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Original Research

The efficacy of IV infusion of magnesium sulphate during epidural anaesthesia using 0.5% bupivacaine for post operative pain in infra-umbilical surgery

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ABSTRACT:
Magnesium is the fourth most abundant cation in the body responsible for many biochemical reactions. It is also called as "*nature's physiologic calcium channel blocker*". Magnesium is an inorganic ion that has a non-competitive N-Methyl-D-Aspartate (NMDA) receptor antagonist property with antinociceptive effects in animals and human models. This antagonism reduces the induction and maintenance of central sensitization of nociceptive stimulation by altering pain processing. Seventy patients aged between 18yrs and 60yrs of physical status ASA grade 1 and ASA grade 2 undergoing elective infra umbilical surgeries were included in the study after ethical clearance from the college ethical committee. The mean duration of motor block in Magnesium sulphate group was 361.62±43.04 min and 208.29±27.38min in Normal saline group. Duration of motor blockade is more with MG group compared to NS group, which is statistically significant (p=<0.001)
Keywords: Magnesium Sulphate, Epidural Anesthesia, Bupivacaine

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INTRODUCTION

Epidural anesthesia is one of the central neuraxial blockade which provides better pain relief than other pain medications, effective analgesia without the need for systemic opioids, minimal changes in hemodynamics, Level of block can be changed by giving top up doses through the epidural catheter and thus surgery of any duration can be performed by giving top up and infusions.

Since infra-umbilical surgeries are associated with moderate to severe pain post-operatively, patients require analgesia throughout the day and night with various pain-killers. Nowadays adjuvants are used intravenously (Dexmeditomedine, Magnesium Sulphate) along with spinal anaesthesia to enhance the efficacy and duration of spinal blockade and post operative analgesia.

Magnesium is the fourth most abundant cation in the body responsible for many biochemical reactions. It is also called as "*nature's physiologic calcium channel blocker*".[1,2] Magnesium is an inorganic ion that has a non-competitive N-Methyl-D-Aspartate (NMDA) receptor antagonist property with antinociceptive effects in animals and human models [3,4]. This antagonism reduces the induction and maintenance of central sensitization of nociceptive stimulation by altering pain processing.

Numerous clinical investigations have demonstrated that magnesium infusion during general anesthesia and spinal anaesthesia reduced anesthetic requirements and post-operative analgesic consumption[5,6]

With this background, we hypothesized that the concomitant use of intravenous infusion of magnesium sulphate may have an effect on the block

characteristics and the duration of action of epidural bupivacaine. This study is designed to evaluate and observe the effects of concomitant intravenous infusion of magnesium sulphate on epidural block characteristics and duration of post operative analgesia in patients undergoing infra umbilical surgeries under epidural block with bupivacaine.

METHODOLOGY

TYPE OF STUDY

Prospective Study

STUDY DESIGN

Randomised Clinical Study

SAMPLE SIZE

Two groups of 35 each

Sample size estimation was done using power and sample size calculation software version 2.1.30. Using this data and assuming a study power of 80% and probability of type I error of 5%, a sample size of 70 patients was found to be required for obtaining statistically significant mean difference of mean duration of analgesia in two groups. So assuming equal distribution of patients in both groups **a** total number of 70 patients were incorporated in the study with 35 patients in each group.

$N=2(Z_\alpha+Z_\beta)\sigma^2/(\mu_1-\mu_2)^2$

N=Sample size

Z_α=Level of significance

Z_β= Required power

σ=Anticipated standard deviation

$\mu_1-\mu_2$=Meaningful difference between two means

SAMPLING METHOD

Randomization is done using numbers generated from

METHOD OF COLLECTION OF DATA

Seventy patients aged between 18yrs and 60yrs of physical status ASA grade 1 and ASA grade 2 undergoing elective infra umbilical surgeries were included in the study after ethical clearance from the college ethical committee.

Each patient was visited pre-operatively and the procedure explained and written informed consent was obtained. Complete blood count, blood grouping, blood sugar, bleeding time, clotting time, blood urea,serum creatinine, serum electrolytes(sodium, potassium, chloride), chest x-ray, ECG were done as institutional protocol. All patients were pre-medicated with tablet alprazolam 0.5 mg overnight the day before surgery.

RESULTS

Table 1: Comparison of duration of surgery between the groups

Variables	Group MG	Group NS	P value
Duration of surgery(minutes)	106.18±9.62	105.57±9.22	0.790

The mean duration of surgery was 106.18±9.62 minutes in group MG and 105.57±9.22minutes in group NS which was comparable with p = 0.790

Table 2: Onset of Sensory blockade(in minutes)

Variables	Group MG	Group NS	P value
Onset of blockade Sensory(in minutes)	9.09±2.23	9.34±2.29	0.642

The mean onset time of sensory block in MG group was 9.09±2.23min and 9.34±2.29 min in NS group. The statistical analysis showed no significant difference between the two groups (p=0.642).

Table 3: Onset of motor blockade (in minutes)

	Group MG	Group NS	P value
Onset of motor blockade (in minutes)	13.35±2.62	13.54±2.60	0.763

The mean onset time of motor block in MG group was 13.35±2.62 min, and13.54±2.60min in NS group. No significant statistical difference was seen between the two groups (p=0.763).

Table 4: Duration of sensory blockade (in minutes)

	Group MG (n=35)	Group NS (n=35)	P value
Duration of sensory blockade(in minutes)	424.12±53.43	226.57±27.22	<0.001**

The mean duration of sensory block in Magnesium sulphate group was 424.12±53.43 min and 226.57±27.22min in Normal saline group. Duration of sensory blockade is more with MG group compared to NS group, which is statistically significant (p=<0.001**).

Table 5: Duration of motor blockade (in minutes)

	Group MG (n=35)	Group NS (n=35)	P value
Duration of motor blockade(in minutes)	361.62±43.04	208.29±27.38	<0.001**

The mean duration of motor block in Magnesium sulphate group was 361.62±43.04 min and 208.29±27.38min in Normal saline group. Duration of motor blockade is more with MG group compared to NS group, which is statistically significant (p=<0.001)

Table 6: Duration of analgesia(in minutes)

	Group MG (n=35)	Group MG (n=35)	p value
Duration of analgesia (in minutes)	436.18±53.88	234.00±30.31	<0.001**

The mean duration of analgesia in Magnesium sulphate group was436.18±53.88 min and234.00±30.31min in Normal saline group. Duration of analgesia is more with MG group compared to NS group, which is statistically significant (p=<0.001)

DISCUSSION

In our study demographic data comparing age, sex, weight, duration of surgery showed no statistically significant differences between both the groups.

In our study, we observed that onset time of sensory block in magnesium group was 9.09 ± 2.23 minutes and 9.34± 2.29 minutes in Normal saline group, which is statistically insignificant(p=0.642).

The onset time of motor block in Magnesium sulphate group was 13.35 ± 2.62 minutes and 13.54± 2.60 minutes in Normal saline group, which again is statistically insignificant(p=0.763).In our study onset time of sensory and motor blockade in Magnesium sulphate group was comparable with Normal saline group.

These findings were similar to that of the findings in a study by Enas M.Samir et al, where there was no significant difference in the time taken for the onset of sensory blockade between the study groups.[7]

In a study conducted by JitendraAgarwal et al, observed that the two groups were similar in terms of onset time of sensory and motor blockade.[8]

In our study the duration of sensory block was more in magnesium sulphate group i.e. 424.12±53.43 minutes compared to normal saline group i.e. 226.57±27.22 minutes.

Similar to our study Enas M Samir et al, also in their study observed that duration of sensory block (min)significant prolongation in the duration of sensory blockade as well as analgesia when magnesium sulphate was used as an adjuvant, irrespective of the route of administration.[7]

Akansha Agarwalet al in their study, found that the duration of sensory block was longer in magnesium sulphate group compared with normal saline group

In the study carried out by Mahendra kumaret al found that duration of sensory block was more in patient who received magnesium sulphate infusion.

The above observations were similar to our results which prove that magnesium sulphate infusion prolongs the duration of sensory blockade.

The duration of motor blockade, in our study was 361.62±43.04 minutes in magnesium sulphate group and 208.29±27.38 minutes in normal saline group. which is statistically significant (p= <0.001).

Prerana N.Shah et al, in their study found that infusion of magnesium sulphate prolonged the duration of motor blockade.[9]

Fatih Kahraman et al,also had similar observation with respect to duration of motor blockade after magnesium sulphate infusion.[10]

In our study the duration of sensory block was 436.18±53.88 minutes in magnesium sulphate group and 234.00±30.31 minutes in normal saline group. Which is statistically significant (p= <0.001).

J.H. Ryu et al, in their study observed that postoperative pain scores, cumulative analgesic consumption, and shivering incidents were significantly lower in the test group compared to the control group.[11]

J.Y. Hwang et al,concluded that magnesium sulphate given intravenous during spinal anaesthesia reduced postoperative pain and analgesic consumption without complications.[12]

Hwang et al, in their study found that the time to first pain in MG group was little later than in the control group.

Our study confirms to the findings of the above studies, which have stated that the duration of sensory and motor block and duration of analgesia in patient

who received magnesium sulphate infusion was more compared to control group.

Hence, we conclude, iv infusionofmagnesium sulphate during epidural anaesthesia using 0.5% bupivacaine in infra-umbilical surgery increases duration of sensory and motor blockade and duration of analgesia.

CONCLUSION

In conclusion of our study, IV infusion of magnesium sulphate during epidural anaesthesia using 0.5% Bupivacaine for infra-umbilical surgeries has better post operative analgesia compared to 0.5% Bupivacaine alone with haemodynamic stability.

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