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DEXMEDETOMIDINE V/S CLONIDINE AS ADJUVANTS TO BUPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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Abstract:

Background and Aim: Regional nerve blocks with local anesthetics provide intra operative anesthesia as well as Postoperative analgesia. Our study has been undertaken to compare the onset time, duration and analgesic efficacy of clonidine with dexmedetomidine when added as adjuvant to bupivacaine(0.25%) for brachial plexus block by supraclavicular approach.

Methods: 60 patients aged 18-65 years belonging to ASA PS –I & II of both sexes undergoing elective upperlimb surgeries under Brachialplexus block were included in our study. Patients satisfying the inclusion criteria were allotted into 2 groups of 40 each. Group 1: Bupivacaine 0.25%(35 cc) + clonidine 1 mcg/kg, Group 2: Bupivacaine 0.25%(35 cc) +dexmedetomidine 1mcg/kg.

Results: The mean time for onset of sensory block in group A was (20.23 ±1.104) mins and that observed in group B was (14.83±1.744) mins. The mean time for onset of motor block in group A was(18.43 ±1.135) mins and (12.67±1.539) mins in group B. . Mean duration of sensory block in group A was (476.77±9.313) mins and in group B was (730.13±52.208) mins. The mean duration of motor block in group A was (420.60±8.896)mins and in group B was(649.6±45.040)mins. The mean duration of analgesia in group A was (522.23±11.047) and in group B was (757.13± 44.044) All the above differences were statistically significant with a p value < 0.05%.

Conclusion: From our study we conclude that, dexmedetomidine when added to bupivacaine compared to clonidine has 1. Faster onset of sensory block 2. Faster onset of motor block 3. Prolonged duration of sensory block 4. Prolonged duration of motor block 5. Prolonged duration of analgesia 6. Comfortable sedation where the patient can be arousable at any time 7. No

significant difference in hemodynamic variables.

Keywords: Brachial plexus block, clonidine, dexmedetomidine

Introduction:

Peripheral nerve blocks not only provide intra operative anaesthesia, but also extend analgesia in the post operative period without any systemic side effects. The brachial plexus block is one among the most popular regional nerve blocks performed for upper limb surgeries. Supraclavicular approach for brachial plexus block is being done for surgeries on the elbow, forearm and hand.Local anaesthetic drugs like lignocaine,bupivacaine and levobupivacaine are used in peripheral nerve block.[1,2] Its increased popularity is because of the advancement in regional anaesthesia techniques in terms of local anaesthetic drugs,newer adjuvant drugs and the use of ultrasound for safe and successful conduct of block. It helps in reduced hospital stay,less financial burden and also leads to avoidance of undesirable side effects of general anaesthesia. Since the introduction of first brachial plexus block using cocaine by Halsted in 1884, the technique of brachial plexus block has evolved from classical blind technique to the use of nerve stimulator and ultrasound guidance for supraclavicular brachial plexus block. [3,4] Alpha2adrenergic receptor agonist have been the focus of interest for their sedative, analgesic, perioperative sympatholytic and cardiovascular stabilizing effects with reduced anaesthetic requirements. Alpha 2 adrenergic agents have been tried either alone or in combination with other drugs in epidural, intrathecal and peripheral nerve blocks. [5]

Clonidine, an alpha-2 agonist which had been used initially as an antihypertensive has sedative, sympatholytic and analgesic properties. Clonidine is 200 times more selective to alpha 2 receptors when compared to alpha1 receptor. Dexmedetomidine, a novel highly potent alpha-2 agonist, is also a sedative, anxiolytic and analgesic agent similar to clonidine.[5]

The current study was designed to test the hypothesis that dexmedetomidine when used as an adjuvant to local anaesthetic in supraclavicular brachial plexus block enhanced duration of both sensory and motor blockade,hastened the onset of action and prolonged the duration of analgesia when compared to clonidine.

Materials and Methods:

It was a Descriptive Study done for 12 months at Major operation theatre, Government Medical College, Kottayam. Among ASA I and ASA II patients of either sex, aged 18 -65 years undergoing various upperlimb surgeries under supraclavicular brachial plexus block at government medical college,kottayam during the year 2018-2019. Estimated sample size was 30 in each group, from the study conducted from Sri devaraj medical college in India [2]

Inclusion Criteria- Adult patients aged 18 -65 years of both sex undergoing various orthopaedic surgeries of the upper limb.

Exclusion Criteria-

1. Known case of hypersensitivity to local anaesthetics
2. Patient on adrenoreceptor agonist/antagonist therapy
3. Patient with bleeding disorders
4. Patient with history of cardiac,respiratory,hepatic or renal disorders
5. Emergency surgeries
6. Patient on anticoagulant therapy
7. Uncontrolled DM
8. Pregnant women
9. Pre existing peripheral neuropathy.

Methodology-

The study will be conducted on 60 ASA grade I and II patients of either sex aged 18-65 years undergoing various elective surgeries of the upperlimb under supraclavicular brachial plexus block.

The study will be conducted in two groups of 30 patients each.

GROUP A: BUPIVACAINE 0.25%(35 cc) + clonidine 1 mcg/kg

GROUP B: BUPIVACAINE 0.25% (35cc)+ dexmedetomidine 1 mcg/kg

All patients received brachial plexus block through the supraclavicular approach. Following negative aspiration 35 ml of a solution containing local anaesthetic (0.25% bupivacaine) combined with clonidine and dexmedetomidine as mentioned above will be injected .A 3 min massage will be performed to facilitate even drug distribution. After research methodology and ethical committee approval for the study, study subjects were selected from those coming for upperlimb surgeries during the period of study at medical college hospital. Written informed consent was taken from all the subjects. All patients fasted for 6 to 8 hrs before surgery.

The patients were premedicated with midazolam 0.02mg per kg .Baseline measurement of NoninvasiveBP, HR and SpO2 was recorded before performing the block. Under aseptic precaution, supraclavicular brachial plexus block was performed. Neural localisation is by a peripheral nerve locator connected to a 22 G, 50 mm long stimulating needle. The Location end point is a distal motor response with an output lower than 0.5 mA in the median nerve region. Following negative aspiration , 35 ml of a solution containing local anaesthetic combined with clonidine or dexmedetomidine were injected .The duration of analgesia ,onset and duration of sensory block,onset and duration of motor block were assessed.

Sensory block onset is defined as reduction in sensibility to 30% or less. Assessment of motor block will be determined according to a modified bromage scale for upper extremities on a 3 point scale.

Grade 0 normal motor function with full flexion and extension of elbow , wrist and fingers
Grade 1 decreased motor strength with ability to move fingers only
Grade2 complete motor block with inability to move fingers
Motor block onset is defined as a reduction in power to grade 1

Duration of sensory block- Time interval between the onset of sensory block and complete resolution of anaesthesia on all nerves.

Duration of motor block- Time interval between the onset of motor block and recovery of motor function of hand and forearm

Analgesic effect was measured by assessing the duration between the local anaesthetic administration and the requirement of first dose of the analgesics. Post operative pain was assessed by Numerical Rating Scale (NRS).

Statistical Analysis-

The data will be numerically coded and cited in Microsoft excel spread sheet. Further analysis was done using SPSS software. Chi square tests was applied for demographic data, Independent t test was applied for hemodynamic parameters, onset and duration of sensory and motor blockade and duration of analgesia. P value<0.05 and highly significant <0.001.

Results

Table 1- Comparison of group based on onset of sensory block ,motor block ,duration of sensory block and motor block ,duration of analgesia and sedation score

	GROUP	N	Mean	Std. Deviation	T	P value
SENSORY ONSET	A	30	20.23	1.104	14.33	P<0.05
	B	30	14.83	1.744		
MOTOR ONSET	A	30	18.43	1.135	16.51	P<0.05
	B	30	12.67	1.539		
SENSORY DURATION	A	30	476.77	9.313	26.13	P<0.05
	B	30	730.13	52.208		
MOTOR DURATION	A	30	420.60	8.896	27.31	P<0.05
	B	30	649.67	45.070		
ANALGESIA DURATION	A	30	522.23	11.047	28.31	P<0.05
	B	30	757.13	44.044		
SEDATION SCORE	A	30	1.57	.504	3.47	P<0.05
	B	30	1.17	.379		

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A total of 60 patients were included in the study.30 patients were allocated group A and 30 patients were allocated group B. Age, gender ASA grading and weight were comparable in both the groups.

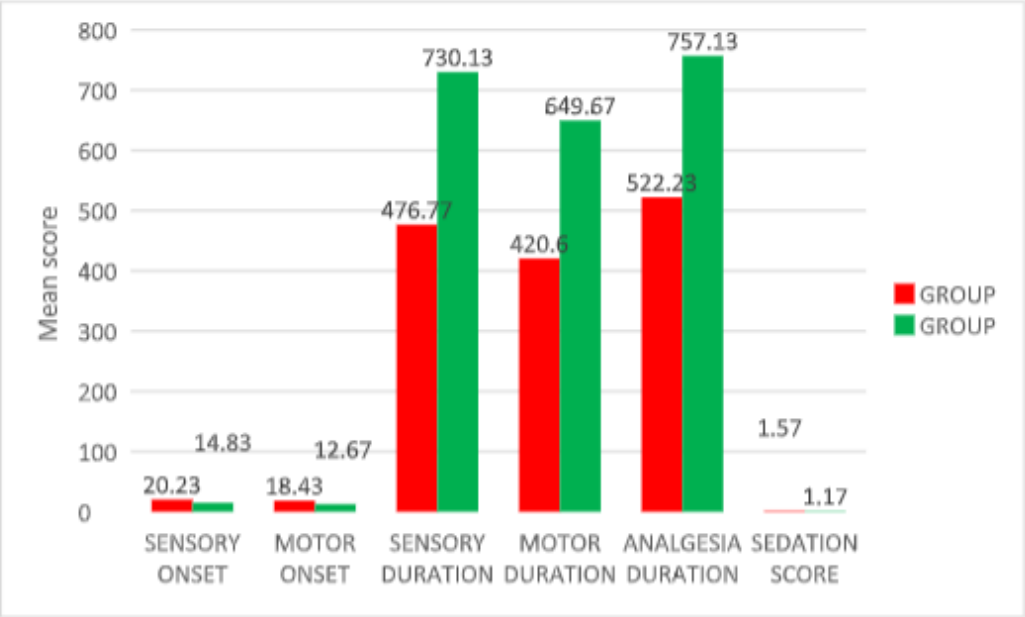

Figure 1-bar diagram showing comparison of onset,duration of block,duration of analgesia and sedation score.

From the above figures, mean time for onset of sensory block in group A was 20.23±1.104 while in group B was 14.83 ±1.744. The data was analysed using t test and yielded a P<0.05 which is significant. The mean time for onset of motor block in group A was 18.43±1.135 and in group B was 12.67±1.539.The analysis by t test yielded a P<0.05 which shows that there is a significant difference in the onset of motor block between the two groups. The data was analysed using t test and yielded a P<0.05 in both the cases which means that there is a significant difference between the two groups in terms of duration of sensory and motor block. The mean time for duration of analgesia in group A and group B was 522.23±11.047 and 757.13 ±44.044 respectively. The analysis of this data by t test yielded a P value < 0.05 which is significant.

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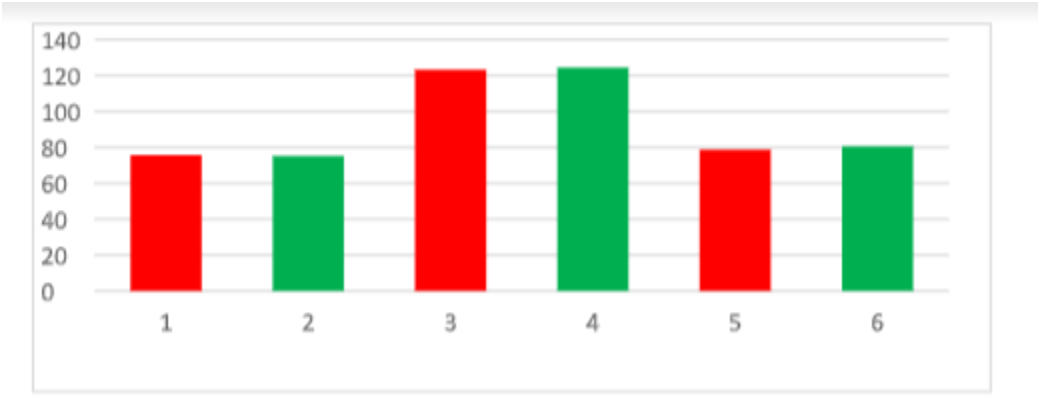
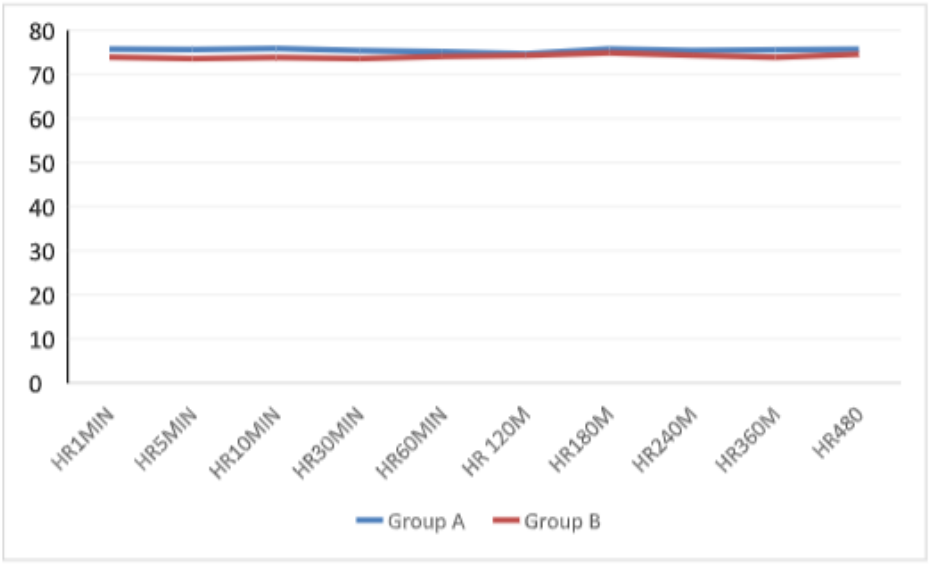
Figure no:2 Comparison of baseline parameters HR, SBP, DBP.



The baseline hemodynamic parameters HR, SBP, and DBP were analysed using t test. The mean baseline HR of the study population in group A was75.70± 8.056 and in group B was 75.17±7.047 with a p value <0.05. The mean baseline SBP in both groups were 123.27±14.408 and 124.43±10.523 respectively .The mean baseline DBP in both the groups were 78.67 ±10.148 and 80.60±8.139 respectively .The analysis of the above data using t test yielded a p<0.05.Thus the baseline HR SBP and DBP in both the groups were comparable.

Figure no 3 Line diagram showing comparison of heart rate



The mean heart rate in both the groups did not show much difference and the statistical analysis of the above data yielded a p value >0.05 which is insignificant.

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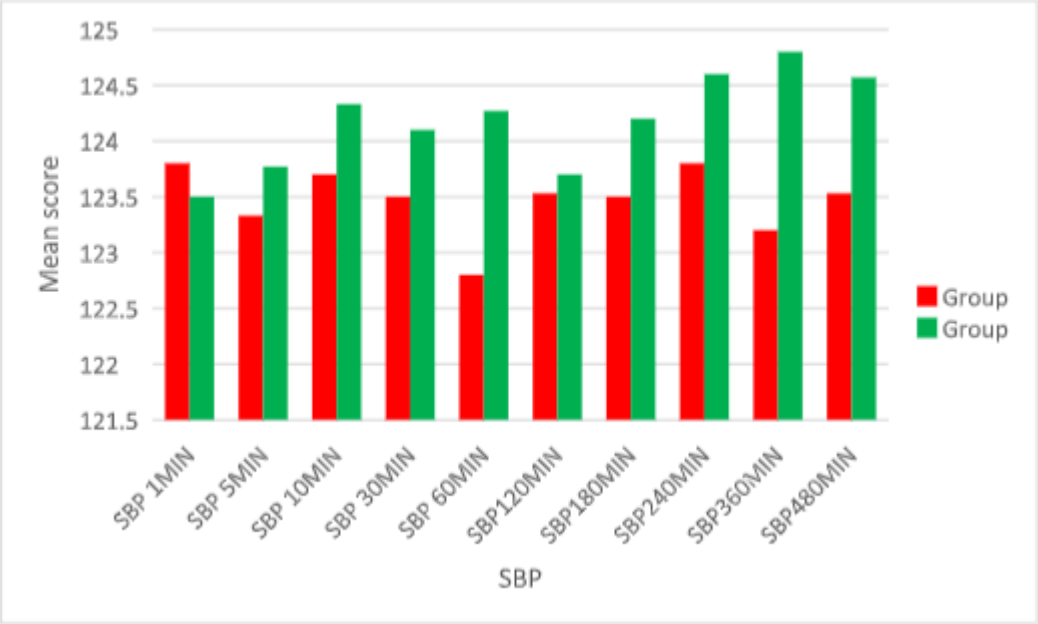
Figure no 4 Bardiagram showing comparison of systolic bloodpressure



From the above diagram it is clear that the SBP in both the groups did not show much variation and the statistical analysis using t test was not found to be significant. The mean time for onset of sensory block in group A was (20.23 ±1.104) mins and that observed in group B was (14.83±1.744) mins. The mean time for onset of motor block in group A was (18.43 ±1.135) mins and (12.67±1.539) mins in group B. We found that P value was found to be significant when the two groups were compared in terms of onset of block, duration of block ,and duration of analgesia. Patients in group D had a rapid onset of motor and sensory block, improved duration of motor and sensory block and prolonged duration of analgesia when compared to clonidine group. However there was no significant difference in the hemodynamic parameters between the two groups.

Discussion

Our study was aimed at comparing the effects of dexmedetomidine and clonidine when used as an adjuvant to 0.25% bupivacaine in supraclavicular brachial plexus block. In our study, it was found that the onset of sensory block and motor block were significantly faster in patients who received a combination of bupivacaine and dexmedetomidine than the combination of bupivacaine and clonidine. The mean time for onset of sensory block in group A was (20.23 ±1.104) mins and that observed in group B was (14.83±1.744) mins. The mean time for onset of motor block in group A was (18.43 ±1.135) mins and (12.67±1.539) mins in group B.

The sensory onset was shortened by a mean of 5.76 minutes. The motor onset was shortened by a mean of 5.4 minutes. The motor duration was prolonged by a mean of 229.07 minutes. The sensory duration was prolonged by a mean of 253.36 minutes. The analgesia duration was prolonged by mean of 234.9 minutes. Sedation was more in clonidine group by a mean of 0.40

minutes. However, there were no significant differences in the hemodynamic parameters of the two study population.

In the study conducted by Archanatripati,khusboo Sharma et al , compared the effects of addition of clonidine(1 μg/kg) and dexmedetomidine (1 μg/kg) to bupivacaine in supraclavicular brachial plexus block in 60 ASA I and II patients. [4] Yoshitomi et al. found that addition of clonidine or dexmedetomidine to lignocaine enhances local analgesic effect. [5] They postulated that improved analgesic effect of clonidine and dexmedetomidine was mediated through α-2adrenoreceptors. Memiset al. compared between adding dexmedetomidine to bupivacaine in peribulbar block and intravenous dexmedetomidine during peribulbar block for cataract surgery.[6] Study was conducted on 90 patients for cataract surgery under peribulbar anaesthesia. They concluded that dexmedetomidine as an additive,shortens onset time, prolongs block duration and significantly reduces the intraoperative pain with minimal side effects. [6]

Esmaogluet al. study was done on 40 patients scheduled for elective hand surgeries. IVRA was achieved using 3ml/kg lidocaine diluted with saline to a total volume of 40 ml in the control group or 1 mcg/kg of dexmedetomidine +3 mg/kg lidocaine diluted to a total volume of 40 ml in dexmedetomidine group. They concluded that addition of dexmedetomidine to local anaesthetic solution in IVRA improved the quality of anesthesia and decreased analgesic requirements, but had no effect on the sensory and motor block onset and regression times. [7] A study by Brumettet al. [8] showed that dexmedetomidine enhances duration of bupivacaine anaesthesia and analgesia of sciatic nerve block in rats without any damage to the nerve Bajwa et al. had compared the dexmedetomidine and clonidine in epidural anesthesia and concluded that dexmedetomidine is a better neuraxial adjuvant compared with clonidine for providing an early onset of sensory analgesia and prolonged postoperative analgesia. [9]

The study conducted by Sandhya Aggarwal and other authors [10,11,12], compared the effects of adding dexmedetomidine to a 30 ml solution of 0.325% bupivacaine in supraclavicular brachial plexus block. Onset and duration of sensory and motor block along with duration of analgesia were the primary end points. Study was conducted on 50 ASA I and II patients posted for elective upperlimb surgeries. They concluded that dexmedetomidine when added as an adjvant to bupivacaine for supraclavcular brachial plexus block significantly shortens the onset time and prolongs the duration of motor and sensory block and duration of analgesia.
However urmey and Copeland [13,14] found no difference in duration of analgesia between dexmedetomidine or clonidine when added to bupivacaine during pediatric caudal anesthesia

Conclusion:

From our study,we conclude that Dexmedetomidine is a better adjuvant to 0.25% Bupivacaine in supraclavicular brachial plexus block in terms of onset of block ,duration of block ,analgesic efficacy and is not associated with major side effects .

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