#### **Research Article**

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## Analytical study of effects of Magnesium sulphate on pressor response during laryngoscopy and intubation

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#### **ABSTRACT**

**Background:** Induction of general anaesthesia and endotracheal intubation for maintenance of airway and prevention of aspiration is carried out frequently by the anesthesiologist in day to day practice. This study was aimed to study the effects of Magnesium sulphate on pressor response during laryngoscopy and intubation.

**Methods:** It was carried out in 50 patients of both sexes, between the age group of 20-60 years, belonging to ASA physical status grade I and II. Magnesium sulphate 50mg Kg-1 given intravenously 60 seconds before intubation and the pressor response to laryngoscopy and intubation assessed.

**Results:** Magnesium sulphate 50mg Kg-1 given intravenously 60 seconds before intubation, attenuated the pressor response to laryngoscopy and intubation to a significant level, except transient mild tachycardia, which at the end of 5 minutes settled back to near pre-induction value.

**Conclusions:** We conclude that magnesium sulphate is superior for attenuation of pressor response to laryngoscopy and intubation.

Keywords: Laryngoscopy, Intubation, Magnesium Sulphate, Pressor Response

#### INTRODUCTION

Laryngoscopy and endotracheal intubation is an integral part of anesthesia. Induction of general anesthesia and endotracheal intubation for maintenance of airway and prevention of aspiration is carried out frequently by the anesthesiologist in day to day practice. Although endotracheal intubation adds tremendous safety to the administration of general anesthesia, it has deleterious effects especially on cardiovascular system. These responses are due to intense sympathetic discharge caused by stimulation of upper respiratory tract both during laryngoscopy and tracheal tube insertion. This pressor response is associated with the release of catecholamine's in large amount, in the body. 1,2

A normal healthy patient may be able to deal with these responses. In patients with various diseases like coronary artery disease, hypertension, intracranial aneurysms, dissecting aneurysm, the response to laryngoscopy and intubation may prove potentially lethal. In order to attenuate this pressor response various techniques have been tried by many workers. All of these depend upon the blockade of adrenergic response. In recent times magnesium sulphate has elicited a lot of interest and has shown promising results in this field. Magnesium inhibits catecholamine release from the adrenergic nerve terminals and from the adrenal medulla in vitro. Hence it could be used as an alternative to the above mentioned drugs for attenuation of pressor response.

The purpose of this study is to evaluate the effects of magnesium sulphate for attenuating pressor response to

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laryngoscopy and endotracheal intubation. This study was aimed to study the effects of Magnesium sulphate on pressor response during laryngoscopy and intubation.

#### **METHODS**

The Present study was carried out in 50 patients of both sexes, between the age group of 20-60 years, belonging to ASA physical status grade I and II. The patients were scheduled to undergo various elective operative procedures at Kidwai Memorial Institute Oncology, Bangalore.

The personal and medical history was obtained by interview and hospital indoor record sheet. Patients with history of hypertension, diabetes mellitus, respiratory or cardiovascular diseases are not included in the study. Patients posted for emergency surgery were excluded from study. Written consent was obtained from all the patients.

The selected 50 patients were preoxygenated with 100% oxygen for three minutes. Anaesthesia was induced with thiopentone (2.5%) 5mgKg-1 intravenously. Following this, patients received injection Magnesium sulphate 50mgKg-1 diluted to 10ml over a period of one minute. Then succinylcholine 1.5 mg Kg-1 was given intravenously for facilitation of intubation. After 1 minute patients were intubated orally with suitable sized cuffed endotracheal tubes under laryngoscopic vision by the anaesthesiologists who were unaware of the drug used.

Heart rate and blood pressure were recorded at before induction, after induction, after trial drug administration, immediately after intubation, 2 minutes after intubation and 5 minutes after intubation. Mean arterial pressure and rate pressure product at different stages of the study were calculated. 1 hour post procedure and a chest x ray was ordered after 12 hours. Once the lung had expanded and drain output had decreased to less 50 ml for 3 consecutive days, chest drain was removed.

#### **RESULTS**

50 each patients belonging to ASA grade -1 and II were studied. The following are the observations of the study.

Table 1: Age and weight distribution of patients.

Group	Age(in years) (Mean±SD)	Weight (in kilograms) (Mean±SD)
Mg SO <sub>4</sub> (M)	39.84±10.75	58.08 ±9.26

After administration of trial drug there was a rise in heart rate. Immediately after intubation rise in heart rate from preinduction value increased (Preinduction  $80.36 \pm 6.20$ , immediately after intubation  $98.70 \pm 6.79$ ). 5 minutes

after intubation heart rate in magnesium group came back to near baseline value but it was still higher.

**Table 2: Sex Distribution of patients.** 

Sex Distribution				
	Group	Male	Female	Total
	Mg SO <sub>4</sub> (M)	13	37	50

Table 3: Heart rate (beats/minutes) changes in Magnesium sulphate.

	Magnesium Sulphate (Mean±SD)
Pre-induction	80.36±6.20
After induction	84.48±6.42
After trial drug	91.00±6.46
Immediately after intubation	98.70±6.79
2 min after intubation	92.48±5.74
5 min after intubation	85.44±6.44

Table 4: Systolic Blood Pressure (mmHg) changes in Magnesium sulphate.

	Magnesium Sulphate (Mean±SD)
Pre-induction	123.32±10.81
After induction	122.52 ±10.45
After trial drug	119.16±10.39
Immediately after intubation	138.04 ±10.97
2 min after intubation	129.20 ±9.67
5 min after intubation	120.64±10.25

There was marginal fall in SBP following induction and after trial drug administration. Immediately after intubation there was increase in SBP (pre induction 123.32  $\pm$  10.81, immediately after intubation 138.04  $\pm$  10.97). 5 minutes after intubation SBP went below the preinduction value.

Table 5: Mean Arterial Pressure (mmHg) changes in Magnesium Sulphate.

	Magnesium Sulphate (Mean±SD)
Pre-induction	91.60±6.75
After induction	91.33±6.51
After trial drug	90.20±6.82
Immediately after intubation	99.72±7.41
2 min after intubation	94.51±6.70
5 min after intubation	90.54±6.39

There was statistically insignificant fall of MAP after induction and after trial drug administration. Immediately after intubation there was rise in map. 5 minutes after intubation map (90.54  $\pm$  6.39) went below pre-induction value.

Table 6: Rate Pressure Product (RPP) changes in Magnesium Sulphate.

	Magnesium Sulphate (Mean±SD)
Pre-induction	9930.72±1351.12
After induction	$10354.20 \pm 1429.89$
After trial drug	10871.98±1500.95
Immediately after intubation	13651.18±1716.26
2 min after intubation	11965.28±1385.66
5 min after intubation	10334.80±1410.20

After induction and after trial drug administration there was rise in rpp. The rise in rpp in magnesium sulphate group immediately after intubation was significantly less (pre-induction  $9930.72 \pm 1351.12$ , immediately after intubation  $13651.18 \pm 1716.26$ ).

#### **DISCUSSION**

Although endotracheal intubation adds on tremendous safety to the administration of general anesthesia, it is associated with deleterious effects on cardiovascular system Viz tachycardia, hypertension<sup>4</sup>, dysarrhythmias.<sup>5</sup> these responses are due to intense sympathetic discharge caused by stimulation of upper respiratory tract both during laryngoscopy and tracheal tube insertion. The pressor response is associated with the release of catecholamines in the body.

These responses though well tolerated in normal patients, could be catastrophic in patients with cardiovascular or cerebrovascular diseases. It is therefore logical that attempts should be made to attenuate cardiovascular responses to laryngoscopy and intubation.

In order to attenuate the pressor responses various techniques have been tried by many workers. These methods include deep general anesthesia, adrenoreceptor blockers. <sup>6,7</sup> calcium channel blockers, <sup>8,9</sup> opioids, <sup>10,11</sup> and vasodilators<sup>12</sup> These above mentioned drugs have their own side effects like excess sedation, respiratory depression and hypotension. Hence anaesthesiologists were in a constant search for an ideal drug for attenuation of pressor responses.

We have studied heamodynamic changes following laryngoscopy and intubation in 50 ASA grade I & II adult patients who received Inj. Magnesium sulphate (50mgKg-1) intravenously.

Recently Magnesium Sulphate has elicited interest among the anesthesiologists regarding its property to suppress the catecholamine release during intubation.

Magnesium produces vasodilatation by directly acting on the blood vessels and by interfering with a wide range of vasoconstrictor substances. In addition to its direct effects on the vessel wall, raise serum magnesium levels may also reduce peripheral vascular tone by a number of other mechanisms, including sympathetic blockade and inhibition of catecholamine release. Serum magnesium concentration exceeding 2.5mmol/l produces progressive inhibition of the release of catecholamine from both adrenergic nerve terminals and from the adrenal medulla. On the isolated heart, magnesium produces bradycardia. However in intact subjects, the inhibition of vagal acetylcholine release produced by magnesium overrides the intrinsic slowing, and mild tachycardia commonly occurs.

The study was intended to compare the effectiveness of intravenous magnesium sulphate in attenuation of pressor response to laryngoscopy and intubation. In our study there was a rise in heart rate nearly 18.44 beats/ min immediately after intubation from its preinduction value in magnesium sulphate group, which returned to just above the preinduction value 5 minutes after intubation. The after induction there was marginal fall in systolic arterial pressure (SAP). Immediately after intubation SAP nearly increased 14.72 mm Hg from preinduction value in magnesium sulphate group but at the end of 5 minutes it went below the preinduction value. This better control of blood pressure in magnesium group was probably due to direct vasodilatory effects and inhibition of catecholamine release.

Though the heart rate did not come down to baseline value at the end of 5 minutes, the fall in blood pressure maintained the RPP value very near to preinduction value. As RPP signifies the myocardial oxygen demand it can be concluded that in magnesium sulphate group the oxygen demand was less.

Magnesium has well known inhibitory actions at the motor end plate, at varying serum concentrations usually exceeding 5mmol/lt. There is wide spread belief that magnesium potentiates the action of succinylcholine. But in our study none of the patient in magnesium group had prolonged apnea. (More than 10 minutes) following succinylcholine injection. The studies of James et al. <sup>13</sup> Stacey et al. <sup>14</sup> showed that magnesium does not increase the duration of action of succinylcholine and supports our findings.

Pressor response (heart rate, blood pressure) to laryngoscopy and intubation were recorded before induction, after induction, after trial drug, immediately after intubation, 2 minutes and 5 minutes after intubation. The patients had a significantly lesser increase in mean arterial pressure, systolic pressure, rate pressure product.

5 minutes after intubation systolic and mean arterial pressure went below the preinduction value. Immediately after intubation there was tachycardia. But at the end of 5 minutes, the heart rate came back to near preinduction value in magnesium group.

#### **CONCLUSIONS**

Magnesium sulphate 50mg Kg-1 given intravenously 60 seconds before intubation attenuated the pressor response to laryngoscopy and intubation to a significant level, except transient mild tachycardia, which at the end of 5 minutes settled back to near pre-induction value. We conclude that magnesium sulphate is superior for attenuation of pressor response to laryngoscopy and intubation.

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institutional ethics committee

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