

# EFFECT OF ADDING MEGNISIIUM SULPHATE AS AN ADJUVANT TO BUPIVACAINE IN SPINAL ANESTHESIA FOR LOWER ABDOMINAL SURGERY

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## **Abstract:**

**Back ground::** Regional anesthesia is a safe, effective and cheap anesthesia with an added advantage of long duration of post operative analgesia. With epidural block, catheter have been used to produce long post operative analgesia while with spinal anesthesia many adjuvant are used with local anesthetic agent to increase the total duration of effective analgesia.

The present study was conducted in selected 60 patients aged 20-60yrs, ASA GRADE I and II scheduled for lower abdominal surgeries after taking written informed consent.

**Method:** The patients were randomly allocated in 2 groups, each having 30 patients. Group A: 0.5% heavy bupivacaine 3ml (15 mg) + Normal saline 0.2 ml Group B: 0.5% heavy bupivacaine 3ml(15 mg)+50%mgso4 0.2 ml(100mg) Total drug volume with saline in both groups was 3.2ml.and effects were assessed :

**Observations:** Difference in the duration of effective analgesia between the two groups was statistically highly significant ( $P$  value  $< 0.001$ ). The duration of effective analgesia was significantly lower in Group A (Bupivacaine) compared to group B (Bupivacaine-Magnesium sulphate).

**Conclusion** It was concluded that magnesium sulphate used as an adjuvant to bupivacaine to produce Central neuroaxial block is useful in prolonging the duration of spinal analgesia and post operative analgesia without any significant side effects.

## **INTRODUCTION**

Pain is "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage"

Regional anesthesia is a safe, effective and cheap anesthesia with an added advantage of long duration of post operative analgesia. With epidural block, catheter have been used to produce long post operative analgesia while with spinal anesthesia many adjuvant are used with local anesthetic agent to increase the total duration of effective analgesia.

Magnesium sulphate blocks NMDA channels in a voltage dependent fashion & such NMDA antagonism can prevent the induction of central sensitisation from peripheral nociceptive stimulation. Ketamine is one NMDA receptor blocker which have been studied for this purpose but magnesium sulphate is new drug. Intrathecal magnesium used as a sole anesthetic adjuvant in single dose is shown to strengthen analgesic effect of spinal anesthesia.

This study was undertaken to evaluate efficacy and potency of intrathecally administered Bupivacaine and Bupivacaine with Magnesium sulphate for onset and duration of sensory and motor block, hemodynamic stability, duration of effective analgesia, including post op analgesia and any adverse effects with each combination in patients undergoing lower abdominal surgeries.

## **AIMS AND OBJECTIVES OF THE STUDY**

This study was conducted to evaluate the effect of Mgso<sub>4</sub> when added to Bupivacaine for instituting central neuroaxial block. In one group A Bupivacaine plus normal saline and in group B Mgso<sub>4</sub> was taken as sole adjuvant with Bupivacaine to produce Central neuraxial block. Both these group were compared.

- To compare the onset of sensory and motor block.
- To compare the duration of sensory and motor block.
- To assess the duration of post-op analgesia obtained in both the groups.
- To compare per-op and post-op hemodynamic changes and side effect.

## **MATERIAL AND METHODS**

The present study was conducted in selected 60 patients aged 20-60yrs, ASA GRADE I and II scheduled for lower abdominal surgeries after taking written informed consent.

The patients were randomly allocated in 2 groups, each having 30 patients.

**Group A:** 0.5% heavy bupivacaine 3ml (15 mg) + Normal saline 0.2 ml

**Group B:** 0.5% heavy bupivacaine 3ml(15 mg)+50%mgso<sub>4</sub> 0.2 ml(100mg)

Total drug volume with saline in both groups was 3.2ml.

## **STUDY PROTOCOL**

### **Pre anesthetic assessment:**

- Detailed preoperative history and physical examination done on the previous day of surgery.
- Procedure explained to the patient and patient was informed to communicate about the perception of any discomfort or pain during surgery.
- Explained about VAS score.
- Written informed consent was taken from the patients and his/her relatives.

### **Equipments:**

Equipments used in the study consist of:

- An autoclaved tray consisting of instrument used for painting and drapping.
- Disposable 23G lumber puncture needle.
- Disposable 5 cc syringe, tuberculin syringe.

### **Drugs :**

- Inj bupivacaine 0.5% heavy 1 ampoule
- Inj Magnesium sulphate 50% preservative free 1 ampoule

### **In the operation theatre:**

- IV line taken and each patient were preloaded with 15ml/ kg of Ringer's lactate solution before procedure.
- Pulse oximeter, non-invasive blood pressure monitoring and ECG were attached and base line reading taken.

### **Technique:**

- Under all strict aseptic and antiseptic precaution, with patient in left lateral position lumber puncture was performed at L2-L3 intervertebral space with 23G Quincke needle and selected drug was given slowly after free flow of clear CSF. After completion of procedure, patient was immediately turned to supine position.
- Pulse, BP, SPO<sub>2</sub> and RR were recorded Preoperatively & every 1, 5, 10, 15, 20, 25, 30, 45 and 60 minutes after giving spinal anesthesia and then every 30 minutes till the completion of surgery.

### **Evaluation:**

- The onset and duration of sensory blockade was assessed by using pinprick test every 1 minute till 15 minutes. Then at 20, 30, 45 and 60 minutes and then every 30 minutes till completion of surgery.
- Time required for sensory block to reach level T<sub>10</sub> was considered as sensory onset.
- Motor blockade was assessed by modified bromage score.
- Time for onset of grade 3 motor blockade was noted.
- Time for sensory regression to S<sub>2</sub> was noted.
- Time for motor regression to bromage 0 was noted.
- After establishment of adequate level of block, surgery was started and time of beginning of surgery was noted.
- Intravenous fluid was administered in dose depending on the weight of patient and adjusted according to surgery.
- The duration of effective analgesia was defined as time from intrathecal injection to complaint of unbearable pain.
- Patients were watched for any intraoperative complications like bradycardia, hypotension, sedation, nausea, vomiting, dryness of mouth, pruritus and respiratory depression.
- Hypotension was defined as MAP > 20% decrease from baseline value.
- Tachycardia was defined as heart rate >100/mins and bradycardia was defined as heart rate < 60/mins.
- After surgery, patients were monitored every hourly for 12 hours.
- Postoperatively pain measurement was done using VAS scale.
- Sedation score measurement

## OBSERVATION AND RESULT

Both the groups were comparable in respect to age, height, weight and sex ratio.

The mean duration of surgery was 85±18.8 minutes in group A given Bupivacaine alone, 93±19 minutes in group B given Bupivacaine and Magnesium sulphate which were comparable.

The mean time to achieve T<sub>10</sub> sensory level and modified bromage scale III was prolonged in group B (5.1±0.8, 7±1) as compared to group A (4.3±0.8, 5.2±0.8) which was statistically highly significant (P value < 0.001).

The changes in Heart Rate and mean arterial pressure in both the groups were comparable and statistically not significant.

**TABLE-1: DURATION OF SENSORY AND MOTOR BLOCKAGE**

TIME (minutes)	Group A (Mean± SD)	Group B (Mean± SD)	P value
Sensory regression to S <sub>2</sub> from highest sensory level	169.7±7.90	204.3±6.34	A VS B-<0.001
Motor regression to bromage scale 0	147.75±8.34	175.25±7.69	A VS B-<0.001

Table 1 showing statistically significant prolongation of duration of sensory and motor blockade in group B (P value < 0.001) as compared to group A.

**TABLE-2: DURATION OF POST OPERATIVE ANALGESIA**

	Group A	Group B
No. of patients	30	30
Duration of effective analgesia (mins)	170-220	210-260
Mean ± SD	188±6.54	238±6.77

(mins)		
P value : A VS B- <0.001		

Table 2 showing the difference in the duration of effective analgesia between the two groups was statistically highly significant (P value < 0.001). The duration of effective analgesia was significantly lower in Group A (Bupivacaine) compared to group B (Bupivacaine-Magnesium sulphate).

The incidence of hypotension was 20% in group A (Bupivacaine) and 15% in group B (Bupivacaine +Mgso4). The incidence of bradycardia was 15 % in both the groups. The incidence of sedation was 2% in group B and no sedation in group A. No incidence of pruritus in both the groups. There was no incidence of nausea, vomiting, dryness of mouth and respiratory depression in any of the groups.

### Discussion

Central neuroaxial block is one of the preferred anesthetic technique for lower abdominal surgeries. General anesthesia is associated with many biochemical changes in the body. It also produces more discomfort and may be best avoided in circumstances like Diabetes mellitus, Respiratory diseases. Spinal anesthesia is easier to perform, it has rapid and predictable onset, produce more intense and complete block and has high success rate.

In the context of “augmentation strategies” for spinal analgesia, the discovery of NMDA receptors in spinal cord and subsequent development of technique of intrathecal NMDA receptor blocker is undoubtedly one of the most significant advances in pain management in last three decades. Magnesium sulphate is one the substance which is found to useful for NMDA receptor antagonism. Meltzer and Haubold et al. (1906) were the first to perform spinal anesthesia in humans using Magnesium sulphate. They showed that 1000–2000 mg of intrathecal Magnesium sulphate produced spinal anesthesia that included profound motor and sensory block and observed significant analgesia without any permanent untoward effects. It does not appear that Magnesium sulphate has any primary analgesic effect in its own right, but it does offer secondary analgesic effects that may enhance the action of other analgesic agents.(8)

A recent human study found no harmful effects of Intrathecal magnesium sulphate on spinal opioid analgesia in labour. Thus, intrathecal magnesium sulphate seems to have a good safety profile. Therefore, we have chosen intrathecal route for Magnesium sulphate as an adjuvant in our study.(10)

We have selected dose 100mg magnesium sulphate for lower abdominal surgery.

We selected 60 adult patients of ASA grade I and II undergoing elective lower abdominal surgeries and divided into 2 groups of 30 patients in each.

**Group A (n=30):** 0.5% heavy bupivacaine 3ml (15mg) +Normal saline 0.2 ml

**Group B (n=30):** 0.5% heavy bupivacaine 3ml (15mg) +50%mgso4 0.2 ml (100mg) +Normal saline 0.5 ml.

Total volume of drug with saline in both the groups was 3.2ml.

We evaluated the time taken for the onset and duration of sensory and motor blockade, hemodynamic stability, duration of analgesia and perioperative side effects in each study group.

Our study demonstrates that addition of 100mg Magnesium sulphate had no significant effect on mean pulse rate and mean arterial blood pressure.

In our study, addition Magnesium sulphate to intrathecal Bupivacaine did affect the onset of sensory and motor block significantly ( $p < 0.001$ ); the mean onset time (measured from administration of drug to achieving T10 level by pin prick method) was ( $4.3 \pm 0.8, 5.2 \pm 0.7$  min) in group A, ( $5.1 \pm 0.8, 7 \pm 1$  min) in Group B. (6)

It indicates that Magnesium sulphate produced longer duration of sensory and motor block when added as an adjuvant to Bupivacaine than Bupivacaine alone ( $p < 0.05$ ).

Duration of effective analgesia means time from the administration of spinal block and the first request for supplemental analgesic.

In our study, the duration of effective analgesia was  $188 \pm 6.54$  min. in group A,  $238 \pm 6.77$  min in group B; which was statistically significant ( $p < 0.001$ ). This shows that addition of Magnesium sulphate to intrathecal Bupivacaine significantly prolonged the duration of effective analgesia.

### **Summary and conclusion**

So we concluded that magnesium sulphate used as an adjuvant to bupivacaine to produce Central neuroaxial block is useful in prolonging the duration of spinal analgesia and post operative analgesia without any significant side effects.

### **References**

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