



COMPARISON OF INTRAVENOUS MAGNESIUM SULFATE AND LIGNOCAINE FOR ATTENUATION OF CARDIOVASCULAR RESPONSE TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION IN ELECTIVE SURGICAL PATIENTS

Anaesthesiology

Dr. Monal Ramani	Associate Professor, Department Of Anaesthesiology, B J Medical College, Ahmedabad-380016.
Dr. Saravanan V Kandasamy	Resident, Department Of Anaesthesiology, B J Medical, College, Ahmedabad- 380016.
Dr. Dhriti Patel	Final Year Mbbs, B J Medical College, Ahmedabad-380016.
Dr. Sukanksha Goley*	Resident, Department Of Anaesthesiology, B J Medical, College, Ahmedabad- 380016. *Corresponding Author

ABSTRACT

INTRODUCTION: Laryngoscopy and endotracheal intubation are essential components of general anesthesia. But it is always associated with side effects called reflex cardiovascular responses. Many methods have been identified to attenuate these responses like intravenous lidocaine, deep inhalational anesthesia, vasodilators, intravenous magnesium sulphate even though therapeutic superiority remains understudied.

METHODS: An institutional-based cohort study on 90 adult patients aged between 18–60 years was applied. 30 patients in the non-exposed group (Group N), 30 in the lidocaine group (Group L), and 30 in magnesium sulphate (Group M) were included. The hemodynamic parameters like heart rate, systolic, diastolic and mean arterial blood pressure at various time points up to 7 minutes post-intubation were recorded and the effect of both drugs to reduce hemodynamic responses was compared. Parametric data were analyzed using ANOVA and nonparametric data using the Kuruska-Wallis H rank test. P-value < 0.05 considered statistically significant.

RESULTS: In all three groups, there was a statistically significant rise in heart rate and blood pressure from baseline. There was a statistically significant difference in mean heart rate throughout study minutes among the groups ($p < 0.001$). However, there was no statistically significant difference in mean heart rate between Groups M and L at all post-intubation time intervals. In blood pressure at all three parameters there was statistically significant difference among groups at all-time points except no difference at 7th minutes in DBP. There was significantly lower blood pressure in group M compared to both groups.

CONCLUSION: In conclusion, prophylactic administration of magnesium sulphate and lidocaine was effective in attenuating hemodynamic responses to the stress effect of laryngoscopy and intubation. But based on our finding prophylaxis of magnesium sulphate is associated with a more favorable hemodynamic response.

KEYWORDS

Lidocaine, Magnesium sulphate, Laryngoscopy, Pressure response.

INTRODUCTION

General anaesthesia involve the laryngoscopy and endotracheal intubation as an integral part. The standard technique of laryngoscopy and endotracheal intubation involves the stimulation of Larynx, Pharynx, Epipharynx and trachea, which are extensively innervated by Autonomic nervous system, namely the parasympathetic innervation via vagus and glossopharyngeal nerves and sympathetic via superior cervical ganglion. Laryngoscopy and tracheal intubation violate the patients protective airway reflexes and lead to adverse hemodynamic & cardiovascular responses like tachycardia, HTN due to sympathetic stimulation and release of catecholamines, which are detrimental to the patients posted for various surgeries under GA. Although these responses may be of short duration reaching peak value in 1 minutes and ends in 5 to 10 minutes, variable, unpredictable and of little consequence in healthy individuals. However, these changes can facilitate and accelerate the development of myocardial ischemia, arrhythmia, infarction and cerebral haemorrhage in patients with coronary artery disease, hypertension or cerebrovascular disease. Hence, suppression of the cardiovascular response to laryngoscopy and endotracheal intubation is mandated.

So this study is to assess the efficacy of intravenous Magnesium sulphate of dose 20mg/kg as premedication in attenuating the cardiovascular response to laryngoscopy and intubation in a group of normotensive patients, mild hypertensive patients compared to the control group with intravenous preservative free Lignocaine of dose 1.5mg/kg.

Materials And Methods

After obtaining institutional ethical committee approval and written informed valid consent, a study of 60 patients of either sex, ASA-I/II in any age group was conducted in patients undergoing surgery in general anesthesia in civil hospital Ahmedabad. STUDY DESIGN: This is prospective, simple randomised, observational study.

- Inclusion Criteria:** ASA grade I and II physical status, Patient requiring general anaesthesia and not on elective ventilation, Age

between 18-60yrs, belonging to either sex, Weight 50-100 kg.

- Exclusion Criteria:** Known Hypertensive or unstable blood pressure SBP <70 & >150, Poor Left ventricular function, Emergency Surgery, Diabetics, Difficult Airway, Impaired renal function and electrolyte imbalance.

Procedure: Patients were taken on OT table and all the minimum mandatory monitors that are non-invasive blood pressure (NIBP), heart rate (HR), pulse oximetry, end tidal CO₂, were applied. Randomization was performed using a coin toss method to allocate patients to various groups. Patients were randomly divided into two groups.

Group 1: inj. MgSo₄ iv was given as a dose of 20/kg as a pre medication before induction.

Group 2: inj. Lignocaine was given at dose of 1.5mg/kg as a premedication before induction.

After that Patients were premedicated with glycopyrrolate 4 microgram/kg, fentanyl 2 microgram/kg and ondansetron 0.15 mg/kg IV 20 minutes prior to induction. General anaesthesia were standardized for all patients in all two groups. Patient were induced with Inj. Thiopentone Sodium 6 mg/kg and Inj. SuccinylCholine 2mg/kg intravenously to facilitate tracheal intubation with proper endotracheal tube size. Patient were maintained under controlled ventilation with O₂, sevoflurane. After completion of surgical procedure, the patients were extubated after reversal of neuromuscular blockade by neostigmine 0.05mg/kg and glycopyrrolate 8 microgram/kg intravenously. Patients were transferred to post anaesthesia care unit (PACU). Throughout the procedure heart rate (HR), blood pressure, SPO₂, ET CO₂ were observed.

Statistical Analysis

All patients data were recorded in proforma of study. Data was expressed as mean values ± standard deviation (SD). Quantitative data was analysed using t-test and qualitative by chi square test. Statistical

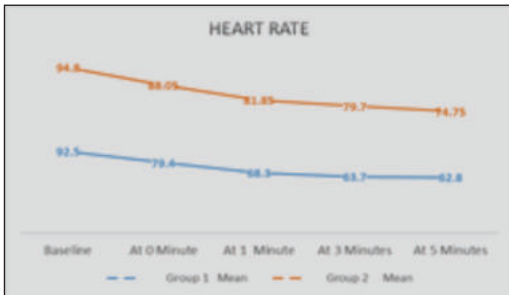
calculations were carried out using Microsoft Office Excel 2010 and Graph Pad Prism 6.05 (quickcalc) Software (Graph pad software inc. La Jalla CA USA). Changes in hemodynamic variables from baseline and a comparison of means were analysed by paired test for each time interval. A p-value <0.05 was considered statistically significant and p-value >0.05 was considered non-significant.

Observation And Results

The patients have been divided into two groups with 30 patients in each group.

Group 1: MgSO4 20 mg/kg. Group 2 - Lignocaine 1.5 mg/kg. There is significant reduction in heart rate in group 1. Group 1 base line heart rate is 92.5, 5 min after intubation is 68.3. P value is 0.001 (<0.05) which is significant.

There is some reduction in heart rate in group 2. But it is less significant.

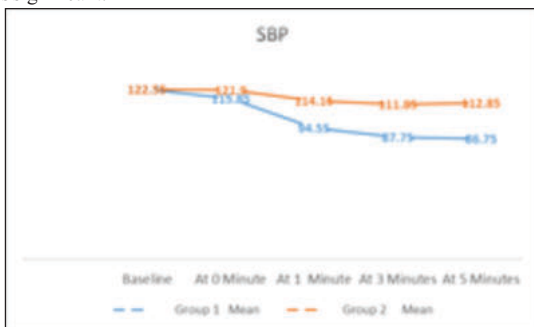


Graphical Representation Of Heart Rate

After 5 minutes of administration of magnesium sulphate there is significant reduction in systolic blood pressure.

Group 1 base line SBP is 122.3, 5 min after intubation is 94.5, P value is 0.001 (<0.05) which is significant.

There is some reduction in systolic blood pressure in group 2. But it is less significant.

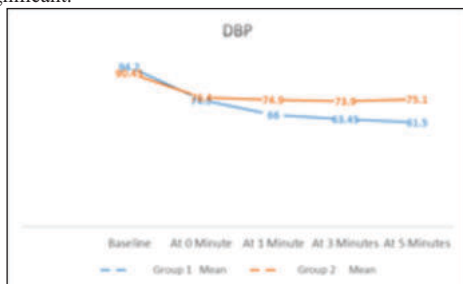


Comparison Of Systolic Blood Pressure

After 5 minutes of administration of magnesium sulphate there is significant reduction in diastolic blood pressure in group 1.

Group 1 base line DBP is 94.2, 5 min after intubation is 66, P value is 0.001 (<0.05) which is significant.

There is some reduction in diastolic blood pressure in group 2. But it is less significant.

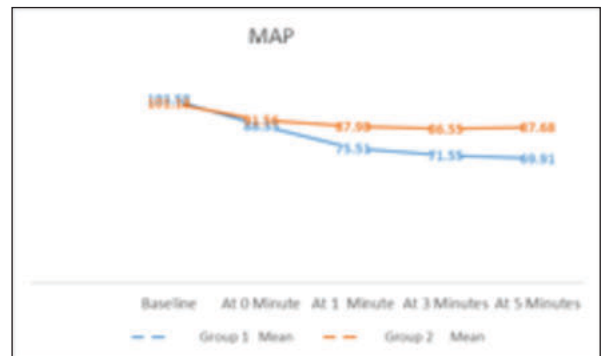


Comparison Of Diastolic Blood Pressure

After 5 minutes of administration magnesium sulphate of there is significant reduction in mean blood pressure in group 1.

Group 1 base line MAP is 103.58, 5 min after intubation is 75.51, P value is 0.001 (<0.05) which is significant.

There is some reduction in mean blood pressure in group 2. But it is less significant.



Comparison Of Mean Blood Pressure

DISCUSSION

A powerful noxious stimulus like laryngoscopy and tracheal intubation induces hypothalamic activity and results in an increased outflow in the sympathetic tracts. Consequently norepinephrine is released by post ganglionic sympathetic fibres and increase secretion from adrenal medulla leading to increase in heart rate and blood pressure.

In 1940, Reid and Brace first described hemodynamic responses to laryngoscopy. In 1951, King et al first described the reflex circulatory responses to direct laryngoscopy and tracheal intubation of sympathetic stimulation. Typically this response of increase in blood pressure starts within 15 seconds of laryngoscopy and peak in 30 seconds to 1 minute. It returns to control level within 5-10 minute. This physiology helps in the timing of administration of the drug and the peak effect used for attenuation of hemodynamic response, should correspond to those of hemodynamic response.

C.Prys-Roberts et al (1971) reported high incidence of cardiac arrhythmias, myocardial ischemia-infarction, acute LVF and cerebrovascular accidents following intubation in patients of hypertension, myocardial insufficiency, pre-eclampsia, eclampsia and in raised intracranial tension.

Laryngoscopy alone without intubation cause a supraglottic stimulus in which both SBP and DBP increased when compared to Heart rate. Increase in BP is due norepinephrine, while increase in heart rate is due to epinephrine.

Endotracheal intubation creates an extra cardiovascular response and catecholamine discharge due to infraglottic stimulus. Stress response increases at this stage and both SBP and DBP increase by 36-40% in contrast to control levels. HR levels increase more than 20% with tracheal intubation in contrast to laryngoscopy.

Given intravenously, lignocaine can be used during advanced airway management as an adjuvant to tracheal intubation, obtunding the hypertensive response to laryngoscopy and potentially reducing the incidence of myalgia and hyperkalemia when succinylcholine is given. Lidocaine is a class Ib antiarrhythmic agent.

Magnesium sulphate produces a fall in HR and BP by directly blocking the release of catecholamines from both adrenal gland and adrenergic nerve terminals and indirectly through negative feedback mechanism. It also acts directly on the blood vessels leading to vasodilatation and decreases vasopressin-stimulated vasoconstriction.

Some of the various drugs and methods used previously in attenuating the cardiovascular response to laryngoscopy and intubation.

- A) Premedicating patient with antihypertensive drugs such as,
 1. Vasodilators (eg. hydralazine),
 2. beta blockers (eg. Esmolol, labetalol),

3. calcium channel blockers (eg. nifedipine)
4. α -2 agonists (clonidine, dexmedetomidine)
5. Nitroglycerine (intravenous, intranasal spray or sublingual)
6. ACE inhibitors (eg. captopril, enalapril)
- B) Opioids (fentanyl, remifentanyl, alfentanil, sufentanyl)
- C) Lignocaine (intravenous, spray or gargles)
- D) Deepen plane of anaesthesia by intravenous induction agent or increasing concentration of volatile anaesthetic during mask ventilation
- E) Decreasing laryngoscopy time to less than 15 seconds

CONCLUSION

From our results we conclude that magnesium sulphate (20 mg/kg) iv has advantage of causing controlled hypotension and reduction in heart rate compared to lignocaine (1.5 mg/kg) iv. Both these drugs are safe in all elective surgery.

REFERENCES

1. Kovac AL. Controlling the hemodynamic response to laryngoscopy and endotracheal intubation. *J Clin Anesth.* 1996;8:63-79.
2. Miller Forbes A, Dally F. Acute hypertension during induction of anaesthesia and endotracheal intubation in normotensive patients. *Br J Anaesth.* 1970;42:618.
3. Prys Roberts C, Greene LT, Meloche R, Fox P. Haemodynamic consequences of induction and endotracheal intubation. *Can J Anaesth.* 1973;70:26-30.
4. Reid LC, Brace DE. Irritation of respiratory tract and its reflex effects upon the heart. *Surgery Gynecology Obstetrics.* 1940;70:157.
5. King B D, Harris L C, Griffenstein F E, Elder J D: Reflex circulatory responses to direct laryngoscopy nad tracheal intubation performed during general anaesthesia. *Anesthesiology.* 1951;12:556-566.
6. Firozbakhsh F, Mohammadi F H, Safari S, Khashayar P: The effect of intravenous Nitroglycerine on blood pressure during intubation. *M.E.J. Anesth.* 2008;19:859-867.
7. Agrawal P, Bhalla S, Singh I: To Study The Efficacy Of Intravenous Esmolol, Lidocaine And Diltiazem In Attenuating Haemodynamic Response To Laryngoscopy And Intubation. *The Internet Journal of Anesthesiology.* 2011;28:45-50.
8. Kothari D, Mehrotra A, Choudhary B, Mehra A. Effect of Intravenous Magnesium Sulfate and Fentanyl Citrate on Circulatory Changes During Anaesthesia and Surgery: A Clinical Study. *Indian J Anaesth.* 2008;52:800-805.
9. Mollick MT, Hossain MD, Ali NP. Attenuation of cardiovascular response during laryngoscopy and endotracheal intubation by using pethine with lignocaine. *JAFMC Bangladesh.* 2010;6:40-43.
10. Bromage PR, Robson JG. Concentrations of lignocaine in the blood after intravenous, intramuscular epidural and endotracheal administration. *Anaesthesia.* 1961;16:461-478.
11. James MF, Beer RE, Esser JD. Intravenous magnesium sulfate inhibits catecholamine release associated with tracheal intubation. *Anesth Analg.* 1989;68:772-776.
12. Allen RW, James MF, Uys PC. Attenuation of the pressor response to tracheal intubation in hypertensive proteinuric pregnant patients by lignocaine, alfentanil and magnesium sulphate. *Br J Anaesth.* 1991;66:216-23.