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Original Research Paper

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DEXMEDETOMIDINE AS ADJUVANT TO ROPIVACAINE FOR SUPRACLAVICULAR BLOCK IN UPPER LIMB SURGERIES

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ABSTRACT This study evaluated the efficacy of Dexmedetomidine as an adjuvant when added to Ropivacaine for Supraclavicular blocks done for upper limb surgeries. Sixty patients were divided into two groups of thirty each, one of whom received Ropivacaine only and the other received Ropivacaine and Dexmedetomidine at a dose of 1mcg/Kg. Results showed that The mean duration of analgesia in the Dexmedetomidine group was 726.66 minutes while in the Ropivacaine only group it was 542.33 minutes. The addition of dexmedetomidine to ropivacaine in the brachial plexus block led to a longer duration of analgesia. Also seen were improved VAS scores. There were no complications observed in the study.

KEYWORDS : Supraclavicular block, Dexmedetomidine, Upper limb surgery, Brachial block, Ropivacaine

INTRODUCTION

The Supraclavicular brachial plexus block provides ideal operative conditions by good muscle relaxation, stable hemodynamics and intraoperative analgesia, for upper limb surgeries.It has an anatomical advantage of tightly grouped nerve bundles whenblocked by a single injection gives a very rapid onset. Ultrasound-guided enables the needle to be correctly positioned and monitor the administration of drugs.Various adjuvants have been evaluated to prolong the block and shorten onset time of the blockade since local anaesthetics, when used alone do not offer a longer duration. Ropivacaine with less cardiovascular and neurotoxicity due to its stereo selective properties and less lipophilicity, is an ideal local anesthetic. Dexmedetomidine is a α-2 agonist. It is highly selective for α_2 adrenoreceptor and is used as adjuvant to shorten the onset time and prolong the duration of block and analgesia. The present study evaluated the efficacy of Dexmedetomidine as an adjuvant when added to Ropivacaine in Supraclavicular blocks for upper limb surgeries.

METHODS

A randomised prospective controlled trial was performed after ethical clearance on sixty patients of age 18 and above, weighing 40 to 70kg, ASA I and II undergoing elective mid-humerus, elbow, forearm and hand surgery. Patients having drug hypersensitivity, coagulopathy and severe systemic disorders were excluded. They were divided into two groups of thirty each Group R(n=30): who received brachial plexus block with 30 ml of 0.5% of Ropivacaine +0.5ml normal saline (total volume 30.5 ml) and Group RD(n=30): who received brachial plexus block with 30 ml of 0.5 % of Ropivacaine with Dexmedetomidine1microgram/kg. (Approximately 50 microgram or 0.5 ml) (Total volume 30.5 ml).

Written informed consent was obtained and was kept fasting for duration of 8 hours. Patient received Tablet Ranitidine 150 mg orally 2 hours prior to surgery. Standard monitors were placed. Intravenous line was secured. Patients were sedated with Intravenous Midazolam 0.02 mg/kg body weight. The patients were positioned supine with arm by the side and the head turned 45° to the contralateral side. After sterile precautions, from the head end, in the coronal oblique plane, the probe was kept in the supraclavicular fossa. The subclavian artery was identified using its hypoechoic and pulsatile nature. The probe was manipulated to bring in view the artery, rib, pleura, and plexus simultaneously. The needle was guided inferior to the first rib, medial to the subclavian artery and superior to the nerves after local skin infiltration. The needle was entered in-plane from lateral plexus which was visualized. The local anaesthetic solution was injected after aspiration, and spread was seen encircling the trunks. After injection adequacy of block was tested.

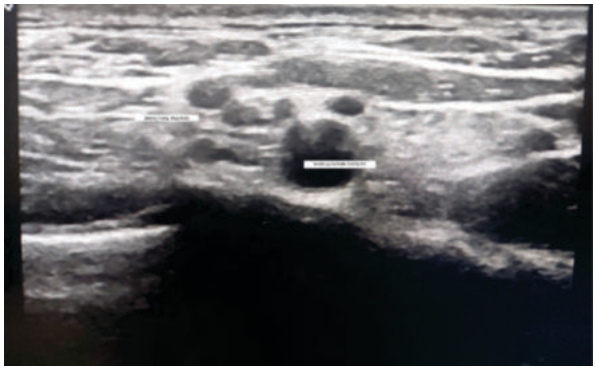


Figure 1: Ultrasonographic Anatomy Of The Brachial Plexus. The Upper, Middle And Lower Trunks Are Clearly Seen.

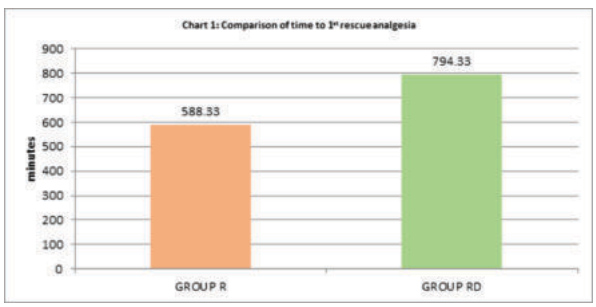
Sensory block was evaluated by pin prick method in the dermatome areas corresponding to median, radial, ulnar and musculocutaneous nerves until the completion of sensory blockade. Evaluation of motor block was done by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), flexion of the elbow in supination, and pronation of the forearm (musculocutaneous nerve).Sedation of patient was assessed by the Ramsay sedation scale.Patients were assessed for duration of analgesia as per VAS. After the surgery, it was monitored every 1 h until the score reaches 5. The rescue analgesia was given with diclofenac injection when the VAS reaches 5 and the time of the injection was recorded.

All patients are observed for any side effects such as nausea, vomiting and complications such as pneumothorax, hematoma and local anaesthetic toxicity in the intra and post-operative periods.Time interval between the completion of local anaesthetic solution administration and the complete resolution of anaesthesia on all nerves is known as the duration of sensory block. The time interval between the completion of local anaesthetic administration and the recovery of complete motor function is the duration of motor block. A VAS consists of a line, often 10 cm long, with verbal anchors at either end. In the numerical scale, 0 corresponds to no pain and 10 designate the worst possible pain. The parameters of age, weight, total time taken for surgery, heart rate, blood pressure, oxygen saturation, time taken forsensory and motor blockade, offset time for sensory and motor blockade and total time of analgesia were analysed by

independent t-test. Chi-square test was used for sex and ASA. A p value of < 0.05 was considered statistically significant.

RESULTS

The two groups were comparable by age, height ,weight and ASA category.The pulse rate, systolic BP, and diastolic BP were recorded at intervals of 0, 2, 5, 10, 15, 30, 60, and 120 minutes. In group R and RD, there was no difference in pulse rate, systolic BP, and diastolic BP till 10 minutes. In group RD, the pulse rate, systolic BP, and diastolic BP reduced after 15 minutes onwards, which is statically significant.In group R, the mean time to the first rescue analgesic request was 588.33 minutes with a standard deviation of 50.47. In group RD, it was 794.33 minutes with a standard deviation of 80.236. More patients in Group R required rescue analgesia than Group RD (p <0.0001). The mean VAS score at 12 and 24 hours is statically significant (p value<0.0001) between the Groups. No complications like nausea, vomiting, bradycardia, hypotension, hematoma, or pneumothorax were observed in both groups.The use of dexmedetomidine in the RD group caused a significant fall in pulse rate, systolic BP, and diastolic BP after 15 minutes onwards. Its use should be with caution in patients with risks of hemodynamic instability.The mean duration of analgesia in the RD group was 726.66 minutes with a standard deviation of 72.35, while in the R group it was 542.33 minutes with a standard deviation of 58.119. The addition of dexmedetomidine to ropivacaine in the brachial plexus block led to a longer duration of analgesia.



DISCUSSION

Supraclavicular brachial plexus block is preferred for its rapid, safe, reliable anaesthesia performed at the level of nerve trunks, where entire nerve bundles are confined. Abrahams et al concluded that ultrasound method improves the quality of blockade when compared to peripheral nerve stimulator for nerve identification[1]. Here dexmedetomidine was tried as an adjuvant to ropivacaine in ultrasound guided supraclavicular block to assess its efficacy.It has been shown thataddition of α-2 adrenergic agonist drugs improves the nerve block characteristics [2, 3]. There was no statically significant (p>0.05) difference in the patients characteristics between the two groups with regard to age, gender, weight, height, ASA score, type of surgery and duration of surgery.

The onset of sensory block was 5.63±1.168 min in group RDwhile in Group R it was 7.53±1.334 min which was statistically significant p<0.0001. This finding correlates with the finding of Esmaoglu et al, Kathuria et al , Sudani et al, Kaygusuz et al, Amay s Ammar and Mahmoudand Mangal et al[4,5,6,7,8]. In the study by Kaygusuz et al[8] study, onset of sensory blockade was 7.75 ±2.22 min in patients, who received Levobupivacaine and Dexmedetomidine (100 microgram) as compared with patients received Levobupivacaine alone(10.75+/-2.55 min). In our study the onset of motor block was early in RD group11.3±1.715 min than group R 14.066±1.965 min (p value < 0.0001). This finding is similar to the finding ofEsmaoglu et al [5]; Marhofer et al[9]and Ammar et al[10]. In Marhofer et al [9]study, onset of motor blockade was significantly earlier in patients who received Dexmedetomidine (20 microgram) in peripheral nerve block(21±15 min vs 47±36 min) .Theyfound onset was hastened by the use of Dexmedetomidine[9]. We have observed that addition of dexmedetomidine significantly shortened the onset of sensory and motor block in this study.

The mean duration of sensory blockade was 677.66±52.32 min in group RD as compared to 566.33±41.91 min in group R (p value < 0.0001).Similarly, Patki et all[11] showed the mean of total duration of sensory blockade in group R was 566.67 ± 24.89 minutes and in group RD was 728.83± 10.23 minutes which was statistically significant (p value < 0.001).This finding also corroborates with the finding of Gugrala et al[12] and Das et al[13]. The mean duration of Motor blockade was 597.66±43.41 min in group RDwhile in group R it was502±66.82 min (p value < 0.0001). Similarly, in study of Patki et al[11];the duration of motor blockade in group R was 462.83±15.01 minutes and in group RD was 608.83±10.23 minutes (p value <0.005).

In our study the mean duration of analgesia was 726.66±72.35 min in Group RD and 542.33±58.119 min in Group R (p value < 0.0001). Esmaoglu et al [5]observed (p value < 0.05) longer duration of post operative analgesia in Dexmedetomidine group as compared with plain Levobupivacaine. Kaygusuz et al[8] observed that the postoperative duration of analgesia was 1279.54 +/-138.42 min in Dexmedetomidine group as compared with Levobupivacaine (736.80 +/- 45.31 min). added to ropivacaine increased the duration of dense sensory blockade and time for return to normal sensory function in a dose- dependent fashion (p< 0.005) [14].

Dexmedetomidine acts on α-2 receptor and inhibit the firing of nociceptive neurons stimulated by peripheral Aα and C fibres; it also inhibits the release of the nociceptive neurotransmitter substance P. This is responsible for its potentiation of analgesic effect of local anaesthetics.

Mean sedation scores in Group RD was 2.4±0.489 while in Group R it was1.83±0.372which was statically significant (P value<0.0001). No patient in Group RD required sedation intraoperatively. They were under comfortable arousable sedative effect. The sedative effect of perineural dexmedetomidine may be due to the partial vascular uptake of dexmedetomidine and its transport to the central nervous system where it acts and produces sedation.The VAS score in Group RD at 12 and 24 hours was 4.366±0.481 and 8.066±0.727 respectively and in Group R it was 6.733±0.771 and 9.466±0.498 respectively. The difference in two groups was statically significant (P value<0.0001). Similarly, the study conducted by Liu et al[15]showed that Group RD was associated with a significantly greater reduction of VAS scores at 8 to 24 hours postoperatively as compared to Group R.

In this study the hemodynamic parameters were maintained. The heart rate, systolic blood pressure and diastolic blood pressure remained stable throughout the surgery and postoperatively. There was no clinically significant difference, but statistically significant difference was observed in heart rate, SBP and DBP in Group RD after 15 minutes of induction. After 30 min the decrease in heart rate, SBP and DBP was not statistically significant (p value>0.005). Rancourt et al[16], Kaygusuz et al[8], Swami et al[17], observed similar haemodynamic condition in their studies. In all these studies heart rate and mean arterial pressure was decreased in Dexmedetomidine group but no patient required treatment. Bradycardia (heart rate less than 60/min) was not observed in any patients in two group This is in contrast to the study conducted by Das et al[13] and Kathuria et al[6] where Bradycardia was observed in Group RD, which responded to single dose of injection atropine sulphate.

There was no incidence of nausea and vomiting. Hypotension was not seen in any of the patientwhich is similar to study conducted by Das et al[13].Patient acceptance was good and no

complications were observed at postoperative follow-up in either group in our study.

CONCLUSION

Dexmedetomidine is a □-2 agonist which can be used to augment the quality of supraclavicular brachial plexus block when use in conjunction with local anaesthetic.At a dose of 1microgram/kg added to local anaesthetic solution, itshortens the onset time and prolongs the duration of block with improved VAS scores following upper limb surgeries with supraclavicular brachial plexus block.

REFERENCES

1. Abrahams MS, Aziz MF, Fu RF, Horn JL. Ultrasound guidance compared with electrical neurostimulation for peripheral nerve block: A systematic review and meta-analysis of randomized controlled trials. Br J Anaesth 2009;102:408-17.
2. Singh, S., & Aggarwal, A.A randomized controlled double-blinded prospective study of the efficacy of clonidine added to bupivacaine as compared with bupivacaine alone used in supraclavicular brachial plexus block for upper limb surgeries. Indian J Anaesth, 2010; 54: 552-7.
3. Yoshitomi, T., Kohjitani, A., Maeda, S., Higuchi, H., Shimada, M., &Miyawaki, T. Dexmedetomidine enhances the local anesthetic action of lidocaine via an alpha-2A adrenoceptor. AnesthAnalg, 2008; 107, 96-101.
4. Mangal V, Mistry T, Sharma G, Kazim M, Ahuja N, Kulshrestha A. Effects of dexmedetomidine as an adjuvant to ropivacaine in ultrasound-guided supraclavicular brachial plexus Block: A prospective, randomized, double-blind study. J Anaesthesiol Clin Pharmacol 2018; 34:357-61.
5. Esmaoglu, A., Yegenoglu, F., Akin, A., & Turk, C.Y. Dexmedetomidine added to levobupivacaine prolongs axillary brachial plexus block. AnesthAnalg, 2010;111:1548-51.
6. Kathuria S, Gupta S, Dhawan I. Dexmedetomidine as an adjuvant toropivacaine in supraclavicular brachial plexus block. Saudi J Anaesth 2015; 9:148-54.
7. Sudani C, Rao SM, Munta K. A comparative study of ropivacaine alone versus ropivacaine with dexmedetomedine in supraclavicular brachial plexus block. Anesthesiol Open J. 2016; 1:28–34.
8. Kenan Kayagusuz, Iclal OzelemirKol, CevdetDuger, UlkuKayacan. Effects of adding dexmedetomidine to levobupivacaine in axillary brachial plexus block. Curr Ther Res. 2012(June);vol 73;103-111.
9. Marhofer D., Kettner SC, Marhofer P, Pils S, Weber M, Zeitlinger M Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block. BJA 2012; Vol.110: 438-442.
10. Amany S Ammar, Khaled Mahmoud USG guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery; Saudi Journal of Anaesthesia. 2012; vol6: 109- 114.
11. Patki, Y.S., Bengali, D.R., & Patil, D.T. Efficacy of Dexmedetomidine as an adjuvant to 0.5% Ropivacaine in Supraclavicular Brachial Plexus Block for Postoperative Analgesia. Int J Sci Res.2015;4:2345.
12. Gurajala I, Thipparampall AK, Durga P, Gopinath R. Effect of perineural dexmedetomidine on the quality of supraclavicular brachial plexus block with 0.5% ropivacaine and its interaction with general anaesthesia. Indian J Anaesthesia. 2015;59(2):8995.
13. Das A, Majumdar S, Halder S, Chattopadhyay S. Effect of dexmedetomidine as adjuvant in ropivacaine-induced supraclavicular brachial plexus block: A prospective, double-blinded and randomized controlled study. Saudi J Anaesth. 2014; 8:72–7.
14. Brummett, C.M., Padda, A.K., Amodeo, F.S., Welch, K.B., &Lydic, R. (2009). Perineural dexmedetomidine added to ropivacaine causes a dose-dependent increase in the duration of thermal antinociception in sciatic nerve block in rat. Anesthesiology, 111, 1111-9. 21.
15. Liu, Z., Jiang, M., Xu, T. et al. Analgesic effect of Ropivacaine combined with Dexmedetomidine on brachial plexus block. BMC Anesthesiol 18, 107 (2018).
16. Rancourt MP, Albert NT, Cote M, Letourneau DR, Bernard PM. Posterior tibial nerve sensory blockade duration prolonged by adding dexmedetomidine to ropivacaine. AnesthAnalg. 2012; 115:958–62.
17. Swami SS, Keniya VM, Ladi SD, Rao R. Comparison of dexmedetomidine and clonidine (α2 agonist drugs) as an adjuvant to local Anesthesia in supraclavicular brachial plexus block: A randomised double-blind prospective study. Indian J Anaesth. 2012;56:243-9.