A Comparison of efficacy of I.V.Lignocaine and I.V.Verapamil for attenuation of stress response to laryngoscopy and Tracheal intubation

Pallavi Gupta[1], Sharad Kumar Mathur[2], Mandeep Manohar Harison Madia[3]

[1]Junior Resident, Department of Anaesthesiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, [2] Professor, Department of Anaesthesiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, [3]Junior Resident, Department of Anaesthesiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi.

ABSTRACT

Context: Direct laryngoscopy and endotracheal intubation following induction of anesthesia is almost always associated with hemodynamic stress response due to reflex sympathoadrenal discharge.

Aim & Objectives: Aim of our study was to compare the efficacy of lignocaine and verapamil in attenuating the hemodynamic response to laryngoscopy and intubation. The present prospective randomized study was carried out in a tertiary care teaching hospital. A total of 60 American Society of Anesthesiologist physical status I and II patients posted for elective surgery under general anesthesia were enrolled in the study. Patients were randomly divided into two groups, group L (lignocaine group) and group V (verapamil group) with 30 patients in each group.

Materials and Methods: Group L received 1.5 mg/kg of lignocaine intravenous (IV) and group V received.1 mg/kg of verapamil IV. propofol was given until verbal response disappeared, and intubation was facilitated with vecuronium. Anesthesia was maintained with oxygen: Nitrous oxide, isoflurane, and vecuronium. Hemodynamic parameters were recorded during the before intubation, immediate after intubation, 1 min,2min, 3 min, 5 min after intubation.

Conclusion: Lignocaine attenuates the hemodynamic stress response to laryngoscopy and intubation more effectively compared with verapamil without any deleterious effects.

Key words: Hemodynamic stress response, intubation, laryngoscopy, lignocaine, verapamil.

INTRODUCTION

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 may result in hypertension, tachycardia, and arrhythmias.[1-3] Transitory hypertension and tachycardia may predispose to the development of pulmonary edema,[4] and myocardial insufficiency. Various agents such as opioids,[5] beta adrenergic blockers,[6,7] calcium channel antagonists,[8] and clonidine[9] have been used to blunt the hemodynamic response to laryngoscopy and intubation, but they all had limitations.

Intravenous (IV) lignocaine is one of the oldest and most easily available drug used for attenuation of hemodynamic response to laryngoscopy and intubation.[10-15].It acts by inhibiting sodium channels in the neuronal cell membrane, decreasing the sensitivity of the heart muscles to the electrical impulses, has direct cardiac depression and peripheral vasodilatation properties.

Verapamil attenuates the cardiovascular response to intubation by blocking voltage-sensitive L- type channels and inhibiting calcium entry mediated action potential in the smooth and cardiac muscle cell. It also controls hypertension by its peripheral vasodilating action [16].

After obtaining institutional review board approval and informed written consent from the patients, the present prospective randomized study was carried out in SIR SUNDERLAL hospital. A total of 60 American Society of Anesthesiologists (ASA) physical status I and II patients aged between 18 and 60 years undergoing elective surgery were enrolled in the study. Patients with hypertension, cardiac, coronary, renal, hepatic, cerebral diseases, and peripheral vascular diseases, bradycardia, obese patients, anticipated difficult airway, pregnant, and nursing women, history suggestive of sensitivity to drugs used during the study were excluded from the study.

Patients were randomly divided into two groups with the help of computer-generated coded envelopes, group L (lignocaine group) and group V (verapamil group) with 30 patients in each group. All patients included in the study were given Tab Ranitidine 150 mg, Tab Alprazolam 0.25 mg and Tab Metoclopromide 10 mg at bed time the previous day and in morning on the day of surgery.

On arrival in the operation theatre, standard anaesthesia monitors (pulse oximeter, ECG leads, blood pressure cuff) were connected and baseline reading like heart rate, systolic and diastolic blood pressure, mean arterial pressure, oxygen saturation were recorded and an i.v. access was established.

After preoxygenation, all patients were premedicated with i.v. fentanyl 3mcg/kg and midazolam 0.1mg/kg. Anaesthesia was induced with inj. propofol 2.5mg/kg followed by inj. Vecuronium bromide 0.1mg/kg to facilitate endotracheal intubation. Syringes filled with the test drugs inj. verapamil 0.1mg/kg or inj. Lignocaine 1.5mg/kg was administered 3 min before laryngoscopy and intubation and bag and mask was continued for 3 minutes.

The patients were intubated using appropriate sized cuffed endotracheal tubes. After confirming bilateral equal air entry, the endotracheal tube was secured. Vitals were recorded immediately after and at 1, 3 and 5 minutes interval after laryngoscopy and intubation. Anaesthesia was maintained using nitrous oxide and oxygen (50:50) mixture and intermittent vecuronium bromide (0.02 mg/kg). Inhalational isoflurane (1.2%) was given 5 minutes after intubation. At the end of the procedure patient was reversed using inj. neostigmine 50microgram/kg and inj. glycoplyrrolate 10mcg/kg. Hemodynamic parameters were recorded before intubation, immediately after intubation, 1 min, 2min, 3 min, 5 min after intubation.

The statistical analysis was done using statistical software SPSS for windows (Version 23.0). The recorded data were compared and presented as Mean± SD, frequency and percentage. The various categorical variables studied during observation period were compared using Chi-squaretest. For comparing two groups of mean Student's t test was used. Intra-group comparison of haemodynamic variable from the baseline values was done using paired t test. The critical value of 'p' indicating the probability of significant difference was taken as <0.05 for comparison.

RESULTS

All the data was expressed as mean and standard deviation for continuous data and number and percent for categorical data. The two groups were comparable in patient characteristics with respect to age, weight, gender, and ASA physical status (P > 0.05). Inter group comparison of group - Lignocaine and group – verapamil both shows attenuation of heart rate response in group – lignocaine which is significant till 5minutes post intubation.

After intubation the attenuation of increase in Systolic blood pressure in group – Lignocaine was statistically significant as compared to group – Verapamil .Similarly after intubation there was statistically significant (P<0.001)attenuation of Mean arterial pressure in group - Lignocaine as compared to groupVerapamil. [table 2,3, 4]

Table 1: Mean of heart rate and their group comparison among study groups at different intervals

Time Interval	Group Lignocaine Mean±SD (n=30)	Group Verapamil Mean±SD (n=30)	t-value	p-value
HR before induction	84.767±11.8371	84.667±11.3634	0.033	0.973
HR immediate after intubation	86.833±10.4587	94.933±10.0273	-3.062	0.003
HR after 1 min	89.900±11.9000	96.933±11.8901	-2.290	0.026
HR 2 min	80.567±11.7962	90.100±13.4967	-2.913	0.005
HR 3 min	76.667±12.2061	85.067±13.0884	-2.571	0.013
HR 5 min	72.800±12.4413	81.900±12.3298	-2.846	0.006

Table 2: Mean of systolic blood pressure (SBP) and their group comparison among study groups at different intervals

Time Interval	Group Lignocaine Mean±SD (n=30)	Group Verapamil Mean±SD (n=30)	t-value	p-value
SBP before induction	123.767±10.8459	122.467±10.0781	0.481	0.632
SBP immediate after intubation	117.700±10.3129	123.500±11.7847	-2.029	0.047
SBP after 1 min	115.500±12.1336	124.767±10.4508	-3.169	0.002
SBP 2 min	107.367±8.9731	115.033±10.7559	-2.998	0.004
SBP 3 min	103.333±9.7745	110.667±8.2392	-3.142	0.003
SBP 5 min	103.033±10.8262	111.067±12.5339	-2.657	0.010

Table 3: Mean of mean arterial pressure (MAP) and their group comparison among study groups at different intervals

Time Interval	Group Lignocaine Mean±SD (n=30)	Group Verapamil Mean±SD (n=30)	t-value	p-value
MAP before induction	94.85±7.21	93.26±7.69	0.825	0.413
MAP immediate after intubation	86.50±11.01	93.63±10.72	-2.541	0.014
MAP after 1 min	85.63±9.79	93.34±8.88	-3.194	0.002
MAP 2 min	80.01±7.84	87.27±8.89	-3.357	0.001
MAP 3 min	78.08±8.20	83.57±5.71	-3.007	0.004
MAP 5 min	76.25±9.30	82.37±7.13	-2.859	0.006

DISCUSSION

The precise mechanism which leads to the haemodynamic response to laryngoscopy and intubation probably involves intense sympathetic discharges caused by stimulation of epipharynx and laryngopharynx. Hassan[17] concluded that during laryngoscopy and endotracheal intubation placing of tube through the cords and inflating the cuff in infraglottic region contributes significantly to sympathoadrenal response caused by supraglotic stimulation.

Lignocaine has been a popular agent for attenuating circulatory responses associated with intubation. The various properties of lignocaine that makes it suitable for attenuation of stress response are analgesia, antiarrythmic effect, rapid onset, short duration and suppression of laryngeal reflexes. In our study we found that heart rate increase in patients receiving lignocainewas statistically attenuated as compared to verapamil ($p<0.001$) for a maximum duration of 5 minutes after intubation, though there was statistically significant increase in heart rate immediately after intubation in both groups as compared to baseline levels. This is consistent with finding of Wilson et al[14]

Verapamil inhibits calcium entry mediated action potential in cardiac muscle cell. It also controls hypertension by its peripheral vasodilating action.Calcium channel blocking agents used for their cardiovascular and cerebrovascular actions. Verapamilis the treatment of choice in supraventicular tachycardias and a useful antihypertensive and antiaginal agent.It has also been used for attenuation of cardiovascular responses to laryngoscopy and intubation..This is consistent with finding of Jyotsna et al.[18]

CONCLUSION

Intravenous lignocaine (1.5 mg/kg) given 3 min before intubation is effective in attenuating hemodynamic response to laryngoscopy and intubation, without any deleterious effects,while verapamil (0.1 mg/kg) not attenuates the response effectively.

REFERENCES

1. Stoelting RK. Blood pressure and heart rate changes during short- duration laryngoscopy for tracheal intubation: Influence of viscous or intravenous lidocaine. Anesth Analg 1978;57:197-9.

2. Prys-Roberts C, Greene LT, Meloche R, Foëx P. Studies of anaesthesia in relation to hypertension. II. Haemodynamic consequences of induction and endotracheal intubation. Br J Anaesth 1971;43:531-47.

3. Barak M, Ziser A, Greenberg A, Lischinsky S, Rosenberg B. Hemodynamic and catecholamine response to tracheal intubation: Direct laryngoscopy compared with fiberoptic intubation. J Clin Anesth 2003;15:132-6.

4. Fox EJ, Sklar GS, Hill CH, Villanueva R, King BD. Complications related to the pressor response to endotracheal intubation. Anesthesiology 1977;47:524-5.

5. Dahlgren N, Messeter K. Treatment of stress response to laryngoscopy and intubation with fentanyl. Anaesthesia 1981;36:1022-6.

6. Figueredo E, Garcia-Fuentes EM. Assessment of the efficacy of esmolol on the haemodynamic changes induced by laryngoscopy and tracheal intubation: A meta-analysis. Acta Anaesthesiol Scand 2001;45:1011-22.

7. Singh SP, Quadir A, Malhotra P. Comparison of esmolol and labetalol, in low doses, for attenuation of sympathomimetic response to laryngoscopy and intubation. Saudi J Anaesth 2010;4:163-8.

8. Mikawa K, Nishina K, Maekawa N, Obara H. Comparison of nicardipine, diltiazem and verapamil for controlling the cardiovascular responses to tracheal intubation. Br J Anaesth 1996;76:221-6.

9. Mikawa K, Nishina K, Maekawa N, Takao Y, Asano M, Obara H. Atenuation of the catecholamine response to tracheal intubation with oral clonidine in children. Can J Anaesth 1995;42:869-74.

10. Splinter WM, Cervenko F. Haemodynamic responses to laryngoscopy and tracheal intubation in geriatric patients: Effects of fentanyl, lidocaine and thiopentone. Can J Anaesth 1989;36:370-6.

11. Abou-Madi MN, Keszler H, Yacoub JM. Cardiovascular reactions to laryngoscopy and tracheal intubation following small and large intravenous doses of lidocaine. Can Anaesth Soc J 1977;24:12-9.

12. Miller CD, Warren SJ. IV lignocaine fails to atenuate the cardiovascular response to laryngoscopy and tracheal intubation. Br J Anaesth 1990;65:216-9.

13. Hamill JF, Bedford RF, Weaver DC, Colohan AR. Lidocaine before endotracheal intubation: Intravenous or laryngotracheal? Anesthesiology 1981;55:578-81.

14. Wilson IG, Meiklejohn BH, Smith G. Intravenous lignocaine and sympathoadrenal responses to laryngoscopy and intubation. The effect of varying time of injection. Anaesthesia 1991;46:177-80.

15. Tam S, Chung F, Campbell M. Intravenous lidocaine: optimal time of injection before tracheal intubation. Anesth Analg 1987;66:1036-8.

16. Singh BN, Ellrodt G, Peter CT.Verapamil: a review of its pharmacological properties and therapeutic uses. Drugs15:169-97,1978

17. Hassan,HG,El-Sharkawy, Renk H, Mansour G. Haemodynamic and catecholamine responses to laryngoscopy with Vs without endotracheal intubation. Acta Anaesthesiol Scand 1991; 35: 442.

18. Jyotsna Wig MD, Manohar Sharma MD, Neelu Baichoo MO, Anil Agarwal. Compared the efficacy of iv nicardipine hydrochloride and verapamil hydrochloride in attenuating the cardiovascular responses to laryngoscopy and tracheal intubation.CAN J ANAESTH/41:42/pp1185-8