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DOES ADDITION OF MAGNESIUM SULPHATE TO SPINAL ANAESTHESIA PROLONG THE DURATION OF SENSORY BLOCKADE?

Anaesthesiology

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ABSTRACT

Background : Spinal anaesthesia is the most common procedure done for caesarean sections. The aim was to evaluate the duration of sensory blockade on addition of magnesium sulphate to intrathecal hyperbaric bupivacaine for prolongation of the same. **Methods** : 100 parturients undergoing caesarean section were divided into two groups of 50 each. Group N received 10mg of bupivacaine with 0.1cc NS and Group M 10mg bupivacaine with 50 mg magnesium sulphate. The Statistical software Open Epi, Version 2.3 was used for the analysis of the data. **Results** : The average duration of spinal analgesia in Group N was 104.45 $\pm$ 18.38mins whereas it was 205.45 $\pm$ 6.36 mins in Group M with a significant p value of < 0.001. **Conclusion:** Addition of magnesium sulphate significantly prolongs the duration of sensory blockade in parturients undergoing elective caesarean sections, henceforth decreasing the need for a rescue analgesic.

Conflict of interest : None

KEYWORDS

Magnesium Sulphate, Spinal Anaesthesia, Intrathecal adjuvant, Sensory Blockade, Rescue Analgesic, Caesarean Section

INTRODUCTION :

India is the second most populous country in the world. Caesarean section as a mode of delivery is fast picking up pace and is on the rise and the rate of caesarean section deliveries has gone up from 7.2% in 2000 to 18.1% in 2015 [1]. Regional anaesthesia is the safest and most cost effective procedure that is widely available. Risks involving airway manipulations and hemodynamic changes during intubation, laryngoscopy and extubation can be reduced with the administration of regional anaesthesia.[2-4] Spinal anesthesia is the most commonly used method of regional anaesthesia even though there are certain limitations to the technique like short duration of action and limited duration of postoperative analgesia. Addition of intrathecal adjuvants such as opioids increases the duration of the spinal block and post-operative analgesia[2]. Apart from opioids, various other drugs like ketamine, α2 adrenergic agonists such as clonidine, dexmedetomidine are being investigated as adjuvants to sub arachnoid block.

Magnesium is a NMDA receptor antagonist and a calcium channel blocker. The analgesic effect of magnesium is due to its effect on NMDA receptors. Various studies have already established the role of magnesium sulphate as an adjuvant to peripheral nerve blocks [5]. Few studies have demonstrated the addition of magnesium sulfate to intrathecal bupivacaine but the mechanism of action still remains unclear [6-8].

In the present study, it was hypothesized that addition of magnesium sulphate as an adjuvant to local anaesthetic in spinal analgesia led to prolongation of sensory blockade and reduced the need for rescue analgesic. Many previous studies focussed on the prolongation of sensory blockade by supplementing magnesium sulphate to an already potent mixture of a local anaesthetic, mostly bupivacaine and an opioid. Thus, we felt the need to evaluate the potency of magnesium alone and directly, when given in spinal anaesthesia along with hyperbaric bupivacaine only.

Materials and methods :

It was a prospective, randomised comparative study consisting of 100 parturients of ASA grade I and II in the age group of 18-35 years with normal obstetric history scheduled for caesarean section under spinal anaesthesia. The ethics committee approval and patient consent was taken. All parturients between ages of 18-35 years with a normal obstetric history were included under the study. All parturients who refused to consent for the procedure, those who had infection at the site of procedure, all parturients above the age of 35years, those who underwent infertility treatments or had IVF conceptions, those whose pregnancies were precious, those who had risk complicating pregnancies, mentally challenged parturients, those with obesity or short stature were excluded from the study.

Upon arrival of the parturient to the pre-op room, an IV line was established and preoperative fluid loading was done with ringer's lactate. Inj. Ondansetron was given IV as a preoperative medication. After shifting to the OR, the parturient was connected to a pulse oximeter and her PR, BP, SpO_2 and ECG were monitored. She was advised to lie on left lateral side.

Based on computer generated randomisation, the parturients were divided into two groups of 50 each.

Group N consisted of 50 parturients who received 2 c.c. of hyperbaric Bupivacaine with 0.1c.c. of Normal saline and Group M consisting of 50 parturients receiving 2c.c. of Hyperbaric Bupivavcaine with 0.1 c.c. (50mg) of magnesium sulphate.

The parturient was placed in left lateral position and aseptic preparation of procedural site was done. Lumbar puncture was done with a 25G Quincke needle in L_3-L_4 interspinous space with a midline approach. Upon observation of a clear spinal tap, the test drug was administered. The parturient was returned to the supine posture immediately and a wedge was placed under the right hip to facilitate left uterine displacement.

Sensory block level assessment was done with loss of sensation to pin prick and motor level assessment with modified bromage scale. Vital parameter monitoring was done periodically and were maintained within normal limits. No complications were observed. Duration of analgesia was noted as the difference in time between the intrathecal injection of the test drug and the time at the which the parturtient called for the first dose of rescue analgesic.

Inj. Tramadol 50mg was used as a rescue analgesic. The number of doses of inj tramadol and the total amount were calculated over 48 hours post operatively. The time duration was obtained. Sample size calculation was based on a previous study. With a significance level of 95%, power of study 80%, α error of 0.05 and β error of 0.2, to show a 20% difference in the duration of analgesia, at least 40 patients per group were needed. We took 50 patients per group for our study to compensate for any drop-outs. Duration of analgesia were analyzed by the t-test. For categorical covariates (sex, nausea/vomiting, hypotension, bradycardia), the comparison was done using a chi-square test or Fisher's exact test. The significance level was defined as P < 0.001. Data were expressed as mean ± SD.The Statistical software namely Open Epi, Version 2.3 was used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS:

All 100 parturients divided into two groups, (group M) 50 parturients in the magnesium sulphate group and (Group N) 50 in the normal saline group, completed the study. The parturient's characteristics including Age, BMI and Height were similar between the two groups.

DEMOGRAPHIC PARAMETERS

PARAMETERS	GROUP N	GROUP M	p-VALUE
Age (years)	25.8±4.85	26.15±5.38	0.4705
BMI	21.705±2.17	22.3±1.97	0.5010
Height (cms)	150.65±6.69	148.8±7.4	0.4828

Hemodynamic vital parameters such as heart rate (HR) and blood pressure(BP) were similar in both groups. Two parturients in the magnesium sulphate group and one in the control group experienced nausea and vomiting. Postoperative follow-up was uneventful in all patients. There was no neurologic deficit in any of the parturients. Apgar score of babies (at one, five and ten minutes) was similar in both groups.

Duration of sensory block (analgesia) was significantly prolonged in the Group M (Magnesium Sulphate) when compared to the group N (Normal saline) group. The parturients in the group receiving Normal Saline had a sensory block of average duration of 104.45± 18.38 minutes whereas parturients in the group receiving Magnesium Sulphate had an average duration of 205.45± 6.36minutes with a significant p-value of <0.001.

DURATION OF ANAESTHESIA (minutes)		
GROUP N	GROUP M	p-value
104.45±18.38	205.45±6.36	0.00002201

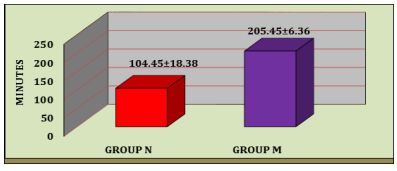
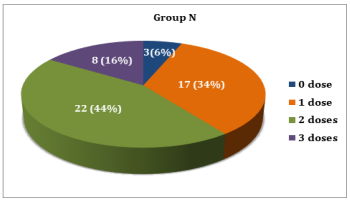


Figure 1 Duration of Anaesthesia

Injection tramadol was given as the rescue analgesic. Number of doses and volume of tramadol consumed over 48hrs post operatively was noted. It was observed that the consumption of tramadol postoperatively was significantly lower in the magnesium sulphate group than the normal saline group. 12(24%) out of 50 parturients had not required any rescue analgesic in the magnesium group whereas it was only 3 (6%) out of 50 in the normal saline group. 17 (34%) out of 50 required one dose of tramadol in group N whereas 30 (60%) out of 60 required the same in group M. Only 8 (16%) out of 50 required two doses of tramadol in group M whereas it was as high as 22 (44%) in group N. In Group M, none of them required any 3rd dose of tramadol whereas about 8 (16%) of them in group N required a 3rd dose of tramadol. On the whole, 24% of the parturients in group M had not required any tramadol and none of them in this group needed any 3rd dose. 60% of the parturients in the magnesium group were satisfied with a single dose of tramadol. Also, the average dose of tramadol needed for post operative analgesia in Group M was significantly lower than that in Group N.

CONSUMPTION OF RESCUE ANALGESIC (Inj TRAMADOL)

Number of Doses of Tramadol Administered				
No of patients in each group	0 doses	1 dose	2 doses	3 doses
Group N	3 (6%)	17 (34%)	22 (44%)	8 (16%)
Group M	12 (24%)	30 (60%)	8 (16%)	0 (0%)



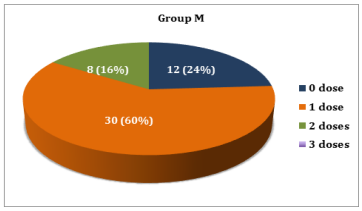


Figure 2 No of doses of Tramadol consumed

Average dose of Tramadol required			
	Group N	Group M	p-Value
Dose (mg)	92.5±28.61	52.5±33.47	<0.001

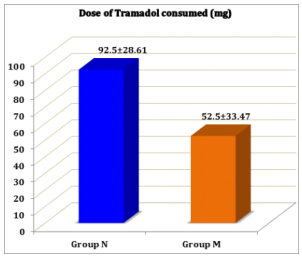


Figure 3 Dose of Tramadol consumed

DISCUSSION :

The main objective of the study was to evaluate the duration of sensory block in the parturients receiving hyperbaric bupivacaine with magnesium sulphate and it was observed that there was a significant prolongation of sensory block in that group.

In a study done by Lee et al[5] , magnesium has been shown to prolong duration of analgesia and decreases postoperative pain in interscalene nerve block.

In studies done by Koinig et al[9] , Tramer et al[10] , Moharari et al[11] , Sedighinejad A et al[12] magnesium sulphate when administrated through intravenous route, it was found to decrease intraoperative and post operative analgesic requirements. Also, patients had lesser discomfort and better sleep quality.

In a previous study done by C Sirisha et al[13] in orthopedic hip surgeries where general anaesthesia was adminstered, a single intravenous preoperative dose of magnesium sulphate reduced the postoperative analgesic requirements.

Pascual-Ramirez J et al[6] included 50-100mg of intrathecal Magnesium in Spinal anaesthesia which prolonged the duration of anaesthesia.

Faiz et al[7] proved that magnesium sulphate is a safe and effective adjuvant to spinal anaesthesia.

Ozalevli M et al[14] added 50mg of magnesium sulphate to intrathecal bupivacaine and fentanyl which prolonged period of anaesthesia in lower extremity surgery.

In a different study done by Shoeibi et al[15] which had magnesium sulphate added to lidocaine in spinal anaesthesia for caesarean sections, it resulted in prolongation of spinal analgesia.

Arcioni et al[16] supplemented spinal anaesthesia with intrathecal and epidural magnesium sulphate which led to reduced post operative analgesic requirements.

Ghrab BE et al[17] studied caesarean sections done under spinal anaesthesia where 100mg of magnesium sulphate was added to a mixture of local anesthetic with 100µg of morphine and it was found to improve quality and duration of postoperative analgesia.

Jabalameli et al[18] performed caesarean sections under spinal anaesthesia with hyperbaric bupivacaine to which they added different doses of magnesium sulphate. Addition of 50mg,75mg,100mg proved to be safe and effective and among all, they ascertained that addition of 75mg was most effective.

In contrary to all the studies mentioned above, a study done by Unlugenc H et al[19] stated that 50mg of magnesium sulphate when added to 10mg of hyperbaric bupivacaine for caesarean section done under spinal anaesthesia did not shorten onset time of sensory and motor block nor did it prolong duration of spinal anaesthesia.

Howerver, our study focuses on the point that a 50mg dose of magnesium sulphate alone when added to 10 mg of hyperbaric bupivacaine for caesarean sections done under spinal anaesthesia significantly prolonged the duration of spinal analgesia and decreased the need for rescue analgesic by improving duration and quality of post operative analgesia.

The fallacy of the study was that only a single parameter was studied extensively while ignoring other variables like onset of sensory and motor blockade, height of blockade attained, two segment regression time, depth of motor blockade.

Conclusion :

Thus, this study done on 100 parturients undergoing caesarean section under spinal anaesthesia concludes that 50mg of magnesium sulphate added as an adjuvant to 10mg of intrathecal hyperbaric bupivacaine significantly prolongs duration of sensory blockade.

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