

Use of Adenosine and Magnesium Sulphate Vs Bupivacaine in Upper Limb Surgeries and Post-Operative Analgesia: A Comparative Hospital Based Study

Suraj Kumar^{1*}, Anurag Agarwal², Shivani Rastogi², PK Das³, Mamta Harjai³, Deepak Malviya⁴

¹Assistant Professor; ²Associate Professor; ³Professor (Junior Grade); ⁴Professor & Head, Department of Anaesthesiology, Dr. Ram Manohar Lohia Institute of Medical Sciences Gomti Nagar, Lucknow

ABSTRACT

Background: The present study was conducted to compare the additives adenosine and magnesium sulphate with bupivacaine in infraclavicular infusion for upper limb surgeries and postoperative analgesia

Methods: This Prospective study was done at the Department of Anaesthesiology. Around 26 patients scheduled for elective unilateral upper limb surgeries involving distal arm/ elbow/ forearm/hand divided into two groups A (n=13) and B (n=13) 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: Result showed that Group A had a faster Onset time of sensory and motor block and faster recovery as compared to group B. Group A needed more rescue analgesia than group B..

Conclusions: 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.

Keywords: Bupivacaine, Adenosine, Magnesium Sulfate

Available Online: 30th March 2020

Received: 10.01.20

Accepted: 05.02.20

*Corresponding Author

Dr. Suraj Kumar

Assistant Professor, Department of Anaesthesiology, Dr. Ram Manohar Lohia Institute of Medical Sciences Gomti Nagar, Lucknow
Email: Surajchautharysrk@gmail.com

Copyright: © the author(s). IABCR is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.




This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial

INTRODUCTION

The infraclavicular brachial plexus square (ICB) is intended to store sedative high in the plexus, accomplishing sedation of the hand, lower arm, elbow, and distal arm.¹ Adenosine is a metabolic moderate that is associated with almost all parts of cell work, including neurotransmission and sign transduction inside the body. Adenosine has a significant job in the focal and fringe intervention of agony. Adenosine A₁, A_{2A}, A_{2B}, 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 A_{2A}, A_{2B}, and A₃ receptors is still vague. A_{2A} 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 copious cation in the body and the second most abundant intracellular cation after potassium. Against nociceptive impacts of magnesium are because of guideline of calcium deluge into the cell and opposition of the N-methyl D-aspartate (NMDA) receptors. Many clinical investigations like Dogru et al³ and Choi et al⁴ have demonstrated that Mg administration in peripheral nerve plexus block has prolonged the analgesic effect and reduced postoperative analgesic consumption. In spite of the fact that magnesium has a pain relieving property, it has not been concentrated well as an adjuvant to bupivacaine in infraclavicular brachial

Access this article online	
Website: www.iabcr.org	Quick Response code 
DOI: 10.21276/iabcr.2020.6.1.09	

How to cite this article: Kumar S, Agarwal A, Rastogi S, Das PK, Harjai M, Malviya D. Use of Adenosine and Magnesium Sulphate Vs Bupivacaine in Upper Limb Surgeries and Post-Operative Analgesia: A Comparative Hospital Based Study. Int Arch BioMed Clin Res. 2020;6(1):AN4-AN6.

Source of Support: Nil, **Conflict of Interest:** None

plexus square. The point of this examination to think about the added substances adenosine and magnesium sulfate with bupivacaine in infraclavicular imbue ment for upper appendage medical procedures and postoperative absence of pain.

METHODS

This prospective comparative study was undertaken on 26 enrolled patients at Department of Anaesthesiology. 13 patients in each groups belonging to 20 to 50 years of age 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.

Observation: Sensory (using pinprick test, 3 point score) and motor (using modified Bromage scale, 3 point score) blockade assessed every two minutes after the block From time of completion of block to the complete loss of sensation (anaesthesia) of all the four nerves (radial, ulnar, median, musculocutaneous) is noted as sensory onset time and loss of finger movements is motor onset time. Recovery is regained of all sensations in all areas of four nerves as sensory and all movements of fingers as motor recovery. Visual analog score, sedation (Ramsay sedation score), nausea and vomiting score, need for rescue analgesics and postoperative complications were observed. Unsuccessful block requiring general anesthesia are excluded from the study.

RESULTS

Complete sensory block occurred at 8 minutes in group A and in group B the complete block occurred at 10 minutes. Group A had an earlier onset than group B. Group A recovered from sensory effect at 40 hours and group B at 44 hours completely. Group A recovered earlier than group B. Complete motor block occurred at 10 minutes in group A and group B took 14 minutes for complete motor block. There was a statistically significant difference between two groups at 10 minutes (P value 0.006) and 14 minutes (P value=0.006). Group A recovered completely at 28 hours and group B at 32 hours. Group A (P value=0.002) and group B (P value=0.093) and it is statistically significant. There is a significant difference in pain (VAS) score from 4 minutes (P value <0.001) to 14minutes (P value 0.001) and from 28hrs (P value <0.0001) to 48 hrs (p value =0.011). Group A had pain relief at 8 minutes and B had at 10 minutes and group B had better pain score for prolonged time (44 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 had more duration of analgesia (44 hours) than group A (40 hours) 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

Intraclavicular subcoracoid brachial plexus square is statement of neighbourhood sedative at the string level where all the nerves providing upper appendage lie in a minimal way to get anesthetized totally absent a lot of difficulties than other methodology 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.^[5] 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.^[3] 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] Ekmeckzi 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.^[3,4] Kasturi et al.¹⁰ in supraclavicular route, Lee et al in interscalene route and Gunduz et al.⁷ 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 Khaleed et al.^[8] They need continuous infusion for prolonged effect. Group B needed less rescue analgesics. Lee et al¹² 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 hours. Sedation score; nausea and vomiting score did not show much difference between the two groups.

CONCLUSION

Therefore, it can be concluded that Continuous infusion of 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 longer time for its onset but gives prolonged duration of analgesia and better pain score postoperatively.

REFERENCES

1. Sandhu NS, Capan LM. Ultrasound-guided infraclavicular brachial plexus block. *Br J Anaesth.*2002;89:254–9.
2. Apan A, Ozcan S, Buyukkocak U, Anbarci O, Basar H. Perioperative intravenous adenosine infusion to extend postoperative analgesia in brachial plexus block. *Eur J Anaesthesiol.* 2003;20:916–9.
3. Dogru K, Yildirim D, Ulgey A, Aksu R, Bicer C, Boyaci A. Adding magnesium to levobupivacaine for axillary brachial plexus block in arteriovenous fistule surgery. *Bratisl Lek Listy.* 2012;113:607–9.

4. Choi IG, Choi YS, Kim YH, Min JH, Chae YK, Lee YK, et al. The Effects of Postoperative Brachial Plexus Block Using MgSO₄ (4) on the Postoperative Pain after Upper Extremity Surgery. *Korean J Pain*. 2011;24:158–63
5. Fukunaga AF, Alexander GE, Stark CW. Characterization of the analgesic actions of adenosine: Comparison of adenosine and remifentanyl infusions in patients undergoing major surgical procedures. *Pain*. 2003;101:129–38.
6. Gan TJ, Habib AS. Adenosine as a non-opioid analgesic in the perioperative setting. *Anesth Analg*. 2007;105:487–94.
7. Gunduz A, Bilir A, Gulec S. Magnesium added to prilocaine prolongs the duration of axillary plexus block. *Reg Anesth Pain Med*. 2006;31:233–6.
8. Mohammed KM, Amnar AS. USG guided continuous infusion in infraclavicular block using bupivacaine alone and combined with adenosine for pain control in upper extremity surgeries. *Saudi J anaesth* 2011;5(2):132-37.
9. Ekmekci P, Bengisun ZK, Akan B, Kazbek BK, Ozkan KS, Suer AH. The effect of magnesium added to levobupivacaine for femoral nerve block on postoperative analgesia in patients undergoing ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2013;21:1119–24.
10. Mukherjee K, Das A, Roy S. Evaluation of magnesium as adjunct in ropivacaine induced supraclavicular brachial plexus block-a prospective, double blinded randomised study. *J Res Pharm Pract* 2014;3(4):123-129.
11. Apan A, Ozcan S, Buyukkocak U, Anbarci O, Basar H. Perioperative intravenous adenosine infusion to extend postoperative analgesia in brachial plexus block. *Eur J Anaesthesiol*. 2003;20:916–9.
12. Lee AR, Yi HW, Chung IS, Ko JS, Ahn HJ, Gwak MS, et al. Magnesium added to bupivacaine prolongs the duration of analgesia after interscalene nerve block. *Can J Anaesth*. 2012;59:21–7.

