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Original Research Article

Comparison of ropivacaine with magnesium sulphate and plain ropivacaine in ultrasound guided supraclavicular blocks for upper limb surgeries

R. Jaya Shridevi[1], Arthi Asokan[1,*]

[1] *Dept. of Anaesthesiology, Sri Venkateswara Medical College, Pondicherry, India*

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ABSTRACT

In the modern era of technology and life style, non communicable disease are more prevalent with additional risk factors involved in the subjects admitted for upper limb surgeries, hence regional anesthesia techniques has gained importance. Adjuvant usage in regional anesthesia has a beneficial effect in extending the prolongation of anesthesia and hence our study aimed to compare the efficacy of 0.75% ropivacaine added with magnesium sulphate and 0.75% plain ropivacaine in ultrasound guided supraclavicular nerve blocks for upper limb surgeries. A total of 60 study subjects with 30 in each group were randomized to the study. Results obtained showed a statistically significant difference with rapid beginning and time duration of motor and sensory anesthesia in the patients who received Magnesium sulphate as adjuvant when compared to the plain ropivacaine group.

1. Introduction

Regional anesthesia is a newer emerging technique used as a safer and effective method for various surgical procedures including upper limb surgery. It can prolong the duration of analgesia during surgery and assist with post-operative pain management. Supraclavicular block is a cost effective and safest technique with the advantages of ideal operating conditions and effective post–operating analgesia. Ultrasound guided (USG) supraclaviclar blocks allows the better view of underlying structures, positioning, needle movement and direct spread of local anesthetic. It also thereby making the procedure a safe and effective as compared to nerve stimulator guided technique.[1] As local anesthesia is safe, inexpensive and itshas been always a concern on the duration of anesthesia and post operative requirement of analgesics. Hence in the modern era of medicine perineural adjuvant came into picture to enhance the earlier onset action and prolongedefficacy. Magnesium sulphate by the virtue of NMDA receptors antagonist property[2] has been established as an adjuvant to local anesthetics inneuraxial blocks, peripheral nerve blocks[3] and transverses abdominal blocks.[4] It can also be used as an adjuvant in supraclavicular blockswith good encouraging results; still its consensus to be attained. We compare the use of ropivacaine with magnesium sulphate and plain ropivacaine in ultrasound guided supraclavicular blocks for upper limb surgeries with relation to prolonged duration and rapid onset of analgesic effect.

2. Methods and Materials

A Prospective double-blind study with 60 patients aged 18 – 60years were recruited and randomized into 2 groups: Group 1 – 30 patients received 0.75% ropivacaine (23.5ml) with 150mg of magnesium sulphate (1.5ml) total volume of 25ml in the USG guided supraclavicular nerve blocks. Group 2 – 30 patientsreceived 0.75% ropivacaine (23.5ml)

* *Corresponding author.*
E-mail address: drarthimd@gmail.com (A. Asokan).

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with Normal saline (1.5ml) total volume of 25ml in the USG guided supraclavicular nerve blocks.

Our aim is to compare and evaluate the efficacy of 0.75% of ropivacaine with the addition of magnesium sulphate and 0.75% plain ropivacaine without any adjuvant for upper limb surgeries using ultrasound guided supraclavicular nerve blocks. Inclusion criteria; patients of age between 18 -60 year with both gender admitted for upper limb surgeries (fracture of forearm, wound debridement etc) were selected. Patients with cardiac, renal, hepatic disease, chronic use of calcium channel blockers, local infection, bleeding disorders and lack of ability to perceive the visual analogue scale (VAS) for pain assessment were excluded. Note: The block was considered to be a failed block, when the patients required supplementary anesthesia in the intra operative period.

In patients the routine pre anesthesia evaluation and other routine protocols were followed. Assessment of the primary outcome is based on duration of analgesia and the secondary outcome is the onset of sensory anesthesia. Patients also were educated about the VAS during the preoperative period. Patients will be assessed for both sensory and motor components. In all the subjects involved in this study, standard sterile precautions and a standard procedure with the aid ultrasound was followed in the procedure of local installation of the drugs.

Sensory loss assessment[5] was carried out by using pinprick test in the upper limbs with three point of scale: 0 is indicated as sharp pain to the prick, 1 is indicated as Analgesia (loss of sensation to pinprick) but perception of touch feel is present and 2 is indicated as loss of touch sensation.

Motor block was assessed[6] by asking the patient to flex and extend the wrist and fingers using a three point scale: 0 is to be considered as a total movement of finger and wrist to command normally, 1 is to be considered as the reduced movement of fingers and wrist to command and 2 is considered as inability(not able to perform) to move fingers and wrist.

After injection of local anesthestic agent using ultrasound guided, both groups were analyzed every 3mins up to 30 min subsequently. After which further assessment was carried out every one hour after procedure for having a check on efficacy parameters for the requirement of post operative analgesics. The sensory blockade onset was described as the time interval between end of infiltration and loss of sensation to pinprick or score 1. The duration of sensory blockade was the interval between lose of sensation to the pinprick to reappearance of pinprick sensation.

Motor blockade onset was described as time interval between the end of infiltration of drug to complete motor paralysis of the wrist and hand, the duration of motor blockade was described as time interval between complete motor paralysis of wrist and hand to the complete movement of wrist and hand.

VAS was used as a tool to assess the pain experienced by the subject. Pain assessment was obtained by the response of patient to rate the intensity of pain perceived and express it on 10cm of horizontal scale ranging from no pain at the one end[7] to the worst possible pain at the other end.[8]

The total duration of analgesia was determined from the time completion of block to the demand of first rescue analgesia in the post operative phase. Rescue analgesia was used in the form of injection as diclofenac intramuscularly (1.5mg/kg) to patients with VAS more than 4. If patient does not show any improvement to pain, injection tramadol was given IV route (2mg/kg). All patients were monitored carefully for vitals and other side effects. The data obtained was tabulated and statistical analysis will be done for results.

3. Results

Sixty patients who require upper limp surgery were included in the study. Thirty patients were randomized to each group. Group M have received 0.75% ropivacaine to the addition of magnesium sulphate and Group N have received 0.75% ropivacaine to the addition of normal saline.

The mean sensory block duration in group M who received magnesium sulphate along with ropivacaine was 229±19.12 and in the control Group N who received plain ropivacaine was 150±15.12. The onset time of sensory block in Group M was 11.98±1.08 and the onset time of block in control Group N was 14.9±2.02 ($p<0.0243$; statistically significant).

The mean motor block duration in the case of Group M who received magnesium sulphate along with ropivacaine was 212±18.98 and in the control group who received plain ropivacaine was 134±24.12. The time onset of motor block in Group M was 22.7±1.01 and the time onset of motor block in control Group N was 31.12±2.47 ($p<0.048$; statistically significant).

4. Discussion

Out of many trace elements the most important one is a magnesium, which is a competitive N-methyl-D-aspartate receptor - receptor antagonist and inhibits the voltage dependent ion channels, in addition it also increases the length of the block in regional anesthesia.[7] In our study we documented that addition of 150mg of MgSO4 to ropivacaine (group M) in USG-guided supraclavicular brachial plexus block significantly prolongs the duration of analgesia, fastens the time onset of sensory and motor blockade, and decreases the number of analgesic requirement in post operative period. There were no adverse drug reactions noted in the patients. In our study we analysed the effects of adding magnesium sulfate with 0.75% ropivacaine in supraclavicular brachial plexus blocks. In our study we found the duration of

Table 1: Comparison of demographic data between two study groups

	Group M	Group N
Age	44.9±11.4	40.5±13.2
Sex (M/F)	20(66.6%)/ 10(33.3%)	18(60%)/ 12(40%)
BMI	22.67±2.97	21.48±2.18

Table 2: Onset time and duration of sensory and motor block

Variables	Duration (mnts)		Onset (mnts)		p value
	Group M	Group N	Group M	Group N	
Sensory block	229±19.12	150±15.12	11.98±1.08	14.9±2.02	p<0.0243
Motor block	212±18.98	134±24.12	22.7±1.01	31.12±2.47	p<0.048

sensory and motor blocks in 0.75% ropivacaine with magnesium sulphate(Group M) was longer than the 0.75% ropivacaine with normal saline placebo (Group N) which also demonstrated statically significant. We also evaluated the time onset of sensory and motor blocks between two groups.

The time onset of sensory block was significantly shorter for the 0.75% ropivacaine with magnesium sulphate when compared to the group who received 0.75% ropivacaine with normal saline. The time onset of motor block also required a lesser time for the group who received magnesium sulphate when compared with Group who received normal saline which also was statistically significant.

Ozalevli et al[8]in his study he compared the effect of adding intrathecal magnesium sulphate to bupivacaine-fentanyl spinal anaesthesia and magnesium with 0.9% sodium chloride in the patients undergoing lower limb surgery,in their study they concluded that, magnesium had delayed onset of sensory and motor blocks, but prolonged the duration of spinal anesthesia. In a study conducted by Elsharnouby et al. in Cairo in 2008, intra-articular injections of bupivacaine with magnesium resulted in longer periods of analgesia (Duration) when compared with the control group that received a placebo.[9] Two similar studies conducted by Arcioni et al. and by ElKerdawy reported that the addition of magnesium sulphate prolonged time duration of an epidural analgesia[10,11] Narang et al. investigated that the effect of magnesium sulphate in a Bier block and reported that the onset of sensory and motor analgesia was faster in the magnesium sulphate group than in the placebo group.[12] Gunduz et al. reported that the magnesium sulphate prolongs the duration of supraclavicular brachial plexus block.[13]

In a study done by Rao et al. demonstrated that onset and duration of both sensory an motor block was not significant statistically.[14] In a study done by Varma et al. they demonstrated that sensory and motor block durations were prolonged the duration of Group BM1 as compared to BM0.5 and B (P = 0.00) where the earlier one where they used magnesium sulphate as adjuvantt.[15] In a study done by Mukerji et al. described that the onset time of the sensory and motor block duration and time to first analgesic use were significantly longer and the total need for rescue analgesics was lower in group RM (P = 0.026) than group RN.[16]

5. Conclusion

In the present study use of magnesium sulphate as adjuvant with ropivacaine in supraclaviclar block for upper limb surgeries showed beneficial results in both prolonged duration and faster onset of motor and sensory anesthesia.

6. Limitations

Small study group and done in a single centre.

7. Source of Funding

None.

8. Conflict of Interest

None.

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Author biography

R. Jaya Shridevi, Assistant Professor

Arthi Asokan, Assistant Professor

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