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A COMPARATIVE EVALUATION OF TWO DIFFERENT DOSES OF MAGNESIUM SULPHATE WITH BUPIVACAINE ON THE QUALITY OF SPINAL BLOCK AND POST OP ANALGESIA IN PATIENTS UNDERGOING LOWER SEGMENT CAESAREAN SECTION

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ABSTRACT

Regional anaesthesia is preferred for caesarean sections ince it allows parturient to remain awake and participate in the birth of her babywhist avoiding the risk of general anaesthesia.1Spinal Aaesthesia is easier to perform and has quick onset.Bupivacive is amide local anaesthetic which is commonly used for spinal and epidural anaesthesia.But, in recent years intrathecal adjuvants have gained poularitywith the aim of prolonging the block and better success rate.Magneium is avoltage gatedantagonist at the NMDA receptorin the spinal cord and this antagonism alters painprocessing and reduces the induction and maintenance of central sensitisation from nociceptive stimulation,. Therefore we conducted this study by adding 25mg and 50mg magnesium sulphate as adjuvant to bupivacaine in paturients undergoing caesarean section under spinal anaesthesia. METHOD Ninety ASA I-II etween the age group of 20-40 years undergoing LSCS were included in this prospective randomized double blind study. The patients were randomly allocated to one of the 3 groups of 30 each and spinal anaesthesia was administered . Group C recieved 2 ml 0.5% bupivacaine with 0.5 ml of normal saline, Group M25 received 2ml of 0.5% bupivacaine with 25mg of magnesium sulphate in 0.5 ml of normal saline and Group M50 received 2ml of 0.5% bupivacaine with 50mg of magnesium sulphate in 0.5 ml of normal saline. Intra-operatively standard monitoring was established with ECG, pulse oximetry and non invasive blood pressure . Recordings was noted every 5 min till 30 min, then every 10 minutes till 60 minutes and then hourly till 2 hours and then 2 hourly till 6 hours RESULTS The maternal demographics profile of age, weight and height were similar among three groups. Also no difference was also noted in ASA category. The maternal demographics profile of age, weight and height were similar among three groups. Also no difference was also noted in ASA category. Duration of analgesia was 130.6+10.2min for control group,176.3+18.2min for M25 group and220.4+22.6 for M50 group(p= 0.000). Sensory duration was 116.7+8.7min for control, 158.1+17.5min for M25 and 201.1+19.2 min for M50 group(p= 0.000).Motor duration was 124.1+8.8 min for control, 168.2+17.5 for M25 and 211.3+20.6min for M50 group(p= 0.000). CONCLUSIONOur study showed that addition of 50 mg of magnesium sulphate to bupivacaine for intrathecal administration in lower segment caesarean section significantly increases the duration of sensory and motor block and duration of analgesia in comparison with 25 mg of magnesium sulphate and bupivacaine alone without increasing the incidence of side effects,

INTRODUCTION

Subarachnoid block is a technique of regional anaesthesia which is gold standard for LSCS.The quality and duration of sensory and motor block and decrease post operative pain are important factor in caesarean section .There have been an increasing trend in the use of adjuvants to bupivacaine for this purpose. Opioids and other drugs like clonidine and neostigmine have been used but significant side effects such as pruritus, respiratory depression, nausea, and vomiting may limit their use[2]. Noxious stimulation leads to the release of glutamate and aspartate neurotransmitters, which binds to various subclasses of excitatory amino acid receptors ,including NMDA receptors. activation of NMDA receptors leads to calcium and sodium influx into the cell, with an efflux of potassium and initiation of central sensitization and wind up[3,4]. NMDA receptor signalling may be important in determining the duration and intensity of postoperative pain. Magnesium blocks NMDA channels in a voltage-dependant way, and the addition of magnesium produces a reduction of NMDA-induced currents.intrathecal Magnesium as an adjuvant to bupivacaine has shown promising results in improving the quality of block and providing post operative pain relief in TAH and orthopaedic surgeries however, there are few studies showing its efficacy in LSCS hence this randomized double blind study was designed to compare the analgesic efficacy of two different doses of magnesium in patients undergoing LSCS.

MATERIALS AND METHODS

After approval from the ethical committee and written informed consent from the patients, Ninety ASA I-II between the age group of 20-40 years undergoing LSCS were included in this study,

Study Design prospective randomized double blind study.
Sample size 90

Exclusion criteria included contraindications to regional anesthesia , known sensitivity to local anesthetics or patients on chronic analgesic therapy were excluded from the study . Patients having co existing systemic disorders like PIH, multiple pregnancy , BMI>38 and fetal prematurity were also excluded from the study. Randomization was done using a random number table generated from computer software SPSS version 20. Both patient and anaesthesist were blind to treatment.

The study drug was given by an anaesthesiologist who was blinded to the study and drug was prepared by a senior anaesthesiologist in unlabelled syringes, who did not participated in the study or data collection.

Procedure Methodology

After careful pre-anesthetic check up and routine investigations, an informed consent was taken from all the patients. Patients were kept fasted overnight for 8 hrs pre-operatively and pre-medicated with ranitidine 150 mg and metoclopramide 10 mg. After shifting the patient to operating table, intravenous access was secured with an 18 G cannula and patients were pre loaded with 12 -15 ml/ kg. ringer lactate solution before surgery.

The patients were randomly allocated to one of the 3 groups of 30 each. Group C recieved 2 ml 0.5% bupivacaine with 0.5 ml of normal saline, Group M25 received 2ml of 0.5% bupivacaine with 25mg of magnesium sulphate in 0.5 ml of normal saline and Group M50 received 2ml of 0.5% bupivacaine with 50mg of magnesium sulphate in 0.5 ml of normal saline.

Under all aseptic conditions, lumbar puncture was performed in the sitting position. A 25 gauge spinal needle was introduced into the subarachnoid space at the L3 –L4 lumbar level mid line approach. Cerebrospinal fluid was aspirated and drugs were injected to subarachnoid space. Immediately after the block, each patient was placed supine with left uterine displacement.

Intra-operatively standard monitoring was established with ECG,

pulse oximetry and non invasive blood pressure . Recordings was noted every 5 min till 30 min, then every 10 minutes till 60 minutes and then hourly till 2 hours and then 2 hourly till 6 hours.

A hypotensive episode defined as a SBP<90 mm Hg or a decrease in SBP more than or equal to 20% of base line values was managed by rapid fluid infusion and 6 mg intravenous ephiderine in incremental doses.

Clinical relevant bradycardia defined as a HR <50 bpm was managed with aliquots of 0.3 mg intravenous atropine.

Onset of sensory block (time taken for loss of pain sensation with pin prick test till $_{T10}$ level) was noted every 2 minute for initial 10 minutes till T_{10} level of sensory block is achieved. The maximum height of block was noted. Onset of motor block was defined by the time taken to achieve Bromage scale 3 was noted (table1).

Quality of surgical anesthesia graded as Excellent- no complaint from patient at any time during surgery. Good - Patient allowed the surgery but required midazolam for sedation or fentanyl 1 mcg/kg i.v for analgesia.

Poor - If anesthesia is inadequate and requires supplementation with intravenous and inhalational anesthesia.

Any other side effects notably hypotension, nausea, vomiting, pruritus , bradycardia ,excessive sedation,hypoxemia and ECG changes (arrhythmia or ischemia) were recorded.

Postoperatively NIBP and HR were noted hourly for 2 hours and then 2 hourly till 6 hours. Duration of sensory and motor block was assessed hourly by noting the time taken for regression of sensory block to T10 and by assessing the Bromage scale hourly till Bromage scale reaches 0.Time to first rescue analgesia and the total number of analgesic doses required in first 24 hours was recorded. Sedation was assessed using sedation scale (wide awake=0,sleeping comfortably but responding to verbal commands=1,deep sleep but arousable=2,deep sleep not arousable=3) .The study ended on administration of first dose of rescue analgesia.

Statistical Analysis

All data were collected and analyzed by SPSS version 17 statistical software . One way ANOVA with post hoc comparision with Scheffe's procedure was used.

RESULTS

The maternal demographics profile of age, weight and height were similar among three groups. Also no difference was also noted in ASA category.

TABLE 1: Demographic profile of patients of three the group

Demographic characteristics	Control (n= 30)	M25 (n=30)	M50 (n=30)	p-value (ANOVA)
Age (years)	23.8+1.74	23.4+1.92	24.26+1.52	0.162
Weight(Kg)	63.13± 6.57	60.33± 4.95	60.93±5.48	0.142
Height	155.76± 4.81	154.2 ±4.49	156.46 ±4.26	0.146
ASA(I/II)	27/3	27/3	27/3	

Likewise the mean values of heart rate, systolic blood pressure and diastolic blood pressure were comparable among all the three groups. The mean heart rate for control group was 85.8±7.75 beats/min and that of M25, M50 was 83.9±8.82 and 86.16±8.89 beats/min respectively. The mean SBP was 115.79±8.99, 115.13±9.57 and 113.38±8.98 mm of Hg for control, M25 and M50 group respectively. The mean DBP was 71.5±6.02, 70.35±5.88 and 67.44±4.78 mm of Hg for control, M25 and M50 group respectively. Heart rate, SBP and DBP were also recorded in pre op, 5min, 10min, 15min, 20mn, 25min, 30min, 1hr, 2hr, 4hr and 6hr interval and the data were comparable among three groups. The onset of time of sensory block was 3.9± 0.59 min for control group, 5.56± 0.72min for M25 group and 6.8±0.85 min for M50 group (p= 0.000).The time for motor onset was 5.1±0.74min. for control, 7.1±0.7min. for M25 and 8.3±1.1min.for M50 group(p= 0.000).

TABLE 2Showing mean of sensory onset in three group

Sensory onset	N	Mean	Std. deviation	Std. error	p-value
Control	30	3.9000	0.59306	0.108	0.000
M25	30	5.5667	0.72793	0.132	
M50	30	6.8833	0.85786	0.15662	

TABLE 3- Showing mean of motor onset in three groups

Motor onset	N	Mean	Std. deviation	Std. error	p-value
Control	30	5.1333	0.74201	0.13547	0.000
M25	30	7.1167	0.70324	0.12839	
M50	30	8.3500	1.115333	0.20363	

TABLE 4- Showing mean of sensory duration in three groups

Sensory duration	N	Mean	Std. deviation	Std. error	p-value
Control	30	116.7000	8.78930	1.60470	0.000
M25	30	158.1333	17.50612	3.19617	
M50	30	201.1333	19.21518	3.50820	

TABLE 5- Showing mean of motor duration in three groups

Motor duration	N	Mean	Std. deviation	Std. error	p-value
Control	30	124.1667	8.80471	1.60751	0.000
M25	30	168.2000	17.56839	3.20753	
M50	30	211.3000	20.68341	3.77626	

Duration of analgesia was 130.6+10.2min for control group,176.3+18.2min for M25 group and220.4+22.6 for M50 group(p= 0.000).

TABLE 6: Comparison of side effects observed in the 3 groups during and after the operative period.

Side effect	Group C (n=30)	GroupM 25 (n=30)	Group M50 (n=30)
Nausea/ Vomiting	0 (0)	0 (0)	0 (0)
Pruritus	0 (0)	0(0)	(0)
Hypotension	2 (6.6%)	2(6.6%)	2(6.6%)
Bradycardia	1(3.3%)	1 (3.3%)	1(3.3%)
Need for intraoperative analgesia	0 (0)	0 (0)	0(0)
Shivering			
Respiratory depression	0 (0)	0 (0)	0(0)
	0(0)	0 (0)	0(0))

DISCUSSION

Recent trends in obstetric anaesthesia shows increased popularity of regional anaesthesia amongst anaesthesiologists. subarachnoid block is a technique of regional anaesthesia which is gold standard for LSCS.

There has been an increasing trend in the use of adjuvants to LA for this purpose.opioids and other drugs like clonidine and neostigmine have been used but significant side effects such as pruritus, respiratory depression, nausea, and vomiting may limit their use[2].

NMDA receptor signalling may be important in determining the duration and intensity of postoperative pain. Magnesium blocks NMDA channels in a voltage-dependant way, and the addition of magnesium produces a reduction of NMDA-induced currents.

In this study all 90 patients posted for LSCS were statistically similar with respect to age, height and weight.

Haemodynamic parameters monitored preo-peratively ,intra-operately and post-operatively were comparable and statistically insignificant in all the three groups. All the patients attained a

height of block T6 or above it. The height of block attained in each group were comparable.

In our study onset of sensory and motor block was prolonged in M50 group as compared to M25 group, which was prolonged as compared to the control group and was statistically significant (p value 0.000).Though the onset time is little delayed , it didnot cause any problem for the surgery.

This finding is similar to previous study done by Mitra Jabalameli and Seyed Hamid Pakzadmoghadam [5](2012) who also concluded that addition of 50,75,or 100mg magnesium sulphate(50%) led to a significant delay in the onset of both sensory and motor block.

Ozalevli[5] (2005) also observed a similar delay in onset of spinal anaesthesia when adding intrathecal MgSO4 to fentanyl and isobaric bupivacaine. They suggested that the difference in the pH and baricity of the solution containing Mg contributed to the delayed onset, which was also supported by the study of Malleeswaran et al[7] (2010) on mild pre-eclampsia patients .still further studies and clinical trials are required.

The duration of sensory block was 116.7±8.7min for control, 158.1±17.5min for M25 and 201.1±19.2 min for M50 group(p= 0.000). The duration of motor block was 124.1±8.8 min for control, 168.2±17.5 for M25 and 211.3±20.6min for M50 group(p= 0.000 (p=0.000).Hence in our study the duration of sensory and motor block was significantly prolonged by the addition of 25 and 50 mg of MgSO4 intrathecally to bupivacaine as compared to control group.

These results were similar to study done by Mitra Jabalmeli and Seyed Hamid Pakzadmoghadam[5] (2012) where addition of 50,75,100 mg of magnesium prolonged the duration of sensory and motor block as compared to control without increasing major side effects.

In study by Nath et al[8](2012) using 100mg of intrathecal magnesium sulphate in patients for hysterectomy ,the time to complete motor recovery was , 240±16.149 which was higher than other studies possibly due to higher doses of bupivacaine and magnesium.

Arcioni et al[9](2007) also observed that intrathecal and epidural Mg potentiated and prolonged motor block In our study the duration of analgesia was 130.6±10.2min for control group, 176.3±18.2min for M25 group and220.4±22.6 for M50 group. Thus the duration of analgesia was more in M50 group as compared to M25 group which was more as compared to control.

This is similar to the result of study done by Nath et al[8](2012) who found a significant increase in the duration of analgesia when magnesium (100 mg) was added to intrathecal bupivacaine and fentanyl in patients undergoing total abdominal hysterectomy.

Ghrab et al[10](2009) also demonstrated that in patients undergoing caesarean section under spinal anaesthesia ,the addition of intrathecal magnesium sulphate to morphine improved the quality and duration postoperative analgesia without increasing the incidence of adverse effects.

Incidence of side-effects

In our study ,1 case in each group was found to have bradycardia treated with 0.3 mg of aliquots of atropine.This may be attributed to the effect of spinal anaesthesia. 2 cases in each group had hypotension treated with intravenous fluids and mephentermine.this may be due to the compression of inferior vena cava by pregnant uterus.also,it can be caused by sympathectomy of spinal block.

Side effects like nausea, vomiting, pruritus, shivering , or need for intraoperative analgesia were not found in any of the study groups.

An increased risk of respiratory depression in labor has been reported with magnesium sulphate therapy and an increased incidence of respiratory depression may be expected when other drugs are combined; however we did not observe this because of lesser dose administered intrathecally.These findings were comparable with the studies done by Nath et al[8](2012) .

Ozalevil et al [5] (2005) observed that 50 mg of intrathecal magnesium sulphate to spinal anaesthesia induced by bupivacaine and fentanyl prolonged the period of anaesthesia without additional side effects.

CONCLUSION

Our result shows that addition of 50 mg of magnesium sulphate to bupivacaine for intrathecal administration in lower segment caesarean section significantly increases the duration of sensory and motor block and duration of analgesia in comparison with 25 mg of magnesium sulphate and bupivacaine alone without increasing the incidence of side effects.

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