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Study to assess effect of adding Magnesium Sulphate as an adjuvant to Bupivacaine in patients with Pregnancy Induced Hypertension undergoing caesarean section under Spinal Anaesthesia

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Abstract

Background: Adequate analgesia following caesarean section improves patient outcome, causes early ambulation and facilitates care of the newborn baby. Prolongation of analgesia by use of Intrathecal Magnesium, an NMDA antagonist,had been shown to occur in healthy parturients. We performed a study to assess effect of adding Magnesium sulphate as an adjuvant to bupivacaine in patients with pregnancy induced hypertension undergoing caesarean section under spinal anaesthesia.

Aim: To study and compare the effect of addition of Magnesium sulphate (50mg) and Fentanyl 25 mcg to 0.5% (10mg) Bupivacaine, in patients with pregnancy induced hypertension undergoing Caesarean section under spinal anesthesia.

Materials and Methods: 90 patients undergoing caesarean section under spinal anaesthesia were randomly divided into three groups. Control group (N=30) received 0.5% 2ml (10mg) Inj.bupivacaine+0.6 ml normal saline. Fentanyl group (N=30) received 0.5% 2 ml (10mg) Inj. Bupivacaine + 0.5 ml (25mcg) Inj. Fentanyl + 0.1ml normal saline. Magnesium sulphate group (N=30) received 0.5% 2 ml (10mg) Inj. Bupivacaine + 0.5 ml (25mcg) Inj.fentanyl + 0.1ml 50% (50mg) magnesium sulphate. Onset and duration of sensory and motor block, duration of spinal anaesthesia, APGAR score and duration of post operative analgesia were studied. Statistical analysis was done using univariate analysis, ANOVA and two group 'T' test. $p<0.05$ was taken as statistically significant.

Results: Time of onset of both sensory and motor block were delayed in the magnesium sulphate group which was significant. Duration of block and post-operative analgesia were also significantly prolonged in Magnesium sulphate group.

Conclusion: Addition of magnesium sulphate to intrathecal bupivacaine is beneficial in patients undergoing caesarean section, as it prolongs the motor blockade and duration of analgesia.

Keywords: Magnesium sulphate, Fentanyl, Bupivacaine, Pregnancy induced hypertension

Introduction

Ever since the introduction of local anaesthetic drugs, different classes of drugs such as epinephrine, opioids, clonidine and ketamine etc. have been added as adjuvants to local anaesthetics to prolong analgesia and reduce the incidence of side effects. Release of Glutamate and aspartate neurotransmitters occurs due to noxious stimulation and they bind to NMDA receptors. Activation of these NMDA receptors causes calcium entry and thus leading to central sensitization and long term potentiation in spinal cord[1] .These NMDA receptors have a important role in the duration of acute pain[2]. Magnesium blocks the calcium entry and thus antagonises the NMDA receptor channels in a voltage dependent way.[3,4,5] Parenteral magnesium has been used for many years for intraoperative and postoperative analgesia. However its intrathecal use has not been evaluated much clinically. It has been used safely in humans in some experimental studies. In this prospective randomized double blind controlled study, we studied the effect of adding Magnesium Sulphate to intrathecal Bupivacaine and Fentanyl in patients of PIH undergoing Caesarean section under SAB.

Materials and Methods

90 Pregnant women with PIH undergoing Caesarean section under spinal anaesthesia were randomly divided into three groups.

Control group: Control group (N=30) recieved 0.5% 2ml (10mg) Inj.bupivacaine + 0.6ml normal saline.

Fentanyl group: Fentanyl group (N= 30) received 0.5% 2ml Inj. bupivacaine + 0.5ml (25mcg) Inj.fentanyl + 0.1ml NS.

MgSO4 group: MgSO4 group (N=30) received 0.5% 2ml Inj.bupivacaine + 0.5ml Inj.fentanyl + 0.1ml 50% (50mg) Inj.MgSO4.

Inclusion criteria: ASA I and II, Age between 18-35 years, Planned for Caesarean Section ,Mild PIH (BP<160/110mmHg).

Exclusion criteria: Patient refusal for spinal Anaesthesia, Patient with coagulation Disorders,Heart disease, Foetal distress, Eclampsia, Allergy to local anaesthetic drugs.

All patients received premedication with Inj. Ondansetron 4 mg IV and Inj. Metoclopramide 10 mg IV, 10 min before surgery and preloaded with RL 10-12ml /kg. All vitals were monitored throughout the procedure. Under aseptic precaution, with patient in left lateral decubitus position, spinal anaesthesia was performed by mid line approach. Wedge was placed to prevent decreased venous return due to aortocaval compression. The study drug was prepared by the assistant according to the group and spinal anesthesia was given by the performer who injected drug without knowing the content of the drug and he recorded his findings. Oxygen at rate 5L/ min was given through mask throughout the procedure. After the delivery of baby, Inj. Oxytocin was given 10 IU in drip and 10 IU IM

Parameters monitored

The onset of sensory and motor blockade, , APGAR Score, duration of motor block, postoperative analgesia duration and hemodynamic parameters were observed. Motor block was assessed by Bromage motor score and sensory block onset by following score.

Sensory Score

Score	Response
0	Normal sensation
1	analgesia (loss of pin prick sensation)
2	anaesthesia (loss of touch sensation)

Bromage Motor score

Grade Response Degree of block	Response	Degree of block
0	no motor block	Nil (0%)
1	unable to do straight leg raise	Partial (33%)
2	unable to flex knee against resistance	Almost complete (66%)
3	unable to flex ankle	complete

Sensory block onset time: Time interval between end of intrathecal drug injection and appearance of cutaneous analgesia in dermatomes T-8- T-6. Duration of motor block: Time interval between drug administration and attainment of grade 0 in Bromage motor scale. Duration of analgesia: Time interval between administration of drug and absence of cutaneous sensation at each dermatomal level. Post-op analgesia duration: Time interval between administration of anaesthetic drug and time of analgesic requirement in PACU.

Results

Table 1: Sensory block onset time in min

	Sensory block onset time (mean ±SD)	P value
Control group	0.74± 0.133	**<0.05**
Fentanyl group	0.9± 0.224	
MgSO4 group	1.2± 0.446	

Table 2: Motor Block onset time in min

	Motor block onset time (mean ±SD)	P value
Control group	2.325± 0.67	**<0.05**
Fentanyl group	4.650± 1.43	
MgSO4 group	7.250± 1.62	

Table 3: Duration of motor block in min

	Duration (mean ±SD)	P value
Control group	130.60 ±12.065	**<0.05**
Fentanyl group	145.90 ±10.634	
MgSO4 group	198.40± 20.329	

Table 4: Duration of Post-operative analgesia in min

	Duration (mean ±SD)	P value
Control group	240.45 ±13.942	**<0.05**
Fentanyl group	320.80± 25.548	
MgSO4 group	415.65± 27.186	

Table 5: APGAR 5min

	Duration (mean ±SD)	P value
Control group	8.19 ±0.748	>0.05
Fentanyl group	8.21± 0.961	
MgSO4 group	8.52± 0.531	

Discussion

The study was conducted on 90 pregnant patient with PIH ASA I and II undergoing Caesarean Section under spinal anaesthesia after obtaining informed consent. Sensory and motor block onset time, Duration of analgesia and motor blockade, APGAR score and hemodynamics between the groups were compared. The safety of intrathecal administration of magnesium sulphate in humans and animals have been established. Simpson et al and Kroin et al demonstrated by their study that use of intrathecal magnesium sulphate in animals has a safety profile.[6,7] Ozalevli et al and Buvendran et al in their study on humans demonstrated no deleterious effects of intrathecal 50 mg of magnesium sulphate administration.[8,9]

In our study, onset time of sensory block was prolonged in magnesium sulphate group in comparison to control group and it was statistically significant (P value <0.05). In their study, Tanmoy Ghatak et al concluded that use of magnesium sulphate as an adjuvant to epidural bupivacaine reduces the onset time of both sensory and motor block.[10] In our study onset of motor block was delayed in magnesium sulphate group when compared to control group and was statistically significant (P value <0.05). The results of my study were similar to the study by Buvanendran et al where the onset time of sensory and motor block in the magnesium sulphate group was delayed than the control group.[9] However, Unlugenc and Ozalevli et al in their study concluded that the addition of magnesium sulfate (50 mg) intrathecally to 10 mg of spinal bupivacaine (0.5%) did not shorten the onset time of sensory and motor blockade or prolong the duration of spinal anaesthesia, as is seen with fentanyl.[8]

Duration of analgesia and motor block is prolonged in magnesium sulphate group when compared to control group which is statistically significant (p Value < 0.05). Buvanendran et al and Malleswaran S et al in their studies concluded that there was prolongation in analgesic and motor blockade duration in magnesium sulphate group.[9,11] Tramer MR et al and Kara H concluded that the perioperative use of magnesium sulphate is associated with smaller analgesic requirement, and a better quality of sleep in the postoperative period without any significant adverse effects.[12,13] Vaibhav Shahi et al in their study concluded that epidurally administered magnesium sulphate, prolongs the duration of analgesia but lesser than that compared to dexmedetomidine.[14]

In our study, the blood pressure was higher in the Magnesium sulphate group than in control group due to high level of blockade in the control group. The p value was <0.05 showing that it was significant. Malleeswaran S et al also noted a similar trend in the haemodynamic changes in the magnesium sulphate group.[11]

In our study duration of post-operative analgesia was prolonged in Magnesium sulphate group (415.65± 27.18 min) when compared to control group (240.45 ±13.94 min) difference being statistically significant (p value <0.05). M. Ozalevli and T.O. Cetin et al in their study also showed that duration of post-operative analgesia was prolonged in the magnesium sulphate group.[15] Arcioni et al in his study concluded that combined use of intrathecal and epidural magnesium significantly reduces the post-operative analgesic requirements.[16]

The difference in APGAR score at 5 min between the three groups was statistically insignificant (p value >0.05). 2 patients in fentanyl groups complained of prurities. Sahar M et al in their study concluded that supplementation of spinal bupivacaine anaesthesia with

intrathecal fentanyl provides a better quality of anaesthesia with decreased incidence of side effects as compared with use of same dose of IV fentanyl.[17]

Conclusion

There is a delay in the onset of sensory and motor blockade with the use of intrathecal magnesium sulphate as an adjuvant to bupivacaine spinal anaesthesia. However there is prolongation of motor blockade and duration of post operative analgesia. In conclusion, magnesium sulphate added as an adjuvant to intrathecal bupivacaine is beneficial in terms of post-operative analgesia without affecting the APGAR score.

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