ORIGINAL ARITICLE

Effect of Magnesium Sulphate on the Dose Requirement of Atracurium

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ABSTRACT

Objective: To compare the mean intraoperative consumption of Atracurium with and without intravenous administration of Magnesium sulphate in patients undergoing elective abdominal surgery under general anaesthesia.
Study design: Randomized controlled trial.
Setting: Department of Anaesthesia, Services hospital, Lahore.
Duration of Study: Six months (1st July, 2011 to 31st December, 2011).
Material and methods: One hundred patients of elective abdominal surgery were divided into two groups, group S (control) and group M (Magnesium) comprising of 50 patients each. Magnesium group received Magnesium sulphate 50 mg/kg administered as a slow intravenous bolus and 15 mg/kg/hr by continuous intravenous infusion. The same volume of isotonic saline was administered to the control group. Neuromuscular block was monitored using train-of-four stimulation. Atracurium bolus of 0.15 mg/kg was repeated when more than two responses were detected until the start of closure of peritoneum. Magnesium sulphate infusion was stopped after skin closure.
Results: Out of 100 patients, in group S 6(12%) were males and 44(88%) were females while in group M, 12(24%) were males and 38(76%) were females .age was between 25-45 years when compared, the dose of Atracurium in Control group with that of Magnesium group statistically, the difference was significant (P<0.05).
Conclusion: The administration of Magnesium led to a significant reduction in the dose of Atracurium used during general anaesthesia.
Keywords: Magnesium sulphate, dose, Atracurium, effect.

INTRODUCTION

The rationale for use of non depolarizing compounds was multifactorial and included the desire to replace the depolarizing neuromuscular blocking agent, succinylcholine, which has several adverse effects.[1]Recently the importance of Magnesium in anaesthesia practice has been highlighted. Normal plasma magnesium levels range from 1.7-2.1mEq/L or 1.7-2.4mg/dL[2]. Magnesium is distributed principally between bone (53%) intracellular compartments of muscle (27%) and soft tissue (19%)[3]. Serum Magnesium is present in three states–ionized (62%), protein bound (33%) mainly to albumin, and complexed to anions such as citrate and phosphate (5%)[4]. Inhibition of calcium-mediated neuro-endocrine secretion by Magnesium has been demonstrated, with clinically useful effects.[5] Magnesium is highly effective arteriolar vasodilator resulting in maintained cardiac filling and enhanced cardiac output[6]. Magnesium maintains beta-agonist effects while demonstrating excellent alpha-adrenergic antagonist actions in animals and humans[7,8]. Magnesium may produce effects similar to calcium-entry-blocking drugs.[9] Magnesium is involved as a cofactor regulation of cardiac excitability and neurotransmitter release.[10] Magnesium is also a physiological calcium antagonist at different voltage-gated channels[11], which may be important in the mechanisms of antinociception[12] perioperative Magnesium supplementation may prevent postoperative hypomagnesemia and has a beneficial effect on postoperative pain[13]. Magnesium prevents or controls convulsions by blocking neuromuscular transmission and decreasing the amount of acetylcholine liberated at the end plate by the motor nerve impulse[14]. Perioperative Magnesium sulphate reduces anesthetic requirements and improves postoperative analgesia[15,16].

MATERIAL AND METHODS

This randomized controlled trial study was carried out in the Department of Anaesthesiology, Services Hospital, Lahore for six month (1st July 2011 to 31st December, 2011). The calculated sample size was 100 cases 50 in each group. Sampling technique was non-probability purposive sampling.

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Inclusion Criteria

- ASA-I and ASA-II patients of either sex.
- Patients of 25-45 years of age.
- Weight 45-65 kg
- Patients undergoing elective abdominal surgery under general anesthesia.

Exclusion Criteria

- Known allergy to Magnesium sulphate assessed on history.
- Patients receiving treatment with calcium channel blockers or Magnesium assessed on history.

RESULTS

A total number of one hundred (ASA-1 and ASA-2) patients of elective abdominal surgery undergoing general anesthesia, divided in two groups; each group comprised of 50 patients. Out of which 6 (12%) were males and 44(88%) were females in group S while in group M there were 12(24%) males and 38(76%) females. Male to female ratio was 1:6.4 in group S, and 1:3.2 in group M. Statistically the difference was not significant (P>0.05). Table 2 shows the Dose of Atracurium consumed by patients between the two groups. The mean±standard deviation of control group is 0.87±0.054 mg/kg/hr and Magnesium group is 0.65±0.041mg/kg/hr. Statistically, the difference between the groups is significant (P<0.05)

Table 1: Gender distribution of cases (n=100*)*

Gender	Control group (n=50)		Magnesium group (n=50)	
	Frequency	%age	Frequency	%age
Males	6	12.0	12	24.0
Females	44	88.0	38	76.0

Male to female ratio 1:6.4 1:3.2

Table 2: Frequency of dose of Atracurium(mg/kg/hr) (n=100)

Dose of Atracurium (mg/kg/hr)	Control group (n=50)		Magnesium group (n=50)	
	Fre-quency	%age	Fre-quency	%age
0.585-0.710	-	-	39	78.0
0.711-0.835	9	18.0	11	22.0
0.836-0.960	41	82.0	-	-

Mean±SD 0.87± 0.05 0.65±0.04 P value P<0.05

DISCUSSION

The current study comprised of the possible effects of Magnesium sulphate in reducing the dose requirements of Atracurium during general anaesthesia with oxygen, nitrous oxide and isoflorane. Importantly, we used an objective, quantitative measure of muscle relaxation (train-of-four stimulation) to guide the dose requirement of muscle relaxant and to determine end-points. The results demonstrate a significant reduction in the consumption of Atracurium with Magnesium administration. In the present study, the aim was to find out if Magnesium could reduce dose requirements of Atracurium during general anaesthesia. The data demonstrated a significant reduction in Atracurium consumption during general anaesthesia with continuous Magnesium administration. Following studies are showing the results comparable to our study. Koinig and colleagues demonstrated that Magnesium can be an adjuvant to peroperative analgesic management by lowering the fentanyl requirement[17]. Recently, in a study by Shulz-Stübner and colleagues, magnesium sulphate given as a bolus after induction produced a significant reduction in remifentanil and mivacurium consumption during general anaesthesia.[18] Arnold and colleagues showed that doses of Magnesium similar to those used in this study, were shown to produce reductions in analgesic requirements both during and after surgical interventions[19] A study by Na HS, Lee JH Showed that I.V. magnesium sulphate reduces rocuronium requirements and postoperative analgesic consumption in children with CP[20].

CONCLUSION

Magnesium premeditation has a positive effects on neuromuscular block, provides a better quality of anaesthesia while hastening functional recovery. The patients receiving Magnesium sulphate infusion during perioperative period had better pain relief and lesser requirement of rescue analgesics in the early postoperative period without any major side effect.

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