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# A Comparative Study between Dexmedetomidine Vs Dexamethasone As an Adjuvant To 0.5% Bupivacaine in an Ultrasound Guided Supraclavicular Block

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## Abstract

**Background:** Perineural dexamethasone or dexmedetomidine prolongs the duration of single-injection peripheral nerve block when added to the local anaesthetic solution. The aim of this study was to compare the onset, duration of sensory and motor block along with duration of analgesia when adjuvants was added to 0.5% bupivacaine.

**Methods:** 60 patients belonging to ASA 1 and 2 were selected randomly for orthopedic surgery of upper limb distal to the humerus under supraclavicular block. These patients were divided into two groups with 30 each in each group. Group A received 20ml 0.5% bupivacaine plus dexmedetomidine and group B received 20ml of 8mg of dexamethasone. Onset of sensory and motor block, duration of block and duration of analgesia were recorded.

**Results:** The onset of sensory block was earlier in group B, whereas the duration of the block and analgesia was extended in group B. No adverse effect were noted during the study

**Conclusion:** The study concludes that dexmedetomidine added in bupivacaine prolongs the duration of block and analgesia compared to dexamethasone; whereas the onset of block is faster with dexamethasone

**Keywords**: Supraclavicular , Dexamethasone, Dexmedetomididne, Bupivacaine

## Introduction

Brachial plexus block is a regional anaesthesia technique that is used as a safe and as an alternative to general anaesthesia for upper limb surgeries. Because of the advent of nerve stimulator and ultrasound, the blocks can be given safely in even in ASA 3 and 4 patients thereby avoiding the use of general anesthesia and also have a stable hemodynamic parameters[1].

Ultrasound facilitates the deposition of drug at the correct place and therefore the chance of failure is remote. The brachial plexus at supraclavicular regions is compact and shallow (20-30 mm deep) and the nerve visibility is remarkable [(2,3)].

Among the various brachial plexus block supraclavicular is considered as effective, easily approachable and can be given quickly when compared with other approaches of blocks. Among the local anaesthetic, bupivacaine is the most commonly used because of the longer duration of action. When adjuvants are used along with local anesthetics , it can prolong the duration of action, shorten the onset time of the blockade and also increase the duration of action of postoperative analgesia. Various adjuvants used are Opioids, steroids, midazolam, ketamine, alpha 2 receptor agonists like clonidine and dexmedetomididne, magnesium sulphate and neostigmine[4].

Among these drugs α2 adrenergic receptor agonists received attention due to their sedative, analgesic, perioperative sympatholytic and cardiovascular stabilizing effects with reduced anaesthetic requirements.

Dexmedetomidine is alpha 2 agonist with alpha 1:2 ration is 1600:1 which is 8 times potent than clonidine. In peripheral nerve blocks it prolongs duration of analgesia by hyperpolarisation of cyclic nucleotide gated cation channels. There have been studies showing dexmedetomidine has been shown to increase quality and duration of analgesia of commonly used local anaesthetics like ropivacaine and bupivacaine[4].

Dexamethasone has a potent anti-inflammatory and anti- nociceptive action .There is evidence to show that dexamethasone has local action on nerve fibres and systemic effects, both potentiate its analgesic properties[5]. A recent study by Liu et al demonstrated that perineural dexamethasone (1, 2 and 4 mg) can prolong the duration of analgesia and motor blockade of bupivacaine in patients receiving supraclavicular brachial plexus nerve block for ambulatory shoulder surgery[6].

Here we conduct a study to compare dexmedetomidine vs dexamethasone as an adjuvant to 0.5%bupivacaine and evaluate based on their onset, time, duration of sensory and motor block

**Materials And Method**

The study was conducted in the department of Anesthesiology at MGM Medical College and Hospital, Navi Mumbai.

**Inclusion Criteria**

A total of 60 patients of ASA 1 and 2 posted for elbow, forearm, hand and wrist surgeries aged between 18 and 65yrs of either sex.

**Exclusion Criteria**

1. Infection at the local site
2. Severe coagulopathy
3. Pneumothorax
4. Peripheral neuropathy
5. Previous history of any adverse reaction with local anesthetic.

All patients received standard premedication on the night before surgery and the fasting guidelines were followed. Procedure was explained to the participants in their own language and informed written consent was obtained.

1. The patients were randomly allocated into two groups 30 each
2. Group A : Patient received 20ml of 0.5% bupivacaine with 1mcg/kg dexmedetomidine
3. Group B : Patient receives 20ml of 0.5% bupivacaine with 8 mg dexamethasone
4. The treatment group was selected randomly by blinding method
5. Sensory and Motor Block parameters were studied

Sensory modalities like touch and temperature were assessed by a spirit swab. Pain was assessed by loss of pinprick sensation along the distribution of the major peripheral nerves by a blunt 27 G needle at an interval of 5 minutes for the first 30 minutes.

Thenar eminence was used for checking Median Nerve, Radial Nerve block was checked over Lateral side of dorsum of Hand, Little Finger was used to check sensation for Ulnar Nerve and Lateral Border of Forearm over the site of radial artery was used to check sensation for Musculocutaneous Nerve.

Motor function of the limb was measured at every 10 minutes for first 30 minutes and it was assessed by Thumb opposition to check Median Nerve, Thumb abduction for Radial Nerve, Thumb adduction for Ulnar Nerve while Elbow flexion was used to assess Musculocuatneous nerve.

The data was compared using statistical tools like mean, range, and percentage and chi square test

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**Results**



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**Table 1: Comparison of Age, Sex, ASA grading and Weight of the patients**

| Variables | Dexmedetomi-dine Group Mean ± SD | Dexamethasone Group Mean ± SD | P-Value |
|---|---|---|---|
| | | | |
| Age (Mean ± SD) | 32.5 ± 7.2 | 33.7 ± 5.4 | 0.2 |
| Sex | | | |
| Male | 19 | 20 | |
| Female | 11 | 10 | |
| ASA | | | |
| I | 21 | 19 | |
| II | 9 | 11 | |
| Weight(Mean ± SD) | 61 ± 10.1 | 60.5 ± 9.3 | 0.13 |

**Table 2: Comparison of intraoperative variables between Group A and Group B**

| Variables | Dexmedetomidine Group Mean ± SD | Dexamethasone Group P-Value Mean ± SD | P-Value |
|---|---|---|---|
| | | | |
| Duration of Surgery (min) | 78.8 ± 25.7 | 75.7 ± 26.7 | 0.12 |
| Onset of Sensory Block (min) | 9.36 ± 0.6 | 7.95 ± 0.79 | <0.001 |
| Duration of Sensory Block (min) | 958.1 ± 6.6 | 838.7 ± 6.5 | <0.001 |
| Onset of Motor Block (min) | 12.3 ± 0.6 | 14.3 ± 2.5 | 0.0002 |
| Duration of Motor Block (min) | 900.6 ± 6.2 | 780.4 ± 0.5 | <0.001 |
| Duration of Analgesia (min) | 969 ± 4.1 | 840 ± 1.99 | <0.001 |

Sensory block onset was earlier in group B(7.95 ± 0.79 min) as compared to group A(9.36 ± 0.6 min) which was statistically remarkable. ($p<0.001$) Motor block onset is earlier in Group A(12.3 ± 0.6 min) as compared to Group B(14.3 ± 2.5 min) which was statistically remarkable. ($p<0.002$) .

Sensory block duration were longer (958.1 ± 6.6min) in Group A than Group B (838.7 ± 6.5 min) which was statistically remarkable.($p<0.001$)

Motor block duration were longer (900.6 ± 6.2min) in Group A than Group B(780.4 ± 0.5min) which is generally remarkable.($p<0.001$)



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No adverse events were reported on intra & preoperative phases.

No blocks were converted to general anaesthesia.

## Discussion

Brachial plexus block has become a significant anesthesiologist's tool as it can be used to provide both anesthesia for surgery and analgesia thereafter[7]. It is one of the easiest, safest and most commonly performed peripheral nerve blocks in the day to day practice of anaesthesia. Using adjuvants like dexmedetomidine or dexamethasone to the local anaesthetics further enhances the onset, quality and duration of analgesia.

Dexmedetomidine is a selective α-2 adrenoceptor agonist which has both sedative and analgesic effects due to its action on locus cerelus in central nervous system. The propagation of pain signal is terminated by inhibition of norepinephrine release due to pre-synaptic activation of α-2 adrenoceptors in CNS whereas the post-synaptic activation inhibits sympathetic activity leading to decrease in heart rate and blood pressure[8].

Dexamethasone's action to prolong the duration of analgesia is mediated via glucocorticoid receptors. It suppresses the ectopic neuronal discharge and alters the function of potassium channels in the excitable cells by reducing the transmission in unmyelinated C-fibers[9].

In our present study its been showed that the addition of dexmedetomidine to bupivacaine in supraclavicular block leads to prolongation of sensory and motor block along with prolongation in duration of analgesia. On the other hand,dex-amethasone leads to shorter onset of sensory and motor block.

**Kaur M et al. , Biswas D et al** showed that dexmedetomidine acts through α-2 adrenoceptors or it provides analgesic effect through inhibition of norepinephrine release and increasing potassium conduction along the unmyelinated C- fibres responsible for conduction of pain stimulus. Its analgesic and sedative action is also centrally mediated through its action on locus cerelus[8].

**Hamada et.al, Marhoferet.al**, showed that the dexmedetomidine as an adjuvant significantly pro-longed block duration as well as analgesia[10].

**Zhang P et.al,** has studied the addition of dexmedetomidine in interscalene nerve block along with ropivacaine and has shown to improve the quality as well as analgesia with no adverse effects[11].

**Swain et al**. has studied the effect of addition of dexmedetomidine in supraclavicular, interscalene, cervical plexus and ulnar nerve blocks where dexmedetomidine has shown to increase quality and duration of analgesia of commonly used local anesthetics like ropivacaine and bupivacaine[12].

There are also studies which shows dexamethasone as an adjuvant to local anesthetic resulted in longer sensory and motor blockade duration.This is shown by Tandoc MN et.al.

**Tandoc MN et. al,** showed that perineural dexamethasone (4mg and 8mg) significantly prolongs the duration of motor block and improved quality of analgesia when used with 0.5% bupivacaine in inter-scalene nerve block. In addition, this study did not show statistically any significant difference between low dose and high dose of dexamethasone on analgesia duration and motor block prolongation[13].

**Biradar et al,** also demonstrated a rapid onset of motor and sensory block when dexamethasone was used as an adjuvant to bupivacaine in ultrasound guided supraclavicular plexus block[14].

There were no complications recorded with respect to the block technique used in this study or to the drugs in the form of hemodynamic instability, hematoma formation, infection or local anesthetic toxicity.

## Conclusion

Dexmedetomididne when used as an adjuvant to bupivacaine in supraclavicular brachial plexus block, significantly extends the motor and sensory block duration compared to dexamethasone, but onset of block was shorter when dexamethasone was added to the bupivacaine.

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