Original Research Paper

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A PROSPECTIVE ANALYTICAL STUDY TO EVALUATE EFFICACY OF NEBULIZED MAGNESIUM SULPHATE TO BLUNT INTUBATION RESPONSE

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ABSTRACT **Background:** Laryngoscopy and endotracheal intubation cause sympathoadrenal discharge that can be deleterious in patients with cardio and cerebrovascular disease which are increasing in incidence. There is a paucity in literature of an ideal single best least invasive agent/technique, to prevent/attenuate intubation response with minimal side effects and set guidelines for usage. Magnesium sulphate is a versatile commonly used drug in anesthetists armamentarium. **Method:** This Prospective, analytical study was carried out amongst 80 patients undergoing elective surgery with general anesthesia and endotracheal intubation. Patients were divided into 2 groups - Group 1 -nebulized with Normal saline and Group 2 -nebulized with Magnesium sulphate. HR/SBP/DBP were recorded prior starting nebulization, on 10 mins,20 min post nebulization, post induction ,post endotracheal intubation ,5min and 10 min later. **Results:** Preoperative magnesium sulphate nebulization has a significant effect (p value < 0.001) on decreasing HR-from 20 mins of start of nebulization, SBP- from 10 mins of start of nebulization ,DBP post induction, attenuating the stress response to tracheal intubation and continuing up to 10 minutes post intubation . **Conclusion:** Magnesium sulphate has significant effect in attenuating intubation response with no observed side effect.

KEYWORDS : Magnesium Sulphate, Nebulization, Intubation response

INTRODUCTION

Laryngoscopy and intubation are essential components of general anesthesia and are always nearly associated with tachycardia, systemic hypertension and arrythmias due to sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation(1) Intubation response can be deleterious in patients with ischemic heart disease, hypertension ,diabetes mellitus ,raised intracranial pressures causing cardiovascular catastrophes.In the backdrop of increasing incidence of coronary artery disease, metabolic syndrome ,obesity and traumatic brain injury it is becoming increasingly important to discover new drugs and routes to decrease intubation response(2). Magnesium sulphate is an N-Methyl-D-Aspartate(NMDA) receptor antagonist with local analgesic and anti inflammatory effects and acts on both central and peripheral nervous system .Nebulized ensures equivalent, lesser dose and effectual distribution of drug all over the respiratory trac and is non invasive(3). Magnesium with its diverse actions, good safety profile ,high therapeutic index and cost effectiveness has proven to be a versatile wonder drug for anesthesiologists(4,5). As few studies are available regarding use of nebulized Magnesium sulphate ,hence this study was carried out to find out effects on intubation response after nebulization.

MATERIAL AND METHODOLOGY :

This Prospective ,analytical study was carried out between the time period of January 2022 to June 2022 in the Department of Anesthesiology, Vydehi Institute of Medical Science and Research Centre. All the patients posted for elective surgery under general anesthesia who satisfied inclusion criteria during the study period were included. The first 40 patients (Group 1) satisfying inclusion criteria were allocated into the Group 1 who were nebulized with Normal saline and the next 40 cases with MgSO4 (Group 2) by an anesthetist undertaking the study . The intubation was done by an anesthetist blinded to the study and results were later analyzed by anesthetist undertaking the study.

Inclusion Criteria:

1)Patients of class ASA 1&2 undergoing elective surgery under General anesthesia with endotracheal intubation.
2)Patients who gave written informed consent for the procedure.

Exclusion Criteria:

1)Patient refusal for study
2)Anticipated difficult airway
3)Known hypersensitivity to Magnesium sulphate
4)Patients with known coronary artery disease, cardiac arrythmias, heart failure, renal failure, reactive airway, patient on beta blockers.
5)Patients who required more than 2 attempts at intubation.

PROCEDURE

Pre anesthetic check up was done a day prior to surgery and study subjects were selected. On day of surgery in preoperative holding room ,patients –NPO status confirmed, intra venous access was secured ,ASA standard monitors attached and baseline vitals noted. The first 40 patients scheduled for elective surgery who satisfied inclusion criteria were allocated into the Group 1 who were nebulized with Normal saline 5ml over 20 minutes and the next 40 cases, Group 2 nebulized with MgSO4 500mg diluted to 5ml over 20 minutes by an anesthetist undertaking the study .Post completion of nebulization patients were shifted to Operating Room(anesthetist not involved in study) and ASA standard monitors were attached and preoxygenated with 100% oxygen for 3 minutes. Patients were induced with IV Fentanyl 2mcg/kg+ IV Propofol 2mg/kg iv +Sevoflurane 2-3%.After confirmation of ability to ventilate IV Vecuronium 0.1 mg/kg was administered. After 3 minutes Laryngoscopy was done with appropriate size Macintosh blade and intubation was done with appropriate size ET Tube.

HR, SBP, DBP were measured @

1)Baseline pre start of nebulization
2)10minutes on start of nebulization
3) 20 minutes on start of nebulization
4)Pre induction in OT
5)Immediate post intubation
6)5 minutes post intubation
7)10 minutes post intubation.

Data Analysis

Data was entered into Microsoft Excel Data sheet and were analyzed using SPSSN22 version software.

Statistical tests applied – Independent sample t test was used to compare between groups ,p value <0.005 was considered to be statistically significant .

Statistical software: MS excel ,SSPS version 22(IBM SPSS Statistics, Somers NY,USA) was used to analyze data

RESULTS

Our study showed that according to Table 1 and Figure 1 there was a significant decrease in heart rate from 20 minutes after start of nebulization onwards up to 20 minutes post intubation in MgSO4 group.(P<0.001)

Table 1:Effect Of MgSO4 Nebulization On Heart Rate

Time period	GROUP 1 Mean ± SD	GROUP 2 Mean ± SD	P value
Baseline	76.0 ± 1.46	80.35 ± 2.49	<0.001* (Significant)
10 min	72.65 ± 1.38	72.23 ± 1.16	0.14 (not Significant)

20 min	74.55 ± 1.43	73.0 ± 1.50	<0.001* (Significant)
Post induction	76.40 ± 1.89	79.80 ± 1.85	<0.001* (Significant)
Immediate post intubation	87.83 ± 4.93	77.48 ± 1.71	<0.001* (Significant)
5 min post intubation	80.85 ± 4.02	69.60 ± 1.19	<0.001* (Significant)
10 min post intubation	78.83 ± 3.77	66.43 ± 1.10	<0.001* (Significant)

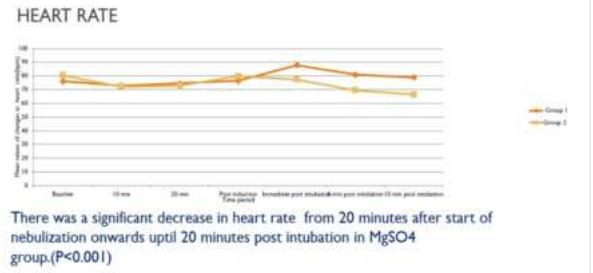

Figure 1: Effect of Normal Saline and MgSO4 nebulization on Heart Rate

According to Table 2 and Figure 2 There was a significant decrease in SBP post 10 minutes of start of nebulization upto 20 mins post intubation

Table 2: Effect Of MgSO4 Nebulization On SBP

Time period	GROUP 1 Mean ± SD	GROUP 2 Mean ± SD	P value
Baseline	130.33 ± 2.82	127.48 ± 3.90	<0.06* (not Significant)
10 min	120.63 ± 4.01	117.53 ± 3.88	<0.001* (Significant)
20 min	124.28± 2.30	115.20 ± 3.39	<0.001* (Significant)
Post induction	102.43± 1.69	98.15 ± 1.90	<0.001* (Significant)
Immediate post intubation	131.78 ± 4.76	113.58 ± 3.26	<0.001* (Significant)
5 min post intubation	131.43± 2.33	103.10 ±1.61	<0.001* (Significant)
10 min post intubation	122.18 ± 3.62	103.10 ± 2.29	<0.001* (Significant)

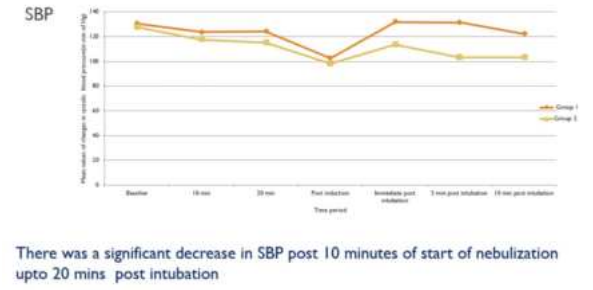

Figure 2 : Effect of Normal Saline and MgSO4 nebulization on SBP

According to Table 3 and Figure 3 there was a significant decrease in DBP post induction onwards (P<0.001)

Table 3: Effect of MgSO4 Nebulization On DBP

Time period	GROUP 1 Mean ± SD	GROUP 2 Mean ± SD	P value
Baseline	75.98 ± 1.44	81.25 ± 2.40	<0.001* (Significant)
10 min	73.03 ± 1.38	72.63 ± 1.17	0.16 (not significant)
20 min	74.95 ± 1.50	73.83 ± 1.66	0.01(not significant)
Post induction	75.78 ± 2.16	79.80 ± 1.55	<0.001* (Significant)
Immediate post intubation	86.65 ± 3.12	77.58 ± 1.81	<0.001* (Significant)
5 min post intubation	81.00 ± 3.50	69.65 ± 1.02	<0.001* (Significant)
10 min post intubation	74.95 ± 1.96	66.33 ± 1.87	<0.001* (Significant)

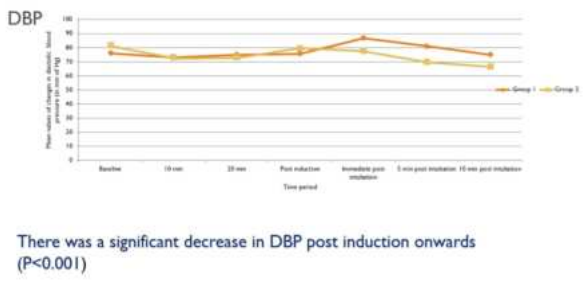

Figure 3 : Effect of Normal Saline and MgSO4 nebulization on SBP

Overall MgSO4 group had lower HR,SBP,DBP from post induction up to 20 minutes post intubation onwards than Normal Saline group.

There was also no observed side effects like delayed recovery from anesthesia, cardiac conduction defects ,hypotonia and diarrhea.

DISCUSSION

Magnesium is an important anion predominantly found intracellularly acts via NMDA receptor antagonism. NMDA receptors are found both in the central nervous system and in the peripheral nerves. Peripherally administered NMDA receptor antagonists are involved with antinociception and anti-inflammatory cascade by reducing NFκβ activity, TNF-α (tumor necrosis factor α) production, expression of inducible nitric oxide synthase, serum C-reactive protein, IL-6 and IL-10. NMDA antagonism via mechanism of blocking calcium influx into cells, activates sodium calcium pump causing decrease neuronal excitability and cause anti nociceptive action, smooth muscle relaxation, decrease in the atrial contraction, bradycardia, and vasodilatation and also suppresses sympathetic surge by reducing levels of serum epinephrine (7,8) Magnesium is hence a versatile drug in the anesthetists armamentarium with many routes of administration -intravenous, gargle, lozenges, nebulization .The nebulization route is non invasive, has less toxicity potential due to more targeted delivery into airways with lesser dose(3).

Our study had correlated with the study by Elmeligy et al where 50 patients were nebulized with 240 mg magnesium sulphate for 15 minutes and found SBP, DBP, HR decreased post ETT intubation and up to 6 min later (9).

A study by Grover N et al where 30 patients were nebulized with 40mg/kg MgSO4 30 minutes prior induction had effectively blunted stress response to laryngoscopy (10)

A study by Rajan et al where 30 patients were nebulized with magnesium sulfate 500 mg, 15 min before induction of general anesthesia and intubation and concluded that it provided analgesia to decrease post operative sore throat(11)

A study by Raghavendra et al that nebulization with magnesium sulphate for at 10mg/kg, 20 mins prior induction was more effective than intravenous route and acted as analgesic and decrease postoperative sore throat (12).

A study by Honarmand A et al that the use of intravenous $MgSO_4$ in doses less than 50 mg/kg in 120 patients caused no significant changes in HR while it caused a decrease in SBP and DBP, arterial blood pressure and hence was effective to reduce cardiovascular instability related to laryngoscopy and tracheal intubation(13).

A study by Salman et al where magnesium sulphate (30 mg/kg) was administered preoperatively in 20 patients undergoing lower abdominal surgery and found MgSO4 is effective drug in attenuating the reflex sympathetic stimulation during airway instrumentation (14) There are a few limitations to our study- fixed dose was used . We did not measure the serum levels of magnesium to monitor the drug levels or see the other systemic effects , and laryngoscopy was done by different anesthetists.

CONCLUSION

In our study we conclude that nebulization with Magnesium sulphate is efficient and attenuates intubation response with no observed side effects.

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