ORIGINAL ARTICLE

Atracurium With and Without Administrating Magnesium Sulphate in Patients Undergoing Abdominal Surgeries

RIFFAT SAEED[1], MUHAMMAD SARWAR[2], ARIF JAVED[3], IRM QAMAR[4], TARIQ BANGASH[5], IRFAN ALI KAKEPOTTO[6]
[1,4]Assistant Prof. of Anaesthesia, Shaikh Zayed Hospital, Lahore
[2,6]Consultant Anaesthetist, Shaikh Zayed Hospital, Lahore
[3]Assistant Prof. of Surgery, Shaikh Zayed Hospital, Lahore
[5]Associate Prof. of Hepatobiliary Unit, Head of Department, Shaikh Zayed Hospital, Lahore
Correspondence to Dr. Riffat Saeed, Email: riffatsaeeddr@gmail.com. Mob: 0302-4615150,

ABSTRACT

Background: Globally thousands of elective abdominal surgeries are being conducted under general Anaesthesia. Muscle relaxants are principally used to provide good muscle relaxation for induction and maintenance of Anaesthesia.
Aim: To compare the mean consumption of atracurium with and without administration of intra-venous magnesium sulphate in patient undergoing abdominal procedures under general anaesthesia.
Place and dates: Department of Anesthesiology, Sh. Zayed Hospital, Lahore from February 2016 to August 2016.
Methodology: This is a randomized control trial study and carried out in the Department of Anaesthesia at Shaikh Zayed Hospital, Lahore within one year. A total of hundred cases; 50 in each group and taking magnitude of atracurium consumption i.e., 340.7±81.7ug/kg/h in control group and 183.7±78.1ug/kg/h in MgSO4 group in patients undergoing abdominal surgeries under general anaesthesia. Patients were randomized by lottery method in group A (Magnesium Group). Patients were given 50mg/kg Magnesium Sulphate in slow IV infusion from Intra operatively and in group B, patients were given normal saline as placebo
Results: With magnesium sulphate, the mean consumption of atracurium was 181.24±23.04 and without magnesium sulphate, the mean consumption of atracurium was 339.54±23.68. There is a significant difference in mean consumption of atracurium with and without magnesium sulphate ($p<0.000$).
Conclusion: There is a significant difference in mean consumption of atracurium with and without magnesium sulphate. It is less with administration of intravenous magnesium sulphate as compared to normal saline in patients undergoing abdominal surgeries under general anaesthesia.
Key Words: Atracurium, Magnesium Sulphate, Anesthesia, Abdominal Surgeries.

INTRODUCTION

Globally thousands of elective abdominal surgeries are being conducted under general Anaesthesia. Muscle relaxants are principally used to provide good muscle relaxation for induction and maintenanceof Anaesthesia. For emergency operations, patients are considered full stomach and rapid sequence induction is done with depolarizing neuromuscular blocking agent (suxamethonium). For maintenance of muscle relaxation non depolarizing muscle relaxants are routinely used[1]. Among non-depolarizing neuromuscular blocking agent atracurium is most commonly used. Higher dose of atracurium has some side effects like prolonged neuromuscular blockage, hypotension, vasodilation, laryngospasm, bronchospasm, urticaria. The posterior sheath of the rectus and the transverses muscles are fused with the peritoneum in the upper abdomen. If the patient has not had any relaxant drugs for a period of 20 minutes, there is no contraindication[2-3].

Magnesium Sulphate is a non-competitive N-methyl-D-Asparate (NMDA) receptor antagonist with antinociceptive effects. Magnesium Sulphate (MgSO4) has been previously investigated as a possible adjuvant for intra-operative and postoperative analgesia. The majority of these studies suggest that perioperative (MgSO4) reduces anaesthetic requirements and improves post-operative analgesia requirement[4-5]. Mean consumption of atracurium was 340.7±81.7ug/kg/h in control group and 183.7±78.1ug/kg/h in Magnesium sulphate group. This was a significant difference[6]. Magnesium Sulphate reduced intra-operative neuromuscular blocking agents (NMBA) requirements and decreased analgesic consumption after operation without any adverse effect[7].

Received on 15-09-2020
Accepted on 23-12-2020

PATIENTS AND METHODS

After approval certificate from hospital ethical committee, 100 patients were included in the study from Department of Anesthesia, Shaikh Zayed Hospital Lahore. Informed written consent and demographics of patients was obtained. Patients were randomized by lottery method in group A. Patients were given 50mg/kg Magnesium Sulphate in slow IV infusion from Intra operatively and in group B, patients were given normal saline as placebo. Before induction pre-oxygenation was done for three minutes, Analgesia (Nalbine 1mg/kg) is given then followed by propofol (2mg/kg) and a loading dose of atracurium (0.5mg/kg). After 3-4 minutes tracheal intubation was done with cuffed endotracheal tube (ETT) # 7. Anaesthesia was maintained using 66% nitrous oxide in oxygen, isoflorane and subsequent maintenance doses of atracurium. The end tidal concentration of CO_2 was maintained between 30-35mmHg. Nerve stimulator was used for monitoring of

neuromuscular blockade atracurium maintenance dose of 0.15mg/kg was administered when more than two responses were detected in train of four. After skin closure $MgSO_4$ infusion was stopped. Total amount of atracurium consumed was noted.

RESULTS

In this study, 100 patients with abdominal surgeries were included. In group-A, 20(40%) were males and 30(60%) females. In group-B, 18(36%) were males and 32(64%) females. The mean age of the patient was 30.5±4.3 years. In group-A, 16(32%) had ages between 20-25 years. While 12(24%), 10(20%) and 12(24%) patients were between 26-30 years, 31-35 years and 36-40 years of age groups respectively. In group-B, 12(24%) had ages between 20-25 years. While 14(28%), 12(24%) and 12(24%) patients were between 26-30 years, 31-35 years and 36-40 years of age groups respectively. In group-A, 18(36%) had 1 hour duration of surgery.

Table 1: Comparison of gender distribution between groups (n=100)

Gender	Group		Total
	With MgSo4	Without MgSo4	
Male	20(40%)	18(36%)	38(38%)
Female	30(60%)	32(64%)	62(62%)
Total	50(100%)	50(100%)	100

Table 2: Comparison of age distribution between groups

Age Groups	Groups		Total
	With MgSo4	Without MgSo4	
20-25	16(32%)	12(24%)	28(28%)
26-30	12(24%)	14(28%)	26(26%)
31-35	10(20%)	12(24%)	22(22%)
36-40	12(24%)	12(24%)	24(24%)

Table 3: Comparison of ASA distribution between groups

ASA Status	Group	
	With MgSo4	Without MgSo4
ASA-I	0 (0%)	0 (0%)
ASA-II	50(100%)	50(100%)

Table 4: Descriptive statistics of different ages and consumption of atracurium in both groups

Groups	Statistics	Age	Consumption of Atracurium
With MgSo4	Mean	29.9	181.2
	Std. Error of Mean	0.92	3.2
	Median	29.0	180.0
	Std. Deviation	6.5	23.0
	Variance	42.7	530.8
	Minimum	20.0	140.0
	Maximum	40.0	219.0
Without MgSo4	Mean	30.3	339.5
	Std. Error of Mean	0.80	3.3
	Median	30.0	339.0
	Std. Deviation	5.7	23.6
	Variance	32.7	560.7
	Minimum	20.0	302.0
	Maximum	39.0	380.0

While 18(36%) and 14(28%) patients had 2 hours and 3 hours duration of surgery respectively. In group-B, 17(34%) had had 1 hour duration of surgery. While 14(28%) and 19(38%) patients had 2 hours and 3 hours duration of surgery respectively. With magnesium sulphate, the mean consumption of atracurium was 181.24±23.04 ($mgkg^{-1}h^{-1}$) and without magnesium sulphate, the mean consumption of atracurium was 339.54±23.68 ($mgkg^{-1}h^{-1}$. There is a significant difference in mean consumption of atracurium with and without magnesium sulphate (p<0.000).

Table 5: Comparison of duration of surgery distribution between groups

Duration of Surgery	Groups		Total
	With MgSo4	Without MgSo4	
1 Hour	18(36%)	17(34)	35(35%)
2 Hours	18(36%)	14(28%)	32(32%)
3 Hours	14(28%)	19(38%)	33(33%)

Table 6: Comparison of mean consumption of atracurium in both groups

Groups		Mean±SD	P value
Consumption of Atracurium	With MgSo4	181.2±23.0	0.000
	Without MgSo4	339.5±23.6	

Table 7: Duration of surgery wise stratification of mean consumption of atracurium in both groups

Duration of Surgery			Mean±SD	P value
1 Hour	Consumption of Atracurium	With MgSo4	185.5±24.9	0.000
		Without MgSo4	336.1±22.2	
2 Hours		With MgSo4	172.2±20.8	0.000
		Without MgSo4	329.6±22.5	
3 Hours		With MgSo4	161.0±22.4	0.000
		Without MgSo4	318.6±27.7	

DISCUSSION

Magnesium is a physiologic calcium channel blocker[8] and a non-competitive N-methyl-D-aspartate receptor antagonist[9] and play an important role in treatment of peri-operative pain[10]. The potency of volatile anaesthetics can be increased by non-competitive NMDA antagonist and the analgesic effects of magnesium are probably enhanced by volatile anaesthetics[11]. Magnesium blocks the release of catecholamines[12] and produces vasodilatation by acting directly on blood vessels[13]. The magnesium sulphate prolongs and potentiates neuromuscular block by non-depolarizing neuromuscular blocking agents[14]. This study results support previous clinical studies[15] by demonstrating that magnesium lowers neuromuscular blocker requirements. Magnesium sulphate was found to delay postoperative recovery[16]. It observed that pre-treatment with IV magnesium sulfate had no impact on post-operative pain and analgesic consumption[17]. These studies have shown that infusion of magnesium sulfate given before induction of anesthesia is associated with less post-operative pain undergoing elective cesarean section[18].

Bahatia et al studied the effects of Magnesium infusion on analgesia during cholecystectomy and reported significant decrease in the amount of consumed atracurium[19]. It observed that atracurium consumption was decreased significantly in Magnesium treated group compared to control group. There was no difference in pain intensity at 48 hours after surgery[20]. The analgesic effect of epidural Magnesium sulfate on patients undergoing elective hip replacement and revealed that less atracurium was consumed for analgesia in the patients receiving magnesium sulfate[21]. They concluded that peri-operative

intravenous magnesium reduces atracurium consumption and to a lesser extent, pain scores in first 24 hour postoperatively[22].

The mean consumption of atracurium was 181.24±23.04 ($mgkg^{-1}$ h^{-1}) and without magnesium sulphate, the mean consumption of atracurium was 339.54±23.68 ($mgkg^{-1}h^{-1}$). The mean was 340.7±81.7ug/kg/h in control group and 183.7±78.1ug/kg/h in Magnesium sulphate group. This was a significant difference[6]. Magnesium Sulphate reduced intra-operative NMBA (Atracurium) requirements and decreased analgesic consumption after operation without any adverse effects. Thus I/V Magnesium Sulphate should be considered as a useful adjuvant for abdominal surgeries under general anaesthesia[7].

CONCLUSION

There is a significant difference in mean consumption of atracurium with and without magnesium sulphate. The mean consumption of atracurium is less with administration of intravenous magnesium sulphate as compared to normal saline in patients undergoing abdominal surgeries under general anaesthesia.

REFERENCES

1. Robinson N, Hall G, Fawcell W. How to survive in anesthesia. New Dehli: Wiley-Blackwell; 2012:148.
2. Donati F, Bean DR. Neuromuscular blocking agents. In: Barash PG, Cullen BF, Stocking RK, Clinical anaesthiesia. 6 ed. Philadelphia, PA: Willioms and Wilson 1999:498.
3. Peach MJ, Magann EF, Doherty DA Verity LJ, Newnham JP. Does magnesium sulphate reduce the short- term and long-term requirements for pain relief after caesarean delivery? A double-blind placebo controlled trial. Am J Obstet Gynecol 2006;194:1596-602.
4. Ryu JH, Kang MH, Park KS, Do SH. Effects of magnesium sulphate on intraoperative anaesthetic requirements and postoperative analgesia in gynaecology patients receiving total intravenous anaesthesia. Br J Anaesthesia 2009; 100(3):397-403.
5. Na Hs, Lee JH, Hawang JY, Rgn JH, Hen SH, Jeen YT. Effects of magnesium sulphate neuromuscular blocking agent requirements.
6. Lee DH, Known IC. Magnesium sulphate has beneficial effects as an adjuvant during general anaesthesia for caesarean selection. Br J Anaesthesia 2009;106(6):861-66.
7. Zia MA, Rehman A, Ashraf R, Gilani T. Mean Intra-operative consumption of atraeurium with and without intravenous administration of MgSO4 in elective abdominal surgeries. Pak J Med Health Sci 2012;6(4):1010-2.
8. Kiran S, Gupta R, Verma D. Evaluation of a single-dose of intravenous magnesium sulphate for prevention of postoperative pain after inguinal surgery. Indian J Anaesth. 2011;55:31–3.
9. Levaux C, Bonhomme V, Dewandre PY, Brichant JF, Hans P. Effect of intra-operative magnesium sulphate on pain relief and patient comfort after major lumbar orthopaedic surgery. Anaesthesia. 2003;58:131–5.
10. Ryu JH, Park KS, Kim KO, Do SH. The effects of magnesium sulfate infusion on tiva (propofol and remifentanil) in gynecologic operation. Reg Anesth Pain Med. 2006;31:87.
11. Tan TY, Hu XG, Xiao YF. The Effect of magnesium sulphate on postoperative pain after laparosopic cholecystectomy. J Clin Res. 2006;12:112-6.
12. Bhatia A, Kashyap L, Pawar DK, Trikha A. Effect of intraoperative magnesium infusion on perioperative analgesia in open cholecystectomy. J Clin Anesth. 2004;16:262-5.
13. Paech MJ, Magann EF, Doherty DA, Verity LJ, Newnham JP. Does magnesium sulfate reduce the short and long-term requirements for pain relief after caesarean delivery? A double-blind placebo-controlled trial.Am J Obstet Gynecol. 2006;194:1596-602.
14. Ko SH, Lim HR, Kim DC, Han YJ, Choe H, Song HS. Magnesium sulfate does not reduce postoperative analgesic requirements. Anesthesiology. 2001;95:640-6.
15. Dube L, Granry JC. The therapeutic use of magnesium in anesthesiology, intensive care and emergency medicine: A review. Can J Anaesth. 2003;50:732-6.
16. Wadhwa A, Sengupta P, Durrani J, Akca O, Lenhardt R, Sessler DI. Magnesium sulphate only slightly reduces the shivering threshold in humans. Br J Anaesth. 2005;94:756-62.
17. James MF. Magnesium: An emerging drug in anaesthesia. Br J Anaesth. 2009;103:465-7.
18. Dabbagh A, Elyasi H, Razavi SS, Fathi M, Rajaei S. Intravenous magnesium sulphate for post-operative pain in patients undergoing lower limb orthopedic surgery. Acta Anaesthesiol Scand. 2009;53:1088-91.
19. Farouk S. Pre-incisional epidural magnesium provides pre-emptive and preventive analgesia in patients undergoing abdominal hysterectomy. Br J Anaesth. 2008;101:694-9.
20. Kaur S, Baghla N. Evaluation of intravenous magnesium sulphate for postoperative analgesia in upper limb orthopaedic surgery under general anaesthesia: A comparative study. Internet J Anesthesiol. 2012;30:742-4.
21. Banwait S, Sharma S, Pawar M, Garg R, Sood R. Evaluation of single epidural bolus dose of magnesium as an adjuvant to epidural fentanyl for postoperative analgesia: A prospective, randomized, double-blind study. Saudi J Anaesth. 2012;6:273-8.
22. Hwang JY, Na HS, Jeon YT, Ro YJ, Kim CS, Do SH. I.V. infusion of magnesium sulphate during spinal anaesthesia improves postoperative analgesia. Br J Anaesth. 2010;104:89-93.