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COMPARISON OF EFFECT OF 0.25% BUPIVACAINE ALONE AND 0.25% BUPIVACAINE WITH DEXMEDETOMIDINE IN BRACHIAL PLEXUS BLOCK THROUGH SUPRACLAVICULAR APPROACH

Anaesthesiology

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ABSTRACT

BACKGROUND AND AIM: Brachial plexus block is a safe, effective, low-cost anesthesia with good postoperative analgesia. Adjuvants to local anesthetics may enhance the quality and duration of analgesia. The aim of the study was to study the efficacy of a combination of 0.25% bupivacaine alone versus 0.25% bupivacaine and dexmedetomidine in brachial plexus block by supraclavicular approach.

METHODS: This is a prospective double-blind study conducted on sixty patients of ASA1 and ASA 2 posted for upper limb surgeries, randomized in a double-blind fashion into two groups. Group A (N-30) received 34ml of 0.25% bupivacaine with 0.5ml of distilled water and group B (N-30) received 0.5ml dexmedetomidine (50 µg) with 34ml of 0.25% bupivacaine as supraclavicular brachial plexus block with help of a nerve stimulator. Onset and recovery time of sensory and motor block, duration of analgesia, sedation scores, quality of block, and side effects compared in both groups.

RESULTS: Baseline characteristics were well matched in both groups. The intraoperative hemodynamic recording was done at 15 min time intervals from the administration of the drugs. There was a reduction in heart rate, systolic blood pressure, and diastolic blood pressure 30 mins onwards in both groups. There was no significant difference in the onset of sensory and motor blocks. Duration of sensory block was 299.57 ± 35.94 mins in Group A and 782.2 ± 82.76 mins in Group B, duration of motor block was 272.17 ± 37.31 mins versus 755.63 +/- 86.6 mins respectively, total duration of analgesia was 321 ± 35.46 mins versus 815.80 +/- 88.1 mins respectively. Ramsay sedation score was similar at arrival in both groups but in post-op, the score of 3 was noted in 0% (0/ 30) in Gr A and 93.3% (28/ 30) in Gr B . Quality of analgesia was also better in Group B. There were no significant adverse events noted in both groups.

CONCLUSION: This double-blind Randomized Controlled study showing the combination of dexmedetomidine 50 µg with 34ml of 0.25% bupivacaine is better than 0.5ml of distilled water with 34ml of 0.25% bupivacaine in the duration of sensory and motor block, with better sedation and quality of analgesia with the good safety profile in brachial plexus block by supraclavicular approach.

KEYWORDS

Brachial plexus block, Dexmedetomidine, Bupivacaine, Adjuvants

INTRODUCTION

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.[1] Peripheral nerve blocks provide longer and more localized pain relief than neuraxial techniques while also avoiding the side effects of systemic medication.

Regional anesthesia has been used ever since Percy first proposed the use of cocaine as a topical anesthetic in 1856.[2] Regional anesthesia denotes interruption of pain impulse by physiological blockade at a certain point along their pathway of transmission in peripheral nerves.

The brachial plexus nerve block was reported first accomplished by Halsted, when "freed of cords and nerves of the brachial plexus after blocking the nerve roots in the neck with cocaine solution.[3] Herschel[4] introduced axillary and supraclavicular techniques. Most of the local anesthetic agents developed between 1900-1940 were basically amino ester compounds. They lost their importance due to the short duration of action, associated allergic reactions, and systemic toxicity. In 1957 Ekenstam synthesized bupivacaine, an amide local anesthetic, and was first clinically used in 1963 by Telivuo.[5] There has always been a search for adjuvants to the regional block with drugs that prolongs the duration of analgesia with lesser adverse effects.[6] Many drugs have been tried like opioids, clonidine, hyaluronidase, dexamethasone, midazolam.[7] Alpha 2adrenergic receptor agonists have been tried either alone or in combination with another drug to prolong anesthesia in various methods of anesthetic administration like epidural, intrathecal and regional nerve blocks.[6] Dexmedetomidine is an α2 receptor agonist and its α2/α1 selectivity is 8 times more than clonidine.[2] Several studies have found dexmedetomidine to be safe and effective in various neuraxial and regional anesthesia in humans including intrathecal and IV regional anesthesia with lesser side effects.[8,9]

The aim of this study is to evaluate the effect of the addition of dexmedetomidine to 0.25% bupivacaine in the brachial plexus block.

OBJECTIVES –

1.To study the effects of 0.25% bupivacaine in brachial plexus block

2.To study the effects of 0.25% bupivacaine with dexmedetomidine in brachial plexus block

3. To compare the effects of 0.25% bupivacaine with dexmedetomidine and 0.25% bupivacaine alone in brachial plexus block

MATERIALS AND METHODS-

The study was conducted on 60 Adult patients in the age group of 18-60 years belong to ASA 1 & 2 scheduled for upper limb surgeries admitted in santhiram medical college and general hospital from December 2020 to May 2021.

METHODOLOGY-

Study type- Prospective Randomised, double-blind study

Study duration – 6 months

Sample size- 60 patients selected using a purposive sampling technique

INCLUSION CRITERIA - Undergoing orthopedic surgeries on upper limb

1. ASA(American Society of Anaesthesiologists) grade 1 and 2
2. Between the ages of 18-60years, of either sex
3. people willing to give consent

EXCLUSION CRITERIA-

1. Known hypersensitivity to local anesthetics.
2. Uncontrolled diabetes Miletus
3. Pregnant woman
4. Pre-existing peripheral neuropathy
5. Patients with a bleeding disorder
6. ASA 3 and above
7. Refusal to participate in the study

METHODOLOGY-

After approval of the institutional ethical committee, 60 consenting patients fulfilling the inclusion criteria were considered for our study. A pre-anesthetic checkup was done for all patients which include a detailed history, general physical and systemic examination. Basic investigations were done (Hb%, complete blood counts, bleeding time, clotting time, random blood sugar, serum urea, serum creatinine, if age is above 45yrs then ECG). Patients were kept nil per oral overnight. (8 hrs for solid food)

Selected patients were divided randomly into two groups using the "slips in a box technique" of 30 each, with

GROUPA: 34ml of 0.25% Bupivacaine with 0.5ml distilled water
GROUP B : 34ml of 0.25% Bupivacaine with 0.5ml(50µg) dexmedetomidine

On arrival in the operating room, baseline heart rate, blood pressure, and oxygen saturation were recorded. An intravenous line was secured in the unaffected limb and ringer lactate was started. All the patients received brachial plexus block through the supraclavicular approach by an experienced anaesthesiologist different from the one who assessed the patient intra and postoperatively. Both were blinded to the treatment groups. Each patient was made to lie supine without a pillow, arms at the side, head turned slightly to the opposite side with the shoulders depressed posteriorly and downward by molding the shoulders over a roll placed between the scapulae. The supraclavicular area was aseptically prepared and draped. The anesthesiologist stood at the side of the patient to be blocked, facing the head of the patient.

An intradermal wheal was raised approximately 1cm superior to the clavicle above the midclavicular point. The subclavian artery palpable in the supraclavicular fossa was used as a landmark. Neural localization was achieved by using a nerve locator connected to a 22G, 50mm long stimulating needle. The location endpoint was a distal motor response with an output lower than 0.5mA in the median nerve region. Following negative aspiration, 34 ml of local anesthetic drug with dexmedetomidine or distilled water as mentioned above was injected.

The sensory block will be assessed by pinprick test using a 3-point scale
0 Normal sensation
1 Loss of sensation of pinprick(analgesia)
2 Loss of sensation of touch(anesthesia)

The motor blockade will be done using Bromage three-point score
1 Normal movement
2 Decreased motor strength with the ability to move fingers only
3 Complete motor block with an inability to move fingers
Sensory and motor blocks were evaluated every 3 minutes until 30minutes after injection.

Onset time of sensory block was defined as the time interval between the end of total local anesthetic administration and complete sensory block.

Duration of sensory block was defined as the time interval between the end of local anesthetic administration and the complete resolution of anesthesia on all nerves.

The onset of motor block was defined as the time interval between the end of local anesthetic administration and the complete motor block.

Duration of motor block is defined as the time interval between the end of local anesthetic administration and complete resolution of motor block.

Heart rate, systolic blood pressure(SBP), diastolic blood pressure(DBP), and oxygen saturation(SpO2) were recorded at 0 minutes,5 minutes,10 minutes,15minutes,30 minutes,45 minutes, 60 minutes, 90 minutes, and 120 minutes. Adverse events like hypotension (20% decrease in relation to baseline) and bradycardia (heart rate <50 beats per minute) were corrected mephenetramine in 6mg incremental doses and 0.6mg atropine respectively. Duration of motor and sensory blockade and time of the first analgesic after surgery were noted. Rescue analgesia diclofenac sodium 75mg IM was given when the patient visual analog score >5.

0 - No pain
10 - Worst possible pain

Quality of block was assessed by grading-
Grade 4(excellent)- no complaint from a patient
Grade 3(Good)- minor complaint with no need for supplemental analgesics
Grade 2(Moderate)- a complaint that required supplemental analgesia
Grade 1(Unsuccessful)- Patient is given general anesthesia

STATISTICALANALYSIS-

Data were collected and entered into Microsoft Excel and analyzed using SPSS software version 22 by appropriate statistical tests. Descriptive statistics were expressed as mean ± SD. Comparison of continuous variables was done by independent samples t-test and categorical variables were compared by Pearson's chi-square test.

The intraoperative hemodynamic monitoring in the form of heart rate, systolic blood pressure, and diastolic blood pressure was measured at different time points and compared between the two groups using repeated measures general linear model method. P-value < 0.05 was considered as significant.

RESULTS-

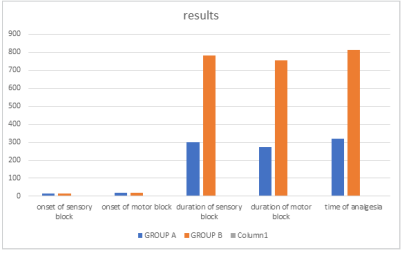
After careful assessment in the enrolment period between December 2020 to May 2021, a total of 60 patients fulfilled the inclusion and exclusion criteria and was randomized; 30 patients were assigned to the intervention limb and given 34ml of 0.25% Bupivacaine with0.5ml distilled water (Group A) and 30 were assigned to placebo limb who received 34ml of 0.25% Bupivacaine with 0.5ml(50µg) dexmedetomidine (Group B). The two study groups were well matched with respect to demographic characteristics and clinical data

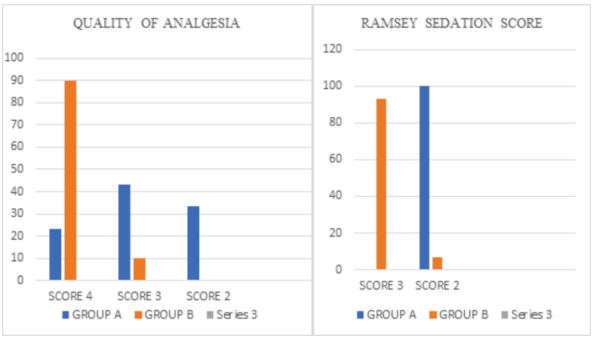
Table -1- demographic and hemodynamic variables in both groups

PARAMETER	GROUP A	GROUP B	P-VALUE
AGE(IN YEARS)	41±13.14	38.4±16.09	0.4
WEIGHT(KGS)	58.63±7.04	60.7±10.54	0.07
GENDER MALE	70%	53.3%	
FEMALE	30%	46.7%	
HEMODYNAMIC VARIABLES			
HEART RATE	75.3±9.69	75.57±11.5	0.16
SYSTOLIC BLOOD PRESSURE	129.4±13.85	125.8±13.85	0.57
DIASTOLIC PRESSURE	83.2±7.42	80.5±7.51	0.98

Table 2- comparison of onset, duration, time of analgesia, quality of analgesia, sedation in both groups

	GROUP -A	GROUP-B	P-VALUE
The onset of sensory block (mins)	15.4± 2.09	15.5 ±2.09	0.24
Onset of motor block (mins)	18.1± 2.9	18.2± 1.77	0.08
Duration of sensory block (mins)	299.57± 35.94	782.2 ±82.76	0.0001
Duration of motor block (mins)	272.17± 37.3	755.63 ±86.58	0.0001
Duration of analgesia	321 ±35.46	815.80± 87.96	0.0001
Quality of analgesia **Score 4** **Score 3** **Score 2**	 23.3 43.3 33.3	 90 10 0	0.0001
Ramsay sedation score **Score 3** **Score 2**	 0 100	 93.3 6.7	0.0001





Adverse drug reactions-

The safety profile of using dexmedetomidine along with bupivacaine (GroupB) and only bupivacaine alone (GroupA) was carefully assessed. Only 2 (6.7%) patients in each group had bradycardia and the remaining patients developed no side effects such as heart block, arrhythmias, and hypotension, etc. There was no statistical difference between the two groups. (p- 1.000).

DISCUSSION-

Pain relief is of paramount importance in anesthesia. Peripheral nerve blocks are known for their perioperative analgesia, without the side effects of general anesthesia. There has always been a search for adjuvants to prolong the duration of analgesia and to improve the quality of the block.

Alpha 2 adrenergic agonist activity has been exploited for more than 100yrs. Various routes of administration such as epidural, intrathecal, and peripheral injections have been tried with local anesthetics to prolong and intensify the anesthesia. In this randomized, double-blind study, we compared dexmedetomidine with bupivacaine versus bupivacaine alone in supraclavicular brachial plexus block and found that the duration of sensory and motor blockade was significantly prolonged. There was improved quality of block, sedation, and hemodynamic stability without any adverse effects.

Esmaoglu et al[8] and Gandhi et al[9] in their Randomized controlled study found that sensory and motor onset times were significantly lower in the dexmedetomidine group, whereas in our study there was no difference in onset of sensory and motor blockade between the two groups. This variation in the above studies is probably due to the difference in doses of dexmedetomidine and local anesthetics used.

In Gandhi R et al[9] study, they concluded that the duration of sensory and motor blockade was longer in the dexmedetomidine group. We also noted similar results with the dexmedetomidine group.

Gandhi R et al[9] showed no intra-operative hemodynamic variability between the two groups. However, in Esmaoglu et al[8] study, there was a significant reduction in systolic blood pressure after 15 mins, diastolic blood pressure after 60 mins, and heart 48 rates after 10 mins. Similarly, our study showed a greater reduction in systolic blood pressure after 30 mins, diastolic blood pressure after 15 mins, and heart rate after 15 mins with the use of dexmedetomidine.

This difference in hemodynamics was noted probably due to the difference in the dose of dexmedetomidine used. (30µg in study by Gandhi R et al[9] , 100 µg in a study by Esmaoglu et al[8] and 50 µg in our study) One of the strengths of our study was that we assessed Ramsey sedation scores and quality of block which was significantly more with the use of dexmedetomidine. Other studies did not assess these parameters.

Bradycardia was observed in 7 out of 30 patients in Esmaoglu et al[8] study, whereas only 2 out of 35 patients in Gandhi R et al[9] and 2 out of 30 patients in our study, this was probably due to the higher dosage of dexmedetomidine (100 µg) used in Esmaoglu et al[8] study.

In both Gandhi Ret al[9] study and Esmaoglu et al[8] study, there were no incidences of hypotension requiring vasopressors, which are comparable to our study.

A recent study by Agarwal S et al[10] on dexmedetomidine with bupivacaine for brachial plexus block through supraclavicular approach showed that onset of sensory and motor blockade in dexmedetomidine group was early compared to the control group and duration of analgesia, sensory, and motor blockade was prolonged in dexmedetomidine group which are comparable to our study.

Ammar S et al[11] in their RCT on dexmedetomidine with bupivacaine in ultrasound-guided infraclavicular brachial plexus block concluded that onset of sensory and motor blockade reduced in dexmedetomidine group. This may be due to the difference in the method of administration of block, dosages of drugs, and grading of motor and sensory blockade. In their study, they also concluded that the duration of sensory and motor blockade and duration of analgesia was prolonged which are comparable to our study. They also showed that verbal rating scales for pain, postoperative opioid requirements were also less in the dexmedetomidine group.

CONCLUSION

The present study entitled "Comparison of the effect of 0.25% bupivacaine alone and 0.25% bupivacaine with dexmedetomidine in brachial plexus block through supraclavicular approach" concludes that

- There is no change in the onset time of sensory and motor blockade when dexmedetomidine added to bupivacaine in supraclavicular brachial plexus block
- The quality of sensory and motor blockade is better with the dexmedetomidine group.
- The duration of motor and sensory blockade was significantly prolonged when dexmedetomidine was added to bupivacaine in the supraclavicular brachial plexus block.
- Duration of analgesia was significantly more with the use of dexmedetomidine with bupivacaine compared to bupivacaine alone
- Sedation was better with the addition of dexmedetomidine to bupivacaine
- There were no significant adverse effects.

REFERENCES-

1. Stephen EA. Chronic pain management. In: Barash PG, Cullen BF, Stoelting RK. Clinical anesthesia, 5th ed. Lippincott Williams and Wilkins, Philadelphia.2006:144
2. Bourne E, Wright C, Royse C. A review of local anesthetic cardiotoxicity and treatment with lipid emulsion. Local and Regional Anesthesia. 2010; 3: 11-19.
3. Singer C. Underwood EA. A short history of medicine. 2nd ed. Clarendon Press, Oxford. 1962:349
4. Hirschel M. Nerve damage from brachial plexus anesthesia. Zentralbl. Chir. 1993;40:77.
5. David LB and Raymond BF. The history of neural blockade and pain management. In: Cousins MJ and Phillip OB. Neural blockade in clinical anesthesia and management of pain. 3rd ed. Lippincott-Raven, Philadelphia.1998:10.
6. Swami SS, Keniya VM, Ladi SD, Rao. Comparison of dexmedetomidine and clonidine as an adjuvant to local anesthesia in supraclavicular brachial plexus block: A randomized double-blind prospective study. Indian Journal of Anaesth, 2012; 56:243-9
7. Esmaoglu A, Mizrak A, Akin A, Turk Y, Boyaci A. Dexmedetomidine to lidocaine intravenous regional Anaesthesia. Eur J Anaesthesia . 2005, Jun; 22(6):447-51.53
8. Aliye Esmaoglu, Fusun Yegenoglu, Aynur Akin, Cemil Yildirim Turk. Dexmedetomidine Added to Levobupivacaine Prolongs Axillary Brachial Plexus Block. Anaesth Analg. 2010;111(6):1548-51
9. Gandhi R, Shah, Patel I. Use of dexmedetomidine along with bupivacaine for brachial plexus block. National Journal of Medical Research. 2012, 2(1):67-69
10. Sandhya Agarwal, Ritu Aggarwal, Praveen Gupta: Dexmedetomidine prolongs the effect of bupivacaine in supraclavicular brachial plexus block. Journal of Anaesthesiology Clinical Pharmacology 2014;30(1):36-40.
11. Ammar AS, Mahmoud KM. Ultrasound-guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery: A prospective randomized controlled trial. Saudi J Anaesth 2012 Apr;6(2):109-14.