



COMPARISON OF EFFICACY OF DEXMEDETOMIDINE VS CLONIDINE AS AN ADJUVANT TO BUPIVACAINE IN ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

Anaesthesiology

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ABSTRACT

Background & Aims: Apha-2 agonists are combined with local anaesthetics to extend the duration of regional anaesthesia. We compared the effect of dexmedetomidine vs clonidine with bupivacaine with respect to duration of motor and sensory block and duration of analgesia in supraclavicular brachial block.

Methods: Hundred patients scheduled for elective forearm and hand surgery were divided into two equal groups in a randomized double blind fashion. The patients received ultrasound guided supraclavicular brachial plexus block. In group C (n=50) 29ml of 0.5% bupivacaine plus 1mcg/kg of clonidine diluted to 1ml and in group D (n=50) 29ml of 0.5% bupivacaine plus 1mcg/kg of dexmedetomidine diluted to 1ml was given. Onset and duration of motor and sensory block and duration of analgesia were recorded. Data analysis was done by SPSS version 22.0 software. Statistical significance was defined as P<0.05.

Result: The addition of 1 µg/kg of dexmedetomidine to 29ml of bupivacaine (0.5%) produces a shorter onset time for sensory and motor blockade in comparison to 1 µg/kg clonidine added to 29ml of 0.5% bupivacaine (p<0.05). It also prolongs the duration of sensory and motor blockade and postoperatively the duration of analgesia is prolonged with minimal reduction in pulse rate, blood pressure.

Conclusion: The addition of dexmedetomidine to bupivacaine in brachial plexus block by supraclavicular approach results in a shorter onset time for sensory and motor blockade, prolongs the duration of sensory and motor blockade and also the duration of analgesia in comparison to clonidine.

KEYWORDS

supraclavicular block, bupivacaine, local anaesthetic

INTRODUCTION:

Supraclavicular brachial plexus blockade is an efficient regional anaesthetic technique for upper limb surgeries. Bupivacaine relieves pain by blocking the transmission of pain signals to the dorsal horn.

Various adjuvants are used to augment the analgesic efficacy while reducing the dose and incidence of adverse reactions related to local anaesthetics.

Clonidine, a partial α_2 adrenoceptor agonist has been reported to prolong the duration of anaesthesia and analgesia.

The α_2 : α_1 selectivity of dexmedetomidine is eight times that of clonidine making it a much more effective sedative and analgesic agent.

It has been used in intrathecal and epidural anaesthesia. Its use in peripheral nerve blocks has recently been described.

However, the reports of its use in supraclavicular brachial plexus block are limited.

The aim of the study was to compare the efficacy of clonidine and dexmedetomidine as an adjunct to bupivacaine in supraclavicular brachial plexus block in upper extremity surgery for the duration of sensory and motor block and duration of analgesia.

MATERIALS AND METHODOLOGY:

After approval of the institutional ethical committee, a written informed consent was obtained from all patients and a double blind randomized, prospective clinical study was carried out in Saraswathi Institute of Medical Sciences, Anwarpur, Hapur (Uttar Pradesh).

Study Duration: Two year (September 2019 to August 2021)

Sample Collection

Total 100 patients (50 in each group)

Study Design:

Randomized, double-blind, prospective, clinical study.

Patients were divided into two groups using "slips in the box technique" into one of the following groups:

Group C: Patients received bupivacaine 0.5% 29ml plus clonidine 1 µg/kg diluted to 1ml.

Group D: Patients received bupivacaine 0.5% 29ml plus dexmedetomidine 1 µg/kg diluted to 1ml.

INCLUSION CRITERIA:

- Aged 18-60 years
- American Society of Anaesthesiologists (ASA)¹⁷ physical status I & II
- Patients of either sex

EXCLUSION CRITERIA:

- Patient with physical status ASA III-IV
- History of allergy to local anaesthetic
- Central or peripheral neuropathies or coagulopathies
- Skin lesion at the site of blockade
- Hepatic, renal or cardiopulmonary abnormality
- History of neurological, psychiatric, or neuromuscular disorders
- Upper limb surgeries requiring bone graft

METHODOLOGY

- On arrival in the operation theatre, intravenous access was established and monitors for non-invasive blood pressure, heart rate, electrocardiogram (ECG), and pulse oximetry (SpO₂) were commenced, baseline parameters as blood pressure, pulse rate and SpO₂ were recorded.
- The ultrasound guided supraclavicular brachial plexus block was performed with the help of ultrasound probe with a frequency of 6-13 Mhz.
- Following negative aspiration, 30mL of a solution containing local anaesthetic combined with clonidine or dexmedetomidine as mentioned was injected.

Sensory block was assessed by the pin prick method. Sensory block graded as-

- Grade 0: Sharp pin felt,
- Grade 1: Analgesia, dull sensation felt,
- Grade 2: Anaesthesia, no sensation felt.
- Onset of motor blockade was considered when there was Grade 1 motor blockade; 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 the fingers only
- Grade 2: Complete motor block with inability to move the fingers
- Patients were assessed for duration of analgesia as per Visual Analogue Scale (VAS) of 0 to 10. The VAS was recorded post-operatively every 60 min till the score of 5. The rescue analgesia was given in the form of injection paracetamol (1g) intravenous at the visual analogue scale of 5 and the time of administration was noted.

The duration of sensory block was defined as the time interval between the end of local anaesthetic administration and the complete resolution of anaesthesia on all nerves mentioned earlier.

The duration of motor block was defined as the time interval between the end of local anaesthetic administration and the recovery of complete motor function of the hand and forearm

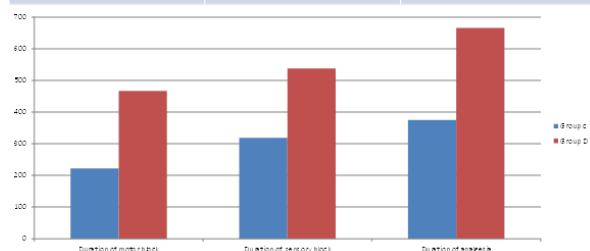
STATISTICAL ANALYSIS:

- The data was imported into Microsoft excel data sheet and analysed using a SPSS version 22 software. Categorical data was represented in form of graph.
- A p-value <0.05 was considered significant and statistical analysis will be done.
- The comparison of efficacy of dexmedetomidine vs clonidine as an adjuvant to bupivacaine in ultrasound guided supraclavicular brachial plexus block was done using independent t-test

RESULTS:

- Sensory and motor block durations were significantly prolonged in Group D compared to Group C ($p < 0.001$). The duration of analgesia was significantly longer in dexmedetomidine group than in clonidine group ($P < 0.001$)
- The mean time for total duration of motor block in Group D was 466.87 minutes. This was higher than in Group C (222.23 minutes). It was statistically significant ($p < 0.05$)

variables	Group c	Group D
Duration of motor block	222.23±17.84	466.87±28.08
Duration of sensory block	319.11±32.74	537.8±32.67
Duration of analgesia	375.23±32.6	666.27±36.54



- The mean time for total duration of sensory block in Group D was 537.8 minutes and in Group C was 319.1 minutes. It was statistically significant ($p < 0.001$).
- The total duration of Analgesia in Group D was 666.27 minutes. This was higher than in Group C (375.23 minutes). It was statistically significant. ($p < 0.001$).

DISCUSSION:

In our study, we compared the addition of clonidine (1 µg/kg) and dexmedetomidine (1 µg/kg) to bupivacaine in supraclavicular brachial plexus block.

There has been increasing use of some adjuncts, e.g., opioids, epinephrine, α -2 adrenoreceptor agonists to local anesthetic agents to improve the block quality in peripheral nerve blocks. It was reported in various studies that the addition of α -2 adrenoreceptor agonists to local anesthetic agents in peripheral nerve blocks improved the quality the anesthesia and prolonged the duration of analgesia

Abosedira[4] compared the effect of adding either clonidine or dexmedetomidine to lidocaine during Bier's block and reported that adding dexmedetomidine to lignocaine during Bier's block is superior in quality of anesthesia, tourniquet tolerance, and intraoperative and

postoperative analgesia than is the addition of clonidine.

Memis *et al.*[2] and Esmaoglu *et al.*[5] found the improved quality of anesthesia and tourniquet pain and reduced postoperative analgesic requirement when they used dexmedetomidine lignocaine mixture during Bier's block

Bajwa *et al.*[6] 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.

However, El-Hennawy *et al.*[3] found no difference in duration of analgesia between either dexmedetomidine or clonidine when added to bupivacaine during pediatric caudal anesthesia.

The mechanism by which α -2 adrenoreceptor agonist produces analgesia and sedation is not fully understood and likely to be multifactorial.[6]

Peripherally α -2 adrenoreceptor agonists produce analgesia by reducing release of norepinephrine[7] and causing α -2 receptor-independent inhibitory effect on nerve action potentials.[9]

Centrally, α -2 adrenoreceptor agonists produce analgesia and sedation by inhibition of substance P release in the nociceptive pathway at the level of the dorsal root neuron and by activation of α -2 adrenoreceptors in locus coeruleus.[10]

α -2 adrenoreceptors are coupled via a pertussis toxin-sensitive G protein to potassium ion channel. Stimulation of α -2 adrenoreceptors results in an increase in the potassium ion channel conductance.[1]

LIMITATION : The limitation of our study is that the sample size is small and therefore power of study is less. A larger sample size will establish further conclusive evidence.

CONCLUSION:

The addition of dexmedetomidine to bupivacaine in brachial plexus block by supraclavicular approach results in a prolonged duration of sensory and motor blockade and also the duration of analgesia, in comparison to clonidine.

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