Original Research Article

Indian Journal of Anesthesia and Analgesia
November – December 2020;7(6)
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7620.74

A Study on Complications of Magnesium Sulphate as an Adjunct to Ropivacaine Versus Plain Ropivacaine in Local Subcutaneous Infiltration for Postoperative Analgesia

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How to cite this article:

Myakala Siddartha, P G Raghavendra. A Study on Complications of Magnesium Sulphate as an Adjunct to Ropivacaine Versus Plain Ropivacaine in Local Subcutaneous Infiltration for Postoperative Analgesia. Indian J Anesth Analg. 2020;7(6):1391–1394.

Abstract

Introduction: Local anaesthesia have been employed during the operation as an adjuvant to anaesthesia or to alleviate postoperative pain. Local anaesthetic is injected to block the nerves before cutting the skin at the beginning of the operation, or after closing the skin at the end. Subcutaneous infiltration of bupivacaine microcapsules prolongs analgesia in humans for up to 96 h, and pre surgical infiltration of levobupivacaine significantly decreases the intensity of postsurgical pain, especially for the first 12 h, thereby reducing analgesic consumption.

Methodology: The minimum samplesize required for the study per group is 23. We have considered 30 patients per group for better statistical representation. A total of 60 patients were included in the study.

Results: None of the patients suffered from bradycardia, hypoxaemia, respiratory depression, skin rash or incision site excessive redness nor was there any evidence of infection. The incidence of sedation and pruritis was similar in both groups with no statistically significant difference.

Conclusion: The incidence of nausea and vomiting was infact lower in group B as compared to group A. This could be explained by the lesser use of rescue analgesic agent in group B since Inj tramadol itself is associated with increased incidence of nausea and vomiting.

Keywords: Local Subcutaneous Infiltration; Postoperative Analgesia; Ropivacaine.

Introduction

Childbirth is an emotional experience for a woman and her family. The mother needs to bond with the new baby as early as possible and initiate early breastfeeding, which helps to contract the uterus and accelerates the process of uterine involution in the postpartum period.[1]

Any form of intervention that leads to improvement in pain relief can positively impact on early breastfeeding. Prompt and adequate postoperative pain relief is therefore an important component of caesarean delivery that can make the period immediately after the operation less uncomfortable and more emotionally gratifying.[2]

Postoperative pain after Caeserean delivery is usually managed with opioids in combination with other forms of analgesics. Caesarean section is performed under spinal anaesthesia, combined spinal epidural, epidural block or general anaesthesia.

Local anaesthesia have been employed during the operation as an adjuvant to anaesthesia or to alleviate postoperative pain. Local anaesthetic is

injected to block the nerves before cutting the skin at the beginning of the operation, or after closing the skin at the end. Subcutaneous infiltration of bupivacaine microcapsules prolongs analgesia in humans for up to 96 h, and pre surgical infiltration of levobupivacaine significantly decreases the intensity of postsurgical pain, especially for the first 12 h, thereby reducing analgesic consumption.[3]

Incisional infiltration achieved analgesia and patient satisfaction comparable with epidural analgesia. Wound infiltration with local anaesthetics is a simple, effective and inexpensive means of providing good analgesia for a variety of surgical procedures without any major side effects.[4]

In particular, local anaesthetic toxicity, wound infection and healing do not appear to be major considerations.Postoperative analgesia is a major component of peri-operative care and local anaesthetic (LA) techniques are more effective than systemic analgesia regardless of the operation and mode of delivery.

By allowing patients to mobilize more quickly, wound infiltration may be as effective as central and proximal peripheral blocks in ensuring a safe postoperative recovery. Although untreated postsurgical pain may cause chronic pain.[5]

Ropivacaine infused intravenously at a rate of 10mg/min (to maximum cumulative dose of 150gm) had a higher threshold than similarly administered Bupivacaine. The mean cumulative doses of Ropivacaine and Bupivacaine tolerated before mild symptoms of CNS toxicity (lightheadedness, tinnitus, numbness of tongue) developed were 124mg and 99mg respectively. Both drugs significantlyincreased blood pressure and heart rate; stroke volume and ejection fraction were reduced but cardiac output was not affected. Although both drugs significantly altered various aspects of ECG, no overt dysrhythmias were observed.[6]

Methodology

a) *Study Area:* Study was conducted in department of Anaesthesia.

b) *Study Population:* Adult parturients classified under ASA class I and class II, scheduled to undergo elective caesarean section.

c) *Study Design:* A Prospective Randomized controlled Study.

d) *Sample Size:* The minimum sample size required for the study per group is 23.

We have considered 30 patients per group for better statistical representation. A total of 60 patients were included in the study.

e) *Study Duration:* study was conducted for 1 year.

f) *Inclusion Criteria:*

- Parturients belonging to American Society of Anaesthesiologists (ASA) grade I or II.
- Parturients posted for elective ceaserean section.

g) *Exclusion Criteria:*

- patients refusal to participate.
- Patients with a history of drug abuse, patients with psychiatric disease.
- morbidly obese patients.
- patients with history of allergic reactions to local anaesthetics, opioids and/or magnesium.

Patients were also observed for any adverse effect like postoperative nausea or vomiting, Skin rash (redness or itching), hypotension (defined as blood pressure less that 20% of baseline values), sedation (as per Ramsay sedation scale), respiratory depression (defined as respiratory rate less than 10/ minute), need for supplemental oxygen (saturation less than 93%), bradycardia (heart rate less than 60 beats/min), any redness or signs of inflammation at the skin incision site.

Results

Table 1: Baseline Characteristics.

	Group A	Group B	p-value
Mean Age (Years)	27.93±1.99	28.10±2.55	0.779
Mean Weight (Kg)	63.87±5.28	64.73±4.32	0.490
Mean Height (cm)	161.70 ± 3.03	162 ±2.49	0.677
Gestational Age (weeks)	38.17±0.69	38.17±0.69	1
Previous surgery (%age)	52 %	47 %	0.791

The mean Age in the group A and group B are almost similar and there is no statistical significant between the mean ages between the two groups.

The mean weight in group A and group B is almost similar and there is no statistical significant difference between the means of the two groups.

The mean height in the group A and group B is almost similar and there is no statistical significant difference between the mean Heights.

Group A and group B has similar gestational age at presentation.

Both groups have similar history of previous surgery.

Level of sensory block was similar in both the groups with no statistically significant difference.

Table 2: Total Tramadol consumption.

	Group	N	Mean	Std. Deviation	p-value
Total Tramadol Consumption	Group A	30	383	23.97	0.001
	Group B	30	208	18.95	

The cumulative analgesic requirement in group A was also greater in group A (383 mg) as compared to group B (208 mg) and the difference was statistically significant (p =0.001) (Table 10).

Table 3: Incidence of Postoperative Adverse Effects.

Incidence of Postoperative Adverse Effects	Group A	Group B
Nausea (N)	53.3%(16 pts)	26%(8 pts)
Vomiting (V)	30%(9 pts)	10%(3 pts)
Sedation (S)	16.66%(5 pts)	10%(3 pts)
Hypotension (H)	16.66%(5 pts)	20%(6 pts)
Pruritus (P)	38.66%(11 pts)	30.66%(9 pts)

Discussion

Ropivacaine in common with other local anaesthetics, reversibly blocks the conduction of nerve impulses by decreasing the permeability of nerve cell membranes to sodium ions.

Results from a recent study, show Ropivacaine induced blockade dissipates more rapidly than bupivacaine induced blockade at equimolar concentrations (5micromol/L). Blockade of potassium channels may contribute to cardiotoxic effects of local anaesthetic drugs by promoting a lengthening of the cardiac action potential. Ropivacaine has been shown to block open human delayed rectifier potassium channels in a concentration dependent manner in vitro. Ropivacaine has a lower affinity for these channels than bupivacaine. The cardio-depressive effects of Ropivacaine have been shown to be dependent on the extra cellular potassium concentration. Compared with lower concentrations (2.7mmol/L, a sub physiological level), high extra cellular potassium concentration (8.7mmol/L, a supraphysiological level which in isolation,would be expected to reduce the strength of concentration) reduced the EC 50 of Ropivacaine with respect to negative ionotropic effect and maximum upstroke velocity. Ropivacaine had less effect on cardiac rhythm than Bupivacaine. Ropivacaine 5.33mg and Bupivacaine 4mg, respectively, increased the QRS interval by about 75 and 155% ($p<0.01$) and QT interval by 18% and 20%.[7]

Changes in cardiac conduction, excitability, refractoriness, contractility and peripheral vascular resistance are minimal at therapeutic concentrations. At toxic levels depression of cardiac conduction and excitability leads to AV block, ventricular dysrythmias and fatal cardiac arrest. Depression of myocardial contractility and peripheral vasodilatation occur leading to decrease in cardiac output and arterial blood pressure. Cardiac toxicity is less than that with Bupivacaine but more than that with Lidocaine.[8]

It can produce both stimulation and depression of central nervous system. Stimulation is manifested as restlessness, tremors, and shivering progressing to convulsions, followed by depression and coma progressing to respiratory arrest. It has a primary depressant effect on the medulla andhigher centers.

The total analgesic consumption in our study in the initial 24 hours was also significantly reduced in group B as compared to group A. Lee et al., also reported reduced opioid consumption in patients whoreceived wound infiltration with magnesium.9

None of the patients suffered from bradycardia, hypoxaemia, respiratory depression, skin rash or incision site excessive redness nor was there any evidence of infection. The incidence of sedation and pruritis was similar in both groups with no statistically significant difference. The incidence of nausea and vomiting was infact lower in group B as compared to group A. This could be explained by the lesser use of rescue analgesic agent in group B since Inj tramadol itself is associated with increased incidence of nausea and vomiting.[10]

Conclusion

Thus, while the potential adverse effects of IV magnesium mentioned above are avoided, still the benefits accrued by its adjunct analgesic effect can be availed. Thus, subcutaneous infiltration in conjunction with local anaesthetic agents holds great promise.

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