

# Role of Magnesium Sulphate in Postoperative Analgesia

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## Abstract

**Background:** The present study was conducted to evaluate role of magnesium sulphate on postoperative pain relief. **Subjects and Methods:** The present study was conducted on 76 patients of ASA grade I and II for surgery. Patients were divided into 2 groups of 38 each. Group I patients were given magnesium sulphate (50mg/kg.i.v.) and group II was control. Pain at rest was evaluated using a 0-10 cm VAS at emergence from anaesthesia and 2, 4, 8, 16 and 24 hrs after surgery. **Results:** The VAS score at emergence from anaesthesia was 1.82 in group I and 1.94 in group II, after 2 hours VAS was 1.35 in group I and 1.54 in group II, after 4 hours was 1.42 in group I and 1.89 in group II, after 8 hours was 2.68 in group I and 3.12 in group II, after 16 hours was 1.32 in group I and 2.01 in group II and after 24 hours was 0.71 in group I and 1.21 in group II. The difference was significant ( $P < 0.05$ ). The mean sedation score in group I was 1.82 and in group II was 1.43. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that administration of intravenous magnesium sulphate preoperatively significantly reduces postoperative pain in patients.

**Keywords:** Magnesium sulphate, Pain, VAS.

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## Introduction

Pre-emptive analgesia has been defined as an antinociceptive treatment that prevents establishment of altered central processing of afferent input from injuries. Therapies that have been tested in pre-emptive trials include NSAIDs, intravenous opioids, intravenous ketamine, peripheral local anaesthetics, caudal and epidural analgesia, dextromethorphan and gabapentin. One intravenous adjuvant medication that has shown potential in pre-emptive analgesia is magnesium.<sup>[1]</sup>

Magnesium (Mg) is the fourth most common cation in the body and it activates approximately 300 enzymes systems, including most of the enzymes involved in energy metabolism and nucleic acid synthesis. Magnesium is of importance in anaesthesia practice for several reasons. First, the ion is essential for many biochemical reactions and its deficiency may produce clinically important consequences during anaesthesia or in intensive care unit.<sup>[2]</sup>

The perioperative use of magnesium sulphate was first reported to decrease analgesic requirements during the postoperative period by Tramer and colleagues, and has since been investigated as an effective adjuvant during anaesthesia and postoperative analgesia.<sup>[3]</sup> Although the mechanism underlying the analgesic effect of magnesium is unclear, magnesium acts as an antagonist of N-methyl-D-aspartate (NMDA) type glutamate receptors, the block of which is known to inhibit the induction and maintenance of central sensitization to nociceptive stimuli<sup>[4]</sup>. The present study was conducted to study the role of magnesium sulphate for

postoperative analgesia.

## Subjects and Methods

The present study was conducted in the department of Anaesthesiology. It comprised of 76 patients of ASA grade I and II for surgery. The study was approved from the institutional ethical committee. All were informed regarding the study and written consent was obtained.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 38 each. Group I patients were given magnesium sulphate and group II was control. The patients of magnesium sulphate group (Group-I) received magnesium sulphate 50 mg/kg in 250 ml of isotonic sodium chloride solution IV whereas patients in control group (Group-II) received same volume of isotonic sodium chloride over 30 minutes preoperatively. The patients were premedicated with tablet alprazolam 0.25 mg the night before and 2 hrs before surgery. Pain at rest was evaluated using a 0-10 cm VAS (0 – No pain at all to 10 – Worst pain imaginable) at emergence from anaesthesia and at 2, 4, 8, 16 and 24 hrs after surgery. The requirement of rescue analgesic during first 24 hrs after operation was noted. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## Results

**Table 1: Distribution of patients**

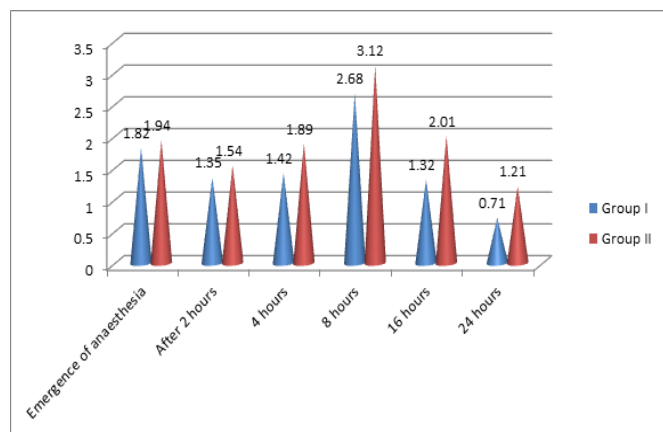
Groups	Group I (Magnesium sulphate)	Group II (Control)
Number	38	38

[Table 1] shows that group I patients were given magnesium sulphate and group II was control. Each group had 38 patients.

**Table 2: Assessment of pain in both groups**

Parameters (VAS)	Group I	Group II	P value
At emergence from anaesthesia	1.82	1.94	0.45
After 2 hours	1.35	1.54	0.01
4 hours	1.42	1.89	0.01
8 hours	2.68	3.12	0.005
16 hours	1.32	2.01	0.01
24 hours	0.71	1.21	0.02

[Table 2 & Figure 1] shows that VAS at emergence of anesthesia was 1.82 in group I and 1.94 in group II, after 2 hours VAS was 1.35 in group I and 1.54 in group II, after 4 hours was 1.42 in group I and 1.89 in group II, after 8 hours was 2.68 in group I and 3.12 in group II, after 16 hours was 1.32 in group I and 2.01 in group II and after 24 hours was 0.71 in group I and 1.21 in group II. The difference was significant ( $P < 0.05$ ).

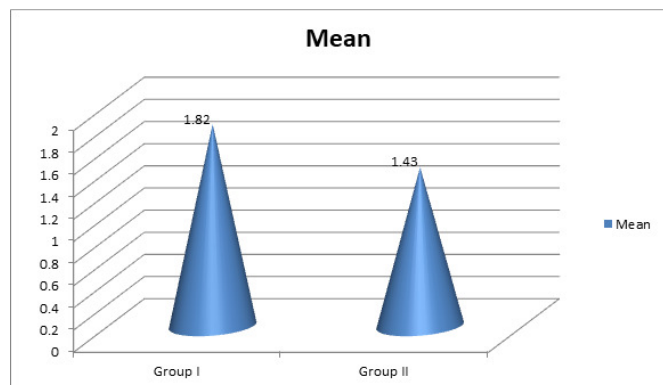


**Figure 1: Assessment of pain in both groups**

**Table 3: Postoperative sedation score**

Group	Mean	P value
Group I	1.82	0.01
Group II	1.43	

[Table 3 & Figure 2] shows that mean sedation score in group I was 1.82 and in group II was 1.43. The difference was significant ( $P < 0.05$ ).



**Figure 2: Postoperative sedation score**

## Discussion

Magnesium sulphate has been studied as an adjuvant drug for anaesthesia and analgesia by numerous investigators.<sup>[5]</sup> Although the majority of studies have concluded that magnesium sulphate has a positive analgesic effect, some have produced negative results. For example, Balkan and colleagues found that magnesium sulphate did not decrease morphine requirements post operatively after lapcholecystectomy.<sup>[6]</sup> As the 4th most common cation, magnesium plays a variety of key roles in the physiological processes of the human body. The normal plasma concentration range of magnesium is around 0.7–1.3 mmol/L (1.4-2.6 mEq/L).<sup>[7]</sup> Unless patient’s renal function is compromised, hyper magnesemia is rare in clinical settings. Hypo magnesemia, on the other hand, is common in perioperative situations because magnesium, supplied through diet, is easily lost by enema, bleeding, and transfusion. Magnesium depletion often occurs in patients just before surgery, which peaks immediately after surgery. From a physiological perspective, magnesium is a noncompetitive N-methyl-d-aspartate (NMDA) receptor antagonist and a calcium channel blocker.<sup>[8]</sup> Kiran et al,<sup>[9]</sup> studied efficacy of single dose of intravenous magnesium sulphate to reduce post-operative pain in patients undergoing inguinal surgery. The present study was conducted to study the role of magnesium sulphate for postoperative analgesia.

In present study, group I patients were given i.v. magnesium sulphate (50mg/kg) and group II was control. Each group had 38 patients. The requirement of rescue analgesic during first 24 hrs after operation was noted. VAS score at emergence from anaesthesia was 1.82 in group I and 1.94 in group II, after 2 hours VAS was 1.35 in group I and 1.54 in group II, after 4 hours was 1.42 in group I and 1.89 in group II, after 8 hours was 2.68 in group I and 3.12 in group II, after 16 hours was 1.32 in group I and 2.01 in group II and after 24 hours was 0.71 in group I and 1.21 in group II. Pain in postoperative period was significantly lower in magnesium sulphate group in comparison to the control group at emergence from anaesthesia and at 2, 4, 8, 16 and 24 hrs postoperatively. Patients in group-I were more sedated as compared to group-II [sedation score 1.82 vs. 1.43 ( $P=0.01$ )]. Rescue analgesia requirement postoperatively in first 4, 8 and 16 hrs was significantly lower in patients of group-I than in group-II.

Woolf et al,<sup>[10]</sup> studied the dependence of the central sensitisation on NMDA receptor activation in rats and found that NMDA receptor activation is involved in the induction and maintenance of central sensitization processes that characterize post injury pain states. Therefore, NMDA receptor antagonist may play a role in prevention and treatment of perioperative pain.

## Conclusion

Authors found that administration of intravenous magnesium sulphate preoperatively significantly reduces postoperative pain in patients.

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