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ATTENUATION OF PRESSOR RESPONSE BY INTRAVENOUS LABETALOL AND ITS COMPARISON WITH INTRAVENOUS LIGNOCAINE

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ABSTRACT

Aims and Objectives: Present study was designed to compare efficacy of intravenous Labetalol and Lignocaine for attenuating haemodynamics response to laryngoscopy and endotracheal intubation.

Method: Sixty patients of either sex, ASA grade I and II, aged 15 to 60 years were scheduled for elective surgical procedures under general anesthesia. Patients were divided into two groups to receive either Labetalol (Group 1) or Lignocaine (Group 2). Thiopentone sodium 2.5 % was given until eyelash reflex disappeared, and intubation was facilitated with Succinylcholine. Hemodynamic parameters were recorded.

Results: Comparing two groups, Labetalol showed a better attenuation of pulse rate than Lignocaine, ($p< 0.05$). Group 1 had less alteration in systolic, diastolic and mean arterial blood pressure and showed better attenuation of pressor response ($p< 0.05$). No side effects were seen in any group.

Conclusion: Thus, Labetalol was found to be superior to Lignocaine.

Introduction

Despite the emergence of new airway devices in recent years, rigid laryngoscopy and tracheal intubation remain the gold standard in airway management. Direct laryngoscopy and endotracheal intubation following induction of anesthesia is almost always associated with hemodynamic changes due to reflex sympathetic discharge. This increased sympathoadrenal activity result in hypertension, tachycardia, and arrhythmias [1-3]. However hemodynamic changes may be dangerous in susceptible patients such as those with hypertension, coronary artery disease, cerebrovascular disease, and intracranial aneurysm and may cause arrhythmias, myocardial infarction (MI), left ventricle failure, and rupture of aneurysm [4].

Various drug regimens and techniques have been used from time to time for attenuating the stress response to laryngoscopy and intubation, including opioids, barbiturates, benzodiazepines, beta blockers, calcium channel blockers, vasodilators, etc [5-9]. But none of these techniques or drugs has proven to be very effective; therefore anaesthesiologists are in constant search for an ideal agent to counteract the catecholamine surge during laryngoscopy and endotracheal intubation.

Intravenous (IV) Lignocaine is one of the oldest, cheapest and most easily available drugs used for attenuation of hemodynamic response to laryngoscopy and intubation [10-11]. However, various studies have been shown that intravenous Lignocaine administration prior to induction of anaesthesia is effective in preventing or attenuating the arterial hypertension and tachycardia in response to endotracheal intubation [12-13]. A few publications have shown the lack of effect of intravenous Lignocaine on haemodynamic response [14-16].

Labetalol is a unique oral and parenteral antihypertensive drug that is α1-.and nonselective β1-.and β2-adrenergic antagonist. It reaches its peak effect at 5-15 min after intravenous (IV) injection and rapidly redistributes (5.9 min redistribution half-life) [17]. It lowers BP by decreasing systemic vascular resistance (α1-blockade), whereas reflex tachycardia triggered by vasodilatation is attenuated by simultaneous β-blockade. Cardiac output remains unchanged [18].

Aim of the present study was to assess and compare the efficacy of 0.25 mg/kg of IV Labetalol and 1.5 mg/kg of Lignocaine in attenuating the hemodynamic response associated with laryngoscopy and intubation.

Materials and Methods

After obtaining approval from institutional ethics committee and written informed consent of all patients, study was carried out in Anaesthesiology Department of Shri Vasantrao Naik Government Medical College, Yavatmal. Total 60 patients of either sex, ASA grade I and II, aged 15 to 60 years and who were normotensive and undergoing elective surgery under general anesthesia were selected for the study. The patients were randomly divided into two groups with the help of computer-generated randomization chart, group 1 (Labetalol group) and group 2 (Lignocaine group) with 30 patients in each group. Patients having moderate to severe hypertension, ischemic heart disease, heart failure, COPD, old age, patients with cerebrovascular diseases, liver disease, arrhythmias and conduction block, shock, anticipated difficult endotracheal intubation {Mallampatti class more than I} were excluded from study. A detailed pre-anaesthetic evaluation including relevant laboratory investigations were done for all the patients.

In the operation theatre monitors were applied to the patient and vital parameters like pulse rate, blood pressure, ECG and SpO2 were monitored. After establishing good intravenous line, patients were preloaded with 500 ml of ringer lactate solution. All patients were premeditated with I.M. Glycopyrolate 0.5ug/kg, intravenous Ranitidine 1 mg/kg, Ondansetron 0.08 mg/kg, Midazolam 0.03 mg/kg. No other analgesic or opioid premedication was required. After preoxygenation for 3 minutes; either injection Labetalol 0.25 mg/kg or Lignocaine 1.5 mg /kg were given intravenously slowly in group 1 and group 2 respectively. Patients were induced with 2.5% Thiopentone sodium (5-7 mg/kg approximately) until eyelash reflex disappeared, one minute after receiving Labetalol or Lignocaine. Endotracheal intubation was facilitated with 2 mg/kg of Succinylcholine given IV 1 min prior to laryngoscopy and intubation. Patients were ventilated with 100 % oxygen till completely relaxed after that smooth and gentle laryngoscopy and endotracheal intubation was performed.

Pulse rate , blood pressure and ECG were recorded at the time of induction and intubation, 1 , 3 , 5 , 15 minutes and every 15 minutes thereafter, till 5 hours after intubation. The occurrence of arrhythmias, if any was noted. Again patients were ventilated with oxygen 50% and nitrous oxide 50 % using Bain's circuit. The patients were paralyzed using non-depolarizing muscle relaxant Vecuronium and no surgical stimulus was given till 5 minutes. Inhalational anesthetic agent like isoflurane was started after

5 minutes of laryngoscopy and endotracheal intubation. Further anesthesia was maintained by using Oxygen 50 % + Nitrous oxide 50 % and Isoflurane 0.5 – 1.5 % and inj. Vecuronium was used as muscle relaxant .

Statistical analysis

The data obtained from the study was organized and analyzed by applying appropriate statistical tests . Student 't' test (Paired 't' within group and unpaired 't' between groups) was applied to find out significance. 'P' value less than 0.05 was considered significant and p value less than 0.001 was considered to be highly significant .

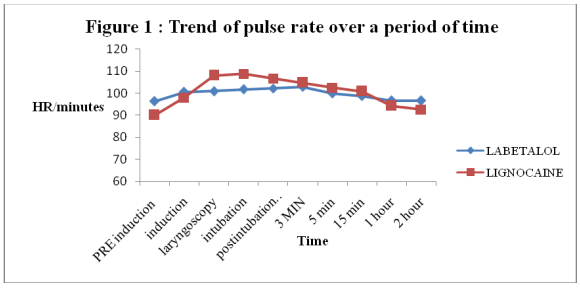
Result

Sixty patients were selected for the study and equally divided into group '1' (Labetalol) and group '2' (Lignocaine). Two groups were comparable in demographic profile and baseline blood pressure and heart rate values (Table-1).

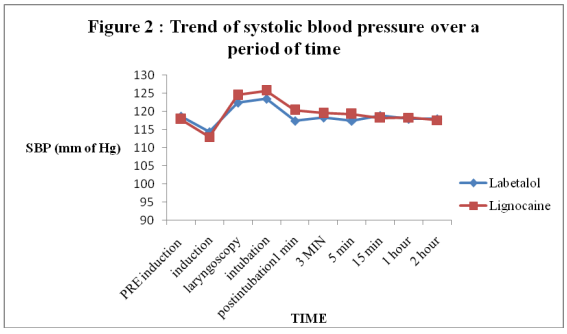
Table 1: Comparison of Demographic Profile and Baseline Haemodynamic Characteristics

Demographic & Haemodynamic Characteristics (Mean±SD)	Group 1 (n=30)	Group 2 (n=30)	(P Value)
Age in years	39.0 ± 6.5	39.2 ± 6.5	P>0.05NS
Height in cm	160.6 ± 6.8	160.4 ± 7.1	P>0.05NS
Weight in kg	58.2 ± 7.0	59.2 ± 6.8	P>0.05NS
HR/minute	96.35±8.6	90±8.1	P>0.05NS
Systolic BP mmHg	118.7±3.3	117.89±4.3	P>0.05NS
Diastolic BP mmHg	80.67±6.6	79.45±7.9	P>0.05NS
MAP mm Hg	92.66±6.3	92.57±5.5	P>0.05NS

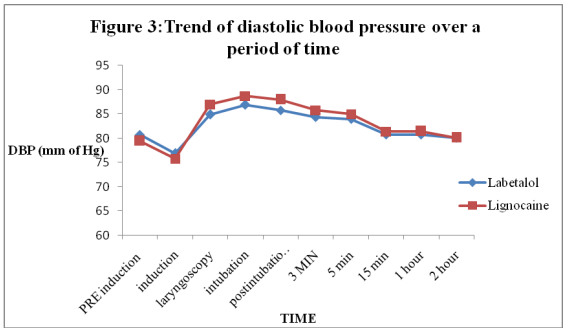
Figure 1 shows that comparison of changes in pulse rate at various time intervals in two groups. Group 1 showed a steady level of heart rate with only mild rise i.e.4 beats/minutes (4.16 %) whereas group 2 showed an initial fall in pulse rate followed by a rise during laryngoscopy and intubation.



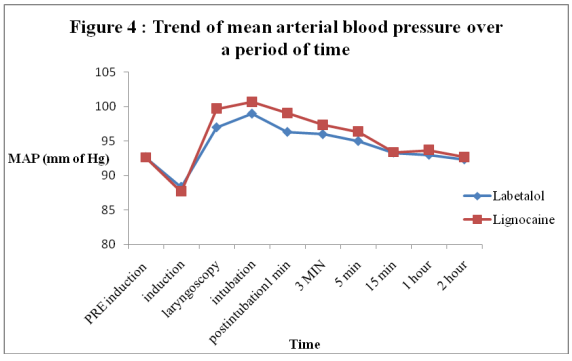
Also group 1 had smaller rise in systolic blood pressure i.e. 5 mm of Hg (4.23%) during laryngoscopy and intubation than group 2 (8 mm of Hg or 6.83 %), difference was not statistically significant (p >0.05), (Figure 2).



As well we observed initial drop in diastolic blood pressure (DBP) in both the groups after administration of bolus dose of Thiopentone,(In group 1 drop in DBP - from 80.67 to 76.88 mm of Hg and in group 2- from 79.45 to 75.77 mm of Hg). In Labetalol group, the drop in DBP persisted till initiation of laryngoscopy. Furthermore, in group 1 and group 2 we observed rise in DBP during laryngoscopy and intubation i.e. 6 and 9 mm of Hg above the base line of 80.67 and 79.45 mm of Hg i.e. percentage of rise of 10 % and 11.39% respectively. After intubation diastolic blood pressure started falling till 15 minutes but never touched the baseline in both the groups. After that it slowly reached to base line. Thus Labetalol caused less alteration in diastolic blood pressure after laryngoscopy and intubation than Lignocaine (Figure 3).



When comparing two groups , Labetalol caused less rise in mean arterial blood pressure i.e. 8 mm of Hg or 8.89 % after laryngoscopy and intubation than Lignocaine (7 mm of Hg or 7.60 %), This was statistically significant (p<0.05), (Figure 4).



No significant bradycardia, conduction defect, arrhythmias were noted following administration of either Labetalol or Lignocaine. Both Labetalol and Lignocaine did not give rise to any side effects either intra or postoperatively.

Discussion

Laryngoscopy and endotracheal intubation are considered as the most critical events during general anesthesia as they provoke transient but marked sympathoadrenal response manifesting as hypertension and tachycardia [1-3]. Such stressful responses are detrimental especially in patients with hypertension, old age ischemic heart disease, cerebrovascular disease and diabetes mellitus. This may at times leads to catastrophes like myocardial infarction or cerebrovascular accidents. Although the cardio vascular responses to laryngoscopy and tracheal intubation are well known and linked with increases in catecholamine blood levels [19]. These effects/responses can be reduced by deeper planes of anaesthesia, which may also be poorly tolerated. Hence various methods and drugs have been tried by various authors for blunting hemodynamic responses [20-22] but none of these techniques or drugs has proven to be very effective; therefore anaesth esiologists are in constant search for an ideal agent to counteract the catecholamine surge during laryngoscopy and endotracheal intubation. Lignocaine is most commonly used drug for attenuation of pressor response. Therefore it was decided to compare it with Labetalol which is a unique antihypertensive drug that exhibits selective alfa 1 and non selective beta 1 and beta 2 adrenergic antagonist effect. Faculty of Dentistry, University of Stellenbosch, Cape Town, South Africa have conducted one study to attenuate pressor response to endotracheal intubation by using three drugs namely Labetalol, acebutalol and Lignocaine[23]. And this study concluded that pre-

induction use of Labetalol in the dose of 1 mg/kg was found to be more effective than acebutolol and lidocaine in attenuating the pressor response to instrumentation and intubation.

Hence the present study was done in two groups to evaluate the efficacy of Labetalol and Lignocaine. Findings of each group were discussed in comparison with their pre-operative values and values at different time intervals with regard to heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and other complications.

The patients from Lignocaine group showed a rise in heart rate after giving induction agent. From baseline heart rate of 90 beats/minutes, it was raised by 8 beats/minutes i.e. a percentage rise of 8.8%. But during laryngoscopy and endotracheal intubation there was a very marginal further rise in heart rate from 98 beats/miutes to 104 beats/minutes and finally 100.78 beats/minutes 15 min after intubation. That was by 6 beats/minutes from induction. It started falling till 15 minutes after intubation but never touched the base line. So, Lignocaine could not prevent rise in heart rate due to inducing agent but blunted the rise seen with laryngoscopy and endotracheal intubation although could not totally attenuate it. Heart rate did not return to its base line till 15 minute after intubation. While in the Labetalol group, the patients showed a rise in heart rate after giving induction agent. From baseline heart rate of 96.35 beats/minutes, it was raised to 100.56 beats/minutes i.e. a percentage rise of 4.16%. But during laryngoscopy and intubation there was almost no further rise in heart rate from induction till 3 minute after intubation, after which it started falling till 15 minutes after intubation but never touched the baseline. Therefore, though Labetalol could not prevent small momentary rise in heart rate due to Thiopentone but it did attenuate the rise seen with laryngoscopy and intubation. Heart rate did not return to its baseline till 15 minutes after intubation. Hence Labetalol was found to control rise in heart rate better than Lignocaine. This was statistically significant, ($p < 0.05$).

Thus it can be inferred that there was general tendency towards rise in heart rate during induction, suggesting a change possibly secondary to the vasodilatation produced by Thiopentone sodium. The subsequent rise in heart rate with peak rise at the laryngoscopy and intubation which is due to catecholamine response was attenuated with the use of both Lignocaine and Labetalol. This was in concurrence with the finding of Russell W.J. et al [24]. Attenuation of rise in pulse rate by Labetalol correlated with the finding by Maharaja RJ et al [25].

Though both the groups show initial drop in systolic, diastolic and mean arterial pressure after giving bolus dose of Thiopentone but drop persisted till initiation of laryngoscopy in Labetalol group. Also we observed increase in systolic, diastolic and mean arterial pressure in both the groups during laryngoscopy and intubation. After intubation blood pressure started falling till 15 minutes but never touched the baseline. After that it slowly reached to base line. Thus Lignocaine and Labetalol caused an initial drop in systolic, diastolic and mean arterial pressure with very little increase during laryngoscopy and intubation, indicating that both drugs cause blunting of pressor response. When comparing two groups, Labetalol caused very marginal alteration in blood pressure after laryngoscopy and intubation than Lignocaine and attenuated the pressor response better than Lignocaine. This finding is similar to study done by Maharaja RJ et al [25].

In our study both Labetalol and Lignocaine did not give rise to any side effects either intra or postoperatively.

Conclusion

We conclude that both Lignocaine (1.5 mg/kg) and Labetalol (0.25 mg/kg) effectively blunt the hemodynamic pressor response to endotracheal intubation and definitely have cardio protective action and can safely be used in high risk patients, with hypertension, ischemic heart disease and cerebrovascular disease. However in lower doses, Labetalol was a better drug than Lignocaine in attenuation of pressor response due to laryngoscopy and intubation.

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