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**Original research article**

# Comparison of Effect of 0.25 % Bupivacaine with Dexmedetomidine and 0.25% Bupivacaine Alone in Brachial Plexus

**Dr. Smriti Kumari[1], Dr. Ashok Kumar[2], Dr. Bijoy kumar[3], Dr. Mritunjay Kumar[4]**

**[1]Junior Resident, Department of Anaesthesiology, NMCH Patna**

**[2]Prof. & Head, Department of Anaesthesiology, NMCH Patna**

**[3]Associate Prof. Department of Anaesthesiology, NMCH Patna**

**[4]Associate Prof. Department of Medicine, NMCH Sasaram**

**Corresponding Author: Dr. Mritunjay Kumar**

**Abstract**

**Background**: Brachial plexus block is a safe, effective, low cost anaesthesia with good postoperative analgesia. Adjuvants to local anaesthetics may enhance the quality and duration of analgesia. The aim of the study was to study the efficacy of combination of 0.25% bupivacaine and dexmedetomodine versus 0.25% bupivacaine alone 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 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 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. Intraoperative hemodynamic recording was done at 15 min time intervals from administration of the drugs. There was reduction in heart rate, systolic blood pressure and diastolic blood pressure 30 mins onwards in both groups ( $p < 0.05$). There was no significant difference in onset of sensory and motor block.

**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 duration of sensory and motor block, with better sedation and quality of analgesia with 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 localised 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 anaesthesia denotes interruption of pain impulse by physiological blockade at a certain point along their pathway of transmission in peripheral nerves. 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 anaesthetic agents developed in between 1900-1940 were basically amino ester compounds.

They lost their importance due to short duration of action, associated allergic reactions and systemic toxicity. In 1957 Ekenstam synthesized bupivacaine, an amide local anaesthetic 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 opiods, clonidine, hyaluronidase, dexamethasone, midazolam.[7] Alpha2 adrenergic receptor agonists have been tried either alone or in combination with another drug to prolong anaesthesia in various methods of anaesthetic administration like epidural, intrathecal and regional nerve blocks.6 Dexmedetomidine is an α2receptor 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 anaesthesia in humans including intrathecal and IV regional anaesthesia with lesser side effects.[8,9]

## Objectives

To study the effects of 0.25% bupivacaine in brachial plexus block 2. To study the effects of 0.25% bupivacaine with dexmedetomodine in brachial plexus block 3. To compare the effects of 0.25% bupivaciane with dexmedetomidine and 0.25% bupivaciane alone in brachial plexus block

## Materials and methods

Patients posted for elective orthopaedic surgeries on the upper limb admitted in Nalanda medical college and Hospital Patna, Bihar.. Study type Prospective Randomised, Double blind study Study duration of Two years. Sample size 60 patients selected using purposive sampling technique

## Inclusion criteria

Patients posted for orthopaedic surgeries on upper limbs:- 1. ASA(American Society of Anaesthesiologists) grade 1 and 2 2. Between the ages of 18-60years, of either sex 3. Undergoing orthopaedic surgeries on upper limb

**Exclusion criteria**

* Patients on adrenoreceptor agonist and antagonist therapy
* Known hypersensitivity to local anaesthetics 3. Uncontrolled diabetes milletus

**Methodology**

60 consenting patients fulfilling the inclusion criteria were considered for our study. A pre-anesthetic check up 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 "slips in a box technique" of 30 each, with

GROUP A: 34ml of 0.25% Bupivacaine with 0.5ml(50µg) dexmedetomidine

GROUP B : 34ml of 0.25% Bupivacaine with 0.5ml distilled water 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 moulding the shoulders over a roll placed between the scapulae. The supraclavicular area was aseptically prepared and draped. The anaesthesiologist 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.

Sensory block will be assessed by pinprick test using 3-point scale 0 Normal sensation 1 Loss of sensation of pinprick(analgesia) 2 Loss of sensation of touch(anaesthesia).

Motor blockade will be done using Bromage three point score 1 Normal movement 2 Decreased motor strength with ability to move fingers only 3 Complete motor block with inability to move finger.

**Results**

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

**Demographic and Baseline Hemodynamics data**

| Parameter | Group A (N- 30) | Group B (N- 30) | P value |
|---|---|---|---|
| Age (in years) | 38.4 ± 16.09 | 41 ± 13.14 | 0.4 |
| Male gender | 16 (53.3%) | 21 ( 70%) | 0.14 |
| Weight (in kgs | 60. 7 ± 10.54 | 58.63 ± 7.04 | 0.07 |
| ASA gra | | | |
| Grade 1 | 25 ( 83.3%) | 20 ( 66.7%) | |
| Grade 11 | 5 (16.7%) | 21 (33.3%) | 0.11 |
| Hemodynamic variables | | | |
| Heart rate | 75. 57 ± 11.5 | 75.3 ± 9.69 | 0.16 |
| Systolic blood pressure | 125.8 ± 13.49 | 129.4 ± 13.85 | 0.57 |
| Diastolic blood pressure | 80.5 ± 7.51 | 83.2 ± 7.42 | 0.98 |

The mean age in intervention group (Group A) was 38.4±16.09 years and 41±13.14 years in placebo group (Group B). There was no statistical difference between the two groups. (p- 0.4) The Ramsey sedation score was assessed at arrival and in post-operative period after the administration of the brachial plexus block intra-operatively in the two patient groups. The score was the same in both groups on arrival as expected. However, post operatively, in the intervention group, 2 (6.7%) patients recorded a score 2 and importantly, the remaining 28 (93.3%) patients recorded a maximum score of 3. However, in the placebo group, all 30 (100%) patients recorded a score of 2 and none recorded score 3. Using chi-square test, the difference noted in Ramsey sedation score postoperatively was statistically significant.

Intraoperative hemodynamic monitoring The intraoperative hemodynamic monitoring was recorded at different time points of 5 mins, 10 mins, 15 mins, 30 mins, 45 mins, 60 mins, 90 and 120 mins in three components namely heart rate, systolic blood pressure and diastolic blood pressure and hence the intraoperative hemodynamic variability was studied using the repeated measures linear model. Using repeated measures linear model, there was no statistically significant difference in baseline heart rate noted between groups. (p- 0.502). However, there was statistically significant reduction in heart rate from 15 minutes onwards compared to baseline in both groups. (p- 0.000). Using repeated measures linear model, there was statistically significant difference noted between the two groups. (p- 0.048). However, there was statistically significant reduction in systolic blood pressure from 30 minutes onwards compared to baseline in both groups. (p- 0.000).

Using repeated measures linear model, there was no statistically significant difference in baseline diastolic blood pressure noted between groups. (p- 0.155). However, there was statistically significant reduction in diastolic blood pressure from 15 minutes onwards compared to baseline in both groups. (p- 0.000). The safety profile of using dexmedetomidine along with bupivacaine (Group A) and only bupivacaine alone (Group B) was carefully assessed. Only 2 (6.7%) patients in each group had bradycardia and remaining patients developed no side effects such as heart block, arrythmias and hypotension etc.

**Discussion**

Pain relief is of paramount importance in anaesthesia. Peripheral nerve blocks are known for their perioperative analgesia, without the side effects of general anaesthesia. There has always been a search for adjuvants to prolong the duration of analgesia and to improve the quality of 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 anaesthetics to prolong and intensify the anaesthesia. 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 al8 and Gandhi et al9 in their Randomized controlled study found that sensory and motor onset time were significantly lower in dexmedetomidine group, where as in our study there was no difference in onset of sensory and motor blockade between the two groups. This variation in above studies is probably due to the difference in doses of dexmedetomidine and local anaesthetics used. In Gandhi R et al9 study, they concluded that duration of sensory and motor blockade were longer in dexmedetomidine group. We also noted similar results with the dexmedetomidine group. Gandhi R et al9 showed no intra-operative hemodynamic variability between the two groups. However in Esmaoglu et al8 study, there was significant reduction in systolic blood pressure after 15 mins, diastolic blood pressure after 60 mins and heart rate after 10 mins. Similarly our study showed 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 al9 , 100 µg in study by Esmaoglu et al8 and 50 µg in our study) One of the strengths in our study was that we assessed Ramsey sedation scores and quality of block which was significantly more with use of dexmedetomidine. Other studies did not assess these parameters. Bradycardia was observed in 7 out of 30 patients in Esmaoglu et al8 study, where as only 2 out of 35 patients in Gandhi R et al9 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 al8 study. In both Gandhi Ret al9 study and Esmaoglu et al8 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. In another RCT by Mirkheshti A et al[12] comparing dexmedetomidine with lignocaine and ketorolac with lignocaine, they found that dexmedetomidine group showed earlier onset in sensory and motor blockade and duration of sensory and motor block were prolonged compared to ketorolac group. This may be due to the difference in method of administration of block, dosages of drugs and grading of motor and sensory blockade. In their study, they also

concluded that duration of sensory and motor blockade and duration of analgesia were prolonged which are comparable to our study. They also showed that verbal rating scales for pain, postoperative opioid requirements were also less in dexmedetomidine group.

## Conclusion

The present study entitled "Comparison of effect of 0.25%bupivacaine with dexmedetomidine and 0.25% bupivacaine alone in brachial plexus.

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 dexmedetomidine group. • The duration of motor and sensory blockade was significantly prolonged when dexmedetomidine added to bupivacaine in supraclavicular brachial plexus block.

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