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# The Efficacy of Clonidine Added to Bupivacaine as Compared to Bupivacaine Alone Used in Supraclavicular Brachial Plexus Block

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**Abstract**

*Introduction:* Supraclavicular brachial plexus block provides anaesthesia of the entire upper extremity in the most consistent and time-efficient manner. The present study was undertaken to evaluate the time of onset, duration of sensory and motor block along with monitoring of heart rate, non-invasive blood pressure, and sedation. The analgesic efficacy of clonidine bupivacaine combination compared to plain bupivacaine for brachial plexus block by supraclavicular approach was also studied. *Material and Methods:* After institutional ethical committee clearance and prior informed consent, fifty patients aged 18 to 60 years undergoing upper limb surgery were included in the study after being divided into two equal groups: one with Bupivacaine – Clonidine (BC), another with bupivacaine (B) alone. Group BC received 30 ml of Bupivacaine 0.25% plus 1 µg/kg of clonidine with Normal saline to make a total of 1 ml and Group B received 30 ml of bupivacaine 0.25% plus 1 ml of Normal saline 0.9%. The onset as well as duration of sensory and motor block along with monitoring of heart rate, NIBP, sedation score were recorded. *Results:* The time of onset of sensory and motor blockades was fast in clonidine group along with prolonged duration of action of the same. There was no statistically significant difference between the two groups with regards to age, gender and weight ($p>0.05$). The mean duration of sensory block in group BC was 500.00 ± 104.61 min and in group B was 326.00 ± 58.31 min. The mean duration of motor block in group BC was 420.60 ± 94.23 min and the group B was 283.00 ± 54.85 min. The statistical analysis by unpaired student's 't'- test showed that the duration of sensory and motor block in group BC was significantly longer when compared to group B ($p < 0.001$). *Conclusion:* This study concludes that clonidine is a better adjuvant to bupicaine for supraclavicular brachial plexus block; it provides faster, longer duration of analgesia and sedation with hemodynamic stability.

**Keywords:** Clonidine; Bupivacaine; Supraclavicular Brachial Plexus Block; Upper Limb Surgeries.

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## Introduction

The recent emergence of pain management and the advantage of regional over general anaesthesia in case of emergent surgeries and the increasing importance of outpatient (ambulatory) surgery in anesthetic practice demand a subspecialty. Regional anaesthesia of upper extremity surgery is close to the ideal match for anaesthetic and surgical procedures for patients, anaesthesiologists and surgeons. Regional anaesthesia provides a safe technique with the advantage of prolonged post operative pain relief and is a low cost anaesthesia technique as compared to general anaesthesia. Supraclavicular brachial plexus block is the preferred regional anaesthesia for upper limb

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surgeries because it has high success rate and rapid onset of action. The brachial plexus is presented most compactly at the proximal division or at the trunk level [1] that provides most reliable anaesthesia for upper limb surgeries by anaesthetizing the middle and lower plexus over 80% of the times (median, radial and ulnar).

Local anesthetics like lignocaine, bupivacaine, mepivacaine, ropivacaine, prilocaine, etidocaine are administered as regional nerve blocks are utilized in providing post operative pain relief in many surgical procedures by blocking signal traffic to the dorsal horn [2]. Of various local anesthetics, bupivacaine is used most frequently as it has longer duration of action varying from 3 to 8 hours. Various drugs like neostigmine [3] (cause antinociception both in the spinal cord and in peripheral nerves), opioids [4], adrenaline (facilitate the uptake of the local anaesthetic into nerves), dexmedetomidine, sodium bicarbonate, ketamine, nonsteroidal anti-inflammatory drugs, hyaluronidase [5], midazolam and clonidine [6-11] have been added to local anesthetics in order to modify the block in terms of quick onset, good quality, prolonged duration and post-operative analgesia and enhance analgesic efficacy while reducing the incidence of adverse reactions.

Among the adjuvants to local anesthetics, clonidine is by far the most used drug in regional anesthesia; its yield in improving and prolonging the effects of local anesthetics is apparent in neuraxial techniques. Clonidine is a selective α2 adrenergic agonist with some α1 agonist property, mainly used as centrally acting anti hypertensive agent. α2 receptors mediate sedation, analgesia, and sympatholysis. Clonidine is known to produce anti-nociception and enhance the effect of local anesthetics when given intrathecally, epidurally and in peripheral nerve blocks. Clonidine produces this effect by modulating pain pathways through presynaptic α2 adrenergic receptors. It also produces sedation through acting on pontine locus ceruleus where highest densities of α2 receptors are present.

In clinical studies, the addition of clonidine to local anesthetic solutions improved peripheral nerve blocks by reducing the onset time, improving the efficacy of the block during the surgery and extending post op analgesia. The effect of clonidine is dose related between 0.1 and 0.5 µg/ kg. A number of these studies have focused on the effect of clonidine as adjuvant to either lignocaine or mepivacaine. Some studies have shown that clonidine prolongs the effects of local anesthetics [2,11,12] but other studies have failed to show any effect of clonidine independently from the type of local anesthetic use (ropivacaine, bupivacaine, mepivacaine) and Also, there is no reason for it to be ineffective, specifically in brachial plexus blocks. Moreover, others have indicated an increased incidence of adverse effects like sedation, hypotension and bradycardia [13-16]. The present study is being undertaken in a randomized double blinded manner to evaluate the onset time, duration and analgesic efficacy of clonidine bupivacaine combination compared to plain bupivacaine for brachial plexus block by supraclavicular approach.

*Aims and Objectives*

To evaluate the effect of clonidine as adjuvant to local anesthetic in supraclavicular brachial plexus block on:

The onset and duration of sensory block

The onset and duration of motor block

Duration of Analgesia

Hemodynamic variables (PR, SBP, DBP)

Sedation and side effects to determine the incidence of sedation and side effects with the use of clonidine as compared to controls and to deal with appropriately.

## Material and Methods

Study protocol of this prospective, randomized, double-blinded trial was approved by the Hospital Ethics Committee of a tertiary referral hospital at Kuppam, Andhra Pradesh, India. A written informed consent was obtained. Fifty patients either sex aged between 18 and 60 years of ASA physical status 1 and 2 undergoing upper limb surgeries lasting more than 30 minutes were included in the study. Patients for whom supraclavicular brachial plexus block or the study medications were contraindicated or those who had a history of significant neurological, psychiatric, neuromuscular, cardiovascular, thyroid diseases, diabetes mellitus, hepatic or renal failure, pregnant women were excluded from the study. Patients with history of bleeding disorders and on anticoagulant therapy, alcohol abuse and/or drug abuse, patients taking medication with psychotropic or adrenergic activities and ASA physical status 3 and above were also excluded. The anesthetic procedure to be undertaken including development of paraesthesia was explained to the patients and an attempt was

made to alleviate the anxiety of the patient. All patients received oral alprazolam 0.5 mg night before surgery. No additional sedative medication was administered in the first 60 min after injection of the study dose.

The patients were divided into two groups ($n$=25):

Group BC (bupivacaine–clonidine) received 30 ml of bupivacaine 0.25% plus 1 µg/kg of clonidine with normal saline to make a total of 1 ml and

Group B (bupivacaine) received 30 ml of bupivacaine 0.25% plus 1 ml of NaCl 0.9%.

The anaesthetic solution was prepared according to a random-number table by means of a computer-generated randomization list by an anaesthetist not otherwise involved in the study. The anaesthetist performing the block was blinded to the treatment group. All observations were carried out by a single investigator who was also blinded to the treatment group.

Vitals were recorded once patient entered the Operation Theater (OT). Intravenous access was obtained in the limb opposite to that undergoing surgery with 18G cannula. Standard monitors like ECG, $SpO_2$, and NIBP were connected and monitored in every patient. The patients were administered a brachial plexus block by supraclavicular approach. Using a classic technique, the midpoint of the clavicle was identified and marked. The posterior border of the sternocledomastoid was palpated easily when the patient raised the head slightly. Palpating the belly of the anterior scalene muscle moving towards interscalene groove with the fingers, a mark was made at approximately 1.5 to 2.0 cm posterior to the midpoint of the clavicle. By palpating the subclavian artery at this site, landmark was confirmed. After appropriate preparation and injection of a skin wheal, 22-gauge needle was inserted at the point of entry above the midpoint of clavicle in the backward-inward-downward direction (BID). Paraesthesia in the forearm or hand was elicited. After negative aspiration for air or blood, appropriate drugs were injected. Plexus block was considered successful when at least two out of four nerve territories (ulnar, radial, median and musculocutaneous) were effectively blocked.

The effects of the anesthetic agents on the following parameters were observed immediately and at 5, 10, 15, 20, 25, 30, 35, 40, 60, 120, 180, 240, 300, 360, 420 and 480 min after completion of the injection. Complete recovery of sensation was recorded by an anesthetist only.

The onset time of sensory block was defined as time between injection and no pain. Sensory block was assessed by the response to pin prick method by using 22G 50 mm long stimulating needle (Stimuplex Braun, Germany), was evaluated in 4 nerve areas (median, ulnar, radial and musculocutaneous) at every 5 minutes until complete sensory blockade was achieved. The block was judged to have failed if anaesthesia was not present in 2 or more peripheral nerve distributions and such patients were excluded from the study. Sensory onset was considered when there was a dull sensation to pin prick along the distribution of any of the above-mentioned nerves. Complete sensory block was considered when there was complete loss of sensation to pin prick.

Sensory block was graded as-

Grade 0: Sharp pin felt

Grade 1: Analgesia, dull sensation felt

Grade 2: Anaesthesia, no sensation felt.

Assessment of motor block was carried out by the same observer at every 5 minutes till complete motor blockade was achieved after study drug injection.

The onset time of motor blockwas determined according to a modified Lovett rating scale [9,17,18] ranging from 6 (usual muscular force) to 0 (complete paralysis). As follows: thumb abduction for the radial nerve, thumb adduction for the ulnar nerve, thumb opposition for the median nerve and flexion of elbow for the musculocutaneous nerve. Onset of Motor Block was defined as the time from block to Scale 0 (modified Lovett).

Modified Lovett rating scale:

6 – Normal muscular force

5 – Slightly reduced muscular force

4 – Pronounced reduction of muscular force

3 – Slightly impaired mobility

2 – Pronounced mobility impairment

1 – Almost complete paralysis

0 – Complete paralysis

The duration of sensory blockade, defined as the time between onset of action and return of pinprick response, was assessed every 30 minutes in at least 2 major nerve distributions.

The Duration of Motor Blockwas assessed every 30 minutes till the return of complete muscle power in 2 major nerve distributions.

The Duration of Sensory Block, defined as the time between onset of action and onset of pain,

was the time when patients received the first dose of analgesic. Supplemental analgesia was given when patient felt pain in at least two dermatomes distribution.

During surgery also measured at the above mentioned time points are heart rate, non invasive arterial blood pressure (SBP, DBP) and sedation.

The degree of sedation was evaluated by using the Ramsay Sedation Scale [19]. The sedation score ranged from 1 (anxious) to 6(no response). Symptoms such as bradycardia, hypotension, nausea, vomiting, and drowsiness and other adverse effects/complications were also monitored.

*Ramsay Sedation Scale*

1. Anxious, agitated or restless, or both
2. Cooperative, oriented, and tranquil
3. Responds to commands only
4. Brisk response to a light glabellar (forehead) tap or auditory stimulus
5. Sluggish response to a light glabellar (forehead) tap or loud auditory stimulus
6. No response

*Statistical Analysis*

The data was analyzed by SPSS version (Statistical Package for Social Sciences) software. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumptions on data are made, Assumptions: Dependent variables should be normally distributed, two Samples drawn from the population should be random, and Cases of the samples should be independent.

Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. In this study we analyzed statistical significance of the difference between group B (control) and group BC (Clonidine). A `p` value of >0.05 meant that the difference between the groups was insignificant. A `p` value of < 0.05 was taken to be statistically significant and a value <0.01 was highly significant.

## Observations And Results

*Demographic Profile*

In group BC, there were 13 males and 12 females, and in group B there were 19 males and 6 females (Table 1). The mean age of patients in group BC was 37.80 ± 13.87 years and in group B was 33.00 ± 13.57 years. The mean weight of the patients in group BC was 62.52 ± 8.76 kg and in group B was 63.92 ± 9.40 kg. There was no statistically significant difference between the two groups with regards to age, gender and weight (p>0.05).

*Onset of Block*

The mean time for onset of sensory block in group BC was 17.60 ± 2.93 min and in group B was 26.20 ± 3.32 min (Table 2) the mean time for onset of motor block in group BC was 23.80 ± 3.62 min and in Group B was 31.80 ± 3.19 min. The statistical analysis by unpaired student's 't'- test showed that, the time for onset of sensory and motor block in group BC was significantly faster when compared to group B (p< 0.001).

**Table 1:** Demographic Details

| Parameter | Group BC | Group B | p Value |
|---|---|---|---|
| Mean Age (years) | 37.80 ± 13.87 | 33.00 ± 13.57 | 0.447 |
| Sex (M:F) | 13:12 | 19:6 | 0.100 |
| Mean Weight (kg) | 62.52 ± 8.76 | 63.92 ± 9.40 | 0.589 |

**Table 2:** Comparison of Outcome Variables in two Groups Studied

| Outcome variables | Group B | Group BC | p value |
|---|---|---|---|
| SOT (min) | 26.20 ± 3.32 | 17.60 ± 2.93 | <0.001** |
| MOT (min) | 31.80 ± 3.19 | 23.80 ± 3.62 | <0.001** |
| DOSB (min) | 326.00 ± 58.31 | 500.00 ± 104.61 | <0.001** |
| DOMB (min) | 283.00 ± 54.85 | 420.60 ± 94.23 | <0.001** |
| First analgesic request (min) | 326.00 ± 58.31 | 498.80 ± 103.22 | <0.001** |

**Table 3:** Comparison of mean Sedation score

| Sedation score | Group B | Group BC | p value |
|---|---|---|---|
| 0 min | 1.00 ± 0.00 | 1.00 ± 0.00 | - |
| 5 min | 1.00 ± 0.00 | 1.64 ± 0.49 | <0.001** |
| 10 min | 1.00 ± 0.00 | 1.92 ± 0.28 | <0.001** |
| 20 min | 1.00 ± 0.00 | 2.08 ± 0.28 | <0.001** |
| 40 min | 1.00 ± 0.00 | 2.04 ± 0.20 | <0.001** |
| 60 min | 1.00 ± 0.00 | 2.32 ± 0.48 | <0.001** |

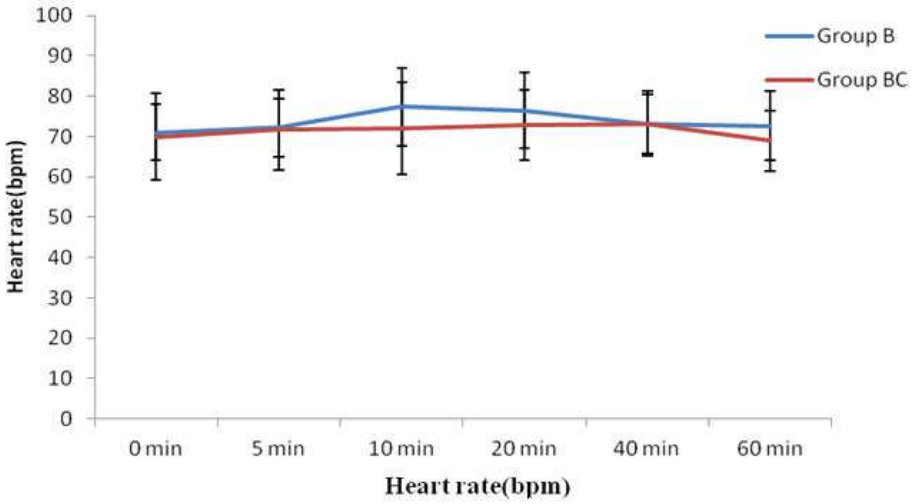


**Fig. 1:**

*Duration of Block*

The mean duration of sensory block in group BC was 500.00 ± 104.61 min (Table 2) and in group B was 326.00 ± 58.31 min. The mean duration of motor block in group BC was 420.60 ± 94.23 min and the group B was 283.00 ± 54.85 min. The statistical analysis by unpaired student's 't'- test showed that the duration of sensory and motor block in group BC was significantly longer when compared to group B ($p < 0.001$).

*Duration of Analgesia*

Duration of analgesia was longer in group BC (498.80 ± 103.22 min) (Table 2) compared to group B (326.00 ± 58.31 min). This difference was clinically and statistically significant (p= <0.001).

*Comparison of mean Sedation score*

In group B, all patients were awake and alert and had sedation score of 1. In group BC, sedation corresponding to score 2 was observed in some patients between 5 min from time of injection and 60 min and had sedation score of 2. sedation score of 3 was observed in 8% of the patients at 20 min, 4% of the patients at 40 min, and 32% of the patients at 60 min (Table 3). Statistical analysis of sedation score by Chi-square test showed that the difference in sedation score was significant in between 5 min and 60 min (p= 0.001).

*Comparison of Heart rate (bpm)*

In group B, the mean pulse rate ranged from 71.00 ± 6.87 to 77.32 ± 9.75 beats /min. In group BC, the mean pulse rate ranged from 68.88 ± 7.49 to 73.20 ± 8.06 beats/min. The statistical analysis by unpaired student's 't'-test showed that there was no significant difference in pulse rate between the two groups ($p > 0.05$). (Figure 1).

*Comparison of Systolic blood pressure (SBP) and Diastolic blood pressure (DBP) in study groups*

The mean SBP ranged from 120.56 ± 8.29 to 123.44 ± 9.96 mm of Hg in group B, whereas in group BC the mean SBP ranged from 118.60±8.10 to 125.24 ± 10.95 mm of Hg. In group B, the mean DBP ranged from 72.52 ± 4.52 to 76.12 ± 8.31 mm of Hg. In group BC, the mean DBP ranged from 70.76 ± 4.92 to 78.44 ± 9.66 mm of Hg. The statistical analysis by unpaired student's 't'- test showed that there was no significant difference in SBP and DBP between the two groups ($p > 0.05$).

## Discussion

Brachial plexus block evolved as an alternative to general anaesthesia [20]. This technique allows us to avoid the rare but significant complications of General anaesthesia. The supraclavicular block is often called the "spinal anesthesia of the upper extremity". The reasons for its high success rate are in its anatomic characteristics. The block is performed at the level of the distal trunks and origin of the divisions, where the brachial plexus is confined to its smallest surface area. The three trunks carry the entire sensory, motor, and sympathetic innervations of the upper extremity, with the exception of the uppermost part of the medial side of the arm (T2) [21].

In our study we chose the supraclavicular technique over other brachial plexus block approaches because of its rapid onset, complete muscle relaxation, stable intraoperative Haemodynamics and complete and predictable anesthesia for entire upper extremity.

Local anesthetics administered as regional nerve blocks are utilized in providing postoperative pain relief in many surgical procedures by blocking signal traffic to the dorsal horn. Among the various local anaesthetics used for brachial plexus block, bupivacaine is a reliable, versatile, long acting local anaesthetic, when used in correct dosage for caudal, spinal, epidural and peripheral nerve blocks. Hence, we chose bupivacaine as a local anaesthetic in our study.

Clonidine was initially used as centrally acting antihypertensive. The actions of clonidine is more pronounced centrally than peripheral, as it acts on α2 adrenergic receptors which are mainly present in locus coeruleus and dorsal horn of spinal cord there by producing its analgesic effect. The concurrent injection of α2 adrenergic agonist drugs has been suggested to improve the nerve block characteristic of local anesthetic solutions through either local vasoconstriction and facilitation of C fiber blockade [22] or a spinal action caused by slow retrograde axonal transport or simple diffusion along the nerve [23].

In clinical studies, the addition of clonidine to local anesthetic solutions improved peripheral nerve blocks by reducing the onset time, improving the efficacy of the block during surgery and extending postoperative analgesia [7,16]. Clonidine possibly enhances or amplifies the sodium channel blockade action of local anesthetics by opening up the potassium channels resulting in membrane hyperpolarization, a state in which the cell is unresponsive to excitatory input [24].

Singelyn et al. reported that a minimum dose of clonidine (0.5 μg/kg) added to mepivacaine prolongs the duration of anaesthesia and analgesia after brachial plexus block. No added benefits were found with doses exceeding 1.5 μg/kg. Therefore, we decided to use clonidine at a dose of 1 μg/kg in our study. In a few clinical studies, a lower dose of clonidine (0.1-0.5 μg/kg) [16] was used as adjuvant for brachial plexus block. Considering the fact that Indian population has relatively lower body weight and that there are few studies with low dose clonidine, we planned to compare the effect of low dose clonidine (1 μg/kg).

Our study was a prospective, randomized, double-blind study carried out at a tertiary care hospital in kuppam. A total of 50 ASA physical status 1 and 2 patients undergoing elective upper limb surgeries within the age group of 18-60 years were included in the study.

### *Onset of block*

In our study, onset of sensory block in group BC was 17.60 ± 2.93 min and in group B was 26.20 ± 3.32 min. onset of motor block in group BC was 23.80 ± 3.62 min and in Group B was 31.80 ± 3.19 min. The time for onset of sensory and motor block in group BC was significantly faster when compared to group B ($p < 0.001$).

The early onset could be due to a local direct action of Clonidine and its synergistic action with that of local anaesthetics. The onset of sensory block was found to be faster than the onset of motor block in both groups. These results are similar to the results of various studies by Sushmita et al., McCartney et al. using clonidine as an adjuvant.

### *Duration of Block*

In our study the duration of sensory block in group BC was 500.00 ± 104.61 min and in group B was 326.00 ± 58.31 min. The mean duration of motor block in group BC was 420.60 ± 94.23 min and the group B was 283.00 ± 54.85 min. the duration of sensory and motor block in group BC was significantly longer when compared to group B ($p < 0.001$).

Our results showed that sensory block tended to last longer as compared to motor block which agrees with the observation by de Jong et al. [25] These authors explained that large fibres require a higher concentration of local anaesthetic than small

fibres. The minimal effective concentration of local anaesthetic for large (motor) fibres is greater than for small (sensory) fibres. Singh S et al. [17], showed that addition of clonidine 150 µg to bupivacaine for supraclavicular nerve block produced prolonged motor blockade without any significant hemodynamic changes and adverse effects.

*Duration of Analgesia*

Duration of analgesia was longer in group BC (498.80 ± 103.22 min), compared to group B (326.00 ± 58.31 min). This difference was clinically and statistically significant (p= <0.001).

The prolonged analgesia in Group BC could be due to the action of Clonidine by inhibiting action potential of A & C fibers in peripheral nerves as demonstrated by Gaumann et al. [22]. Many authors favor the hypothesis that Clonidine exerts its local anesthetic-prolonging effect directly on nerve fiber, as a result of complex interaction between Clonidine and axonal ion channels or receptors. Masuki et al. [26] suggested Clonidine may produce local vasoconstriction resulting in a delayed absorption of local anesthetic and block prolongation. Butterworth et al. [24] found Clonidine to produce tonic and phasic block of nerve conduction in rat sciatic nerve fibers by directly binding to α2 adrenergic receptors on presynaptic peripheral nerves to modify neuronal excitability. These results are comparable to other studies like McCartney et al. [27], who found that a Bupivacaine and Clonidine combination prolonged postoperative analgesia compared to a Bupivacaine alone when administered for various peripheral nerve blocks. Eledjam J.J et al. [28] showed that clonidine is an attractive alternative to epinephrine to prolong duration of analgesia in supraclavicular brachial plexus block.

Most studies have quoted that addition of clonidine to ropivacaine (El Saied et al.) [29] and bupivacaine (Iskandar et al. [2], Damien B Murphy et al. [30]) for supraclavicular block prolongs the duration of sensory, motor block and duration of analgesia.

*Sedation Score*

Sedation score was assessed using Ramsay sedation Scale. In group B, all patients were awake and alert and had sedation score of 1 throughout the study. In group BC, sedation corresponding to score 2 was observed in 64% patients at end of 5 min, 92% patients at end of 20 min, 96% patients at end of 40 min and 68% patients at end of 60 min from time of injection. The difference in sedation score was significant in between 5 min and 60 min (p= 0.001).

Similar observation was made in the above mentioned study by Chakraborty *et al.* [31] This may have been due to partial vascular uptake of Clonidine, and its transport to the central nervous system where it acts and produces sedation. The limited duration of sedation could be explained by the fact that Clonidine is highly lipophilic and diffuses faster into the blood vessels. Though the mean sedation score in group BC was higher as compared to group B ($p < 0.01$), we did not observe clinically significant sedation in patients in group BC. No patient experienced airway compromise or required airway assistance. This mild sedation was actually desirable during that period.

*Haemodynamic Parameters*

The difference in perioperative heart rate, systolic and diastolic blood pressure in both the groups was statistically insignificant ($p > 0.05$).

In our study we observed that perioperative Haemodynamics were stable in both the groups. Moreover, sedation, which is often associated with the use of clonidine [7], was not apparent in our study.

Most of the studies conducted using clonidine in regional anaesthesia did not report any adverse effects [16]. However, studies by and Bernard et al. [7] and Buttner et al. [32] reported the incidence of hypotension and bradycardia with the use of clonidine. In our study, no side-effects were observed in both the clonidine and the control group throughout the study period.

In conclusion, Clonidine 1 µg/kg when added to 30 ml of Bupivacaine 0.25% for supraclavicular brachial plexus block, speeds the onset of sensory and motor blocks ($p < 0.05$). The combination produces improved analgesia, resulting in a prolonged effect and reduced requirements for rescue analgesics.

The major limitations of our study are that we did not use ultrasound-guided blocks because of unavailability at the time of our study; this could have helped us to lower dosages and volumes of local anaesthetic. In spite of an intensive search of the published literature, we were unable to identify an ideal scale for assessment of quality of block achieved. While the higher cost of dexmedetomidine can be suggested as a reason for preference for clonidine, the increased requirement of supplementary analgesia and sedation with clonidine may balance this. We admit that further studies to determine the cost-effectiveness of the drug are necessary.

## Conclusion

From our study, we conclude that, the addition of Clonidine (1 µg/kg body weight) as an adjuvant to Bupivacaine 30 ml (0.25%) has following effects:

Faster onset of sensory block.

Faster onset of motor block.

Longer duration of sensory block.

Longer duration of motor block.

Longer duration of analgesia

Comfortable sedation intraoperatively without any need for airway assistance.

No significant difference in haemodynamic variables i.e., pulse rate, systolic BP and diastolic BP.

*Source of support:* nil

*Conflict of interest:* none declared

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