Attenuation of sympathetic pressor responses to laryngoscopy and intubation in patients with preeclampsia: Comparison between IV lignocaine and IV lignocaine with labetalol

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Abstract

Introduction: tracheal intubation and laryngoscopy are invariably associated with reflex sympathetic pressor responses resulting in elevated HR & BP. This may prove detrimental in preeclampsia patients.

Objectives: To compare the efficacy of adding labetalol 0.5mg/kg IV to lignocaine 1.5mg/kg IV for attenuating increases in HR,SBP,DBP and MAP during laryngoscopy and intubation under general anaesthesia in parturients with preeclampsia posted for LSCS and to study the incident of any side effects.

Materials and Methods: 60 patients with mild PIH presenting for LSCS, either elective or emergency, under GA were studied and randomly allocated to one of the two groups of 30 patients each. All patients were premedicated with inj glycopyrrolate 0.01mg/kg IV, inj fentanyl 1 µg/kg along with study drug labetalol 0.5mg/kg given 5minutes before laryngoscopy and intubation. Patients were induced with thiopentone 5mg/kg IV and succinylcholine 2mg/kg IV, preservative free lignocaine 1.5mg/kg IV given 2minutes before intubation. HR, SBP, DBP were recorded before and after intubation, at 1st, 3rd, 5th and 10th minutes.

Results: Rise in the HR,SBP,DBP,MAP were observed in both the groups at one minute following laryngoscopy and intubation and these responses persisted for about 3 minutes after which they returned towards basal values and below the baseline in case of group 1(labetalol with lignocaine) compared to group 2(lignocaine) in preeclampsia.

Conclusions: Adding labetalol 0.5mg/kg IV to lignocaine 1.5mg/kg IV is effective in further attenuation of haemodynamic response to laryngoscopy and intubation in preeclampsia patients.

Keywords: Attenuation, Intubation, Laryngoscopy, Lignocaine, Labetalol, Preeclampsia.

Introduction

Endotracheal intubation has become an integral part of anaesthetic management and critical care. King et al. (1951) described the haemodynamic responses following laryngoscopy and tracheal intubation as reflex sympathoadrenal stimulation.[1-3] Even though the elevation in blood pressure and heart rate are brief due to laryngoscopy and intubation, they may have detrimental effects in high risk patients.[4]

Many drugs such as Hydralazine, Clonidine, Dexmedetomedine, Fentanyl, Lignocaine, Sodium Nitroprusside, Nitroglycerine, Magnesium sulphate and Nifedipine have been used with varying degrees of success to attenuate intubation response. Although Lignocaine is commonly used to attenuate the adrenergic response, its effectiveness, particularly in severe preeclampsia, has been questioned.[5]

Labetalol is tried in attenuation of adrenergic response during laryngoscopy and intubation, which has some important properties like better safety profile and hemodynamic stability. It has no rebound hypertension and does not cross placenta. Published literature with respect to use and effective dose of labetalol in this group of patients is scant. In the present randomised, prospective study, we evaluated the efficacy of a bolus dose of Lignocaine with/without Labetalol for attenuating cardiovascular stress responses in patients with PIH undergoing caesarean section under general anaesthesia.

Materials and Methods

Pregnant patients in the age group of 20-35 years with pre-eclampsia coming for lower segment caesarean section at VIMS, Bellary during the period from December 2012 to September 2014 were selected.

Inclusion criteria

1. Pre eclamptic patients coming for LSCS.
2. Age : 20 – 35 yrs
3. Weight: 50 – 70 Kgs

Exclusion criteria

1. Difficult airway
2. Eclamptic patients
3. Severe Pregnancy induced hypertension
4. Patients already on beta blockers
5. Contra indications to beta blockade (Significant bradycardia, heart block, hyper-reactive airways disease, hypothyroidism, diabetes mellitus)
   a. Foetal compromise
   b. Significant hepatic / renal dysfunction
   c. Drug allergy
   d. Patient refusal

All study patients underwent the following non-invasive investigations like Haemoglobin, RBS, Blood Urea, Serum Creatinine, PIH profile, Urine albumin, ECG and others as necessary. Informed/ written consent from each patient was obtained. 60 patients with a diagnosis of mild PIH presenting for caesarean section under GA, were studied and randomly allocated to one of the two groups of 30 patients each, to receive:

Group 1: Labetolol 0.5 mg/kg i.e. bolus (diluted to 10 ml volume) 5 minutes before laryngoscopy and Lignocaine 1.5mg/kg i.e, bolus 2 minutes before laryngoscopy.

Group 2: Normal saline (10 ml) bolus 5 minutes before laryngoscopy and Lignocaine 1.5mg/kg i.e, bolus 2 minutes before laryngoscopy.

The study solution was prepared by an anaesthesiologist who was not to take further part in the study:

1. All the parameters of the study were recorded at following stages
2. Preoperative
   i. After giving the study drug preintubation
   ii. At 1 minute, 3 minutes, 5 minutes and 10 minutes after intubation.
   iii. Group 1 were studied for effects of combination of lignocaine and labetalol and Group 2 for lignocaine.
3. Results were analyzed statistically.

Results

60 pregnant patients with mild pregnancy induced hypertension for lower segment cesarean section were divided into two groups of 30 each and studied. The two groups were comparable with respect to age distribution, parity, Mallampatti score and the number of patients on antihypertensive therapy and were statistically insignificant (table 1).

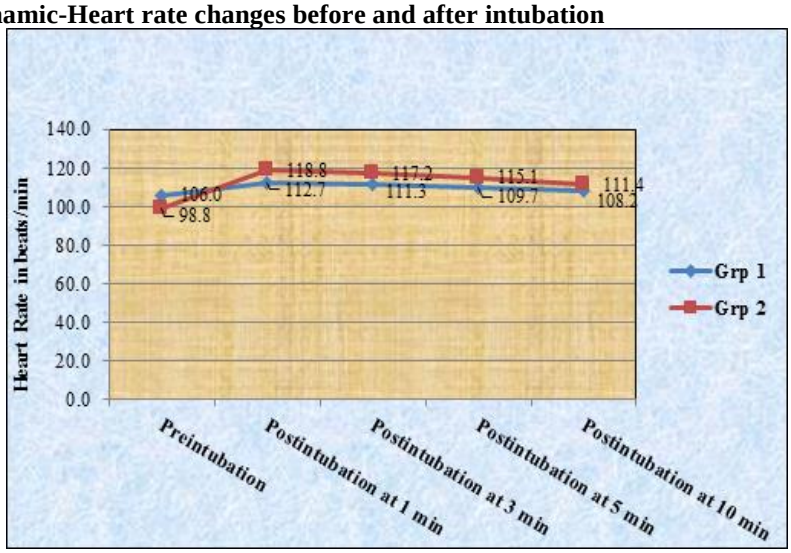
Table 1: Preoperative comparison of the two study groups

Variable		Group 1	Group 2	P value
		n (%)	n (%)	
Age group				
	≤ 20 years	12 (40.0)	10 (33.3)	0.201
	21 - 25 years	10 (33.3)	14 (46.6)	
	> 25 years	8 (26.6)	6 (20.0)	
	Mean±SD	23.76 ± 4.5	23.15 ± 3.8	0.572
Gravida				
	G1	15 (50.0)	19 (63.3)	0.139
	G2	12 (40.0)	8 (26.6)	
	G3	3 (10.0)	3 (10.0)	
Mallampatti score				
	MP-1	14 (46.6)	11 (36.6)	0.224
	MP-2	16 (43.4)	19 (63.4)	
Antihypertensive drugs				
	Yes	9 (30.0)	6 (20.0)	0.196
	No	21 (70.0)	24 (80.0)	

Analysis of Heart Rate

Statistical analysis of changes in heart rate before and after intubation at different (1, 3, 5, 10) time intervals from the onset of laryngoscopy and intubation in both the study groups is presented (Chart 1)

Chart 1: Haemodynamic-Heart rate changes before and after intubation



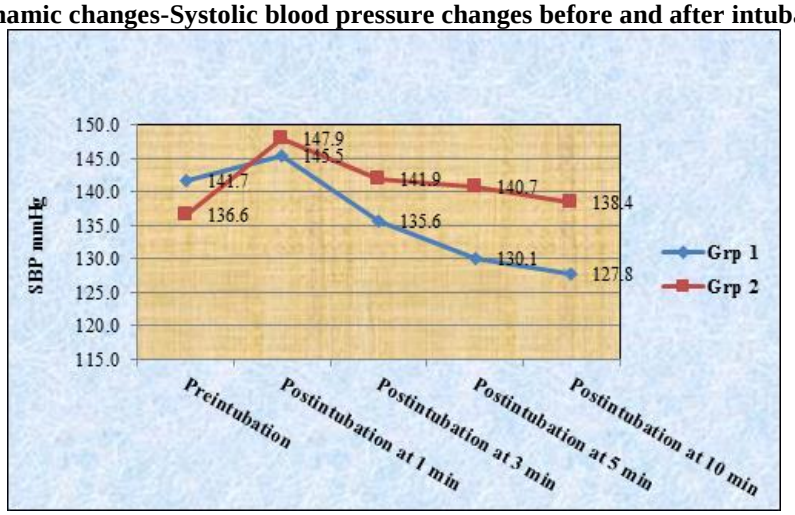
No significant variations were noted in both the groups in heart rate at basal recording, while there was statistically significant attenuation of heart rate response after giving study drug in group1 when compared to group 2.

Though there was reduction in the heart rate after administration of the test drug in both the groups at all time intervals, it was statistically not significant.

Analysis of systolic blood pressure (SBP)

Changes in systolic blood pressure before and after intubation at different (1, 3, 5, 10) time intervals from the onset of laryngoscopy and intubation in two groups is described as follows (Chart 2)

Chart 2: Haemodynamic changes-Systolic blood pressure changes before and after intubation

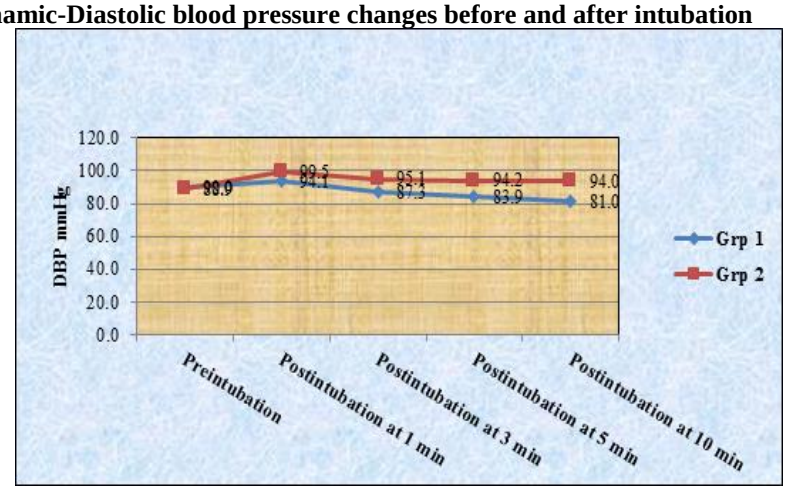


SBP before intubation in both the groups was comparable. Following administration of study drug and after intubation ,there was slight increase in SBP in both the groups at 1 minute and subsequently attenuation of SBP occurred at all time intervals in both the groups but the attenuation was better in group 1 compared to group 2 and was statistically significant.

Analysis of diastolic blood pressure (DBP)

Changes in diastolic blood pressure before and after intubation at different (1, 3, 5, 10) time intervals from the onset of laryngoscopy and intubation in both the study groups is presented (chart 3).

Chart 3: Haemodynamic-Diastolic blood pressure changes before and after intubation

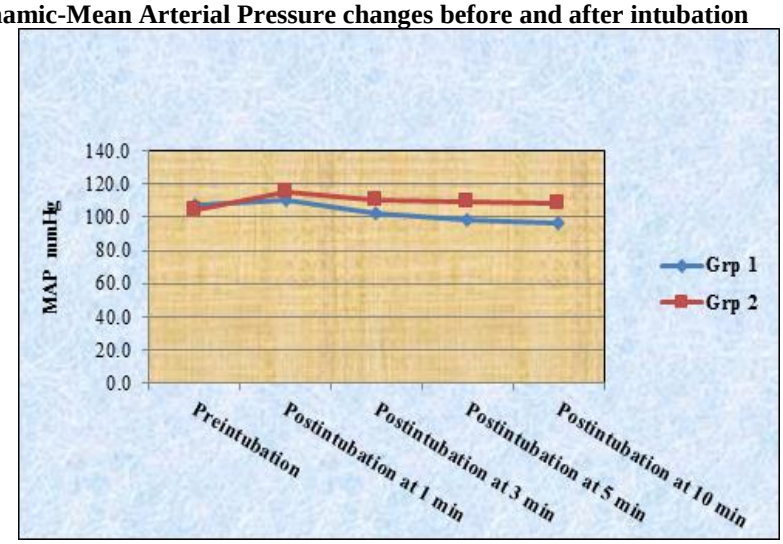


Before intubation the mean DBP was comparable in both the groups. Following administration of the study drug and 1 minute postintubation there was a rise in the Mean DBP in both the groups and was statistically significant. There was significant attenuation of mean DBP from 3rd minute onwards in group 1 while there was decreasing trend in mean DBP in Group 2 that never touched preintubation levels.

Analysis of mean arterial pressure (MAP)

Changes in mean arterial pressure before and after intubation at different (1, 3, 5, 10) time intervals from the onset of laryngoscopy and intubation in both the study groups is presented (Chart 4) .

Chart 4: Haemodynamic-Mean Arterial Pressure changes before and after intubation



No significant variations were noted in both the groups in MAP at preintubation and after giving study drug, there was increase in the MAP at 1 minute and better attenuation of MAP from 3rd to 10th minute in group 1 compared to group 2.

Other parameters studied are given as follows (Table 2)

Table 2: Comparison of APGAR score and ECG between the two Groups

Variable		Group 1	Group 2	P value
		n (%)	n (%)	
APGAR Score at 1 min				
	8 out of 10	19 (63.3%)	17 (56.7%)	0.611
	9 out of 10	11 (36.7%)	13 (43.3%)	
APGAR Score at 5 min				
	10 out of 10	30 (100%)	30 (100%)	

ECG				
	Within normal limits	30 (100%)	30 (100%)	

According to the above findings, electrocardiography was within normal limits in both the groups. None of patients, in both the groups developed arrhythmias and any ST-T changes. And similarly, APGAR score remains almost the same in both groups and was statistically insignificant.

Discussion

The sequence of induction of anaesthesia, laryngoscopy and tracheal intubation are associated with marked haemodynamic changes and autonomic reflex activity which may be a cause of concern in preeclampsia patients.[6]

Laryngoscopy and intubation is associated with rise in heart rate, blood pressure and occurence of cardiac arrhythmias. These potentially dangerous changes disappear within 5 minutes of onset of laryngoscopy.[7]

Bachofen M[8] stated the criteria for selection of appropriate drugs to prevent sympathetic response.It should neither be time consuming nor affect the duration of anaesthesia. Intravenous bolus lignocaine and labetalol appear to fulfill the above criteria.

Hamil et al[9] studied the effect of lignocaine on endotracheal intubation when given by laryngotracheal and intravenous routes and came to a conclusion that intravenous lignocaine is the preferred route for administering lignocaine prior to endotracheal intubation.

Recently new drugs are tried in attenuation of adrenergic response during laryngoscopy and intubation. One such drug is Labetolol; Labetalol, a combined α_1 and non-selective β- adrenergic blocking drug has shown a better safety profile and haemodynamic stability Ratio of β: α effects is 7:1 for intravenous (IV) administration. Onset time after IV administration is 5 minutes, peak effect is seen at 5-15 minutes, with a half-life of 4-6 hrs.Reduces systemic vascular resistance & reflex tachycardia. Not associated with rebound hypertension has low placental transfer due to high degree of ionization at physiological pH. So in our study, lignocaine 1.5mg/kg were given 2 minutes before laryngoscopy and intubation. Labetalol: Robert K Stoelting[10] suggested that, intravenous labetalol given in the dose of 0.5mg/kg 5minutes before laryngoscopy and intubation, sufficiently attenuate the laryngoscope responses because it coincides with onset of action.

This study was done to assess the effect of combining drugs and compare them in attenuating the intubation response.

In present study combinations of labetalol with lignocaine, and lignocaine alone were used in preeclampsia to attenuate the intubation response.

Connell H. Dalgleish J G, Downing J W.[5] observed increase in systolic arterial pressure (SAP) following laryngoscopy and tracheal intubation in patients with severe pregnancy induced hypertension (PIH) , undergoing general anaesthesia for Caesarean section.

In our study, SBP before intubation in both the groups was comparable. Following administration of study drug and after intubation ,there was slight increase in SBP in both the groups at 1 minute and subsequently attenuation of SBP occurred at all time intervals in both the groups but the attenuation was better in group 1 compared to group 2 and was statistically significant.

Inada E, Cullen DJ, Nemeskal AR, Teplick R[11] compared Labetalol with lignocaine and saline to minimize the haemodynamic response to intubation in patients undergoing surgical procedures under general anesthesia. They found that, Labetalol 10 mg prevented a rise in heart rate after intubation compared to patients who received placebo, lignocaine 100 mg, or labetalol 5 mg. Thus they concluded that, Labetalol 10 mg IV just prior to induction of anesthesia is a safe and cost-effective in attenuating haemodynamic response to laryngoscopy and intubation.

In our study, labetalol at the dose of 0.5mg/kg five minutes before intubation, attenuated both heart rate and blood pressure in response to laryngoscopy and intubation.

Ramanathan j, sibai BM, Mabie WC, Chauhan D, Ruiz AG.[12] They studied the effect of labetalol on haemodynamic response to intubation and also on neonatal APGAR score. They randomly assigned preeclampsia patients under general anesthesia to either a labetalol pretreatment group or a control group before the induction of anesthesia. Patients in the labetalol group received 20 mg of labetalol intravenously followed by 10 mg increments up to a total dose of 1 mg/kg, which resulted in moderate reductions in the maternal mean arterial pressure and heart rate with attenuation of haemodynamic responses to laryngoscopy and endotracheal intubation. The neonatal APGAR scores, umbilical arterial and venous pH and blood gas values were similar in both the groups. Side effects such as hypotension, bradycardia, and hypoglycemia were not seen in the neonates in the labetalol treatment group.

In our study the rise in the HR, SBP, DBP, and MAP were significantly less in Group 1(labetalol with lignocaine) compared to group 2(lignocaine) and the neonatal APGAR score was similar in both the groups.

ECG Changes

According to Sharma and Srivastava,[13] the most common ECG finding during laryngoscopy and intubation was sinus tachycardia. They noted that, other rhythms like premature ventricular contractions, nodal rhythms, arrhythmias and ST-T changes can occur at the time of intubation, but these were not frequent events.

Pyrs-Roberts[14] and Harnath Babu[15] have commented that, sinus tachycardia is the most frequent ECG change observed during laryngoscopy and intubation.

In our study, electrocardiography was normal in both the groups. None of patients, in both the groups developed any arrhythmias and ST-T changes. And similarly, APGAR score remains almost the same in both groups and was statistically insignificant.

Limitation of the study

Long term effect of antihypertensive drug could not be studied, because all the cases studied on emergency basis and only few patients with severe hypertension were started on antihypertensive drug such as Nifedipine, Nicardipine, etc. Therefore it was not possible to study the influence of antihypertensive drug on the haemodynamic response to intubation.

Summary

Rise in the HR, SBP, DBP, MAP were observed in both the groups at one minute following laryngoscopy and intubation and these responses persisted for about 3 minutes after which they returned towards base values and even below the baseline values in a significant manner in case of group 1 (labetalol with lignocaine) compared to lignocaine alone in preeclampsia. Electrocardiography was normal in both the groups. And similarly, APGAR score remains almost the same in both groups. There were no significant side effects in both the groups.

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