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Original Research Article

An Observational Study of Magnesium Sulphate Added as an Adjuvant to Intrathecal Levo-Bupivacaine Heavy in Patients with Mild Pregnancy Induced Hypertension Undergoing Caesarean Section

Y Sandhya Rani[1], Yashwant Dhawale[2], Neelesh Nema[3], Spandana Tutika[4], R P Kaushal[5]

[1]Junior Resident, Department of Anesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India

[2]Associate Professor (Designated Professor), Department of Anesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India

[3]Assistant Professor, Department of Anesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India

[4]Junior Resident, Department of Anesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India

[5]Professor and HOD, Department of Anesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India

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Corresponding Author: Dr Spandana Tutika

Conflict of interest: Nil

Abstract:

Background: Adequate analgesia following caesarean section decreases morbidity, improves early ambulation, patient outcome and facilitates care of the newborn baby. Intrathecal Magnesium sulphate, an NMDA antagonist has been shown to prolong analgesia without significant side effects in healthy parturients.

Aims and Objectives: To study the effect of adding intrathecal Magnesium sulphate to 0.5% Levo-Bupuvacaine (heavy) in patients with mild pregnancy induced hypertension where blood pressure increases(i.e >140/90mmHg) after 20 weeks of gestation in women with previously normal blood pressure undergoing caesarean section.

Materials and Methods: After obtaining consent, 60 patients of ASA I & II between the age group of 21 -35 years undergoing elective and semi-emergency caesarean section under spinal anaesthesia are randomly divided into two groups. Group C: Control group, N=30 patients 0.5% 2cc (10mg) Levobupivacaine heavy. Group M: Magnesium sulphate group, N=30 patients 0.5% 2cc (10mg) Levo-Bupivacaine heavy +0.1cc 50% (50mg) magnesium sulphate. Onset, duration and recovery of sensory and motor block, duration of spinal anesthesia and post-operative analgesia were recorded.

Results: The addition of intrathecal magnesium sulfate prolonged the duration of spinal anesthesia by 42 minutes compared to the control group. Postoperative analgesic consumption over 24 hours was significantly lower in the magnesium group. Motor recovery time was prolonged in the magnesium group, but no significant hemodynamic effects were observed.

Conclusion: Intrathecal magnesium sulfate as an adjuvant to spinal anesthesia in cesarean section for PIH patients prolongs spinal anesthesia duration and reduces postoperative analgesic consumption. While motor recovery time was prolonged, no significant hemodynamic effects were noted, indicating its safety and efficacy as an adjunct in obstetric anesthesia.

Keywords: Pregnancy-Induced Hypertension, Spinal Anesthesia, Magnesium Sulfate, Cesarean Section, Postoperative Analgesia.

Introduction

Pregnancy-induced hypertension (PIH), characterized by elevated blood pressure levels after the 20th week of gestation, remains a significant concern in obstetric practice worldwide. Among the complications associated with PIH, the increased risk of maternal and fetal morbidity and mortality during pregnancy and childbirth underscores the importance of effective management strategies, particularly in cases requiring surgical intervention such as cesarean section (CS). [1,2]

Intrathecal anesthesia, commonly employed for cesarean section, provides rapid and reliable anesthesia with minimal systemic effects, making it the preferred choice in obstetric anesthesia. However, optimizing spinal anesthesia in patients with PIH poses unique challenges due to altered

physiological states and potential hemodynamic instability. Therefore, the search for adjuvants to enhance the quality and duration of intrathecal anesthesia while ensuring maternal and fetal safety remains a focus of ongoing research. [3,4]

Magnesium sulfate, a naturally occurring mineral with known neuroprotective and analgesic properties, has emerged as a promising adjuvant in regional anesthesia techniques. Preclinical and clinical studies have suggested its potential to improve the quality and prolong the duration of spinal anesthesia, reduce postoperative analgesic requirements, and mitigate adverse effects such as shivering and pruritus. However, the use of magnesium sulfate as an adjuvant to intrathecal anesthesia in patients with mild pregnancy-induced hypertension undergoing cesarean section warrants further investigation. [5, 6]

This observational study aims to evaluate the efficacy and safety of magnesium sulfate as an adjuvant to intrathecal levo-bupivacaine in patients with mild pregnancy-induced hypertension undergoing cesarean section. By elucidating its impact on intraoperative and postoperative outcomes, including hemodynamic stability, sensory and motor block characteristics, postoperative pain scores, and maternal and neonatal outcomes, this study seeks to contribute valuable insights into the perioperative management of patients with PIH undergoing cesarean delivery.

Through a comprehensive analysis of the existing literature and our institutional experience, this study endeavors to inform clinical practice guidelines and optimize anesthesia protocols for this high-risk obstetric population, ultimately improving maternal and neonatal outcomes and enhancing the quality of obstetric anesthesia care. Hence, we have conducted an observational study where the effect of adding intrathecal Magnesium sulphate 0.1cc to 0.5% hyperbaric bupivacaine in parturients with mild pregnancy induced hypertension (BP <160/110 mmHg) undergoing LSCS.

Materials and Methods

Study Design and Setting: An observational study was conducted at Gandhi Medical College and Hospital, Bhopal, following approval from the institutional ethical committee.

Sample Size: A total of 60 patients were enrolled in the study.

Inclusion criteria included ASA I and II, age between 18-35 years, mild PIH (BP<160/110 mmHg) and patients who planned for elective caesarean section. Exclusion criteria included patient's refusal for spinal anaesthesia, heart disease, foetal distress, eclampsia, allergy to local anaesthetics drugs, seizure disorder and patients with coagulation disorders.

Groups: The participants were divided into two groups:

Control Group (C): Consisting of 30 patients who received 2cc of 0.5% levobupivacaine heavy for spinal anesthesia.

Magnesium Sulphate Group (M): Consisting of 30 patients who received 2cc of 0.5% levobupivacaine heavy along with 0.1cc of 50% magnesium sulfate (50 mg MgSO4) for spinal anesthesia.

Informed Consent and Preoperative Protocol: Informed consent was obtained from all participants. Patients fasted for a minimum of 6 hours prior to surgery. Intravenous (IV) access was established using an 18 G or 20 G IV cannula, and premedication comprising intravenous ondansetron (4 mg) and intravenous metoclopramide (10 mg) was administered 10 minutes before surgery. Patients were preloaded with Ringer's lactate solution at a rate of 10-12 ml/kg.

Monitoring: Patients were continuously monitored for electrocardiography (ECG), non-invasive blood pressure (NBP), and pulse oximetry throughout the procedure.

Spinal Anesthesia Procedure: Under aseptic conditions, spinal anesthesia was performed using a 25G spinal needle with the patient in the left lateral decubitus position.

Monitored Parameters: The following parameters were observed:

- Onset of sensory blockade
- Onset and intensity of motor blockade
- Duration of postoperative analgesia
- Hemodynamic parameters

Oxygen Administration: All patients received oxygen at a rate of 5 L/min via a mask throughout the procedure.

Treatment Protocol: Patients were treated with titrated doses of medications based on the following criteria:

- Intravenous ephedrine (6 mg) was administered if systolic blood pressure (SBP) dropped below 90 mmHg.
- Intravenous atropine (0.6 mg) was administered if heart rate (HR) fell below 60/min.

Post-Delivery Protocol: After the delivery of the baby, intravenous oxytocin (10 IU) was administered through a drip, followed by intramuscular administration of 10 IU of oxytocin.

Statistical Analysis: All the data analysis were performed using IBM SPSS ver. 25 software. Quantitative data were expressed as mean and standard deviation whereas categorical variables were expressed as numbers. The statistical analysis was done using unpaired T test.

Results

Table 1: Characteristics of spinal anaesthesia

Parameters		Control Group (n=30)	Magnesium Group (n-30)	P value
Highest sensory level [n (%)]	T4	21/30 (70%)	14/30 (46.7%)	0.067
	T6	9/30 (30%)	16/30 (53.3%)	
Time to maximum sensory block (min)		7.7±0.8	8.7±0.9	<0.001
Time to T12 (min)		165.7±12.0	197.8±13.8	<0.001
Duration of spinal anaesthesia (min)		187.7±11.0	229.3±15.1	<0.001
Time to onset of motor block (min)		5.1±1.0	5.7±0.7	0.005
Time to complete motor block (min)		8.9±1.0	9.2±0.8	0.214
Time to complete motor recovery (min)		175.3±18.3	200.0±17.8	<0.001

Table 2: Showing side effects between groups

Parameters		Control Group (n=30)	Magnesium Group (n-30)	P value
Hypotension		7 (23.3)	4 (13.3)	0.32
Sedation	Awake and responds readily to name spoken in normal tone	13 (43.3)	14 (46.7)	0.790
	Awake but lethargic response to name spoken in normal tone	17 (56.7)	16 (53.3)	
Nausea		7 (23.3)	13 (43.3)	0.100
Patient satisfaction score	Good	25 (83.3)	13 (43.3)	0.001
	Excellent	5 (16.7)	17 (56.7)	

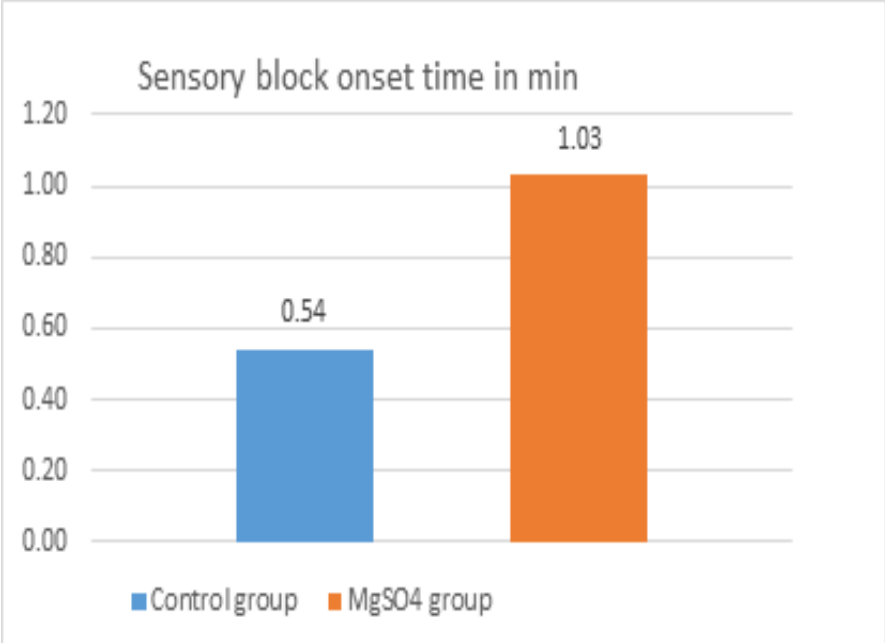

Figure 1: Sensory block onset time in min

The onset of both sensory and motor block was slower in the group M. The duration of spinal anaesthesia (229.3 vs. 187.7 min) and motor block (200 vs. 175.3 min) were significantly longer in the group M. Haemodynamic parameters and side effects were similar in the two groups. There was no nausea and vomiting in the group M. Overall patient satisfaction was better in magnesium group (P=0.001).

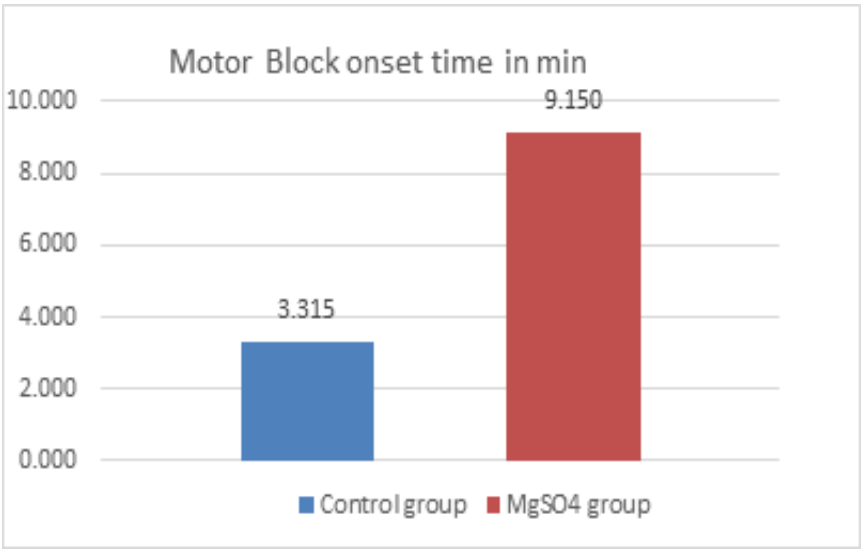

Figure 2: Motor Block onset time in min

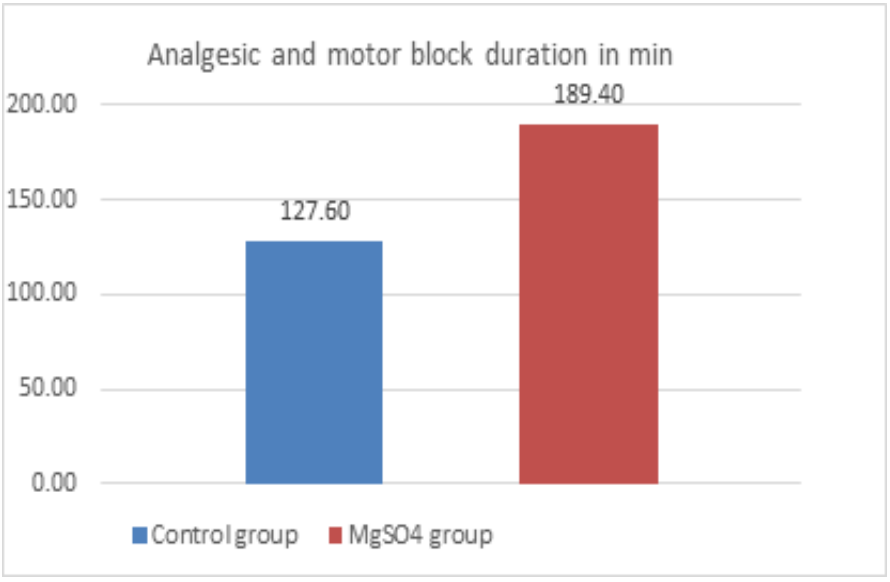

Figure 3: Analgesic and motor block duration in min

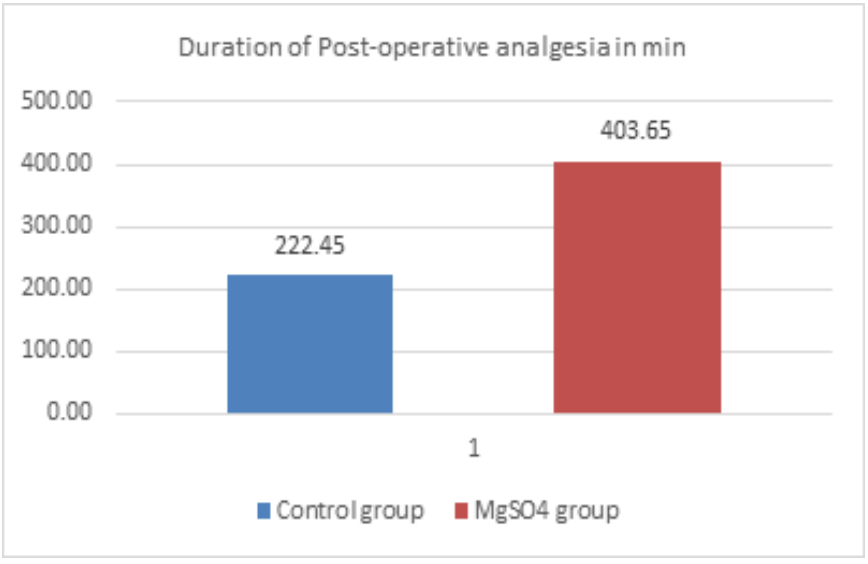

Figure 4: Duration of Post-operative analgesia in min

Discussion

The current study investigated the effects of intrathecal magnesium sulfate as an adjuvant to spinal anesthesia in patients undergoing cesarean section. Our findings revealed several significant observations that contribute to understanding magnesium sulfate's role in enhancing spinal anesthesia and postoperative analgesia.

Our results demonstrated a considerable increase in the duration of spinal anesthesia with the addition of intrathecal magnesium sulfate, extending the anesthesia period by 42 minutes compared to the control group. This prolongation aligns with previous research indicating magnesium sulfate's ability to modulate N-methyl-D-aspartate (NMDA) receptors, thereby augmenting the duration of spinal analgesia. [7]

Furthermore, our study revealed a significant reduction in postoperative analgesic consumption over the first 24 hours in the magnesium group compared to the control group. [8] This finding underscores magnesium sulfate's efficacy in mitigating postoperative pain, potentially through its antagonistic action on NMDA receptors, which play a crucial role in central sensitization and neuropathic pain transmission. [9]

Interestingly, our study findings corroborate previous research by Ko et al. (2017), indicating that intrathecal magnesium sulfate administration does not significantly alter cerebrospinal fluid (CSF) magnesium concentrations compared to systemic administration. This suggests that intrathecal magnesium sulfate can potentiate spinal analgesia without the adverse effects associated with large systemic doses required to achieve therapeutic CSF concentrations. [10]

However, despite the evident benefits of intrathecal magnesium sulfate, our study identified a prolonged time to complete motor recovery in the magnesium group. While this may raise concerns regarding potential motor impairment, it's essential to note that our study did not observe any significant hemodynamic effects following intrathecal magnesium administration[11]. This contrasts with the known propensity of intravenous magnesium to induce hypotension, particularly in the management of eclampsia.

Moreover, our study noted a slightly higher incidence of nausea in the magnesium group, albeit not statistically significant. This finding underscores the importance of monitoring and managing potential adverse effects associated with magnesium sulfate administration, particularly gastrointestinal discomfort.

Conclusion

Our study reinforces the efficacy of intrathecal magnesium sulfate as an adjuvant to spinal anesthesia in cesarean section procedures, highlighting its potential to prolong spinal analgesia and reduce postoperative analgesic requirements. The absence of significant hemodynamic effects despite the prolonged motor recovery time suggests a favorable risk-benefit profile for intrathecal magnesium sulfate administration. To conclude addition of intrathecal magnesium sulphate 50 mg (0.1cc) to levobupivacaine 0.5% 2cc in patients with mild pregnancy induced hyper tension undergoing cesarean section prolongs the duration of analgesia and reduces postoperative analgesic requirements without additional side effects. Further research is warranted to elucidate optimal dosing regimens and to explore potential strategies to mitigate adverse effects, ultimately enhancing the safety and efficacy of magnesium sulfate adjunctive therapy in obstetric anesthesia.

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