.	Mean ± S.D	
Before PAM (Baseline)	94.47 ± 13.43	91.7 ± 10.72	P>0.05
5 Minutes After PAM	100.97 ± 12.47	96.03 ± 12.29	P>0.05
Just before intubation (5 min. after study drug)	93.33 ± 12.59	90.8 ± 12.58	P>0.05
1 Min. after intubation.	109.33 ± 11.68	103.13 ± 10.69	P<0.05
3 Min. after intubation.	103.33 ± 10.62	97.63 ± 8.31	P<0.05
5 Min. after intubation.	102.23 ± 10.18	97.77 ± 9.24	P>0.05
7 Min. after intubation.	93.63 ± 8.86	92.3 ± 7.12	P>0.05
10 Min. after intubation.	90.27 ± 8.7	87.5 ± 6.12	P>0.05
20 Min. after intubation.	88.7 ± 8.09	83 ± 6.1	P<0.05
30 Min. after intubation.	96.17 ± 8.08	88.83 ± 7.69	P<0.05
40 Min. after intubation.	94.37 ± 6.1	87.77 ± 6.26	P<0.05

This table no. 7 show that decrease pulse rate was more in group L than in group E. There was a significant difference in PR during 1, 3, 20, 30, 40 min after intubation showing better control of PR in Labetalol group. Change in PR over rest of the study time was insignificant as compared to each other.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

Systolic Blood Pressure (SBP) :-

Table no. 7
Comparison of Mean ± S.D. of systolic blood pressure at various intervals

Observation Time	E group	L group	P value
between both study Groups (Esmolol V/S Labetalol)			
	Mean ± S.D.	**Mean ± S.D**	
Before PAM (Baseline)	123.2 ± 5.6	123.33 ± 7.92	P>0.05
5 Minutes After PAM	126.67 ± 5.57	122.8 ± 7.24	P<0.05
Just before intubation (5 min. after study drug)	115.73 ± 6.15	114.2 ± 6.85	P>0.05
1 Min. after intubation.	150.47 ± 5.08	137.6 ± 9.24	P<0.05
3 Min. after intubation.	140.13 ± 4.95	133.57 ± 10.11	P<0.05
5 Min. after intubation.	131.33 ± 4.79	128.03 ± 6.29	P<0.05
7 Min. after intubation.	124.83 ± 3.43	124.47 ± 6.18	P>0.05
10 Min. after intubation.	120.83 ± 5.31	119.63 ± 3.7	P>0.05
20 Min. after intubation.	120.17 ± 5.74	117.2 ± 3.21	P<0.05
30 Min. after intubation.	121.87 ± 4.72	123.33 ± 6.21	P>0.05
40 Min. after intubation.	122.57 ± 3.81	119.27 ± 2.6	P<0.05

Above table shows SBP in both groups over the various study intervals. There was significantly better control of SBP in group L compared to Group E at 1, 3, 5, 20, 30 and 40 min of study.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

Diastolic Blood Pressure (DBP) :-.

Table no. 8

Comparison of Mean ± S.D. of DBP at various intervals between both the study Groups (Esmolol V/S Labetalol).

Observation Time	E group	L group	P value
	Mean ± S.D.	Mean ± S.D.	
Before PAM (Baseline)	82.5 ± 4.59	80.17 ± 4.76	P>0.05
5 Minutes After PAM	81 ± 5.09	79.87 ± 4.16	P>0.05
Just before intubation (5 min. after study drug)	75.9 ± 5.22	75 ± 4.99	P>0.05
1 Min. after intubation.	100.7 ± 4.58	92.83 ± 5.27	P<0.05
3 Min. after intubation.	94.63 ± 4.16	89.93 ± 4.9	P<0.05
5 Min. after intubation.	87.93 ± 3.53	85.5 ± 3.43	P<0.05
7 Min. after intubation.	83.8 ± 3.88	82.47 ± 3.95	P>0.05
10 Min. after intubation.	80.53 ± 3.73	79.87 ± 4.24	P>0.05
20 Min. after intubation.	77.17 ± 3.61	79.6 ± 4.52	P<0.05
30 Min. after intubation.	81.27 ± 4.03	83.8 ± 3.93	P<0.05
40 Min. after intubation.	83.17 ± 5.86	81.67 ± 3.9	P>0.05

Above table shows DBP values over the study intervals. From this it is observed there was better control of DBP in Group L compared to Group E at 1, 3, 5 min post intubation.

There was a significant difference in DBP at 20 and 30 post intubation for low values in Group E.

Mean Arterial Blood Pressure (MAP):-

Table 9

Comparison of Mean ± S.D. of MAP at various intervals between both the study Groups (Esmolol V/S Labetalol)

Observation Time	E group	L group	P value
	Mean ± S.D.	Mean ± S.D.	
Before PAM (Baseline)	96.07 ± 4.09	94.56 ± 5.14	P>0.05

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

5 Minutes After PAM	96.22 ± 4.29	94.18 ± 4.3	P>0.05
Just before intubation (5 min. after study drug)	89.18 ± 4.31	88.07 ± 4.93	P>0.05
1 Min. after intubation.	117.29 ± 3.98	107.76 ± 5.87	P<0.05
3 Min. after intubation.	109.8 ± 3.38	104.48 ± 6.12	P<0.05
5 Min. after intubation.	102.4 ± 2.99	99.68 ± 3.7	P<0.05
7 Min. after intubation.	97.48 ± 3.17	96.47 ± 3.95	P>0.05
10 Min. after intubation.	93.97 ± 2.96	93.12 ± 3.22	P>0.05
20 Min. after intubation.	91.5 ± 2.94	92.13 ± 3.13	P>0.05
30 Min. after intubation.	94.8 ± 3.01	96.98 ± 3.46	P<0.05
40 Min. after intubation.	96.3 ± 4.21	94.2 ± 2.45	P<0.05

Above table show that when MAP was compare between Esmolol and labetalol, labetalol decrease it more than Esmolol upto 30 min. But difference was significant at 1, 3, and 5 min. after intubation as in SBP and DBP.

Rate pressure product (RPP):-

Table no. 10
Comparison of Mean ± S.D. of Rate pressure Product at various intervals in patients in both the study Groups (Esmolol V/S Labetalol)

Observation Time	E group	L group	P value
	Mean ± S.D.	Mean ± S.D.	
Before PAM (Baseline)	11623.67 ± 1646.87	11334.67 ± 1680.39	P>0.05
5 Minutes After PAM	12776.83 ± 1595.97	11823.93 ± 1896.17	P<0.05
Just before intubation (5 min. after study drug)	10783.2 ± 1428.39	10390.63 ± 1713.64	P>0.05
1 Min. after intubation.	16442.37 ± 1738.43	14221.87 ± 1986.52	P<0.05

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

3 Min. after intubation.	14463.47 ± 1383.11	13703 ± 2087.46	P>0.05
5 Min. after intubation.	12862.6 ± 1184.17	12524.77 ± 1414.98	P>0.05
7 Min. after intubation.	11691.1 ± 1193.72	11488.87 ± 1058.22	P>0.05
10 Min. after intubation.	10900.87 ± 1074.41	10461.63 ± 715.15	P>0.05
20 Min. after intubation.	10665.3 ± 1170.54	9723.77 ± 713.28	P<0.05
30 Min. after intubation.	11710.9 ± 974.54	10937.17 ± 880.3	P<0.05
40 Min. after intubation.	11576.33 ± 944.99	10466.9 ± 772.61	P<0.05

Above table shows that when Esmolol and labetalol were compared with regard to RPP, labetalol decrease the RPP more than esmolol but difference was significant at 1, 20, 30 and 40 minutes after intubation, other time it was insignificant compared in both groups, in labetalol value never crossed the critical limit **15000** mmHg.min .

Intra operative Side effects and Complications-

Table 11

Comparison of Intra-operative Side effects between the groups

Observation	Group E	Group L
Hypotension	0%	0%
Hypertension	30%	3%
Bradycardia	0%	0%
Tachycardia	18%	3%
ECG change	0%	0%

DISCUSSION

The hemodynamic responses to laryngoscopy and intubation, comprising of elevation in heart rate and rise in systolic and diastolic pressure, are well known. The potential for life threatening complications associated with these responses is also well documented. Traditionally used drugs like lignocaine, fentanyl, clonidine, esmolol etc.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

are either not fully effective or are associated with considerable side effects at doses or required to attenuate these responses.

Labetalol, a combined blocker of α_1 & β-receptor, reaches its peak effect at 5 to 15 minutes after intravenous injection and rapidly redistributes. Presynaptic α2-receptors are spared by labetalol, so that released norepinephrine can continue to inhibit the further release of catecholamines via the negative feedback mechanism resulting from stimulation of α2-receptors. Cardiac output remains unchanged .

It has been used by many researchers like **Sarvesh P et al, Cullen DJ et al, Ramanathan J et al , Maharaj et al** for attenuation of hemodynamic response to tracheal intubation as well as extubation in various doses and along with various anesthetic regimens. They have been quite successful in their efforts and have found labetalol effective in attenuating the pressure responses to laryngoscopy and intubation but their findings need to be further substantiated and effectiveness of labetalol in blunting the pressure response and its comparation to esmolol needs to be evaluated in our scenario because these studies are lacking.

. The major concerns were intra-operative hypotension and bradycardia, The perioperative hemodynamic stabilization and decreased stress response to stimuli such as intubation may be related to its propensity to cause hypotension, bradycardia.

For this study 60 patients of ASA grade 1 & 2, aged between 18 to 45 years, undergoing surgical procedures with general anesthesia were selected randomly after applying inclusion and exclusion criteria. These patients were divided into two groups, group E or Esmolol and group L or Labetalol.

A random allocation of the patients was done in the two groups. The mean age of the patients in E (Esmolol) group was 26.4 ± 6.45 years, in L (Labetalol) group was 26.17 ± 2.74 years.. There was no statistically significant difference between the groups with regard to age (p=>0.05).There was even distribution of weight in the both groups. As depicted the mean baseline variables were comparable between both groups. The mean baseline pulse rate in group E - was 94.4 ± 13.43and in group B – was 91.7 ± 10.72. The difference in pulse rate was not significant as shown by P value of >0.05. Similarly the mean baseline Systolic blood pressure in group E was 123.2 ± 5.6 and in group L was 123.33 ± 7.92. In group E mean Diastolic blood pressure was 82.5 ± 4.59 and in group L was 80.1 ± 4.76 (p value >0.05); for mean blood pressure p value was >0.05 between two groups, in group E mean Mean blood pressure was 96.0 ± 4.09 and in group L was 94.5 ± 5.14. Rate pressure product in group E (mean) was 11623.67 ± 1646.87and in group L 11334.67 ± 1680.39. Baseline rate pressure product was also statistically similar in both groups (p=>0.05) and in group E mean oxygen saturation was 98.8 ± 0.81 and in group **L** was 98.9 ± 0.76. Thus we find that the baseline

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

variables in two groups were similar and can say that the randomization was done adequately and we were able to achieve the desired study and control population.

In group E the mean baseline pulse rate was 94.47 ± 13.43 . 5 min. after the premedication there was statistically significant rise in pulse rate which raise to 100.97 ± 12.47 (table no. 6) . There was statistically insignificant fall in pulse rate just before intubation which fell to 93.33 ± 12.59. The pulse rate was insignificantly below baseline just before intubation **..**1 min. After intubation the pulse rate was significantly increased to 109.33 ± 11.68 from the baseline. The pulse rate remained higher from the baseline at 3 and 5 min after intubation. The pulse rate fell at 7 min,10 min. and 20 min compared to baseline but insignificantly.

Our results are comparable to **Sarvesh p. singh, abdul quadir, poonam malhotra et al** who noticed similar trends in pulse rate after intubation upto 10 min. The pharmacological property of early onset (within 2 min) and peak action (within 6-10 min) of b1- adrenoceptor blockade by esmolol explain post intubation response of heart rate. There was no significant effect of esmolol on PR when compared to the Labetalol, Labetalol had a significantly ($P<0.05$) better effect than esmolol in controlling PR at all points during the study. It seems that when instrumentation stimulus is present labetalol maintains the PRs within normal ranges. When the effect of stimulus weans off, as occurs at 10 min postintubation, the drug's effect takes over and pulse rates go below baseline values.

In L group the mean baseline pulse rate was 91.7 ± 10.72. 5 min. after the premedication there was statistically significant rise in pulse rate which raise to 96.03 ± 12.29 there was statistically insignificant fall in pulse rate just before intubation which fall to 90.8 ± 12.58.). After intubation the pulse rate was significantly increased to 103.13 ± 10.69 from the baseline. The pulse rate remained higher from the baseline at 3 and 5 min after intubation significantly. The pulse rate decreased at 7 min comparable to baseline and 10 min.and 20 min lower than baseline significantly. When compare the both study drugs, increase in pulse rate after the intubation is less in labetalol group than Esmolol group and differences was significant at 1 and 3 min postintubation. Although there is decrease in pulse rate in both study groups, significant bradycardia was not noted in any of the cases. The mean baseline systolic blood pressure in group E was 123.2 ± 5.6 . 5 min after PAM systolic blood pressure increase to 126.67 ± 5.57. The blood pressure decreased to 115.73 ± 6.15 just before intubation.

In preventing the increases in SBP esmolol was completely ineffective. Labetalol prevented the increase in SBP significantly throughout the study period as compared to esmolol ($P<0.05$).

In L group the mean baseline sustolic blood pressure was 123.33 ± 7.92.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE08,2022

5 min after the premedication there was insignificant fall in SBP which decreased to 122.8 ± 7.24 . After intubation the SBP was significantly increased to 137.6 ± 9.24 compared to baseline. The SBP remained higher from the baseline at 3 and 5 min after intubation significantly. The SBP fall at 7 min comparable to baseline and after10 min. 20 and 30 min lower than baseline significantly.

When compare the both study drugs (Esmolol and labetalol), increase in SBP after the intubation was less in labetalol group than esmolol group but. Although there was decrease in SBP in both study groups, significant hypotension was not noted in any of the cases.

The mean baseline diastolic blood pressure When compared there was a significant difference between esmolol and labetalol values at 1, 3 and 5 minute postintubation ($P<0.05$). These were significant finding points of our study.

In L group the mean baseline diastolic blood pressure was 80.17 ± 4.76

. 5 min after the premedication DBP was comparable to baseline 79.87 ± 4.16 . There was statistically significant fall in DBP just before intubation which decreased to 75 ± 4.99. This fall in SBP can be attributed to labetalol mediated α receptor blockade and decreasing systemic vascular resistance and thiopentone mediated effect that decreases pressure .1 min. after intubation the DBP was significantly increased to 92.83 ± 5.27 compared to baseline. The DBP remained higher from the baseline at 3 , 5 and 7 min after intubation significantly. The DBP fell at 10 min comparable to baseline and at 20 min lower than baseline insignificantly.

When compare the both study drugs increase in DBP after the intubation is significantly lower in labetalol group than esmolol group at 1,3 and 5 min. after the intubation, differences were significant at other times at 20 and 30 min postintubation also.

The mean baseline Mean arterial pressure in E group was 96.07 ± 4.09 . 5 min. after PAM the mean blood pressure was comparable to baseline 96.22 ± 4.29.. After the intubation MAP increase significantly at 1, 3, and 5 min. after the intubation, at 7 min. comparable to baseline, at 10 and 20 min. MAP was significantly lower than baseline.

Comparing the esmolol pretintubation readings with baseline revealed that the esmolol group had a significantly less MAP at intubation .

In L group the mean baseline Mean blood pressure was 94.56 ± 5.14.

5 min after the premedication MAP was comparable to baseline 94.18 ± 4.3 . There was statistically significant fall in MAP just before intubation which was 88.07 ± 4.93 as expected.1 min. after intubation the MAP was significantly increased to 107.76 ±

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5.87 compared to baseline. The MAP remained higher from the baseline at 3, 5 and 7 min after intubation significantly. The MAP fall at 10 min and 15 min lower than baseline significantly.

When compare the both study drugs (esmolol and labetalol),increase in MAP after the intubation is significantly lower in labetalol group than esmolol group at 1, 3 and 5 min. after the intubation, similar effect was seen at 30 and 40 min of study too.

Rate pressure product is product of SBP and heart rate formula is {SBP X HR}. In E group the mean baseline rate pressure product was 11623.67 ± 1646.87. 5 min. after the premedication there was significant rise in rate pressure product which rise to 12776.83 ± 1595.97 as expected, because of similar change in pulse and systolic blood pressure . There was statistically significant fall in rate pressure product just before intubation which was 10783.2 ± 1428.39 . 1 min. after intubation the RPP was significantly increased to 16442.37 ± 1738.43 from the baseline. The RPP remained higher from the baseline at 3 and 5 min after intubation, comparable to baseline at 7 min. at 10 min. insignificantly below and 20 min. significantly below from baseline.

Compared labetalol and esmolol groups, the labetalol group had significantly lower values of RPP. Labetalol could not prevent the increase in RPP completely (significantly elevated at intubation and at 1 min postintubation). However, the magnitude of increase was less and never crossed the critical limit of 15000 mmHg/min. The values returned to baseline at 7 min postintubation as compared to other group where they achieved baseline values after 10 min. Therefore, labetalol (0.25 mg/kg) decreases the magnitude and duration of hemodynamic response to laryngoscopy as evident from changes of RPP.

Conclusion: Esmolol and Labetalol both effectively blunts the hemodynamic response to endotracheal intubation in patients undergoing surgical procedures under general anesthesia and can be safely used at induction of general anesthesia. We found that labetalol attenuate the pressor response to laryngoscopy and intubation more than esmolol.

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