ORIGINAL RESEARCH PAPER

Anaesthesiology

EFFECT OF MAGNESIUM SULPHATE ON NEUROMUSCULAR BLOCKADE DURING ABDOMINAL SURGERIES

KEY WORDS: neuromuscular blockade, train of four, extubation time,reversal.

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ABSTRACT

Introduction: This randomized, double-blind, prospective study was undertaken to evaluate the effect of magnesium sulphate on neuromuscular blockade in abdominal surgeries.
Methods: 62 patients who underwent abdominal surgery were randomly divided in to two groups, group I and group II. 5 minutes after intubation the magnesium group (group I) received magnesium sulphate 50 mg/kg diluted in normal saline to total volume of 20 ml @ 240 ml/hour over 5 minutes. The control group (group II) received same amount of normal saline.
Results: Train of four had no statistical significance. Extubation time was more in Group I but had no statistical significance.
Conclusion: magnesium sulphate does not prolong neuromuscular blockade.

INTRODUCTION

Magnesium is of importance in anaesthesia practice and has been studied to potentiate neuromuscular blockade.[1,2] Its ability to inhibit catecholamine release has been used as a rationale for anaesthetic management of pheochromocytoma [3]Magnesium blocks release of catecholamine from both adrenergic nerve terminals and adrenal gland. Intravenous magnesium sulphate inhibits catecholamine release associated with intubation. Magnesium also produces vasodilatation by acting directly on blood vessels and in high doses, attenuates vasopressin mediated vasoconstriction.

Therapeutic uses of magnesium salts[4]

1: Magnesium is the first choice for control of eclamptic convulsions and may have other neuroprotective actions.
2: Magnesium is the first choice as an anti-arrhythmic for torsade de pointes and catecholamine or digitalis associated arrhythmias. It may be life saving in intractable ventricular tachycardia or fibrillation.
3: Magnesium is excellent for controlling catecholamine associated hypertension and is valuable adjunct to the management of pheochromocytoma.
4: Magnesium may be useful in the control of autonomic disturbances associated with tetanus and paraplegia.
5: Magnesium may have a place in assisting the management of poorly responsive asthma but not as a sole agent.
6: Magnesium may be regarded as a physiological calcium antagonist .

MATERIALS AND METHODS

After obtaining approval from hospital Ethical Committee, details of the procedure was explained to the patients and a written informed consent was taken. 62 ASA I or II patients undergoing laparoscopic abdominal surgery were enrolled into the study. Exclusion criteria were; known allergy to any drug in study, cardiovascular disease, asthma, body weight > 75 kgs, hypermagnesemia, kidney disease, endocrine and metabolic disease, diabetes mellitus, and patients on calcium channel blockers.

Patients were randomly divided into two groups according to computer generated randomization table. A patient received one of these solutions as a bolus intravenously 5 minutes after intubation but before pneumoperitoneum was created.

GROUP I (Magnesium group) received magnesium sulphate 50 mg/kg 5 minutes after intubation over a period of 5 minutes diluted in normal saline to total volume 20ml @ 240 ml/hr through infusion pump.

GROUP II (control group) received 20 ml of normal saline @ 240 ml/hr through infusion pump 5 minutes after intubation over a period of 5 minutes.

On the night prior to surgery all patients received tab Pantoprozole 40 mg & Tab Alprazolam 0.5 mg orally as premedication and patients were kept nil by mouth 6 hrs prior to surgery.

On arrival in the operating room, after confirming the identity of the patient, the consent was checked; the preoperative assessment was reviewed and up dated. The nil by mouth status of the patient was confirmed. Anaesthesia machine, monitors and resuscitation equipments were checked. ECG, NIBP and pulse oximeter were applied and baseline readings of parameters like HR, SBP, DBP, MAP and SpO_2 were noted. Capnometer ($ETCO_2$) was attached after intubation.

All patients received premedication injection midazolam 0.02 mg/kg, injection fentanyl 2 µg/kg, and injection Glycopyrolate 4 µg/kg body weight intravenous.

Patients were pre-oxygenated with 100% O_2 for 3 minutes before induction. Induction was done with Inj. Propofol 2 mg/kg body weight i.v in both the groups and injection Rocuronium 0.8 mg/kg iv to facilitate endotracheal intubation. Bilateral air entry was confirmed by auscultation, $ETCO_2$ reading noted and the endotracheal tube was firmly secured using adhesive tape.

Anaesthesia was maintained with oxygen and nitrous oxide mixture 50:50, sevoflurane end- tidal 1.5 to 2.5% and rocuronium 0.2 mg/kg intermittent boluses.

During surgery ringer lactate was infused in accordance with

deficit, maintenance and blood loss. Patients were ventilated mechanically. Tidal volume and respiratory rate were adjusted to maintain end-tidal CO_2 between 35-45mm Hg. Monitoring of TOF HR, SBP, DBP, MBP, SpO_2, $ETCO_2$. All patients were given injection ondanseteron 4mg, injection diclofenac sodium 75mg intravenous towards the end of surgery.
Reversal and Extubation

After completion of surgery and achieving complete haemostasis and placement of dressing at the site of surgery, residual neuromuscular blockade was reversed with a combination of Injection Neostigmine 0.05 mg/kg and Injection Glycopyrrolate 8 µg/kg. Sevoflurane and nitrous Oxide were discontinued once last suture was applied. 100% Oxygen was administered. The patients were extubated once TOF was between 90 % to 100% . Extubation time was noted. All patients were monitored for 30 minutes in recovery room following extubation.

Monitoring and recording of parameters was done at following intervals and analyzed for study.
1) Baseline vitals (Average of 3 readings pre-operative).
2) Five minutes after intubation.
3) Five minutes after infusion of drug.
4) Before creation of pneumoperitoneum.
5) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 60 minutes after pneumoperitoneum

STATISTICAL ANALYSIS:
After data collection, data entry was done in Excel.

Data analysis was done with the help of SPSS Software ver 15 and Sigmaplot Ver 11.

Quantitative data is presented with the help of Mean, Std Dev, Median and IQR, comparison between study groups is done with the help of Unpaired T test or Mann-Whitney test as per results of Normality test.

Qualitative data is presented with the help of Frequency and Percentage table, association among study group is assessed with the help of Chi-Square test.

P value less than 0.05 is taken as significant level.

RESULTS:

Table I: patient characteristics.

	Group I	Group II
Age (yrs)	37.97 ± 10.77	38.16 ± 8.43
Weight (kg)	59.19 ± 7.62	61.77 ± 8.28
M/F	3/28	3/28

Table no 2: comparison of TOF among study groups.

TOF	Group I (N=31)				Group II (N=31)				MannWhitney test	P Value
	Mean	Std.Dev.	Median	IQR	Mean	Std.Dev.	Median	IQR		
BL TOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
5 MIN AFT INTU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
5 M AFT INF DRUG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
BEF PNEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
5 M AFT PNEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
10 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
15 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
20 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
25 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
30 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
35 min	0.74	0.44	1.00	1.00	0.71	0.46	1.00	1.00	0.282	0.778
40 min	1.58	0.50	2.00	1.00	1.55	0.51	2.00	1.00	0.254	0.799
45 min	0.84	1.00	0.00	2.00	0.90	1.01	0.00	2.00	0.254	0.799
50 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
55 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000
1HR TOF	0.29	0.46	0.00	1.00	0.19	0.40	0.00	0.00	0.882	0.378

Table no 3: comparison of extubation time among study groups.

extubation time	Group I (N=31)				Group II (N=31)				MannWhitney test	P Value
	Mean	Std.Dev.	Median	IQR	Mean	Std.Dev.	Median	IQR		
extubation time	5.77	1.12	6.00	2.00	5.48	1.23	5.00	3.00	0.942	0.346

From table 2 there was no statistical significant differ ence in TOF between the two groups.

From table 3 Extubation Time was more in group I than group II but was not statistically significant.

DISCUSSION:
This placebo controlled, double blind study was designed to assess the effects of magnesium sulphate on neuromuscular blockade laparoscopic abdominal surgeries.

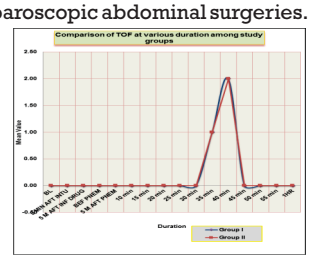

Fig 1 Comparison of TOF at various time intervals among study groups.

K. Montazari et al.[5] studied dose response effect of magnesium sulphate and measured TOF at 45 minutes after induction of anaesthesia. They found there was no statistical significance in TOF between the groups.

Sang-Hun Kim et al.[6] studied the effect of magnesium sulphate pre-treatment on onset and recovery characteristics of cisatracurium. They concluded that MgSO4 results in about 29% shortening of onset time of cisatracurium (0.15 mg/kg) without prolongation of the recovery of neuromuscular block.
L. Telci et al.[7] studied effect of magnesium sulphate in reducing intra operative anaesthetic requirement.. They observed that neuromuscular block was prolonged in magnesium group than control group with significant p value of TOF because continuous infusion dose was used after bolus compared to our study were no prolongation of neuromuscular block by using TOF was found , as only bolus dose of magnesium sulphate was used.

EXTUBATION TIME
We have calculated extubation time from stoppage of

sevoflurane to the removal of endotracheal tube. Sevoflurane and nitrous oxide was turned off when last surgical port was sutured.

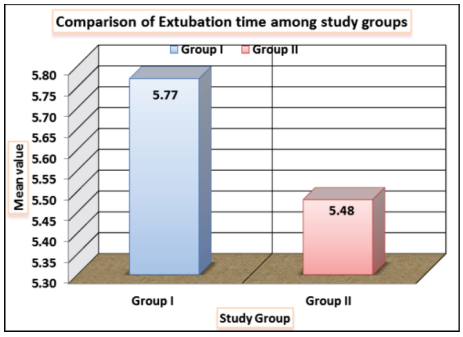

Fig 2 Comparison of extubation time among study groups

From figure 2 it is evident that extubation time in group I was more than group II. In group I extubation time was 5.77 ± 1.12 minutes verses 5.48 ± 1.23 minutes in group II but this difference has no statistical significance with p=0.346.

Various studies have shown similar results like Nand Kishore Kalra et al.[8] studied the effect of magnesium sulphate on hemodynamic responses during laparoscopy surgery, they have observed increased extubation time in magnesium group as compared to control group with p<0.05.

In another study by T. O. Seyhan et al.[9] they used different doses of magnesium sulphate against the control and concluded that magnesium groups have longer extubation time than control group.

Manjushree Ray et al.[10] studied the effect of magnesium sulphate on anaesthetic consumption, haemodynamics and post operative recovery. They found delayed recovery in magnesium as compared to clonidine and control groups.

We concluded from our study that use of magnesium sulphate does not prolong neuromuscular block with single bolus dose, and under strict TOF monitoring. Magnesium sulphate may prolong extubation time but has no adverse effects on patients.

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