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Efficacy of Magnesium Sulphate as an Adjunct to Ropivacaine in Local Subcutaneous Infiltration for Postoperative Analgesia Following Lower Segmental Ceasfrean Section in Parturents under Spinal Anesthesia

Myakala Siddartha[1], P G Raghavendra[2]

Author's Affiliation: [1,2]Assistant Professor, Department of Anesthesiology, Raichur Institute of Medical Sciences, Raichur, Karnataka 584102, India.

Corresponding Author: P G Raghavendra, Assistant Professor, Department of Anesthesiology, Raichur Institute of Medical Sciences, Raichur, Karnataka 584102, India.

E-mail: drpgraghavendra@gmail.com

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Abstract

Introduction: Magnesium is an antagonist of NMDA receptors and associated ion channels. It is found in very small concentrations in the plasma and is chiefly an intracellular ion. It is suggested that magnesium has many important roles to play in nociception. An inverse relationship has been documented between the severity of pain with different painful medical and surgical conditions and the serum magnesium levels.

Methodology: Patients were monitored for postoperative pain and any analgesic requirement for a period of 24 hours. Any patient complaining of pain or reporting VAS ≥4 at any time was administered Inj tramadol 100 mg IV slowly over 2-3 minutes. If pain was not relieved after 30 minutes and patients still complained of pain, additional doses of Inj tramadol 50mg IV was given and this dose could be repeated every 30 minutes upto a total dose of 250 mg in 6 hourly and maximum of 400mg of Inj tramadol over 24 hours.

Results: The number of patients who were administered 2nd, 3rd and 4th doses of rescue analgesics was significantly greater in group A as compared to group B. None of the patients in group B needed more than 4 doses of rescue analgesia while in group A, 5 patients were administered a rescue analgesic for 5th time. The study suggests that local infiltration of local anaesthetic agent alone or in conjunction with magnesium is safe.

Conclusion: The addition of magnesium to local anaesthetics potentiates the effect of local anaesthetics and reduces the postoperative opioid requirement.

Keywords: Magnesium Sulphate; Ropivacaine; Spinal Anaesthesia.

Introduction

Plan for postoperative pain is the hallmark of a good anaesthetic practice. Pain relief after caesarean delivery is especially important as the consequences of inadequate pain relief are borne not only by the mother but by the new born as well, since a parturient who is experiencing pain finds it difficult to feed her new born.[1]

Opioids, which otherwise are the mainstay analgesics in the postoperative period are avoided in the parturient since almost all opioids find their way in the milk predisposing the neonate to their adverse effects.

So other modalities for pain relief are often selected. Now-a-days, multimodal approach to pain relief is recommended so that adverse effects of individual drugs can be reduced. Neuraxial blocks, peripheral Nerve blocks, NSAIDS and local anaesthetic infiltration of wound have all been used as part of multimodal approach.[2]

Local wound infiltration is an attractive strategy since it is efficacious and side effects are minimal. However, this modality is limited by the fact that duration of analgesia is provided only till the effects of local anaesthetic action lasts. Efforts are being made to prolong the duration of action of local anaesthetic skin infiltration and magnesium is one such agent which has been used for this purpose.[3]

Magnesium is an antagonist of NMDA receptors and associated ion channels. It is found in very small concentrations in the plasma and is chiefly an intracellular ion. It is suggested that magnesium has many important roles to play in nociception. An inverse relationship has been documented between the severity of pain with different painful medical and surgical conditions and the serum magnesium levels. Recently, intra-articular infiltration of magnesium has been used in knee and shoulder arthroscopies with good results.[4]

We hypothesized that subcutaneous infiltration of magnesium has the potential to prolong the duration of action of subcutaneous infiltration of local anaesthestic agent at the incision site. Only a handful of studies have evaluated this route of administration of magnesium.

Methodology

Patients were enrolled in the study after a thorough pre anaesthetic check up and routine investigations which included a Complete Haemogram, B. urea, S. creatinine, BT, CT and Random Blood sugar, ECG.

After shifting the patients to the operation theatre, pre induction pulse rate (PR), Non Invasive Blood Pressure (NIBP), Respiratory Rate (RR), Oxygen Saturation (SpO_2) and Electrocardiography (ECG) was recorded. These parameters were monitored throughout the procedure and recorded every 10 minutes.

Intra-operative complications like hypotension, bradycardia, nausea/vomiting, etc were managed as per departmental policy in both the groups.

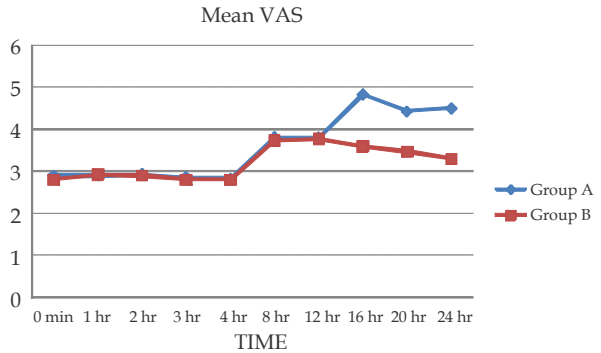
After the closure of uterus and muscle layer but before closure of skin, the allocated drug as per random grouping based on computer randomisation was administered by local subcutaneous wound infiltration at the incision site, by the obstetrician who was blinded to the study drug administered.This time was labeled as '0' and recording of parameters was started from.

Group A patients, administered a Local subcutaneous wound infiltration of Injection (Inj) ropivacaine (0.5%) 100 milligrams (mg) or 20 millilitres (ml) whereas, group B patients administered a Local subcutaneous wound infiltration of Inj magnesium sulphate 500mg (1 ml of 50% Inj Magnesium sulphate) added to Injropivacaine 0.5%(19 ml) making the total volume of injectate to 20 ml. After this, skin closure was done and patients were shifted to Post anaesthesia care unit (PACU).

On arrival to PACU, patients were asked to rate the pain using VAS rulers having slide indicator and were asked to bring the slider on the scale on to the point that they feel represents their current state of pain with '0' mark corresponding to no pain and '10' mark representing worst imaginable pain.

Patients were monitored for postoperative pain and any analgesic requirement for a period of 24 hours.Any patient complaining of pain or reporting VAS ≥4 at any time was administered Inj tramadol 100 mg IV slowly over 2–3 minutes. If pain was not relieved after 30 minutes and patients still complained of pain, additional doses of Inj tramadol 50mg IV was given and this dose could be repeated every 30 minutes upto a total dose of 250 mg in 6 hourly and maximum of 400mg of Inj tramadol over 24 hours.

Results



Graph 1: Mean VAS.

VAS was similar in both the groups with no statistically significant difference till 8th hour There was statistically significant difference in VAS from 12 to 24 hours in both the groups (Graph 1).

The need for IV rescue analgesic for the first time was at 4.65±0.418 hours in group A and at 6.01+0 425hours in group B. Thus, the need for first dose of rescue analgesia was earlier in group A as compared to group B the difference was statistically significantly (p=0.001). However, the need for 2nd and 3rd doses of rescue analgesics was significantly later in group B and the difference was statistically significant with p-value of 0.001 and 0.001 respectively. The time for 4th rescue analgesic, also showed statistically significant difference (p=0.001). (Table 1).

Table 1: Time to Rescue Analgesia.

	Mean	S.D	Mean	S.D	p-value
1st time	4.65	0.41833	6.016667	0.425144	0.001
2nd time	9.833333	0.379049	14.1875	0.247268	0.001
3rd time	14.92308	0.744208	18.5	0.408248	0.001
4th time	18.97619	0.511766	22.95455	0.522233	0.001
5th time	21.175	0.24468	–	–	–

The number of patients who were administered 2nd, 3rd and 4th doses of rescue analgesics was significantly greater in group A as compared to group B. None of the patients in group B needed more than 4 doses of rescue analgesia while in group A, 5 patients were administered a rescueanalgesic for 5th time. (Table 2).

Table 2: Number of patients requiring rescue analgesia.

	Group A	Group B	P-Value
1st	30	30	
2nd	30	24	0.008
3rd	26	16	0.001
4th	21	11	0.001
5th	10	0	0.017

Discussion

Concerns regarding opioid induced hyperalgesia and sensitization are growing and efforts are on to mitigate this opioid related adverse effect.

Recently, there is an interest in the use of NMDA antagonists like magnesium in postoperative pain relief. These agents have the potential to prevent central sensitization to peripheral nociceptive stimulation and also abolish hypersensitivity, if it is established.[5]

The administration of intravenous magnesium in the perioperative period, however, is fraught with risk, as it may potentiate neuromuscular blockade after administration of neuromuscular blocking drugs, increase sedation and contribute to serious cardiac morbidity . These adverse effects have brought attention towards subcutaneous administration of magnesium as an adjunct to the local anaesthetic agents.[6]

The dose of ropivacaine used in our study is as per the recommended dosage guidelines and is well within the safety limits.

The dose of magnesium co-relates with the dose used by Tauzin et al., who used 750 mg of magnesium in 0.25% bupivacaine to a total volume of 20 ml. Larger doses than the dose administered by us, have been safely used in parturients in earlier studies.[7]

The mean heart rate and mean blood pressure did not change significantly from baseline suggesting there are no adverse cardiovascular adverse effects of a small dose of magnesium when used for subcutaneous infiltration. Our results are similar to those of Donadi et al., who also observed no significant change in blood pressure on using magnesium.[8]

VAS in both the groups was similar in both the groups at various time intervals and also showed significant difference from 12 to 24 hours.whereas, the total supplemental analgesic consumption washigher in group B. This was expected, as patients were administered supplemental IV analgesics whenever, patients reported VAS more than 3. For this reason, supplemental analgesic consumption may give a better idea regarding the effectiveness of adjuvant added to the local anaesthetic infiltration.

The need for first dose of supplemental analgesic was later in the group B as compared to group A, the difference was statistically significant. Afterwards, the second, third and fourth supplemental doses of analgesics were consumed much later in group B as compared to group A, and the difference was statistically significant.Group A received five doses of supplemental analgesics as compared tofour doses in the group B.

Our results are similar to Eldaba et al., who used continuous wound infiltration of bupivacaine along with magnesium sulphate in patients undergoing caesarean section and reported an effective analgesiaand reduced postoperative Patient controlled analgesia (PCA) requirements as compared to continuous wound infiltration with local anaesthetic only or placebo.[9]

Conclusion

The result of our study brings out some interesting findings. Our study indicates that subcutaneous infiltration of magnesium reduces postoperative

analgesic requirements after Cesarean delivery and is not associated with any significant adverse effects.

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