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A Comparative Study on the Efficacy of Magnesium Sulphate against Lignocaine in Attenuating the Cardiovascular Responses to Laryngoscopy and Endotracheal Intubation

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Abstract: *This study was conducted in 40 ASA grade I patients who were admitted at Thanjavur Medical College Hospital to undergo various surgical procedures under general anaesthesia. After getting Ethical committee approval and informed written consent from the patients, the total of 40 patients were allocated into two groups of 20 each.All were connected to the non-invasive monitors and the basal heart rate and mean arterial pressure were recorded. Magnesium sulphate was given in the dose of 30mg/kg one minute prior to induction for group M and Lignocaine 1.5mg/kg was given to group L.The induction of anaesthesia was same in both groups and heart rate and mean arterial pressure were recorded following induction, laryngoscopy, and intubation at one, three, and five minutes (before the surgical incision). Train of four was recorded for 45 min. from the time of induction for every 5 minutes until the third twitch appears in the neuromuscular monitoring. Patients were observed for side effects of Magnesium sulphate like hypotension, arrhythmias, nausea, flushing and sweating until they were discharged from post anaesthesia care unit.The results were analysed using student t –test, and a P value of less the 0.05 was taken significant.With patients matched for demographic data the results showed there was no significant difference in base line values between two groups. There was a reduction in the heart rate and mean arterial pressure in both groups but when both the groups were compared there was statistically significant reduction of heart rate and mean arterial pressure in Magnesium sulphate group. (P < 0.05). There was no significant prolongation of Train of four values between the two groups, and there was no side effects observed in any of the patients in this study.*

I. Subjects and Methods

After approval of the study by our institutional Ethics Committee, a total of 40 patients of both sexes in the age group between 15-50years, belonging to ASA grade I undergoing elective surgery under general anaesthesia were included in this double blinded, randomized, clinical study. Informed consent obtained from patients and they were evaluated for fitness for anaesthesia.

Inclusion Criteria

Patients Belonging To ASA Grade – I, MPG Grade – I, And Laryngoscopy Time Less Than 15 Seconds.

Exclusion Criteria

Patients Belonging To ASA Grade More Than 1., MPG > 1, Predicted Difficult Airway, Systemic Hypertension, Coronary Artery Heart Disease, Diabetes Mellitus, Patients On Antihypertensives And Cardiac Drugs, And Valvular Heart Diseases.

Out of the 40 patients 20 were randomly included in the L group (LIGNOCAINE GROUP) and the other 20 were included in the M group (MAGNESIUM SULPHATE GROUP).

All the patients were premedicated with injection Glycopyrolate 0.01mg/kg intramuscularly 45minutes prior to surgery.Patients were shifted to the operation theatre and connected to the noninvasive multimonitor, and intravenous access was obtained using 18G cannula.Baseline Heart rate, Blood pressure (Mean arterial pressure), SPO_2 were recorded.The patients were preoxygenated with 100% oxygen for 3 minutes. All the patients received injection fentanyl 1mcg/kg intravenously.

Two minutes after the administration of fentanyl, patients in L group received injection Lignocaine 1.5mg/kg and the patients in the M group received injection Magnesium sulphate 30mg/kg intravenously.

One minute after that the patients were induced with injection Thiopentone5mg/kg and injection atracurium 0.5mg/kg intravenously. Then the patients were mask ventilated with 100% oxygen and after 3 minutes heart rate, blood pressure (mean arterial pressure) were noted and taken as the post induction value.

Laryngoscopy and Intubation was done using appropriate size Macintosh blade and appropriate size endotracheal tube.Measurement of heart rate, blood pressure (Mean arterial pressure) and SPO_2 was done

immediately after laryngoscopy and at one, three and five minutes after placement of the endotracheal tube. Surgical incision was allowed after the last measurement.Syringes were prepared by a postgraduate who did not take part in the study and the injections were given by him. Intubation was performed by an experienced anaesthesiologist who was double blinded to the drugs given.

Neuromuscular blockade was monitored using the nerve stimulator with train of four for every 5 minutes after intubation upto 45minutes.The incidence of complications like hypotension, arrhythmias, nausea, flushing, sweating were recorded until the patient was discharged from the post anaesthesia care unit.

II. Results And Statistical Analysis

We used student independent "t" test to compare various factors between the two groups. Results were expressed as mean and standard deviation (Mean ± SD) Chi-square test was done to compare proportions, and values less than 0.05 was considered as statistically significant.

Demographic Characteristics Between Groups: (Table:1)

Parameters	Group –L (N=20)	Group – M (N=20)	P Value
Mean Age In Yrs (±S.D.)	34.3 ± 8.86	34.2 ± 8.22	0.97
Mean Weight In Kgs (±S.D.)	53.5 ± 3.38	52.8 ± 4.40	0.54

(S.D. – Standard deviation) **(P > 0.05)**

The groups were matched for demographic data, and there was no statistically significant difference found between the groups in age, sex, weight and surgical position.

Baseline Heart Rate:(Table: 2)

Baseline Hr	Group – L	Group – M
Mean ± S.D.	86.8 ± 5.063	87.25 ± 4.529

(HR – Heart rate) (P> 0.05) Figure :2

With patient on table before giving Lignocaine or Magnesium sulphate, baseline heart rate and mean arterial pressure were recorded for the two groups (Table: 2) and (Table: 3) respectively. There was no significant difference in heart rate and MAP between the 2 groups.
Figure:2 Figure:3

Base Line Mean Arterial Pressure: (Table : 3)

Baseline Map	Group – L	Group – M
Mean ± S.D.	93.6 ± 10.1	95.9 ± 9.49

(MAP – Mean Arterial Pressure) (P > 0.05) Fig.3

Deviation of heart rate from baseline: (Table:4)

There was fall in heart rate (P < 0.05) noted following induction, laryngoscopy, and intubation, in Magnesium group and Lignocaine group, but the fall in heart rate was more significant in the Magnesium group when compared with the Lignocaine group.Fig.4

Heart Rate	Group – L Mean ± S.D	Group – M Mean ± S.D.	P Values
Post Induction	80.85 ± 5.31	75.8 ± 3.95	0.002
Post Laryngscopy	84.4 ± 4.75	78 ± 4.18	0.0001
Post Intubation (1 Min.)	86.2 ± 4.77	79.3 ± 4.02	0.0001
Post Intubation (3 Min.)	84.4 ± 4.82	77.4 ± 4.19	0.0001
Post Intubation (5 Min.)	83 ± 4.36	75.8 ± 4.14	0.0001

Table: 4(P< 0.005)

Deviation of mean arterial pressure from baseline: (Table:5)

Like heart rate there was a significant fall in mean arterial pressure in both the groups, but there was statistically significant fall (P < 0.05) in the Magnesium group when compared with the Lignocaine group. Fig 5

Map	Group – L Mean ± S.D	Group – M Mean ± S.D.	P Values
Post Induction	87.7 ± 9.35	81.8 ± 17	0.021
Post Laryngscopy	91.3 ± 9.23	85.6 ± 7.17	0.035
Post Intubation (1 Min)	92.7 ± 10	86.7 ± 6.78	0.032
Post Intubation (3 Min)	91.2 ± 9.84	85 ± 6.92	0.028
Post Intubation (5 Min.)	90.2 ± 9.96	83.5 ± 6.65	0.017

Table: 5 (P < 0.05)

Average Values of Train of Four: (Table: 6)The train of four values was recorded every 5 minutes upto 45 minutes following drug administration and the duration needed for the return of third twitch using neuromuscular monitoring was recorded. This showed no statistically significant difference between the 2 groups. (P >0.05). (Table: 6)

Tof In Minutes	Group – L	Group – M	P Value
Mean ± S.D.	25.5 ± 4.84	26.5 ± 4.89	0.52

Table: 6(P > 0.05)

The incidence of complications for magnesium like hypotension, sweating, arrhythmia, nausea, flushing, and hot sense were watched for until the patients were discharged from post anaesthesia care unit. There were no such complications observed in this study.

III. Discussion

Calcium exerts a major role in stimulus-response relationship, including the release of catecholamines from the adrenal gland and adrenergic nerve terminals in response to sympathetic stimulation. Because Magnesium competes with calcium for membrane channels, it has been described as the physiological calcium antagonist and can modify many calcium mediated responses.[10].

.D. Puri et.al.[4]n their study on the effect of Magnesium sulphate on haemodynamics and its efficiency in attenuating the response to endotracheal intubation in patients with coronary artery disease, studied 36 patients, of which one group received 50mg/kg of Magnesium sulphate intravenously and another group received 1mg/kg Lignocaine intravenously, showed a decrease in mean arterial pressure from basal values of 91± 14.5 to 86 .6± 14.5 mm of Hg after intubation (P<0.05).Three patients in the magnesium grouphad severe hypotension that needed pharmacological treatment.

On comparison with our study, in which we used Magnesium sulphate in the dose of 30mg/kg intravenously in which no such effects were observed.

In a study done by K.Montazeri M.D., M.Fallah M.D.[1] studied 6 groups of patients of 20 each with varying doses of Magnesium sulphate (10,20,30,40,and 50mg/kg) and compared with the control using Lignocaine in the dose of 1.5mg/kg. and observed that there was significant reduction in heart rate on comparison between Magnesium sulphate and Lignocaine groups (P < 0.05). But within the magnesium groups the difference in heart rate was not significant (P > 0.05). Adverse effects of Magnesium sulphate like hypotension, arrhythmia, nausea, sweating and flushing, were observed in certain patients in higher doses.

R.W.Allen,M.B.C.H.B, F.F.A.R.C.S.I et.al[6]. in their study on attenuation of pressor response to tracheal intubation in hypertensive protinuric pregnant patients, they compared lignocaine and magnesium sulphate 40mg/kg in 69 patients and found that attenuation of heart rate and MAP was more significant in Magnesium group.

Tetsuro Kagawa 1, RyokichiGoto 1, Katsuhiro Iijima et al[11] in their double blinded study on haemodynamic stablisation during tracheal intubation using MgS04 50mg/kg by infusion 30 min. before induction showed suppression of haemodynamic response to tracheal intubation.

Naghibi KH, Akhtari M. et al[5] in their study of attenuation of pressor responses to intubation by MgSo4 showed reduction in MAP and heart rate with very low sedative effect.

James MF, Beer RE, Esser JD etal[3] in their study in IV MgSo4 inhibits catecholamine release associated with tracheal intubation showed pretreatment with Magnesium sulphate 60mg/kg decreases the heart rate, arterial pressure and plasma level of ephinephrine.

N.M.Elsharnouby and M.M.Elsharnouby[7], in their study of Magnesium sulphate as a technique of hypotensive anaesthesia. Used magnesium sulphate 40mg/kg IV bolus before induction and 15mg/kg/hr by infusion during FESS surgeries showed reduction in heart rate, arterial pressure and blood loss.

G.M. Sanders, K.M. Kim etal[12], in their study on Magnesium sulphate as a hypotensive agent in Maxillo facial surgeries showed intraoperative control on blood pressor without cardiovascular side effects and post operative muscle weakness.

In our study using 30mg/kg of Magnesium sulphate there was a reduction in the heart rate (P <0.05) and the mean arterial pressure (P<0.05), which was statistically significant when compared with the lignocaine group lending support to our study. No side effects were observed in any of the patients, and neuromuscular blockade was not significantly prolonged as seen by the train of four values at 45 minutes. Our present study lends support to previous studies that the use of Magnesium sulphate 30mg/kg intravenously one minute prior to induction reduces the heart rate and mean arterial pressure in response to laryngoscopy and intubation in a favorable manner without any side effects.

IV. Conclusion

We conclude that, Magnesium sulphate in the dose of 30mg/kg given intravenously one minute prior to induction,attenuates the cardiovascular responses to laryngoscopy and intubation in a better manner than lignocaine, and does not cause any adverse effects in any of the patients, without any prolongation of the neuromuscular blockade.

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