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Original Research Article

A Study to Observe the Effects of Addition of Intrathecal Magnesium Sulfate to Bupivacaine for Spinal Anesthesia in Cesarean Section

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Conflict of interest: Nil

Abstract:

Background and Aim: Spinal anaesthesia is widely used for caesarean section. Magnesium parenterally has been utilized for intraoperative and postoperative analgesia on an empirical basis for a long time. The present study was designed to examine whether addition of intrathecal magnesium sulphate would enhance the analgesic efficacy of intrathecal bupivacaine in patients undergoing caesarean section.

Material and Methods: The present analysis was done in the department of gynaecology in association with the department of anaesthesiology, in the medical college and associated hospital. A total of 80 pregnant women with mild PIH and were scheduled for elective caesarean section were included in the study. They include patients were divided into three groups randomly as follows: Group A: Control group comprised of 40 patients, the patients were administered with 0.5% 2cc (10mg) Bupivacaine + 0.6cc normal saline and Group B: Test group patients comprised of 40 patients, the patients were administered with MgSO4 group, 0.5% 2cc Bupivacaine +0.5cc Fentanyl along with 0.1cc 50% (50mg) MgSO4. The onset of sensory blockade, motor blockade, upper level of analgesia, intensity of motor block, two segment regression time, APGAR Score, Postoperative analgesia duration and hemodynamic parameters at 1, 5, 15 minutes were observed.

Results: The mean time to achieve T10 sensory level in group B was found to be 3.20 ± 0.20 min and in group A that is control group was found to be 2.1 ± 0.90 min and the difference was found to be statistically significant. Onset of motor block was prolonged in group B (6.16 ± 0.06 min) as compared to group A. Total duration of sensory block was more in group B, which was found to be 200.5 ± 11.22 min and that was when compared to group A (160.5 ± 16.36) min it was found to be significantly higher in group B.

Conclusion: Non-opioid medication magnesium sulphate can be used as an adjuvant with bupivacaine intrathecally to prolong postoperative analgesia without causing any additional side effects. The patient will benefit from this for post-operative analgesia.

Keywords: bupivacaine, Caesarean Section, Fentanyl, Magnesium Sulphate.

Introduction

Regional anaesthesia is a common caesarean section procedure that is both safe and affordable. It prevents the hemodynamic changes brought on by laryngoscopy and intubation and lowers the likelihood of airway problems. The use of intrathecal adjuvant has grown in popularity recently with the goals of extending block duration, improving success rates, and increasing patient satisfaction.[1,2]

The benefits of regional anaesthesia include safe, affordable, and protracted post-operative analgesia. Epidural catheters can help prolong epidural anaesthesia, and intrathecal anaesthesia can also be prolonged by giving adjuvants together with local anaesthesia.[3,4] Magnesium possesses painkilling qualities that are mainly connected to the control of calcium influx into cells and antagonistic effects on N-methyl-D-aspartate receptors in the central nervous system. The idea is that an intrathecal infusion would enable more efficient magnesium action at spinal cord NMDA receptors.5 In fact, research on rats has shown that administering magnesium directly intrathecally improves the antinociceptive effects of opioids used to treat acute incisional pain. There was an increase in the median duration of analgesia in the initial clinical trials looking at intrathecal and epidural magnesium.[5,6]

The "Nature's Physiological Calcium Channel Blocker" is magnesium. Magnesium parenterally

has been utilized for intraoperative and postoperative analgesia on an empirical basis for a long time. Although systemic magnesium reduces the need for postoperative opioids, its intrathecal usage has not been clinically tested. However, it has been used successfully on humans, and research studies have outlined its safety profile.[7] Magnesium's impact on NMDA receptors is what gives it its analgesic properties.

Agents like magnesium can negatively modulate the N-methyl D-aspartate receptor. Additionally, it is connected to ion channels like K+ and Ca2+. NMDA receptors are blocked by magnesium in a voltage-dependent manner.[8] The present study was designed to examine whether addition of intrathecal magnesium sulphate would enhance the analgesic efficacy of intrathecal bupivacaine in patients undergoing caesarean section.

Material and Methods

The present analysis was done in the department of gynaecology in association with the department of anaesthesiology, in the medical college and associated hospital. A total of 80 pregnant women with mild PIH and were scheduled for elective caesarean section were included in the study. The ethical committee was informed about the study purpose and the ethical clearance certificate was obtained prior to the start of the study. All the included patients belonged to either ASA I or ASA II group. The age range of the included patient was found to be 20 to 36 years. Minimal fasting period was 8 hrs, IV line was secured with 18G venflon.

All patients received premedication with Inj. Ranitidine 50mg IV and Inj. Metoclopramide 10 mg IV, 10 min before surgery and were preloaded with RL 10-12ml /kg. All patients received 5L of O2 / min through mask throughout procedure Patients were treated with titrated doses of Inj. Ephedrine 6mg I.V if systolic BP<90mmhg and Inj. Atropine 0.6mg I.V if heartrate <60/min. They include patients were divided into three groups randomly as follows:

Group A: Control group comprised of 40 patients, the patients were administered with 0.5% 2cc (10mg) Bupivacaine + 0.6cc normal saline and Group B: Test group patients comprised of 40 patients, the patients were administered with MgSO4 group, 0.5% 2cc Bupivacaine +0.5cc Fentanyl along with 0.1cc 50% (50mg) MgSO4.

All patients were monitored with ECG, NIBP, and Pulse Oximetry. Respiratory rate, urinary output and knee jerk were also monitored. Under aseptic precaution patient were positioned in right lateral decubitous position and with the help of mid line approach spinal anesthesia was performed in the study group. Wedges were placed to prevent the decrease of venous return due to aortocaval compression. The local anesthetic drug was prepared by the assistant as per the test group and was injected through spinal anesthesia. The administrator was unaware about the content of the drug. The post procedure findings were recorded as per the need of the study. According to a sample size analysis, n = 40 per group was needed to detect a difference of 25 min in analgesia duration between groups with a power of 90% and a significance level of 5%. SPSS for Windows version 15.0 was used to conduct the statistical analysis. Where necessary, the Independent Student's t-test and Chi-square tests were used to conduct statistical comparisons. The threshold for statistical significance was P 0.05.

Observation

The onset of sensory blockade, motor blockade, upper level of analgesia, intensity of motor block, two segment regression time, APGAR Score, Postoperative analgesia duration and hemodynamic parameters at 1, 5, 15 minutes were observed. Motor block was assessed by Bromage motor score and sedation by Ramsay sedation score.

Sensory score

Sensory score: Score	response
0	normal sensation
1	analgesia (loss of pin prick sensation)
2	anesthesia (loss of touch sensation

Ramsay sedation Score

Ramsay sedation Score:	Response
1	anxious or restless or both
2	Co-operative, oriented & tranquil
3	responds to commands
4	brisk response to stimulus
5	sluggish response to stimulus
6	no response to stimulus

Results

The present study was conducted to know the efficacy of intrathecal magnesium to 0.5% Bupivacaine heavy for lower limb surgeries. The demographic profiles for patients in both the

groups were compared and there was no statistical significance in between the groups.

The mean time to achieve T10 sensory level in group B was found to be 3.20 ± 0.20 min and in group A that is control group was found to be 2.1 ± 0.90 min and the difference was found to be statistically significant (the p value <0.001).

(Table 1) Onset of motor block was prolonged in group B (6.16 ± 0.06 min) as compared to group A in which the time was found to be 3.26 ± 2.11 min, the difference was found to be statistically highly significant (P value <0.001). Total duration of sensory block was more in group B, which was found to be 200.5 ± 11.22 min and that was when compared to group A (160.5 ± 16.36) min it was found to be higher in group B.

The difference when compared it was found to be statistically significant. Total duration of motor block was more in group B; when compared to group A.

Total duration of effective analgesia was higher in group B (210.66 ± 14.61 min) than group A (150.4 ± 10.16 min). The difference was found to be statistically significant. (Table 1)

Table 1: comparison of the parameter between the group A and group B

Parameters	Group A	Group B	Significance
Age (in yrs)	38.93	42.36	>0.05
Onset of sensory block (in mins)	2.1 ± 0.90	3.20 ± 0.20	<0.001
Onset of motor block (in mins)	3.26 ± 2.11	6.16 ± 0.06	<0.001
Duration of sensory block (in mins)	160.5 ± 16.36	200.5 ± 11.22	<0.001
Duration of motor block (in mins)	152.5±11.87	190.66±21.2	<0.001
Duration of effective analgesia (in mins)	150.4 ± 10.16	210.66 ± 14.61	<0.001

Discussion

Surgical, obstetric, gynaecological, orthopaedic, and urological procedures frequently involve the use of spinal anaesthesia. Currently, a variety of spinal adjuvants are available to improve the LA square and post-agent analgesia. Intrathecal magnesium stifles nociceptive driving factors in neuropathic pain settings, according to animal research.[9] 1985, Lejuste accidentally administered 1000 mg of magnesium sulphate intravenously to a pregnant woman who needed a McDonald suture. She experienced a severe block that lasted for 90 minutes before to the treatment. In humans, intrathecal magnesium was first used in 1906. Using 1000–2000 mg, Haubold and Meltzer produced a severe sensory and motor block that lasted for 3-27 hours before recovering.[10]

In their work, Ozalevli et al. and Buvendran et al. employed 50mg of MgSO4 and showed that injection of intrathecal magnesium sulphate had no harmful effects on humans.[11] The dosage of magnesium sulphate was determined using data from a rat postoperative pain model where Kroin et al. found that 188 micrograms of intrathecal magnesium sulphate potentiated morphine antinociception. The 188 microgram dose was cautiously extrapolated to 50 mg for humans based on the relative differences between human and rat CSF volume and body weight.[12] MgSO4 intravenous infusion has been shown to be useful in reducing shivering following regional anaesthesia. Therefore, in this work, we assessed its intrathecal effects. The addition of MgSO4 to anaesthetic medications has several advantageous benefits, such as enhancing intraoperative conditions, extending the duration of analgesia, and reducing clinical drug-related side effects such nausia, pruritis, and somnolence. When patients are under spinal anaesthesia and undergoing lower limb procedures, MgSO4 injection can effectively stop shaking. The effect of combining intrathecal MgSO4 with bupivacaine in patients undergoing caesarean section, however, has only been examined in this study.

When the sensory block start time in the magnesium sulphate group and the control group were compared in the current investigation, the difference was found to be statistically significant (P value 0.001). In the magnesium sulphate group, sensory blockage started later than expected.

In the current investigation, the magnesium group took longer for both the onset and resolution of motor blockage as well as the duration to reach their maximum sensory level. Despite the fact that Ozalevli et al. noticed a comparable delay in the onset of spinal anaesthesia when adding intrathecal magnesium to isobaric bupivacaine, hyperbaric bupivacaine was employed in our investigation. These authors hypothesised that the magnesium-containing solution's pH and baricity differences caused the delayed onset, which may also be the case in our work, even though the delay in both studies—of about 1 minute—is most likely minor. In our investigation, the magnesium group took longer to fully regain their motor function; Malleeswaran noted that the duration of analgesia was significantly prolonged by the addition of intrathecal magnesium sulphate to bupivacaine-fentanyl anaesthesia. Magnesium sulphate administered intravenously and epidurally was found to prolong and intensify motor block, according to Arcioni et al.

Conclusion

In conclusion, we discovered that non-opioid medication magnesium sulphate can be used as an adjuvant with bupivacaine intrathecally to prolong postoperative analgesia without causing any additional side effects. The patient will benefit from this for post-operative analgesia.

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