ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Effect of Magnesium Sulphate on postoperative pain in laparoscopic cholecystectomy

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Manuscript Info

Manuscript History:

Received: 18 August 2015
Final Accepted: 16 September 2015
Published Online: October 2015

Key words:

Magnesium Sulphate, analgesia, Laparoscopic Cholecystectomy

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Abstract

Background: Adequate post operative pain relief contributes significantly to patient comfort and a good post operative recovery. Magnesium sulphate has been recently shown to have a potential to prevent post operative pain. The present study was designed primarily to study the effect of Magnesium Sulphate on analgesic requirement of patients undergoing laparoscopic cholecystectomy.

Aim: To evaluate the efficacy of administration of magnesium sulphate to produce adequate post operative pain relief after laparoscopic surgery.

Methods: After taking informed consent, 60 patients were systematically randomised into two groups of 30 each. Patients were kept NPO 8 hours prior and given Tablet Alprazolam 0.25mg and Omeprazole 20 mg at bed time day before surgery and morning of surgery.Group1 received Magnesium sulphate 50 mg/kg in 250 ml of isotonic 0.9%N.S intravenously over 15 to 20 minutes in the preoperative room and Group II ,Same volume of isotonic 0.9%N.S iv. over 15 to 20 minutes ,before shifting the patient immediately afterwards to the operation room.

Results: Magnesium sulphate pretreatment in a dose of 50 mg/kg body weight intravenously before laryngoscopy and intubation effectively reduces and delays post-operative analgesic requirement by reducing post-operative pain.

Conclusion: Magnesium sulphate produce adequate postoperative pain relief associated with laparoscopic cholecystectomy.

INTRODUCTION

Pain has been found to be one of the most common medical causes of delayed discharge after ambulatory surgery, the other two being drowsiness and nausea/vomiting. Negative clinical outcomes resulting from ineffective post operative pain management leads to problems which are unpleasant for the patient and may prolong hospital stay associated with economical and medical implications. In this context the concept of pre-emptive analgesia was introduced demonstrating that a post injury hypersensitivity results via a central mechanism.[1]Magnesium sulphate has been recently shown to have a potential to prevent post operative pain and to reduce intra operative anesthetic and analgesic requirements being an antagonist of N-methyl-D-aspartate (NMDA) receptors and its associated ion channels.[2]Magnesium sulphate has also been previously investigated as a possible adjuvant for intra and postoperative analgesia.[3][4] Majority of these studies suggest that preoperative magnesium sulphate reduces anesthetic requirements and improves postoperative analgesia).[5][6]Intra venous magnesium sulphate administration during spinal anesthesia improves postoperative analgesia.[7] Magnesium sulphate infusion leads to significant reduction in intraoperative propofol, neuromuscular blocking agent requirements, and reduces postoperative pain and analgesic consumption.[8] Magnesium sulphate during total intra venous anesthesia improved the quality of postoperative analgesia.[9]

METHODS:

After obtaining informed consent and approval from institutional ethical committee, this randomized control trial was conducted between May 2010 to May 2013. Study included 60 patients divided into two groups of 30 each, of ASA grade I and II of either sex between the ages of 18-65 years, undergoing laparoscopic cholecystectomy under general anesthesia with endotracheal intubation. After a detailed preanesthetic check up Following patients were excluded from the study:-

1. ASA grade III or greater.
2. Pre-existing cardiovascular disease, significant respiratory, renal

   And hepatic disorder.
3. Patients on treatment with calcium channel blockers or Magnesium.
4. History of drugs or alcohol abuse.
5. Pregnant women.
6. Obese patients (body mass index more than 35 kg/m^2).

Patients were prepared by 8 hours preoperative fasting, receiving Tablet Alprazolam 0.25mg and Omeprazole 20 mg at bed time day before surgery and morning of surgery. After obtaining informed consent, patients were randomly allocated into two groups using computer-generated Microsoft excel program, The two groups of patients received the following treatment in the preoperative room, monitors were attached to the patients and all parameters like heart rate, non invasive blood pressure, oxygen saturation and ECG were recorded. Group I. Magnesium sulphate 50 mg/kg in 250 ml of isotonic 0.9% sodium chloride solution were administered intravenously over 15 to 20 minutes in the preoperative room, immediately before induction of anesthesia. Group II. Same volume of isotonic 0.9% sodium chloride solution intravenously over 15 to 20 minutes in the preoperative room just before induction of anesthesia. During the administration of the preoperative medication patients pulse, blood pressure, and oxygen saturation were monitored. The anesthesiologists in charge of intraoperative management and those responsible for postoperative observation of patient were not aware of the treatment given before anesthesia in the preoperative room (Magnesium Sulphate or normal saline).After this a Ringer lactate infusion at rate of 10ml /kg was started through the intravenous 18G or 20G cannula inserted in a peripheral vein and patients were shifted immediately to operation room along with proper monitoring of vitals, which is continued. Injection Ondansetron 0.1mg/ kg and Fentanyl 0.5 µg/kg was given 5 minutes before induction. After 3 minutes of pre oxygenation, anesthesia was induced with Propofol 2.0 mg/kg body weight over 30 seconds and injection Atracurium 0.5 mg/kg body weight. Depending upon the type and duration of surgery all the patients were maintained with 33% Oxygen, 66% Nitrous oxide, 0.4% Halothane and Atracurium 5mg as intermittent boluses. During surgery CO2 pneumo-peritoneum was established and maintained at a pressure of around 12-14 mm Hg by an automatic insufflation unit till the completion of surgery. At the end of the surgery residual neuromuscular blockade was reversed with injection Neostigmine 0.05mg/kg and injection Glycopyrolate 0.01mg/kg and patient extubated. Postoperatively pain was evaluated using a 0-10 cm visual analog scale (VAS 0-10, with 0 - No pain at all and 10 - Worst pain imaginable) at emergence from anesthesia and at 1, 2, 4 and 6 hrs after surgery. VAS score of > 3 was considered inadequate analgesia .Pain relief in the postoperative period was provided by injection Tramadol in a loading dose of 1 mg/kg intravenous followed by incremental doses of 0.5 mg/kg intravenous as and when needed to a maximum dose of 3 mg/kg to both group of patients.[10] Time to first dose of rescue analgesia & total Tramadol required during first six hours postoperatively was recorded. All the observations made in the study were compared for each parameter within the group and intergroup comparison. All the data obtained was analyzed and subjected to subsequent statistical analysis using, student Independent T- test were intergroup means were compared, paired T- tests for intragroup comparisons and Chi Square tests were non-parametric data was compared.

RESULTS

Age, Sex, ASA, weight and duration of surgery were comparable in both the groups ($p > 0.05$ which is not significant).

Table 1: Inter Group comparison (I v/s II) of VAS at 0 hour (Emergence)

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS

I (N=30)	**2- 9**	**4.70**	**2.152**	**T value= 2.516 P Value= 0.015**	**S**
II (N=30)	**2- 9**	**6.00**	**1.383**		

Unpaired (independent) t test , S= Significant (p> 0.05; Not Significant; p < 0.05; Significant; p <0.001: Highly significant).The results are statistically significant.

Table 2: Inter Group comparison (I v/s II) of VAS at 1 hour

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS
I (N=30)	**2- 7**	**4.43**	**1.654**	**T value= 2.794 P Value= 0.007**	**S**
II (N=30)	**3- 9**	**5.53**	**1.383**		

The results are statistically significant.

Table 3: Inter Group comparison (I vs II) of VAS at 2 hours

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS
I (N=30)	**2- 7**	**4.20**	**1.270**	**T value= 2.745 P Value=0.008**	**S**
II (N=30)	**3- 8**	**5.10**	**1.269**		

The results are statistically significant.

Table 4: Inter Group comparison (Iv/s II) of VAS at 4 hours

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS
I (N=30)	**2- 6**	**4.07**	**1.015**	**t value= 2.649 P Value=0.010**	**S**
II (N=30)	**3- 7**	**4.80**	**1.126**		

The results are statistically significant.

Table 5: Inter Group comparison (I v/s II) of VAS at 6 hours

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS
I (N=30)	0- 6	3.90	1.185	t value= 1.113 P Value=0.270	NS
II (N=30)	3- 7	4.23	1.135		

The results were not statistically significant.

Table 6: Inter Group comparison (I v/s II) of total Tramadol consumption (mg)

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS
I (N=30)	0- 380	79.70	24.149	t value= 4.645 P Value= 0.000	S
II (N=30)	5- 380	106.83	20.988		

Tramadol consumption being more in group II.

Table 7: Inter Group comparison (I v/s II) of time of first dose of Tramadol (minutes)

GROUPS	RANGE	MEAN	STANDARD DEVIATION(±)	STATISTICAL INFERENCE	REMARKS
I (N=30)	0- 115	131.72	140.117	T value= 2.667 P Value= 0.010	S
II (N=30)	40- 135	49.33	93.336		

The time of first dose of Tramadol being early in group II.

Discussion:

Pre-emptive analgesia has gained popularity and its role in the control of pain has been extensively studied in this context It involves administration of analgesic regime before the onset of noxious stimulus, with the goal of preventing sensitization of C.N.S to subsequent stimuli that amplify pain. The effect of magnesium on perioperative analgesic requirements was first evaluated by Koinig and colleagues in patients with identical levels of surgical stimulation.[4] Hammad et al. used the loading dose of MgSO4 was administered 15 min before induction to achieve optimal levels of magnesium before inflicting the pain stimulus.[10] In our study 60 patients divided into two groups

of ASA grade I or 2, VAS score was seen at extubation and at 1, 2, 4 and 6 hours postoperatively. Total tramadol required and time of first dose of tramadol was made note of in both groups. The difference of age, sex, weight, ASA grading and duration of surgery were statistically non significant.

VISUAL ANALOG SCORE (VAS):-

Visual analog Score (at 0, 1, 2, 4 and 6 hour) distribution amongst the two groups was shown in tables 1,2,3,4 and 5 respectively. There is variation in VAS (at 0, 1, 2 and 4 hour) distribution in between the two groups, the values being higher in group II and statistically significant as compared to those in group I, with the exception of VAS at 6 hr which doesn't showed much variation within the two groups hence not statistically significant. This shows magnesium group has better pain control. The result being comparable with the study done by Hammad et al.[10] Table 6 shows the total Tramadol consumption distribution amongst the two groups. There was a difference in the total Tramadol consumption in the two groups which was statistically significant. Tramadol consumption being more in group II (control) i.e 106.83 ± 20.98 mg as compared to group I i.e. 79.70 ± 24.14 mg. The result showing requirement of rescue analgesic (Tramadol) was significantly lower in magnesium group as compared to control group.[10] There was variation in the time of first dose of Tramadol (minutes) as rescue analgesia in between the two groups as shown in table 7 shows time of first dose of Tramadol being early in group II (49.33 ± 93.33) min. as compared to as (131.72 ± 140.11) min. in group The result being comparable with the study done by Hammad et al.[10]

LevauxCh et al. observed that postoperative opioid consumption and pain scores were lower in the magnesium group, the first night's sleep and the global satisfaction scores were better in the magnesium group after major lumbar surgery. .[11] Bhatia et al. found administration of intraoperative MgSO4 as an adjuvant analgesic in patients undergoing open cholecystectomy resulted in better pain relief and comfort in the first postoperative hour,with better sleep quality during the postoperative period, without any significant adverse effects.[12] Tauzin-Fin P at al. study showed that intravenous magnesium sulphate reduces tramadol consumption when used as a postoperative analgesic protocol in radical prostatectomy.[13] Benhaj Amor M et al. evaluated the effect of intra and postoperative magnesium sulphate infusion on postoperative pain in abdominal surgery and the results of the study support the use of magnesium sulphate as useful adjuvant for postoperative analgesia in abdominal surgery.[14] Saadawy IM et al. reported that i.v .lidocaine and magnesium improved post-operative analgesia and reduced intraoperative and post-operative opioid requirements in patients undergoing laparoscopic cholecystectomy.[15] The improvement in quality of recovery might facilitate rapid hospital discharge. Recently Kiran S et al. studied that the administration of intravenous magnesium sulphate 50 mg/kg preoperatively significantly reduces postoperative pain in patients undergoing inguinal surgery.[16] Postoperative analgesic effects of intraperitoneal NMDA receptor antagonists like ketamine and magnesium was seen in patients undergoing laparoscopic cholecystectomy ,showing reduced analgesic requirements.[17][18]

Using different routes like Epidural and intrathecally magnesium reduces postoperative analgesic requirement.[19][20].Also during total intravenous anesthesia in gynecological surgeries magnesium reduces postoperative analgesic requirement.[21]No evidence of adverse effect owing to magnesium sulphate was reported. Recovery and postoperative analgesia in laparoscopic cholecystectomy as well as in thoracotomies have shown favorable results using magnesium sulphate.[22] Intraoperative magnesium sulphate infusion on pain relief and early recovery after laparoscopic surgeries are shown encouraging results with minimal side effects.[23][24]

Conclusion:

We concluded that IV preventive doses (low doses) of Magnesium sulphate 50 mg/kg in 250 ml of isotonic 0.9% sodium chloride solution administered intravenously over 15 to 20 minutes in the preoperative room solution alleviate postoperative pain throughout the first day after laparoscopic cholecystectomy under balanced general anesthesia significantly and reduce opioid consumption as well.

Conflict of Interests

The authors declare that there is no conflict of interests regarding publication of this paper.

Acknowledgments

No funding from any agency, support of ICU staff and OT staff is greatly appreciated. The authors dedicate the great appreciation to Daljeet Singh Charak. Professor Department of Anesthesia, ASCOMS, Jammu, Jammu & Kashmir, India.

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