A Comparative study on Adenosine and Magnesium Sulphate with Bupivacaine in Infraclavicular infusion for Postoperative Analgesia

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**ABSTRACT**

**Background:** Brachial plexus piece has reformed the field of regional anaesthesia for upper limb surgeries. Infraclavicular subcoracoid approach gives complete block without significant difficulties. Aim: To compare the additives adenosine and magnesium sulphate with bupivacaine in infraclavicular for upper limb surgeries and postoperative analgesia. **Materials & Methods:** This Prospective study was conducted at the Department of Anaesthesiology, Govt. Medical College, Azamgarh. Around 24 patients scheduled for elective unilateral upper limb surgeries involving distal arm/elbow/forearm/hand divided into two groups A (n=12) and B (n=12) randomly. Group A - adenosine 6mgs with 28 ml 0.5% bupivacaine bolus followed by infusion of 0.25% bupivacaine 28ml with 6mgs of adenosine (2ml) at a rate of 5ml/hr. Group B - magnesium sulphate 75 mgs (in 2ml) with 28ml of 0.5% bupivacaine bolus followed by infusion of 0.25% bupivacaine 28ml with 75mgs of magnesium sulphate (in 2ml) at a rate of 5ml/hr in USG guided placement of infraclavicular catheter. **Results:** Our Study revealed that Group A had a faster Onset time of sensory and motor block and faster recovery when compared to group B. Group A needed more rescue analgesia than group B. **Conclusion:** The addition of magnesium sulphate as an additive to bupivacaine in brachial plexus block may be a better choice when prolonged postoperative analgesia is required.

**Key words:** Bupivacaine, Adenosine, Magnesium Sulphate, Brachial plexus block.

**INTRODUCTION**

The infraclavicular brachial plexus block (ICB) is intended to store sedative high in the plexus, accomplishing anaesthesia of the hand, lower arm, elbow, and distal arm.\(^1\) Adenosine is an important metabolic intermediate involved in nearly all aspects of cell function, including neurotransmission and signal transduction inside the body. Adenosine has an important role in the central and peripheral mediation of pain. Adenosine A₁, A₂A, A₂B, and A₃ receptors were detected in the spinal cord. The A₁ receptor plays an important role in spinal anti nociception whereas the role of the A₂A, A₂B, and A₃ receptors is still vague. A₂A and A₃ receptors mediate pain transmission peripherally, whereas the A₁ receptor seems to have a central anti-nociceptive effect.\(^2\) Magnesium is the fourth most abundant cation in the body and the second most sample intracellular cation after potassium. Hostile to nociceptive impacts of magnesium are because of direction of calcium convergence into the cell and threat of the N-methyl D-aspartate (NMDA) receptors. Many clinical investigations like Dogru et al\(^3\) and Choi et al\(^4\) have demonstrated that Mg administration in peripheral nerve plexus block has prolonged the analgesic effect and reduced postoperative analgesic consumption. Though magnesium has an analgesic property, it has not been studied well as an adjuvant to bupivacaine in infraclavicular brachial plexus block. Therefore, this study was carried out with the aim of to compare the additives adenosine and magnesium sulphate with bupivacaine in infraclavicular infusion for upper limb surgery.


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surgeries and postoperative analgesia.

METHODS

This prospective comparative study was undertaken on 30 enrolled patients at Department of Anaesthesiology, Govt. Medical College, Azamgarh. 12 patients in each groups belonging to 25 to 55 years of age with weight less than 70kgs from both gender and ASA status 1 and 2 are included. After securing an intravenous line and Boyles machine check, multichannel monitor connected to read pulse rate, NiBp, SpO2, emergency drugs ready, patient sedated with Inj. Midazolam 2 mgs iv., Inj. ondansetron 4mgs iv, Inj. Ranitidine 50mgs iv. After scout scanning block performed under strict aseptic precautions.

Visual Analog score, sedation (Ramsay sedation score), nausea and vomiting score, need for rescue analgesics and postoperative complications were observed. Unsuccessful block requiring general anaesthesia are excluded from the study. Pain in postoperative ward managed with iv paracetamol 1gm (if VAS=4) and Inj. Fentanyl (if VAS>6).

RESULTS

No difference observed in Age, Gender, Height, Weight and Duration of surgery. Pulse rate, NiBP, SpO2 didn’t show any statistical difference between groups. Complete sensory block occurred at 7 minutes in group A and in group B the complete block occurred at 9 minutes. Group A had an earlier onset than group B. Group A recovered from sensory effect at 42 hours and group B at 45 hours completely. Group A recovered earlier than than group B. Complete motor block occurred at 11 minutes in group A and group B took 15 minutes for complete motor block. Group A recovered completely at 26 hours and group B at 31 hours. There is a significant difference in pain (VAS) score from 4 minutes to 14 minutes and from 26 hrs to 46hrs. Group A had pain relief at 9 minutes and B had at 11 minutes and group B had better pain score for prolonged time (45 hours) than group A (40 hours). Regarding sedation there was no statistically significant difference between two groups. Regarding nausea and vomiting score there was no statistically significant difference between two groups noted. Group B needed lesser amount of rescue analgesics. No complications observed in both groups intraoperatively and postoperatively. Long term complications not observed due to patient poor compliance in follow up.

DISCUSSION

Infraclavicular subcoracoid brachial plexus square is testimony of neighbourhood analgesic at the string level where every one of the nerves providing upper appendage lie in a conservative way to get anesthetized totally without much difficulties than other approach when performed under ultrasound direction.\(^1\) The deposition of local anaesthetics alone cannot give prolonged duration of analgesia. Hence addition adjuvants are practiced. Here we added adenosine and magnesium sulphate as adjuvant and compared the effects of both drugs. Fukunga et al.\(^1\) and Gan et al.\(^6\) studied the pain reducing effect of adenosine

In major surgeries by acting on adenosine receptors and found to be a good non-opioid analgesic in perioperative setting. Dogru et al, Choi et al.\(^5\) used magnesium sulphate in their study and found magnesium sulphate gives postoperative analgesia by blocking NMDA receptors. The demographic profile is not statistically significant in our study as stated in Gunduz et al study and hemodynamic parameters also not showed any statistically significant difference between two groups.\(^7\) The sensory and motor onset time is early in group A than in group B. Recovery from sensory and motor effect is faster with group A than group B. Khaleed et al in their study concluded that adenosine has shorter onset time, lower mean VAS score over 48 hours.\(^8\) Ekmekzi et al found the delayed onset and prolonged duration of analgesia when magnesium is given in femoral nerve block.\(^9\) Magnesium sulphate gives prolonged duration of analgesia and better pain scores than adenosine in our study. Dogru et al and Choi et al used magnesium in brachial plexus block and found prolonged analgesia and better pain scores.\(^2,3\) Kasturi et al.\(^10\) in supraclavicular route, Lee et al in interscalene route and Gunduz et al.\(^6\) in axillary route in their study concluded the delayed onset and prolonged analgesic action and motor blockade of magnesium when used in brachial plexus block. The decreased duration of analgesic action of adenosine is due to rapid metabolism is stated in studies of Apan et al.\(^11\) and Khaled et al.\(^8\) They need continuous infusion for prolonged effect. Group B needed lower rescue analgesics. Lee et al.\(^12\) study also got the same result. Khaleed et al in his study claimed 48 hrs of good VAS score with infusion of 10ml/hr of adenosine 12mgs for two hours.\(^8\) We infused for six hours at a rate of 5ml/hr with 6mgs of adenosine. Sensory effect lasted for 44 hrs.

Sedation score; nausea and vomiting score did not show much difference between the two groups. Choi et al in their study has observed no significant difference regarding the same.\(^13,14\)

CONCLUSION

Adenosine when compared to magnesium sulphate has shorter onset time for both sensory and motor blockade and recovers earlier from both effects. The magnesium sulphate takes a little more threshold time for its onset but gives prolonged duration of analgesia and better pain score postoperatively. Hence the addition of magnesium sulphate as an additive to bupivacaine in brachial plexus block may be a better choice when prolonged postoperative analgesia is required.

Limitations

Sample size not adequate, therefore we have planned to conduct the similar study.

REFERENCES


