Comparison of Ropivacaine with Magnesium Sulphate and Plain Ropivacaine in Ultrasound Guided Supraclavicular Blocks for Upper Limb Surgeries

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ABSTRACT

Introdcution: Regional anesthesia has gained importance for upper limb surgeries because of beneficial effect in prolongation of anesthesia without the side-effects of general surgery. This study was designed to compare the efficacy of 0.75% ropivacaine with and without addition of magnesium sulphate in US guided supraclavicular nerve blocks for upper limb surgeries.

Material and methods: 60 patients aged 18 – 60 years were selected and randomly allocated into 2 groups: Group 1 and Group 2.Group 1 is ropivacaine magnesium sulphate group and consists of 30 subjects who 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, also called Group Ropivacaine consists of 30 subjects who received 0.75% ropivacaine (23.5ml) with Normal saline (1.5ml) total volume of 25ml in the USG guided supraclavicular nerve blocks.

Results: The mean duration of sensory block in group M (ropivacaine magnesium sulphate group) was 229±19.12 and in the control Group N (plain ropivacaine group) was 150±15.12. The time of onset of sensory block in Group 1 was 11.98±1.08 and the time of onset of block in control Group 2 was 14.9±2.02 ($p<0.0001$; statistically significant). The mean motor block duration in the case of Group 1 was 212±18.98 and in the control group 2 was 134±24.12. The time of onset of motor block in Group 1 was 22.7±1.01 and the time of onset of motor block in control Group 2 was 31.12±2.47 ($p<0.048$; statistically significant)

Conclusion: The ropivacaine magnesium sulphate group showed fasted onset and increased duration of time than plain ropivacaine group.

Keywords: Supraclavicular Block, Magnesium Sulphate, Ropivacaine

INTRODUCTION

Regional anesthesia, a safer and effective method for many different surgical procedures including upper limb surgeries. Its main advantage is prolonged duration of analgesia and assists with post-operative pain management and avoids the disadvantages of general anesthesia. Supraclavicular block is safe and cost effective. Ultrasound guided (USG) supraclaviclaranesthesia allows better visualization of underlying anatomical structures, positioning and needle movement.[1] Local anesthetics have a limited duration of action. For denser blocks and faster onset, various adjuvants have been added to local anesthetic solution while minimizing systemic adverse effects along with a reduction in total dose of local anesthetic used.[2,3] Magnesium sulphate antagonizes NMDA receptors and due to this property has been established as an adjuvant to local anesthetics in peripheral nerve blocks.[3,4] It has also been used as an adjuvant in supraclavicular nerve blocks with good results. The main objective of this study was to compare ropivacaine with and without magnesium sulphate in ultrasound (US) guided supraclavicular nerve blocks for upper limb surgeries with relation to prolonged duration of action of the drug and rapid onset of analgesic effect.

MATERIAL AND METHODS

A Prospective observationalstudy was conducted after obtaining the ethical clearance from hospital administration. The informed consent was taken from all the participants. 60 patients aged 18 – 60 years were selected and randomly allocated into 2 groups: Group 1 and Group 2. Group 1 is ropivacaine magnesium sulphate group and consists of 30 subjects who 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, also called Group Ropivacaine consists of 30 subjects who received 0.75% ropivacaine (23.5ml) with Normal saline (1.5ml) total volume of 25ml in the USG guided supraclavicular nerve blocks.

This was a comparative study to compare and evaluate the efficacy of 0.75% of ropivacaine with and without the addition of magnesium sulphate for surgeries of upper limbs using US guided supraclavicular nerve blocks.

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Inclusion criteria; patientsaged between 18 -60 years with both male and female genders admitted for upper limb surgeries were included in this study. The exclusion criteria were patients with heart problems, kidney problems, liverdisease, chronic use of calcium channel blockers, local infection, blood disorders and those patients who lack the ability to perceive the visual analogue scale (VAS) for pain assessment. The nerve block was considered a failure, when the patients received supplemental anaesthesia in the intra operative period.

The routine pre anestheticcheck-up was donein all the subjects and other pre-anestheticprotocols were followed. The primary outcome was assessed on the basis of duration of analgesia and the secondary outcome was assessed on the basis of the onset of sensory anesthesia. Patients were also educated about the VAS during the preoperative period. Both sensory and motor components were assessed in all the subjects.

Assessment of Sensory loss (UdaiAmbi et al)[5] was carried out by pinprick test with a 3-point scale:

0 – sharp pain to the prick,

1 - loss of sensation to pinprick but perception of touch feel is present

2 - loss of touch sensation.

Motor block was assessed (Sarkar et al)[6] by asking the patient to flex and extend the wrist and fingers using a 3-point scale:

total movement of finger and wrist to command normally,

reduced movement of fingers and wrist to command

not able to perform to move fingers and wrist.

After injecting LA agent using US guided, both groups were evaluated and analysed every 3 minutes fir up to half an hour subsequently. After which further assessment was carried out every 1 hour. The onset of sensory block onset was described as the time interval between end of infiltration and Score 1 i.e., loss of sensation to pinprick but perception of touch feel is present. The duration of sensory blockade was the interval between Score 1to reappearance of pinprick sensation.

Motor blockade onset was described as time interval between the end of infiltration of drug to Score 2 i.e., complete motor paralysis of the wrist and hand, the duration of motor blockade was described as time interval between Score 2 and Score 0.

VAS was used as a tool to assess the pain experienced by the subject and expressed it on 10-cm 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 of 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 recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages. Student's independent t-test was employed for comparing continuous variables. Chi-square test or Fisher's exact test, whichever appropriate, was applied for comparing categorical variables. A P-value of <0.05 was considered statistically significant.

RESULTS

60 Subjects were selected based on inclusion and exclusion criteria. The patients were randomly selected and were divided into 2 groups. Group M, also called ropivacaine magnesium sulphate group or Group 1 received 0.75% ropivacaine to the addition of magnesium sulphate and Group N, also called Group 2 received 0.75% ropivacaine to the addition of normal saline.

The mean sensory block duration in group M was 229±19.12 and in the control Group N 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 1 was 212±18.98 and in the control group 2 was 134±24.12. The onset time of motor block in Group 1 was 22.7±1.01 and the onset time of motor block in control Group 2 was 31.12±2.47 ($p<0.048$; statistically significant).

DISCUSSION

Magnesium is one of the important trace elements, which competitively antagonizes N-methyl-D-aspartate receptor and inhibits the voltage dependent ion channels.[7] In this study, we found that addition of 150mg of MgSO4 to

Variables	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-1: Comparison of demographic data between two studygroups

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

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

ropivacaine (group 1) in US-guided brachial plexus block significantly prolongs the duration of analgesia, fastens the time of onset sensory and motor blockade, and decreases the amount of analgesic requirement in post-surgical period. We did not find any adverse drug reactions in any patients.

In our study, the duration of sensory and motor blocks in Group 1 was longer than the Group 2 which was statically significant. The time of onset of sensory block was significantly shorter in Group 1 when compared to the Group 2. 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] conducted a study and 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 surgeries, in their study they concluded that, the group with magnesium had delayed onset of sensory and motor blocks, but prolonged 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.

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]

CONCLUSION

The ropivacaine magnesium sulphate group showed fasted onset and increased duration of time than plain ropivacaine group.

REFERENCES

1. AkshayaN, Shetti Debendra, Kumar Tripathy, Mithun Duncan, N Krishnaveni, D Roshansingh. A comparative study of nerve stimulator versus ultrasound-guided supraclavicular brachial plexus block. Anesth Essays Res 201373359640259-1162.
2. M Suzuki Role of N-methyl-D-aspartate receptors antagonists in postoperative pain management. CurrOpin Anaesthesiol 20092261822
3. Prakash KhairnarMunisha Agarwal UttamChandra Verma Rakesh Kumar Comparative efficacy of ropivacaine and levobupivacaine in combined femoral and lateral femoral cutaneous nerve block with adjuvant magnesium for post-operative analgesia. Indian J Anaesth 201660858490019-5049.
4. Shelly Rana Ravinder Kumar Verma Jai Singh Sudarshan Kumar Chaudhary Ankita Chandel Magnesium sulphate as an adjuvant to bupivacaine in ultrasound-guided transversus abdominis plane block in patients scheduled for total abdominal hysterectomy under subarachnoid block. Indian J Anaesth 201660317490019-5049
5. Uday Ambi PVV BhanupriyaShivanandYHulkund DS Prakashappa Comparison between perivascular and perineural ultrasound-guided axillary brachial plexus block using levobupivacaine: A prospective, randomised clinical studyIndian J Anaesth 20155910658630019-5049.
6. D J Sarkar G Khurana A Chaudhary J P Sharma A comparative study on the effects of adding fentanyl and bupernorphine to local anaesthetics in brachial plexus block. J Clin Diagn Res 20104333743
7. A Mirkheshti M R Aryani P Shojaei A Dabbagh The effect of adding magnesium sulfate to lidocaine compared with paracetamol in prevention of acute pain in hand surgery patients under intravenous regional anesthesia (IVRA). Int J Prev Med20123961621
8. M Ozalevli T O Cetin H Unlugenc T Guler G Isik The effect of adding intrathecal magnesium sulphate to bupivacaine-fentanyl spinal anaesthesia. ActaAnaesthesiol Scand 2005491015149
9. Noha M. ElsharnoubyHala E. Eid Nahla F. AbouElezz Ashraf N. Moharram Intraarticular Injection of Magnesium Sulphate and/or Bupivacaine for Postoperative Analgesia After Arthroscopic Knee Surgery. Anesth Analg 2008106515485200003-2999O
10. R. Arcioni S. Palmisani S. Tigano C. Santorsola V. Sauli S. Romanò Combined intrathecal and epidural magnesium sulfate supplementation of spinal anesthesia to reduce post-operative analgesic requirements: a prospective, randomized, double-blind, controlled trial in patients undergoing major orthopedicsurgeryActaAnaesthesiol Scand 200751448290001-5172, 1399-6576Wiley
11. H El-Kerdawy Analgesic requirements for patients undergoing lower extremity orthopedic surgery - the effect of combined spinal and epidural magnesiumMiddle East J Anaesthesiol 200819510131038
12. S. Narang J. S. Dali M. Agarwal R. Garg Evaluation of the Efficacy of Magnesium Sulphate as an Adjuvant to Lignocaine for Intravenous Regional Anaesthesia for Upper Limb SurgeryAnaesth Intensive Care 200836684040310-057X, 1448-0271SAGE Publications
13. A Gunduz A Bilir S Gulec Magnesium added to prilocaine prolongs the duration of axillary plexus block. RegAnesth Pain Med 20063132336
14. L N Rao V Jeyalakshmi M Nagaraju S Anitha The effect of magnesium sulfate as an adjuvant to 0.5% bupivacaine on motor and sensory supraclavicular brachial plexus blockadeInt J Basic Clin Pharmacol

2015431721

15. V Verma S Rana S K Chaudhary J Singh R K Verma S Sood A dose-finding randomised controlled trial of magnesium sulphate as an adjuvant in ultrasound guided supraclavicular brachial plexus blockIndian J Anaesth 2017612505
16. Anjan Das Soumyadip Dutta Parthajit Mandal Kasturi Mukherjee Anindya Mukherjee Sandip Roy Basunia Evaluation of Magnesium as an adjuvant in Ropivacaine-induced supraclavicular brachial plexus block: A prospective, double-blinded randomized controlled studyJ Res Pharm Pract 20143412392279-042

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