Original Paper

COMPARATIVE STUDY BETWEEN EFFICACY OF MAGNESIUM SULPHATE AND LIGNOCAINE IN ATTENUATING HAEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION

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Abstract

Introduction: **Laryngoscopy and endotracheal intubation during general anaesthesia predictably lead to hypertension and tachycardia. It has detrimental effects on other organ system. Many drugs have been suggested to obtund these effects.**

Objective: **This prospective study was designed to assess and compare the efficacy of magnesium sulphate for attenuating haemodynamic response to direct laryngoscopy.**

Methods: **One hundred patients of both sex, age between 18 - 50 years, American society of anaesthesiologists (ASA) physical status I and II, scheduled for elective surgery in combined military hospital (CMH), Dhaka were included in the study. Duration of the study was from January 2009 to November 2009. The patients were divided into two equal groups (50 patients in each group). Then the group I patients were injected with 2% plain lignocaine 1.5 mg/kg body weight intravenously and group II patients with magnesium sulphate 50 mg/kg intravenously just before induction. Baseline parameters like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) were measured non-invasively and rate pressure product (RPP) was calculated and were recorded on 1, 3 and 5 minutes after laryngoscopy and endotracheal intubation.**

Results: **Heart rates were more in group I than group II at 1, 3 and 5 minutes after intubation and differences were statistically significant. Blood pressure changes were more in group I than group II at 1, 3 and 5 minutes after intubation and differences were statistically significant. Rate pressure products (RPP) were more in group I than group II at 1, 3 and 5 minutes after intubation and differences were statistically significant.**

Conclusion: **Therefore we can conclude that magnesium sulphate is superior to lignocaine for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation and patients with hypertension, ischaemic heart disease, myocardial infarction and brain tumour will be benefited from preoperative administration of magnesium sulphate during laryngoscopy and endotracheal intubation.**

Keywords: **Endotrachel intubation, laryngoscopy, haemodynamic change, magnesium sulphate, lignocaine**

Introduction

Haemodynamic stability is an integral and essential goal of any anaesthetic management plan. Hypertension and tachycardia have been reported since 1950 during intubation under light anaesthesia uncomplicated by hypoxia, hypercapnia or cough[1,2]. Increase in blood pressure and heart rate occurs most commonly

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from reflex sympathetic and vagal discharge in response to laryngotracheal stimulation, which in turn leads to increased plasma norepinephrine concentration which may be fatal in patients with heart diseases and high blood pressure[3].

Sudden death has also been reported[4]. Amongst many techniques and drugs, magnesium sulphate, a calcium channel blocker is recently emerging as a promising agent to obtund these reflexes as it can lower cerebral, coronary and peripheral vascular resistance and relieve vasospasm. It is also effective in treatment of severe type of dysrhythmias as it inhibits the release of catecholamine[5]. This prospective study was designed to assess and compare the efficacy of magnesium sulphate for attenuating haemodynamic response to direct laryngoscopy and endotracheal intubation to that of conventional agent, lignocaine hydrochloride.

Materials and Methods

After obtaining permission from Department of Anaesthesia and Intensive Care, Combined Military Hospital (CMH), Dhaka, 100 patients of both sex, age between 18-50 years, ASA (American Society of Anaesthesiologist) physical status I and II, scheduled for elective surgery were included in the study. Patients with known cardiovascular disease, known hypersensitivity to lignocaine and magnesium sulphate, suspected difficult intubation and those who were not willing to participate in the study were excluded from the study. Informed written consent was obtained from each patient. Duration of the study was from January 2009 to November 2009.

The patients were divided into two equal groups (50 patients in each group). Both groups were treated with tablet diazepam 0.15 mg/kg body weight orally, night before operation. In both groups after arrival into operation theatre, baseline parameters like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) were measured non-invasively and recorded. Rate pressure product (RPP) was calculated (HR×SBP). Electrocardiogram (ECG) was also monitored. After giving premedication with injection diazepam 0.1 mg/kg body weight and injection fentanyl 1 μgm/kg body weight intravenously 05 minutes before induction, group I patients were injected with 2% plain lignocaine 1.5 mg/kg intravenously and group II patients with magnesium sulphate 50 mg/kg intravenously. Then all patients were induced with injection thiopentone sodium 5 mg/kg intravenously and vecuronium bromide 0.1 mg/kg intravenously was given in both groups as muscle relaxant for intubation. Patients of both groups were ventilated with 100% oxygen and 0.5% halothane using facemask. Intubation condition was assessed clinically and after 2 minutes, endotracheal intubation was done with standard Macintosh blade in both groups. The cardiovascular parameters were recorded on 1, 3 and 5 minutes after laryngoscopy and endotracheal intubation in a preformed data sheet. Statistical analyses were carried out using computer program statistical package for social science (SPSS) version 13. Results were expressed as mean ± SD and considered statistically significant if p value was less than 0.05.

Results

Patients characteristics were shown in Table-I and those were almost similar in both groups and differences were statistically not significant. Patient's heart rate changes during different timing after intubation were shown in Table II. Changes in blood pressure (systolic blood pressure, diastolic blood pressure and mean arterial pressure) are shown in Table III, IV and V. Rate pressure product (RPP) changes in between two groups were shown in Table VI. Irregular cardiac rhythms (premature atrial or ventricular ectopic beats) were more in lignocaine group of patients than magnesium group although, it was clinically or statistically not significant.

Table -I: Patients characteristics

Characteristics	Group I (n=50)	Group II (n=50)	p value
Age (years)	33.80+6.125	28.30+4.739	>0.05
Body Weight (kg)	59.10+8.212	59.70+8.744	>0.05
Height(cm)	156.25+3.49	152.65+4.04	>0.05
Sex (Male:Female)	32:18	34:16	>0.05
ASA Grading (I:II)	41:9	43:7	>0.05

Table -II: Heart rate changes in two groups

Heart rate	Group I (n= 50)	Group II (n=50)	p value
Baseline	81.96+11.51	82.42+10.69	>0.05
1 min	94.32+11.60	89.54+7.78	<0.05
3 min	88.44+7.16	83.84+5.93	<0.001
5 min	86.44+6.17	81.48+5.40	<0.001

Table -III: Systolic blood pressure changes in two groups

Systolic blood pressure	Group I (n= 50)	Group II (n=50)	p value
Baseline	122.38+11.50	121.82+10.48	>0.05
1 min	130.92+10.79	127.24+7.88	<0.05
3 min	127.82+9.34	123.70+7.27	<0.05
5 min	125.24+8.60	121.60+6.62	<0.05

Table -IV: Diastolic blood pressure changes in two groups

Systolic blood pressure	Group I (n= 50)	Group II (n=50)	p value
Baseline	75.24+9.35	74.56+8.69	>0.05
1 min	84.50+8.69	81.50+6.24	<0.05
3 min	82.80+7.20	78.44+6.04	<0.001
5 min	80.82+7.05	76.04+5.93	<0.001

Table -V: Mean Arterial Pressure (MAP) changes in two groups

Mean arterial pressure	Group I (n= 50)	Group II (n=50)	p value
Baseline	91.98+15.49	92.44+11.82	>0.05
1 min	104.38+13.47	97.42+12.34	<0.05
3 min	102.13+11.57	90.74+10.07	<0.001
5 min	94.96+12.72	88.82+9.90	<0.001

Table -VI: Rate Pressure Product (RPP) changes in two groups

Rate pressure product	Group I (n=50)	Group II (n=50)	p value
Baseline	10044.02+1814.49	10055.44+1656.82	>0.05
1 min	12370.18+2015.47	11392.42+1210.34	<0.01
3 min	11311.00+1311.57	10373.74+1006.07	<0.001
5 min	10832.96+1160.72	9749.82+1638.90	<0.001

Discussion

Laryngoscopy and endotracheal intubation can cause striking changes in haemodynamic and intracranial pressure probably as a result of intense sympathetic nervous system stimulation[6]. In patients who are at risk of developing increased intracranial pressure, arterial hypertension, myocardial ischaemia and these changes may be life threatening. They may lead to cerebral haemorrhage, left ventricular failure and life threatening cardiac arrhythmias. Various techniques were tried to attenuate these cardiovascular responses, one of them being deep inhalation anaesthesia which may cause intracranial hypertension. The other technique being the administration of a large dose of thiopental sodium which can effectively prevent arterial and intracranial hypertension, but in these cases there are risks of cardiac depression. Potent vasodilator drugs need larger doses to attenuate arterial blood pressure and fail to prevent tachycardia caused by laryngoscopy and endotracheal intubation. Vasodilator drugs cause cerebral hypertension. Some of them cause hypertension with reflex tachycardia and others depress the myocardium severely in patients with preexisting left ventricular dysfunction or those receiving beta-adrenergic antagonist. These effects are not desirable and limit their usefulness.

Various studies have shown that intravenous lignocaine is effective in preventing or attenuating the arterial hypertension and tachycardia in response to endotracheal intubation[7]. Some publications have shown the attenuated haemodynamic responses on intubation with intravenous lignocaine[8,9]. Kim et al[10] and Fujii et al[11] carried out several randomized open studies on adult surgical patient to assess the effect of intravenous lignocaine. They also found reduced haemodynamic stimulation during intubation.

Magnesium has much beneficial effect on the human cardiovascular system. The effects of magnesium on the cardiovascular system are preferable to use as preanaesthetic and at the same time, sedative effect of magnesium have been reported by many authors[5]. Magnesium is also effective in the treatment of several types of arrhythmias[12]. Magnesium inhibits the release of catecholamine as a catecholamine receptor antagonist[13]. In this prospective study, there were no significant differences between two groups in age, body weight, height gender and ASA grading. Before induction of anaesthesia HR, SBP, DBP, MAP and RPP were almost similar and differences were statistically not significant. One minute after intubation, these parameters were significantly raised in both groups. The findings of this study are comparable to those of Ashton et al[14], who found a rise of HR, SBP, DBP, MAP and RPP. Author also found gradual return of these parameters to baseline as anaesthesia deepened.

Present study demonstrated highly significant reduction in HR, DBP, MAP and RPP in both groups ($p<0.001$) at 3 and 5 minutes after intubation. But the SBP reduction was only statistically significant ($p<0.05$). In group II patients, these reductions were more than that of in group I patients. Five minutes interval after intubation HR, SBP, DBP, MAP and RPP returned to almost baseline level in group II patients but in group I patients these were above baseline values. These findings are in agreement with that of James et al[15] who showed attenuated haemodynamic responses due to inhibition of catecholamine release associated with tracheal intubation.

In this study it was observed that maximum attenuating effect was observed by intravenous magnesium sulphate on cardiovascular system in response to laryngoscopy and endotracheal intubation. It was also observed that intravenous magnesium sulphate did attenuate the sympathetic responses to laryngoscopy and endotracheal intubation which come down to baseline 5 minutes after intubation. But the groups of patient which had been treated with lignocaine, their sympathetic responses did not come down to base line at 5 minutes after laryngoscopy and endotracheal intubation.

Conclusion

Magnesium sulphate (50 mg/kg) is superior to lignocaine (1.5 mg/kg) for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation. Patients with hypertension, ischaemic heart disease, myocardial infarction and brain tumour will be benefited by giving intravenous magnesium sulphate preoperatively before laryngoscopy and endotracheal intubation.

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