Research Paper

Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Effect of Magnesium Sulphate on Haemodynamic Response to Laryngoscopy and Intubation

Medical Science

KEYWORDS : General anaesthesia, ASA-American Society of Anaesthesiologists, Mean Arterial Pressure

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ABSTRACT

Introduction: Any surgery under general anaesthesia is associated with rise in haemodynamic parameters during laryngoscopy and intubation. Magnesium Sulphate (MgSO4) is believed to attenuate this response and therefore can be used for the same.

Materials and Method: 100 ASA I, II patients undergoing elective surgeries under general anaesthesia were randomly allocated into Study (MgSO4) group and Control group of 50 patients each. After taking the patient in before induction, patients were either given Inj. MgSO4 30 mg/kg or Normal saline I.V. after taking baseline parameters. Thereafter, H.R., Systolic B.P., Diastolic B.P. and MAP were noted till 30 min post intubation.

Observation and Results: There was significant attenuation in haemodynamic parameters in study group as compared to control group without any adverse effects of the drug under study.

Conclusion: We conclude that Inj. MgSO4 can be used for attenuating haemodynamic response during laryngoscopy and intubation in following dose without adverse effects.

Introduction

Despite major advances in general anaesthesia techniques, the haemodynamic response to laryngoscopy and endotracheal intubation does present a problem. Hypertension and tachycardia have been reported since 1950 during intubation under anaesthesia. Increase in blood pressure and heart rate occurs most commonly from reflex sympathetic discharge in response to laryngotracheal stimulation, which in turn leads to increased plasma norepinephrine. These effects are mainly due to release of catecholamines in large amounts. [1]

Many attempts have been made to attenuate the pressor response e.g. deep anaesthesia, beta blockers, anti- hypertensives, etc. But most of the agents used have many side effects while being used for this purpose.

Magnesium sulphate has been used for many years as an anti arrhythmic and for prophylaxis against seizures in pre- eclampsia. We know that, Magnesium sulphate blocks the release of catecholamines from both adrenergic nerve terminals and adrenal glands.[2] Moreover, it produces vasodilatation by acting directly on blood vessels.[3]

A prospective, single blinded randomized controlled clinical investigation was designed to assess the effectiveness of i.v. magnesium sulphate on haemodynamic changes during laryngoscopy and intubation.

Material And Methods

This study was conducted in an attached teaching hospital after approval by ethical committee. 100 patients were selected, ASA I and II from 20 to 60 years posted for elective procedures under general anaesthesia. The exclusion criteria included patients with hypertension, Hypermagnesemia / hypomagnesemia, Any known allergy to magnesium sulphate, Diabetes mellitus, Ischaemic heart disease, Severe hepatic, endocrine and cardiac dysfunction, Acute cholecystitis, Morbid obesity, Raised intracranial tension and intra ocular pressure, Drug or alcohol abuse, Duration of operation < 30 min, Anticipated difficult airway.

Patients were randomly allocated of 50 patients each after detailed pre anaesthetic evaluation.

Group A received equivalent amount of normal saline (over 5 min, 5 min prior to induction)

Group B received 30 mg/kg body wt. 50% Inj.mgso4 i.v. (over 5min, 5 min prior to induction)

On arrival of patient in operating room, heart rate and blood pressure were recorded and i.v. access was secured and Inj. Ondansetron 0.8 mg/kg i.v. was given. Five minutes prior to induction, group B received 30 mg/kg 50 % MgSO4 i.v. in 10 cc normal saline and Group A received equivalent N.S. i.v.

After pre-oxygenation for 3 minutes, anaesthesia was induced with Inj. Fentanyl 2 mcg/kg, Inj. Midazolam 0.02 mg/kg, Inj. Thiopental sodium 5-7 mg/kg followed by Inj. Succinylcholine 2 mg/kg. endotracheal intubation was done with suitable sized cuffed endotracheal tube. Anaesthesia was maintained with Nitrous oxide, oxygen and a non depolarizing muscle relaxant. Bains' circuit was used to provide Intermittent Positive Pressure Ventilation.

Routine monitoring was done including Heart rate, systolic and diastolic B.P. and MAP when patient was brought in operating theatre, at induction and after intubation (at 1^{st},2^{nd},3^{rd},4^{th} and 5^{th} min and then subsequently at 10^{th}, 15^{th}, 20^{th}, 25^{th} and 30^{th} min after intubation).

At the end of operation, neuromuscular relaxation was reversed with Inj. Neostigmine 0.04 mg/kg and Inj. Glycopyrrolate 0.01 mg/kg.

Observation and results

The mean ± SD age for Study group is 32.3 ± 9.4 and for Controls it is 32.7 ± 9.1.The average age did not differ significantly between Study and Control groups (P-value>0.05).The sex distribution of the cases studied did not differ significantly between Study and Control groups (P-value>0.05).Total 19 cases (38.0%) in Study group and 15 cases (30.0%) in Control group were males, while 31 cases (62.0%) in Study group and 35 cases (70.0%) in Control group were females.

Table 1) The age distribution of the cases studied across two study groups.

Age (years)	Study Group (n=50)	Control Group (n=50)	P-value (Study v/s Control)
Mean ± SD	32.2 ± 9.4	32.7 ± 9.1	0.804^{NS}
Min – Max	20 – 55	20 – 58	

Values are Mean ± SD and (Min – Max). P-value by Unpaired

't' test by confirming the underlying normality assumption. P-value<0.05 is considered to be statistically significant. *P-value<0.05, **P-value<0.01, ***P-value<0.001. NS: Statistically Non-Significant.

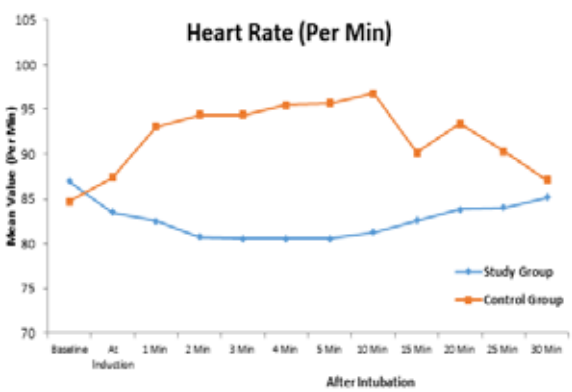
Table 2) The sex distribution of the cases studied across two study groups.

Sex	Study Group (n=50)	Control Group (n=50)	P-value (Study v/s Control)
Male	19 (38.0)	15 (30.0)	0.527^{NS}
Female	31 (62.0)	35 (70.0)	

Values are n (% of cases). P-value by Chi-Square test (Fisher's exact probability test). P-value<0.05 is considered to be statistically significant. *P-value<0.05, **P-value<0.01, ***P-value<0.001. NS: Statistically Non-Significant.

The average heart rate in study group in first 5 min after intubation is significantly less as compared to control group. The average heart rate in study group from 10th min to 30th min after intubation is significantly less than control group. The average heart rate within the groups at induction and at 30th min after intubation compared with baseline is significantly less.

Figure 1) The distribution of heart rate across two study groups at baseline, at induction and after intubation time-points.

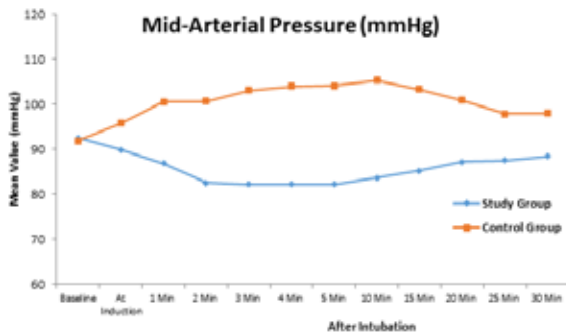


The average systolic B. P. in study group in first 5 min after intubation is significantly less as compared to control group. The average systolic B. P. in study group from 10th min to 30th min after intubation is significantly less than control group. The average systolic B. P. within the groups at induction and at 30th min after intubation compared with the baseline is less.

The average diastolic B. P. in study group in first 5 min after intubation is significantly less as compared to control group. The average diastolic B. P. in study group from 10th min to 30th min after intubation is significantly less than control group. The average diastolic B. P. within the groups at induction and at 30th min after intubation compared with the baseline is less.

The average Mean arterial pressure (MAP) in study group in first 5 min after intubation is significantly less as compared to control group. The average MAP in study group from 10th min to 30th min after intubation is significantly less than control group. The average MAP within the groups at induction and at 30th min after intubation compared with the baseline is less.

Figure 2) The distribution of MAP across two study groups at baseline, at induction and after intubation time-points.



Discussion

Tracheal intubation is one the most important procedures in anaesthetic practice. Laryngoscopy with intubation is known to have profound cardiovascular effect, namely increased blood pressure, heart rate and catecholamine levels. This haemodynamic response, known as intubation response, maybe associated with detrimental effects and should be blunted, especially in the presence of cardiovascular and cerebrovascular disease. [4]

Reflex changes in the cardiovascular system are most marked after laryngoscopy and intubation and lead to an average increase in blood pressure by 40-50 % and 20 % increase in heart rate. [5]

In studies conducted by A. Altan et al studied effects of magnesium sulphate on haemodynamics, propofol consumption and post operative recovery. They found that at bolus dose of magnesium sulphate (30 mg/kg body wt.) and intra operative maintainence infusion (10 mg/kg/ hr), no haemodynamic and cardiovascular effects were seen, but extubation and recovery was slower. The MAP values and heart rate in magnesium group fell significantly after induction. They concluded that magnesium sulphate lowered propofol consumption and attenuated the haemodynamic response to tracheal intubation. [6]

Similarly, studies conducted by Manjushree Ray et al proved that MAP and Heart Rate in group given Magnesium Sulphate 30 mg/kg as bolus and infusion of 10 mg/kg/hr were significantly lower. Also they found that recovery of these patients was longer. The delay in recovery maybe due to CNS depressant effect of Magnesium Sulphate by its infusion. [7]

In our study, the average heart rate at induction is significantly higher in Control group compared to Study group (P-value<0.002).The average heart rate at 1-Min, 2-Min, 3-Min, 4-Min, 5-Min, 10-Min, 15-Min, 20-Min, 25-Min and 30-Min after intubation is significantly higher in Control group compared to Study group (P-value<0.001 for all). (fig.1)

The average Systolic BP and diastolic BP at induction is significantly higher in Control group compared to Study group (P-value<0.001).The average Systolic BP at 1-Min, 2-Min, 3-Min, 4-Min, 5-Min, 10-Min, 15-Min, 20-Min, 25-Min and 30-Min after intubation is significantly higher in Control group compared to Study group (P-value<0.001 for all).

The average MAP at induction is significantly higher in Control group compared to Study group (P-value<0.001).The average MAP at 1-Min, 2-Min, 3-Min, 4-Min, 5-Min, 10-Min, 15-Min, 20-Min, 25-Min and 30-Min after intubation is significantly higher in Control group compared to Study group (P-value<0.001 for all). (fig. 2)

With this background, results obtained in magnesium sulphate

Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

group have been excellent without the delayed recovery as seen in studies done by Altan et al and Majushree Ray et al which can be attributed to Magnesium sulphate infusion, while our study had single bolus dose.

Hence in our opinion we conclude that, magnesium sulphate in single bolus dose can be used regularly to attenuate haemodynamic response of laryngoscopy and intubation because of its properties like more efficacy and minimum side effects.

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