Original Research Paper

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EFFECT OF INTRAVENOUS MAGNESIUM SULPHATE ON POST-OPERATIVE PAIN FOLLOWING SPINAL ANAESTHESIA IN PATIENTS UNDERGOING LOWER LIMB ORTHOPAEDIC SURGERY

Dr Trupti D Shah	Professor , Department Of Anaesthesia, Bj Medical College
Dr Ketu Patel	Senior Resident, Department Of Anaesthesia, Bj Medical College, Ahmedabad
Dr Divya Gosai*	2nd Year Resident, Department Of Anaesthesia, Bj Medical College, Ahmedabad *Corresponding Author

ABSTRACT **Introduction:** This prospective, randomized, controlled study is undertaken to evaluate the Effect of Intravenous Magnesium Sulphate On Post-Operative Pain Following Spinal Anesthesia in Patients undergoing lower limb orthopaedic surgery. **Method:** After thorough pre-anesthetic assessment with necessary investigations; patients fulfilling the inclusion criteria were selected randomly using odd-even method into two equal groups Magnesium Group M (n=35) & Control Group C (n=35). Under all aseptic & antiseptic precautions spinal anesthesia given. Before the start of the surgery, Group M patients received an intravenous magnesium sulfate infusion with dose of 50mg/kg of body weight in a 100ml NS pint over 10-15 mins . The control group (Group C) received 100mlof normal saline (placebo) over 10-15min. The patients were monitored at 1st,2nd,4th,6th,12th & 24th hours after the surgery regarding hemodynamic parameters, VAS pain score, sedation score ,modified aldrete score.**Results:** Perioperative intravenous administration of MgSO4 in orthopedic surgery could reduce postoperative analgesic consumption , provides mild sedation and reduce adverse effects.**Conclusion:** Based on the findings in this study, it is recommended that perioperative intravenous magnesium sulphate should be considered as part of multimodal analgesic regimen. This will help in potentiating the effect of regional anaesthesia and increasing duration of analgesia postoperativel

KEYWORDS : Magnesium sulphate, post-operative pain, orthopedic surgery, VAS score

INTRODUCTION-

Postsurgical pain is one of the most important issues that could have a serious effect on postoperative recovery and comfort. Surgical pain is due to inflammation from tissue trauma (surgical incision, dissection, burns) or direct nerve injury (nerve transaction, stretching, or compression). Magnesium sulphate is an effective analgesic adjuvant for postoperative pain. Magnesium is a calcium channel blocker and noncompetitive NMDA receptor antagonist. In orthopedic surgery, the patient who remains conscious during the procedure may be fearful, anxious, and nervous. The easiest way to prevent such situations is to sedate the patient during the operation, which will reduce the anxiety and fear of the patient while increasing the quality of regional anesthesia. Thus, we have selected magnesium sulfate in this study for its sedative , anti-shivering , analgesic and hemodynamic effects.[4]

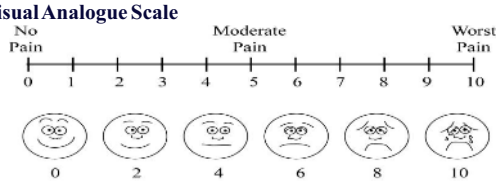
Methodology-

A Prospective, Randomized, Placebo-Controlled, single blind Study was conducted over 70 patients aged 18-50 yrs with ASA grade I, II posted for Lower limb Orthopaedic surgery selected randomly using odd-even method into two equal groups Magnesium Group M (n=35) & Control Group C (n=35) and shifted inside operation theatre. Baseline monitoring of patients were recorded including electrocardiography(ECG),pulse oximetry (SPO2), non-invasive blood pressure(NIBP) heart rate(HR), respiratory rate (RR).Intravenous line was secured with 18G/20G intravenous cannula and inj. Ringer lactate(RL) 500ml solution was given to each patient as preloading over 10-15 minutes. Patients were placed in sitting/lateral position and under all aseptic & antiseptic precautions painting & draping of local part was done. Inj. Lignocaine 2% 2ml was injected in local skin & subcutaneous tissue ;using midline/paramedian approach with 23G Quincke's spinal needle inj. Bupivacaine 0.5% Heavy (3-4ml) was injected in L3-L4 subarachnoid space after free & clear flow of CSF; and then patients were placed in supine position. Patients were kept on a simple oxygen mask with O2 flow rate 5L/min and IV fluids were continued. Using position maneuvers an appropriate sensory block level (T8–T10) was achieved. After a stable block level and appropriate hemodynamic status; before the start of the surgery, Group M patients received an intravenous magnesium sulfate infusion with dose of 50mg/kg of body weight in a 100ml NS pint over 10-15 mins . The control group (Group C) received the same volume of normal saline (placebo) over 10-15min.The anaesthesia resident doctor in operation theatre did the randomization of patients by odd-even method & prepared pints for Group M & Group C. The patients were operated and intraoperative monitoring of hemodynamic parameters like HR,NIBP,RR,SPO2,Urine output & 21

sedation score was documented for every 15min in initial 1st hr then every 30min till the end of surgery. During this study, if hypotension occured inj. Mephenteramine 6mg iv and for bradycardia inj. Atropine 0.6mg iv was given in incremental dose. After the surgery, patients were transferred to the post-anesthesia care unit for monitoring; then they were transferred to the postoperative ward after meeting the recovery criteria(Modified Aldrete Score).In postoperative ward patients were monitored till 24hrs of surgery. For postoperative supplementary analgesia the following protocol was used and documented:

(1) The patients were monitored at 1st,2nd,4th,6th,12th & 24th hours after the surgery regarding hemodynamic parameters, VAS pain score, sedation score ,modified aldrete score;
(2) Whenever a VAS pain score >4 out of 10 was detected, inj.Tramadol 2 mg/kg iv was given.

Visual Analogue Scale



Rss (ramsay Sedation Scale)

Sedation score	Response
1	Anxious and agitated or restless or both
2	Co-operative, oriented and tranquil
3	Responding to commands only
4	Brisk response to light glabellar tap or loud auditory stimulus
5	Sluggish response to light glabellar tap or loud auditory stimulus
6	No response to stimulus

RESULTS-

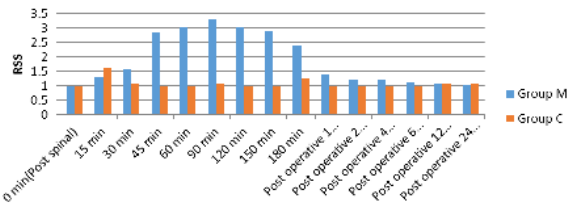
- Suitable Statiscal tests of comparison were done. Continuous variables were analysed with the unpaired test. Categorical variables were analysed with Chi-square test. Statistical significance was taken as $p < 0.05$. The data was analysed using SPSS version 24 and Microsoft excel 2016.

- Heat rate wise distribution initially up to 30 min of intraoperative period there was no statistically significant difference between both groups and mean heart rate was comparable in both groups. Mean heart rate from 30min till 90min was lower in group M compared to group C. There was statistically significant difference found between mean heart rate of both groups at 30,45,60 & 90 min of intraoperative period ($p<0.05$). However in postoperative period there was no statistically significant difference between

group M and group C.

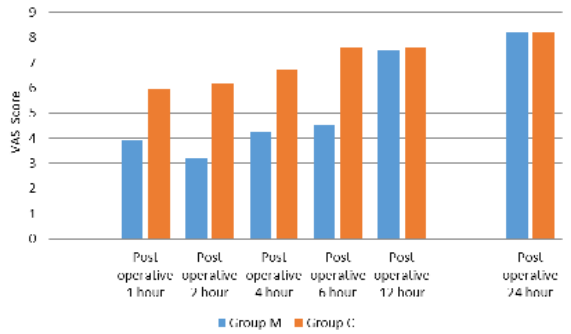
- The mean MAP was comparable in both groups and there was no statistically significant difference found between mean MAP of both groups at different time intervals of intraoperative and postoperative period($p>0.05$).
- There was no statistically significant difference found between mean Respiratory rate of both groups at different time intervals of intraoperative and postoperative period($p<0.05$).

Figure 8. Mean Sedation score



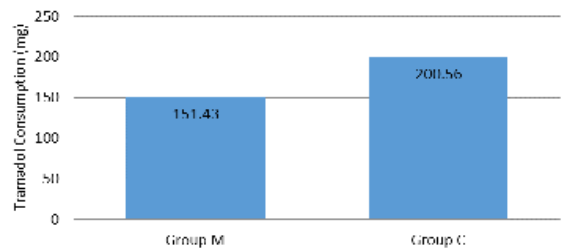
There was statistically significant difference found between mean sedation score among both groups after 45min of spinal anesthesia till the end of surgery($p<0.05$).In group M sedation score was higher compared to group C during intraoperative period. In postoperative period there was no significant difference between mean sedation score and was comparable among both groups.

Figure 9. Mean VAS score



There was statistically significant difference found between mean VAS score among both groups up to postoperative 6 hour($p<0.05$).VAS score was on lower side in group M compared to group C up to postoperative 6 hour . After postoperative 6 hours till 24 hours postoperative period VAS score was comparable in both groups and statistically not significant.

Figure 11. Mean Tramadol consumption



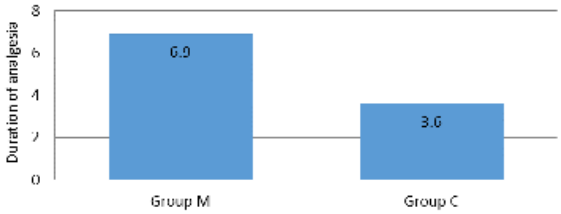
After 24 hours of surgery, the mean tramadol consumption in postoperative period among Group M was 151.43 mg and in Group C was 200.56 mg. A statistically significant difference was found between Tramadol consumption among both groups($p<0.05$).

Table 1. Comparison of Mean Duration of analgesia among both groups

Mean Duration of analgesia (Hours)	Group M	Group C	P-value
	6.9 + 1.1	3.6 + 0.4	0.002

The mean duration of analgesia in group M was 6.9 hours and in group C was 3.6 hours in postoperative period. A statistically significant difference was found between mean duration of analgesia among both groups (<0.05).

Figure 10. Mean Duration of analgesia



DISCUSSION-

Postoperative pain should be effectively treated as it represents an important component of postoperative recovery. Effective treatment serves to blunt autonomic, somatic and endocrine reflexes with a resultant potential decrease in perioperative morbidity [2].Postoperative pain control may be achieved by a variety of mechanisms, including the use of pharmacological agents and interventional techniques[1]. Traditionally, opioid analgesic therapy has served as the mainstay of treatment for acute postoperative pain. However, the use of opioids is associated with increased incidence of postoperative complications such as respiratory depression, sedation, postoperative nausea & vomiting, ileus and urinary retention [10]. These adverse effects can delay recovery and discharge from hospital. Magnesium is a non-opioid and NMDA receptor antagonist which prevents the induction of central sensitization after peripheral nociceptive stimulation. NMDA receptor is an amino acid receptor in the brain and spinal cord responsible for excitatory synaptic transmission [11].

This present study demonstrates the effectiveness of intraoperative magnesium sulphate administration on postoperative pain and a reduction of total cumulative opioid consumption in the first 24hr postoperatively. Increased duration of analgesia without associated hemodynamic disturbances and adverse effects related to magnesium sulphate administration was also observed.

CONCLUSION-

Perioperative intravenous administration of MgSO4 in orthopedic surgery could reduce postoperative analgesic consumption, provides mild sedation and reduce adverse effects such as vomiting, nausea, and shivering.

Based on the findings in this study, it is recommended that perioperative intravenous magnesium sulphate should be considered as part of multimodal analgesic regimen. This will help in potentiating the effect of regional anesthesia thereby reducing postoperative tramadol consumption and increasing duration of analgesia postoperatively.

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