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Original Article

Pretreatment with intravenous Magnesium Sulphate reduces incidence of Succinylcholine induced Postoperative Myalgia among patients undergoing elective surgery under General Anaesthesia-A Prospective study

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Abstract:

Background: Succinylcholine is the most commonly used depolarizing muscle relaxant for endotracheal intubation. The most common side effect of succinylcholine is postoperative myalgia which is distressing to the patient.

Aim of study: This study was designed to evaluate effectiveness of intravenous magnesium sulfate in reducing the incidence of succinylcholine induced postoperative myalgia.

Materials and Methods: 80 (Eighty) adult patients of ASA grade I and II of both sexes for elective surgery under general anesthesia were randomly allocated into two equal groups, magnesium sulfate group and normal saline as placebo group. The patients of magnesium sulfate group were pretreated with magnesium sulfate 40 mg/kg body weight in 10 mL volume, while patients of normal saline (placebo) group were given isotonic saline 0.9% in the same volume (10 mL) intravenously slowly over 10 minutes. Premedication was done by injecting 1.5 mg/kg of fentanyl in iv route. Thereafter, anaesthesia was induced in all patients, by 2 mg/kg of propofol intravenously. Following the loss of eyelid reflex, 1.5 mg/kg of succinylcholine was injected intravenously as a muscle relaxant and then the patients were intubated. The incidence and severity of myalgia were assessed by a blinded observer 24 hours after surgery.

Results: Postoperative myalgia recorded immediately in the postoperative ward and upto 48 hours of postoperative period. Postoperative myalgia were recorded in magnesium sulfate group with 15 (37.5%) patients and 27 (67.5%) patients in normal saline (placebo) group respectively which was statistically significant.

Conclusion: Pretreatment with intravenous Magnesium sulfate 40 mg/kg reduces the incidence of succinylcholine-induced postoperative myalgia using Propofol as induction agent.

Key words: Magnesium Sulfate, Succinylcholine, Propofol, Postoperative Myalgia.

Introduction

Succinylcholine is a depolarizing skeletal muscle relaxant that remains the accepted standard for facilitating endotracheal intubation in many countries.[1] This medication may cause some adverse effects in patients such as increased levels of creatinine kinase (CK) and potassium in blood,[2] apnea, malignant hyperthermia, increased intraocular pressure and increased intracranial pressure,[3,4] emesis with aspiration,[3] fasciculation during induction and postoperative myalgia.[3,5]

Although postoperative myalgia is minor adverse effect of succinylcholine, this may be very unpleasant experience for the patient till 24–48 h after surgery.[5,6] To decrease the rate of fasciculation and postoperative myalgia various methods have been tested. For example, use of Vitamin C,[7] ketamine and propofol,[8,9] calcium gluconate,[10] lidocaine,[11] magnesium sulfate,[9] diclofenac,[12] benzodiazepines,[13] thiopentone,[14] dexmedetomidine,[15] remifentanil,[16] isoflurane,[17] and non-depolarizing neuromuscular blocking agents.[18]

Propofol has also been identified to be a better agent than thiopentone sodium to control succinylcholine -induced myalgia. 19 This study was designed for induction of anesthesia with propofol, after pretreatment with magnesium sulfate to assess the

effect on incidence and severity of succinylcholine-induced postoperative myalgia. Magnesium affects the neuromuscular junction and competes with calcium at prejunctional site. These both ions antagonize each other—high magnesium concentrations inhibit release of acetylcholine, while high calcium concentration increases the release of acetylcholine from the presynaptic nerve terminals.[20] This may explain the control of succinylcholine-induced fasciculation and myalgia by magnesium.

Materials and Methods

This is a randomized controlled double blind study conducted from May to July 2018 in a private clinic named Health Care Pvt. Ltd., Ranking Street, Wari, Dhaka. All 80 adult patients were randomly allocated into two equal groups, magnesium sulfate group was designated as group I and normal saline (placebo group) as group II. The inclusion criteria were American Society of Anesthesiologists (ASA) physical status I and II, need for general anesthesia with endotracheal intubation, not being addicted to any drugs, being 20–50 years of age. The exclusion criteria were hepatic or renal impairment, cardiac ischemia, pulmonary, neuromuscular or metabolic diseases and pregnancy. All participants provided written consent to participate in the study.

Preoperative evaluation included medical history, physical and upper airway examination. A complete blood test, renal function tests, liver function tests and electrocardiogram were conducted on all patients. Routine monitoring like pulse oxymetry ,NIBP ,ECG was conducted after patients arriving in operating room with a monitor. A 20 G cannula was inserted to the dorsum of left hand of the patient and Ringer's Lactate solution was started at a rate of 100ml/hour. The patients of magnesium sulfate group were pretreated with magnesium sulfate 40 mg/kg body weight in 10 ml volume, while patients of normal saline (placebo) group were given isotonic saline 0.9% in the same volume (10ml) intravenously slowly over 10 minutes. Premedication was done by injecting 1.5 mg/kg of fentanyl in iv route. Thereafter, anaesthesia was induced in all patients, by 2 mg/kg of propofol intravenously. Following the loss of eyelid reflex, 1.5 mg/kg of succinylcholine was injected intravenously as a muscle relaxant and then the patients were intubated. The maintenance of anesthesia was continued using a mixture of oxygen, nitrous oxide, halothane and vecuroneum as muscle relaxant. At the end of the surgery, muscle relaxation was reversed using neostigmine and atropine. After the desired spontaneous ventilation, the patients were extubated. The patients were transferred to the recovery room and later in the ward.

The incidence and severity of succinylcholine induced postoperative myalgia in the patients were determined 24 hours after surgery by an anesthesiologist who was unaware of the grouping.. Postoperative myalgia (POM) is defined as "a pain with no surgical interference" and is graded based on Kararmaz et al's2 four-point scale as follows:

0= no muscle pain.
1= muscle stiffness limited to one area of the body.
2= muscle pain or stiffness noticed spontaneously by a patient who requires analgesics.
3= incapacitating generalized, severe muscle stiffness or pain.

Statistical Analysis

Date was summarized as mean ± SD. Unpaired t-test was applied for quantitative data and Chi-square test for qualitative data. P value < 0.05 was taken as significant.

Results

There was no significant difference in terms of age, body weight, sex and ASA status between the groups (Table I). In group I fifteen (37.5%) out of the 40 patients had postoperative myalgia (POM), whereas 27 (67.5%) out of the 40 patients had POM in group II ($P<0.05$). Grade 1 POM was lower number of patients in group I when compared with group II (11 versus 18; $P<0.05$). Grade 2 POM was also lower number of patients in group I when compared with group II (4versus 9; $P<0.05$) and there was no grade 3 POM in any of the two groups (Table II). The baseline values of systolic and diastolic blood pressure and heart rate in both groups were similar and there was no any adverse effect.

Table-I: Comparison of demographic data between the groups

Parameter	Group I (Magnesium sulfate group) n=40	Group II (Saline group) n=40	P-value
Age in year (mean±SD)	34.58±9.47	35.28±9.26	p>0.05
Weight in kg (mean±SD)	55.27±7.42	54.43±7.32	p>0.05
Sex (M/F)	24/16	23/17	p>0.05
ASA status I/II	38/2	37/3	p>0.05

Table II: Incidence and severity of postoperative myalgia

Postoperative myalgia (POM)	Group I (Magnesium sulfate group) n=40	Group II (Saline group) n=40	P-value
Incidence of myalgia number (%)	15 (37.5%)	27 (67.5%)	p<0.05
Grading of myalgia number (%)			
0	25 (62.5%)	13 (32.5%)	p<0.05
1	11 (27.5%)	18 (45%)	p<0.05
2	4 (10%)	9 (22.5%)	p<0.05
3	0	0	-

Discussion

Succinylcholine is a depolarizing muscle relaxant drug with unique status in clinical practice because it quickly and acceptably relaxes muscles followed by spontaneous recovery. Despite its limitations and side effects, succinylcholine is still a drug of choice for endotracheal intubation in operating rooms. Postoperative myalgia is an adverse effect of succinylcholine that may be a very unpleasant experience for patients.

Pretreatment with various drugs have been tried to reduce these side effects. Magnesium sulfate was tried to decrease the postoperative myalgia in the present study. The findings of present study shows, in group I (magnesium sulfate group) fifteen (37.5%) out of the 40 patients had postoperative myalgia (POM), whereas 27 (67.5%) out of the 40 patients had POM in group II (saline group) (P<0.05). Grade 1 POM was lower number of patients in group I when compared with group II (11 versus 18; P<0.05). Grade 2 POM was also lower number of patients in group I when compared with group II (4 versus 9; P<0.05) and there was no grade III POM in any of the two groups.

Raman A et al.[21] used 40mg/kg magnesium sulfate as pretreatment before induction with propofol and observed the incidence of myalgia to be 40% in magnesium sulfate group as compared to 86.6% in the control group (p<0.05). Present study shows myalgia in magnesium group is 37.5% which is comparable to Raman A et al's study who found 40% myalgia in magnesium group.

Kumar Met al.[9] reported 30% postoperative myalgia in control group compared to none in magnesium sulfate group.Ursekar Ret al[22] reported no significant difference in postoperative myalgia between control group and the group receiving magnesium sulphate. The present study is supported by the study of McClymont C[19] who found significantly lower incidence of suxamethonium myalgia (19%) compared with thiopentone group (63%) (P<0.05) using magnesium sulfate as pretreatment. Stacey MR[23] et al noticed no significant difference in the effect of magnesium sulfate on succinylcholine-induced myalgia. Incidences were similar in both the groups. The difference may be due to the fact that in the above study, thiopentone sodium was used as an induction agent, whereas in present study, propofol was used. The lower incidence of myalgia maybe due to synergistic effect of propofol and magnesium sulfate.

Conclusion

Pretreatment with intravenous Magnesium sulfate 40 mg/kg reduces the incidence of succinylcholine-induced postoperative myalgia using Propofol as induction agent.

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