Research Paper Anaesthesiology

Evaluation of Efficacy of Intravenous Magnesium Sulphate on Post -Operative Analgesia for Surgeries Done Under General Anaesthesia

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KEYWORDS Dexmedetomidine, Bupivacaine, spinal anaesthesia

AIM:
To evaluate the efficacy of intravenous magnesium sulphate on post operative analgesia following surgeries done under general anaesthesia.

OBJECTIVES:
1) To evaluate post operative pain at different intervals following the use of preoperative and intraoperative intravenous magnesium sulphate.

2) To assess the level of sedation in the immediate post operative period by sedation score.

3) To monitor hemodynamic parameters i.e., heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), electrocardiogram (ECG), SpO2 perioperatively.

MATERIAL AND METHODS:
Present clinical study was conducted at Great Eastern medical school Srikakulam district andhrapradesh and Kamineni Institute of Medical Sciences, Narketpally, Nalgonda District, Telangana, during the period October 2014 to September 2015. After obtaining approval from institutional ethical committee, present study was undertaken to evaluate the efficacy of Intravenous Magnesium sulphate on post operative analgesia following surgeries done under general anaesthesia. It was prospective control study done on 60 patients undergoing elective surgeries under General anaesthesia.

Inclusion criteria
ASA grade I and II patients.

Age between 20 – 50 years of either gender.

Elective surgeries posted under GA.

Exclusion criteria
Patients with hepatic, renal diseases, diabetes mellitus, asthma, chronic obstructive pulmonary disease, any hematological disorders, neurological diseases or cardiovascular diseases like heart blocks, Hypertension etc.

Patients receiving treatment with calcium channel blockers (CCBs), Mg, anticoagulants and opioids.

Patients with any known allergy to MgSO4 or other drugs.

Pregnancy.

Obesity

METHODS:
After a thorough clinical examination and relevant laboratory investigations of all patients, an informed, valid, written consent was obtained, both for conduct of study as well as administration of General Anaesthesia.

Patients were explained preoperatively about VAS scale.All patients were kept nil by mouth from midnight before surgery and tablet alprazolam (0.01mg/kg) was administered at bed time the day before surgery.Tablet Ranitidine (150mg) was administered in the morning at 6am on the day of surgery.

All the patients were re-examined, assessed and weighed pre-operatively on the day of surgery. Intravenous access was established with an 18G intravenous access and baseline hemodynamic parameters i.e., HR, SBP, DBP, MAP were noted.

Anaesthesia machine and accessories were checked and drugs, including emergency drugs were kept ready. Also monitoring equipments like pulse oximeter, non invasive blood pressure (NIBP) and ECG monitors were checked and applied to each patient on arrival to the operating room.

All the patients were randomly allocated into two groups of 30 each using computer generated random numbers by simple randomization technique.

Group 1 (Magnesium): MgSO4 group. MgSO4 infusion is administered at the rate of 40mg/kg in 100ml NS intravenously over 15minutes pre-operatively 30 minutes before induction of anaesthesia.

Group 2 (Control): saline group. Same volume of isotonic NS intravenously was given.

Intraoperatively: Injection glycopyrrolate (0.004 mg/kg) intravenously, injection ondansetron (0.1mg/kg) intravenously, injection midazolam (0.02mg/kg) IV was given as pre-medication. Hemodynamic parameters (HR, SBP, DBP, and MAP) were recorded before induction, before intubation, after intubation and every 15mins during intraoperative period till the end of surgery.

In group 1, IV infusion of MgSO4 at the rate of 10mg/kg/hr until the end of surgery.

In group 2, IV infusion of same volume of isotonic NS was started.

General Anaesthesia was induced with injection propofol(2mg/kg) intravenously , intubated with appropriate sized cuffed endotracheal tube after administration of injection atracurium (0.5mg/kg) intravenously.

Anaesthesia was maintained with Oxygen: Nitrous in the ratio of 40:60 and incremental doses of injection atracurium and injection fentanyl intravenously.

At the end of surgery, neuromuscular blockade was reversed with injection neostigmine (0.05mg/kg) intravenously and injection glycopyrrolate (0.01mg/kg) intravenously.

After recovery from anaesthesia, sedation level was assessed using four point rating scale. In the recovery room, patient was kept for 4hrs for assessment of analgesia & hemodynamic parameters every 1 hourly.

Post operatively, pain at 0,1,2,3,4,8,16,24 hours was assessed by using VAS scoring. When VAS >3, rescue analgesia was provided in the form of injection tramadol (3mg/kg) IV. Hemodynamic parameters i.e.,HR,SBP,DBP,MAP were recorded at 0,1,2,3,4 ,8,16 & 24 hours.

Thus, following parameters were recorded:

Pain score using VAS score at 0,1,2,3,4,8,16,24 hours postoperatively.

Sedation level by four point rating scale at recovery from GA.

Hemodynamic parameters such as HR, SBP, DBP, and MAP were recorded at baseline, after 30 minutes, before induction, before intubation, after intubation and every 15 minutes till the end of surgery and postoperatively at 0,1,2,3,4,8,16,24 hours.

TABLE III : SEDATION SCORE (FOUR POINT RATING SCALE)

1	patient fully awake.
2	patient somnolent but responds to verbal commands
3	patient somnolent but responds to tactile stimulation
4	patient asleep but responds to pain

VISUAL ANALOGUE SCALE

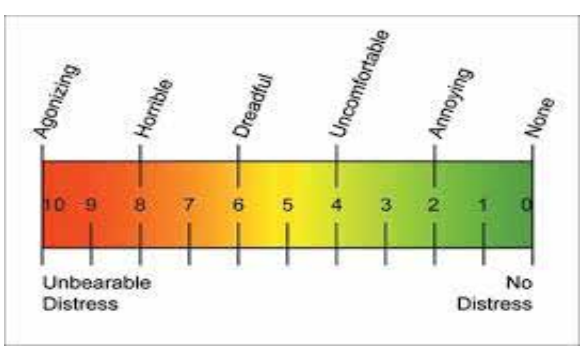

Figure 5 : Visual Analog Scale

All the data was collected, tabulated and analysed statistically. P<0.05 was considered significant.

COMPARISION OF PAIN SCORE (MEAN±SD VAS) AT DIFFERENT INTERVALS IN BOTH GROUPS (N = 60)

Time at hours	Group 1 (n=30)	Group 2 (n=30)	p value
0 Hr	1.60±0.72	2.03±0.71	p<0.05
1 Hr	1.46±0.57	2.00±0.64	p<0.05
2 Hr	1.20±0.48	1.83±0.69	p<0.05
3 Hr	1.33±0.60	2.10±0.60	p<0.05
4 Hr	1.43 ± 0.62	2.23±0.50	p<0.05
8 Hr	2.90±0.95	4.16±0.69	p<0.05
16 Hr	1.93±0.87	2.60±0.77	p<0.05
24 Hr	0.86±0.34	2.03±0.88	p<0.05

p value <0.05 is taken as significant.

VAS scores at different intervals are significantly lower in group 1 (magnesium group).

DISCUSSION

Uncontrolled post operative pain may produce a range of detrimental acute and chronic effects. The attenuation of perioperative pathophysiology that occurs during surgery through reduction of nociceptive input to the central nervous systems and optimization of perioperative analgesia may decrease complications and facilitate recovery during the immediate post-operative period.

Transmission of nociceptive stimuli from the periphery to the CNS result in the neuroendocrine stress response involving hypothalamic pituitary adrenocortical and sympathoadrenal interactions.

This results in sodium and water retention, increased levels of blood glucose, free fatty acids, ketone bodies and lactate. A hypermetabolic state occurs; oxygen consumption increases and metabolic substrates are mobilized from storage depots.

Increased level of blood glucose may cause poor wound healing and depression of immune function.

The negative nitrogen balance and protein catabolism may impede convalescence. The stress response may be an important factor in the post operative development of hypercoagulability.

Sympathetic activation may increase myocardial oxygen consumption which may be important in the development of myocardial ischemia and infarction and may also delay return of postoperative gastrointestinal motility which may develop into paralytic ileus.

Patients with poor pain control may breath less deeply, have an inadequate cough and are susceptible to the development of post operative pulmonary complications. Thus, attenuation of the stress response and post operative pain may facilitate and accelerate the patient's recovery post operatively.

In the present study, pain management was started prior to pain initiation on the basis of preemptive analgesia. The aim of preemptive analgesia ,which has been investigated in recent years, is to provide analgesia prior to a painful stimulus to prevent central sensitization caused by the painful stimulus such as tissue injury during surgery, in an attempt to obtain better pain relief compared with when the same analgesic intervention is used after the painful stimulus.

Consequently, immediate postoperative pain may be reduced and the development of chronic pain may be prevented.

Most commonly used intravenous agents as pre-emeptive analgesics are NSAIDS, opioids and NMDA receptor antagonists. Recently, the importance of Mg in anaesthetic practice has been highlighted.

Mg is a non-competitive NMDA receptor antagonist and a calcium channel blocker with antinociceptive effects.

It has been suggested that magnesium has the potential to treat and prevent pain by acting as an antagonist of NMDA receptors

No adverse effects of magnesium were seen in our study dosage as intravenous MgSO4 infusion is considered to be safe.

Therefore, it may be worthwhile use MgSO4 supplementation to intraoperative anaesthetics and postoperative analgesia, since this molecule is inexpensive, relatively harmless, and the biological basis for its potential antinociceptive effect is promising.

Hence, the present study was undertaken to evaluate the effectiveness of IV MgSO4 as a preemptive analgesic in surgeries done under GA and to assess its effects on postoperative pain scores.

In the present study, mean weight in the magnesium and control groups was 54.63±5.86 and 55.63±6.16 kilograms respectively. Mean weight among the groups was comparable.

SUMMARY:

The present study, was undertaken at Great Eastern medical school Srikakulam district andhrapradesh and Kamineni Institute of Medical Sciences, Narketpally, Nalgonda District, Telangana to evaluate the efficacy of intravenous magnesium sulphate on postoperative analgesia after operations done under general anaesthesia, during the period October 2014 and September 2015.

Sixty patients of ASA grade I and II of 20 to 50 years age, undergoing surgeries under general anaesthesia were randomly divided into two groups of 30 each.

Group 1 received 40mg/kg of intravenous infusion of magnesium sulphate preoperatively and 10mg/kg/hr intraoperatively and group 2 received same volume of normal saline preoperatively and intraoperatively.

Observations were tabulated and analysed using 'students unpaired t-test'.

Haemodynamic parameters (heart rate, systolic, diastolic blood pressure and mean arterial pressure) were comparable in both the groups.

The mean VAS score postoperatively in magnesium group at 0,1,2,3,4,8,16,24 hours was 1.60±0.72, 1.46±0.57, 1.20±0.48, 1.33±0.60, 1.43±0.62, 2.90±0.95, 1.93±0.87, 0.86±0.34 respectively.

The mean VAS score postoperatively in control group at 0,1,2,3,4,8,16,24 hours 2.03±0.71, 2.00±0.64, 1.83±0.69, 2.10±0.60, 2.23±0.50, 4.16±0.69, 2.60±0.77, 2.03±0.88 respectively. The decrease in pain scores in magnesium group was statistically significant ($p<0.05$).

The mean sedation score at recovery was 1.93±0.63 in magnesium group and 1.56±0.56 in control group. The higher level of sedation in magnesium group at recovery was statistically significant ($p<0.05$).

No adverse effects like bradycardia, hypotension, dysrythmias were observed.

CONCLUSIONS:

From the present study it is concluded that IV administration of MgSO4 in the dosage of 40mg/kg preoperatively and 10mg/kg/hr intraoperatively for surgeries done under GA has the following advantages.

It is an adjuvant preemptive analgesic and significantly reduces postoperative pain.

It produces sedation in which patients were asleep and easily arousable.

It is haemodynamically stable.

It was not associated with any adverse effects and hence can be an attractive alternative for other analgesics like opioids, NSAIDs etc.