Section: Anaesthesiology

Original Research Article

A COMPARATIVE STUDY BETWEEN DEXMEDETOMIDINE AS ADJUVANTS WITH BUPIVACAINE AND BUPIVACAINE ALONE IN ULTRA SOUND GUIDED SUPRA CLAVICULAR BRACHIAL PLEXUS BLOCK IN UPPER LIMB SURGERY

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Received : 30/05/2024
Received in revised form : 25/07/2024
Accepted : 09/08/2024

Keywords:
Lignocaine, Supraclavicular Brachial Plexus Block, Dexmeditomedine.

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DOI: 10.47009/jamp.2024.6.4.230

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

Int J Acad Med Pharm
2024; 6 (4); 1157-1160

Abstract

Background: Brachial plexus block provides surgical anaesthesia for elbow, forearm and hand surgeries, also ensures adequate post operative analgesia. Addition of adjuvants such as opiods and non-opiods to local anaesthetics have been found to improve the quality of the block in various literatures. The role of dexmeditomedine in block prolongation has also been highlighted in few studies. The study was to compare the onset and duration of sensory, motor blockade and post operative analgesia with bupivacaine alone and dexmedetomidine as an adjuvant with bupivacaine in supraclavicular block. **Materials and Methods:** The study employed 100 consented patients of either sex, ASA I & II scheduled for upper limb surgeries and were given brachial plexus block via classical supraclavicular approach. The patients were randomly divided into two groups of 50 each -Group A (n=50) received inj. 0.5% Bupivacaine (30ml) with Normal Saline and Group B (n=50) received inj. 0.5% Bupivacaine (30ml) with 1µgm/kg Dexmedetomidine during the block. The onset and duration of sensory block, motor block and side effects were assessed and recorded. **Result:** The study showed that the onset of sensory and motor blockade was 9.51 minutes Vs 4.24 minutes and 10.55 minutes Vs 5.21 minutes in Group A and B respectively which were statistically significant. Thus, the onset of sensory and motor block was faster in group B compared to group A.The duration of sensory were significantly prolonged in Group B (11.23 hours) as compared to Group A (7.84 hours) with a p-value of <0.0001 as also the motor block which were significantly longer in Group B (9.51 hours) as compared to Group A (7.04 hours) with a p-value of <0.0001. No significant side effects were observed in this study. **Conclusion:** Dexmedetomidine provided a faster onset of sensory and motor block, longer duration of sensory and motor blockade, when used as an adjuvant to Bupivacaine, as compared to plain Bupivacaine in supraclavicular brachial plexus block without any significant side effects.

INTRODUCTION

Brachial plexus block is a regional anaesthetic procedure for upper limb surgeries, consisting of injecting local anaesthetic drugs in the fascial planes surrounding the nerve plexus, blocking the autonomic, sensory and motor fibers supplying the upper extremity. It is simple, safe and effective technique of anaesthesia with distinct advantages over general anesthesia as it preserves consciousness, avoids airway instrumentation, provide rapid recovery and significant post operative analgesia. A regional technique is considered whenever the patient's general condition is poor, or the patient is not adequately prepared or in the presence of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

associated conditions like uncontrolled diabetes, cardiovascular or respiratory diseases.[1]

Supraclavicular brachial plexus block also known as "spinal anaesthesia of the upper extremity" is a popular mode of anaesthesia for various upper limb surgeries, due to its effectiveness in terms of cost, performance, margin of safety and good post operative analgesia.[1] It also provides rapid onset, dense anaesthesia of the arm with a single injection.[2] When using a landmark technique for regional blockade, poor localization of nerves can result due to anatomical variation or trauma to the region resulting in failed anaesthesia and complications. In the upper limb, surface ultrasound can clearly identify neural elements of the brachial plexus and surrounding structures.[3-10] Ultrasound guided brachial plexus block has the advantages of accurate nerve localization with minimal attempts, visualization of brachial plexus, blood vessels, needle and local anaesthetic spread.[2]

Various adjuvants can prolong the duration of post operative analgesia and reduces the requirement of systemic analgesia, however the ideal adjuvants are yet to be discovered. Bupivacaine is an amino-amide anaesthetic, because of the amide bond linking aromatic head and hydrocarbon chain, amino-amide anaesthetics are more stable with less chance of allergic reactions with prolonged block and analgesic effects. Dexmedetomidine is highly selective □2 adrenergic agonist. Some studies have suggested that it prolongs the block duration and post operative analgesia when added to local anaesthetics.[11-17]

Very few trials were done to study the efficacy of using dexmedetomidine as an adjuvant in supraclavicular block. We decided to study the onset and duration of sensory and motor blockade, postoperative analgesia, hemodynamic effects using Dexmedetomidine in combination with local anaesthetic bupivacaine.

The primary objective of the study was to compare the onset and duration of sensory, motor blockade and post operative analgesia with bupivacaine alone and dexmedetomidine as an adjuvant with bupivacaine in the supraclavicular brachial plexus block.

MATERIALS AND METHODS

The study was a prospective, randomized clinical trial study conducted in the Department of Anesthesiology at Regional Institute of Medical Sciences, Imphal, Manipur from January 2021 to December 2022. The Institutional Ethics Committee approved the study and written informed consent was obtained from all the patients.

A total of 100 consented adult patients were randomly allocated into two groups (n=50) using a computerized random number table. Patients with American Society of Anaesthesiologists (ASA) grade I and II, between the age 18 and 60 years, both gender, who underwent elective surgeries of elbow, forearm and hand were included in the study.6 Patients with hypertension, diabetes mellitus, neuropathy or with coagulopathy or on anticoagulants, infection at the site of block, several renal, hepatic, respiratory and cardiac diseases, pregnancy and neuromuscular disorders were excluded. Any contraindication to bupivacaine, dexmedetomidine and patient refusal were also excluded.

Patients were divided into two groups and as per computer generated randomization they were made to receive either (group A) 30ml of 0.5% bupivacaine with normal saline or (group B) to receive 30ml of 0.5% bupivacaine with 1µgm/kg dexmedetomidine for the supraclavicular brachial plexus block. Blinding was done at the level of the patients and investigators.

Pre anaesthetic assessment included detailed history, general examination, systemic examinations, airway examination and necessary routine investigation. All the patients received tab-alprazolam 0.5mg night before surgery, and 8 hours of pre operative fasting was ensured. Preoperative basic vitals were recorded. One 18G IV cannula was secured. Premedication was given with Inj. Ondansetron 4mg Iv, Inj. Pantoprazole 40 mg IV.

After aseptic and antiseptic precautions, skin infiltration was done with 3ml 2% Lignocaine. Under the ultrasound guidance supraclavicular brachial plexus block was performed by in plane technique with local anaesthetic and adjuvant according to study groups. The onset of sensory and motor blockade were assessed every 2 minutes until complete sensory and motor block (Hollmen scale)7 were assesed. Onset of sensory block were measured as minimum of Hollmen scale 3 and complete block as scale 4. Duration of sensory block was measured as the time interval between Hollmen scale 3 to onset of pain in post operative period. The onset of motor block was also measured as Hollmen scale 3 and complete motor block as scale 4 while the duration of motor block measured from Hollmen scale 3 to recovery of muscle power.

Complications such as hypotension, bradycardia, arterial puncture, pneumothorasic, Horner's syndrome, local anaesthetic toxicity, were noted. Heart rate, respiratory rate, blood pressure, oxygen saturation were monitored every 5 minutes to 30 minutes and then every 15 minutes.

Sample size was calculated based on the study of Bijapur et al6 where we enrolled 50 patients for each group with □ value of 0.05 and power of 90%. Collected datas were entered in SPSS software version 21.0 for windows. Mean ± standard deviation were used to express the continuous data and categorical data were expressed in frequencies. Continuous and categorical variables were analyzed by Student 't' test and chi square test respectively and P-value <0.05 was considered as statistically significant. Approval from the Research Ethics Board of RIMS, Imphal vide order no A/206/REB-Comm (SP)/RIMS/2015/661/03/2020 and Clinical Trial Registry of India were obtained before the start of the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

study. Collected data were kept password protected. Only the investigator and the co-investigators had access to the data.

RESULTS

All the enrolled patients completed the study protocol. The demographic parameters such as age, sex and weight were comparable in two study groups and statistically not significant as shown in [Table 1]. The onset of sensory blockade and motor blockade, as shown in table 2, were significantly higher in Group A in comparison to Group B, with a p-value of 0.001 and 0.012 respectively in between the two Groups. The duration of sensory blockade (p-value < 0.001) and motor blockade (P<0.0001), were also higher in Group B in comparison to Group A and statistically significant. It indicates that onset of sensory and motor blockade in Group A was prolonged than Group B. The adverse effects were comparable in between both the Groups, but 3 patients in Group B showed episodes of bradycardia and hypotension which was statistically not significant.

Table 1: Comparison of patient characteristics (N=100).

Variables	Sub variables	Group A (n=50)	GroupB (n=50)	P value
Mean age in years		36.23 ± 13.83	41.7 ± 11.48	0.10
Weight in kg		65.23 ± 8.78	64.73 ± 8.64	0.8/2
Sex	Male	25	30	0.43
	Female	25	20	

P<0.05 is Significant

Table 2: Comparison of onset time and duration (minutes) of sensory and motor blockade (N=100)

Parameters	Sub variable	Group A (n=50)	Group B (n=50)	p-value
Onset (minutes)	Sensory	9.23 ± 1.82	4.41 ± 1.63	0.001
	Motor	10.22 ± 1.7	5.41 ± 1.8	0.012
Duration (minutes)	Sensory	554 ± 50.52	786 ± 58.28	<0.001
	Motor	422 ± 50	616 ± 56	<0.0001

P<0.05 is Significant

DISCUSSION

Brachial plexus block provides surgical anaesthesia for elbow, forearm and hand surgeries, also ensures adequate post operative analgesia. Bupivacaine is a long acting amide local anaesthetic. Addition of adjuvants such as opiods and non-opiods have been found to improve the quality of regional anaesthesia8. Dexmedetomidine have been reported to provide a faster onset of sensory and motor block, longer duration of sensory and motor blockade, when used as an adjuvant to Bupivacaine in supraclavicular brachial plexus block.

The present study recorded the onset of sensory blockade was 4.41±1.63 minutes in Group B and 9.23±1.82 minutes in Group A. This result is consistent with the observation of Hamed et al8 who observed the onset of sensory blockade as 5.75±2.2 minutes in Dexmedetomidine group and 6.85±2.4 minutes in Bupivacaine with Fentanyl group in supraclavicular brachial plexus block.

The onset of motor blockade was 10.22±1.7 minutes in the Bupivacaine group and 5.41±1.8 minutes in Dexmedetomidine group in our study and were consistent with the observation of Kaur et al9 who observed the onset of motor blockade quicker in Dexmedetomidine group (8.075±0.27 minutes) when compared with Fentanyl group (9.73±0.54 minutes). Duration of sensory blockade in our study was prolonged in the Dexmedetomidine group (786±58.28 minutes) as compared to Group A (554±50.52 minutes), with a p-value of < 0.001. This result is in corroborative with the observation of Chinnappa et al,[10] where the duration of sensory blockade were 400.8±86.6 minutes in bupivacaine only group, and 630.6±208.2 minutes in bupivacaine with dexmeditomedine group respectively.

The duration of motor blockade in our study was 616±56 minutes in Group B, and 422±50 minutes in Group A, with a p-value of < 0.0001. This result is consistent with the observation of Dharmaro et al,[11] where the duration of motor blockade were 649.56±42.73 minutes in Dexmedetomidine group and 456.75±32.93 minutes in Fentanyl group respectively.

The limitation of our study, was that the actual duration of sensory and motor blockade was not evaluated by electromyography or nerve conduction velocity. Patients in the pediatric and geriatric age groups were also not included. The needs for studies with other ASA physical status needs to be evaluated. The plasma level of study drugs was also not measured.

CONCLUSION

Dexmedetomidine provides significantly faster onset of sensory and motor blockade, prolonged duration of sensory and motor blockade with prolonged post operative analgesia and stable hemodynamic parameters, when used as an adjuvant with bupivacaine in supraclavicular brachial plexus block.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556