*Original Research Article*

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# Comparision of Dexmedetomidine Versus Clonidine as Anadjuvant to 0.5% Ropivacaine in Supraclavicular Brachial Plexus Block: A Randomized Double Blind Prospective Study

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**Abstract**

*Introduction:* Upper limb surgeries are mostly performed under anesthesia such as Supraclavicular brachial plexus block, peripheral nerve block not only provide Intraoperative anaesthesia but also ensure post operative analgesia. *Materials and methods:* This study was conducted on 100 patients of ASA physical status I to III in age group of 18-70 years of either sex posted for elective upper limb surgeries under Supraclavicular brachial plexus bock after taking informed consent at KVG Medical College, Sullia from January 2013 to June 2014. Patients was randomly allocated to 2 groups of 50 each by random number table prepared by another anesthetist not otherwise involved in the study outside the operating room, namely; *Group C:* 33 ml of 0.5% Ropivacaine plus 1 ug/kg Clonidine *Group D:* 33 ml of 0.5% Ropivacaine plus 1 ug/kg Dexmedetomidine *Results:* Onset of sensory block was faster in group D than in Group C, While onset of motor block was faster in group C than in Group D, but the difference was not statically significant ($p > 0.05$). Duration of sensory block and duration of motor block were significantly longer in Group D as compared to Group C ($p < 0.001$). There was significant increase in duration of analgesia in Group D as compared with group C. None of the patients in group D required sedation intraoperatively and they were comfortable throughout the surgery with arousable sedative effects. Significant lower heart rate was observed at 30, 45, 60, 75, 90, 105, 120 and 135 min, but not less than 60 beats/min, in Group D as compared with Group C ($p < 0.001$). Systolic and diastolic blood pressure were found to be significantly lower than baseline from 25 to 60 min in group D as compared with Group C ($p < 0.001$). *Conclusion:* addition of dexmedetomidine as an adjuvant to Ropivacaine produces a significantly faster onset of sensory block and a significantly longer sensory and motor block when compared to Clonidine. Dexmedetomidine significantly reduces the number of rescue analgesia dosage requirements in postoperative 24 hrs and prolongs the duration of analgesia when compared to Clonidine. The mean arterial pressure, heart rate, blood pressure did not require any therapeutic intervention in both study groups.

**Keywords:** Upper limb surgeries, Ropivacaine, Clonidine, Dexmedetomidine

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## Introduction

Upper limb surgeries are Mostly Performed Under peripheral Blocks such as the brachial Plexus block. Peripheral Nerve blocks not only provide intraoperative Anaesthesia but also extend Analgesia in the post-operative period without any systemic side-effects.[1,2] Alpha-2 adrenergic receptor agonists has been focus of the interest for their

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sedative, analgesic, perioperative sympatholytic and cardiovascular stabilizing effects with reduced anaesthetic requirements. Furthermore, various methods of administration, such as epidural, intrathecal and peripheral injections, have been tried either alone or in combination with another drug to prolong and intensify the anaesthesia.[5]

Dexmedetomidine, a potent $\alpha_2$ adrenoceptor agonist, is approximately eight-times more selective towards the $\alpha_2$ adrenoceptor than clonidine. In previous clinical studies, intravenous dexmedetomidine resulted in significant opioid sparing effects as well as a decrease in inhalational anaesthetic requirements.[6] In various animal studies, dexmedetomidine has been reported to enhance sensory and motor blockade along with increased duration of analgesia. In humans, dexmedetomidine has also shown to prolong the duration of block and post-operative analgesia when added to local anaesthetic in various regional blocks.[7] Till date, no studies have compared dexmedetomidine with clonidine with respect to duration of block and post-operative analgesia.[8,9] The present study was designed to test the hypothesis that dexmedetomidine when added as an adjuvant to local anaesthetic in supraclavicular brachial plexus block enhanced the duration of sensory and motor block, duration of analgesia and quality of block as compared with clonidine.[10,11]

**Materials and Methods**

***Source of data collection:*** the study group will comprise of patients admitted in KVG Medical College and hospital, Sullia, for elective or emergency upper limb surgeries from January 2013 to June 2014.

***Method of data collection:*** After the approval by the institutional Ethics Committee of the KVG Medical college and Hospital, Sullia, 100 patients aged between 18 to 70 years with ASA physical status I-III who were scheduled for elective or emergency, upper limb surgeries under brachial plexus block were enrolled in this prospective double blind randomized comparative study with written informed consent.

Patients who will be selected for the study will be randomly allocated to 2 groups of 50 each by random number table or slip in box method, prepared by another anesthetist not otherwise involved in the study, outside the operating room, namely:

(a.) Group C: 33 ml of 0.5% Ropivacaine plus 1 ug/kg Clonidine

(b.) Group D: 33 ml of 0.5% Ropivacaine plus 1 ug/kg Dexmedetomidine

Pre medication was given with tablet alprazolam 0.5 mg orally at 22:00 hrs on the night before surgery. No additional sedative medication was admitted in the first 60 min after injection of the study dose. The anesthetist performing the block was blinded to the treatment group. All observations will be carried out by a single investigator who will also be blinded to the treatment group.

Before being shifted to operation room, IV line with 18G IV cannula in the dorsum of hand of patients will be secured and the patient will be started with ringer lactate half an hour before surgery.

In the operation room, Patients will be monitored with standard anaesthetic monitoring techniques using non invasive blood pressure (NIBP), peripheral oxygen saturation ($SpO_2$) and electrocardiography evaluations. The baseline blood pressure, mean arterial pressure (MAP) and oxygen saturation was monitored and recorded after the block every 5 minutes for half an hour then every 15 minutes until the end of the surgery.

Hundred Patients scheduled for elective or emergency upper limb surgery were randomized and divided into two equal groups. Brachial plexus was approached by Supraclavicular route using a 50mm stimuplexinsulatedneedle connected to a peripheral nerve locator (Inmed). The location end point was a distal motor response with an output lower than 0.5 mA in the median nerve region. Patients were assigned randomly into one of the two groups. Ingroup C (n = 50) 33 ml of 0.5% Ropivacaine plus 1 ug/kg Clonidine and in group D (n = 50) 33 ml of 0.5% Ropivacaine plus 1 ug/kg Dexmedetomidine was given.

During injection, negative aspiration was performed every 5 ml to avoid intravascular injection.

Sensory block was assessed by the pin prick method. Assessment of sensory block was done at each minute after completion of drug injection In the dermatomal areas corresponding to median nerve, radial nerve, ulnar nerve and musculocutaneous nerve till complete sensory block, 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-

1. Grade 0: Sharp pain left

2. Grade 1: Analgesia, Dull sensation felt
3. Grade 3: Anaesthesia, no sensation felt.

Assessment of motor block was carried out by the same observer at each minute till complete motor blockade after drug injection. Onset of motor blockade was considered when there was Grade 1 motor blockade. Peak motor block was considered when there was Grade 2 motor blockade. Motor block will be determined according to a modified bromage scale for upper extremities on a 3 point scale.

1. Grade 0: Normal motor function with full flexion and extension of elbow, withstand fingers.
2. Grade 1: Decrease motor strength with ability to move the fingers only
3. Grade 2: Complete motor block with inability to move the finger

Postoperatively, this testing was done every 30 min until the sensory and motor variables become normal. Postoperatively quality of analgesia was evaluated with visual analogue scale from 0 to 10 where 0 defines no pain and 100 defines worst Pain ever suffered, every 30 min until VAS > 5, Supplementary analgesia was given at VAS > 5.

*Visual Analogue Scale*

| Pain Intensity | Word Scale |
|---|---|
| 0 | No pain |
| 1-2 | Least pain |
| 3-4 | Mild pain |
| 5-6 | Moderate pain |
| 7-8 | Severe pain |
| 9-10 | Excruciating pain |

Pain score > 5 - Supplememtary analgesia given

Sedation was assessed using Ramsay Sedation Scale (RSS) before the block and then every 15 min.

*Ramsay Sedation Scale*

1. Fully Awake
2. Drowsy
3. Dowsy but arousable to touch / call
4. Drowsy but arousable on deep stimuli

The rescue analgesia was given in the form of inj. Diclofenac SodiumAqueous 75 mg Iv Infusion in 500 ml RL or 100 mg IV paracetamol infusion.

Inadequate sensory and motor blockade beyond 30 mins following the infiltration will be considered as unsuccessful block.

***Management of unsuccessful block:*** In the circumstances of inadequate or patchy action of the block, the block was supplemented with general anesthesia. If in case surgery was unduly prolonged and the effect of the block wore off, rescue analgesia was given in the form of intravenous fentanyl 1 mcg/kg and infusion of propofol 50-100 mcg/kg/min. The duration of sensory block was defined as the time interval between the end of local anesthetic administration and the complete resolution of anesthesia on all nerves. The duration of motor block was defined as the time interval between the end of local anesthetic administration and the recovery of complete motor function of the hand and forearm. Assessment of blood loss was done and fluid was administered as per the loss. Duration of surgery will be noted.

***Inclusion criteria***

1. Patient Aged between 18 to 70 years of Either sex.
2. ASA grade I-III.
3. Elective/Emergency upper limb surgeries.

***Exclusion Criteria***

1. Patient refusal for procedure.
2. Any bleeding disorder or patient on anticoagulants.
3. Neurological deficits involving brachial plexus.
4. Patients with allergy to local anesthetics.
5. Local infection at the injection site
6. Patients on any adrenoreceptor agonist or antagonist therapy.
7. Body mass index >35 kg/m2
8. Uncontrolled diabetes mellitus.
9. Pregnant women.

***Study design:*** A prospective study will be conducted in patients with either sex requiring elective or emergency upper limb surgeries after obtaining an informed consent.

***Sample size:*** A sample size of 100 was required. We planned to conduct study on 100 patients in the age group of 18-70 years of either sex, attending KVG hospital for upper limb surgeries.

***Analysis of data:*** The data was analysed by SPSS version 17. Unpaired T-test was applied for demographic data, haemodynamic parameters, onset and duration of sensory and motor blockade

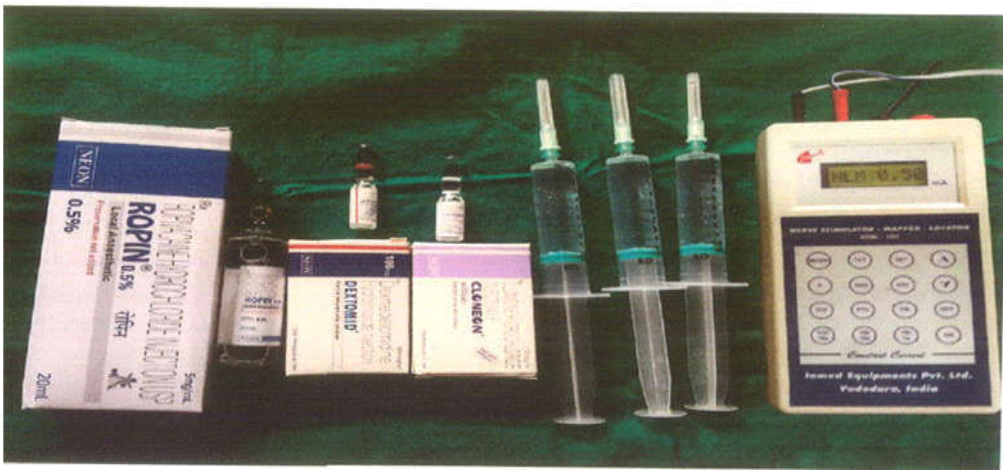


**Fig. 1:** Drugs Used

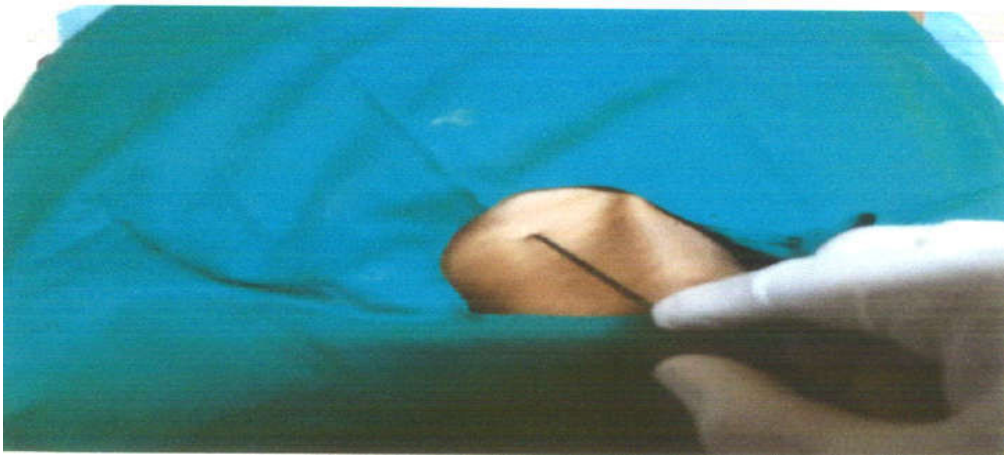

**Fig. 2:** Technique of supraclavicular brachil plexus block nerve mapper

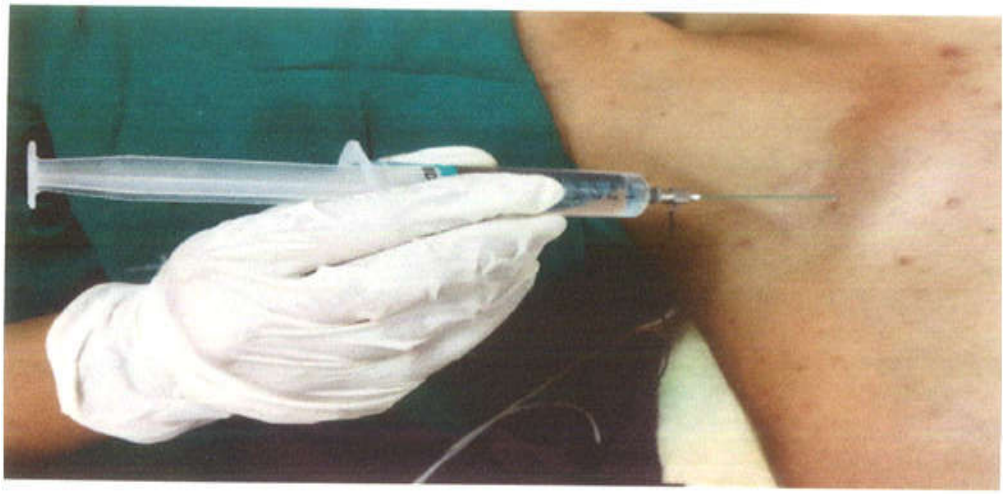

**Fig. 3:** Technique of supraclavicular brachil plexus block with nerve locator

**Fig. 4:** Peripheral nerve Stimulator

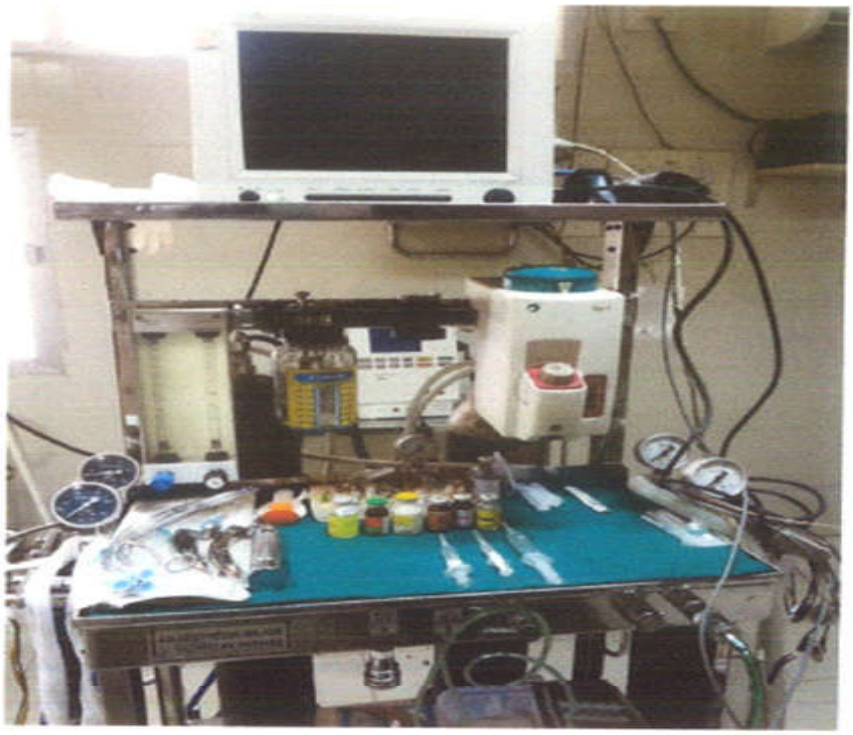

**Fig. 5:** Boyle's Machine

and duration of analgesia, proportions, percentages and chi-square test were used for the analysis of the data. P Value was considered significant if < 0.05 and highly significant if < 0.001.

***Follow up:*** Yes

***Follow Up period:*** 24 hours in postoperative ward.

## Results

Hundred ASA I to III patients of either sex aged between 18 to 70 years, posted for upper limb surgeries under supraclavicular brachial plexus were selected for the study. The study was undertaken to evaluate the efficacy of Dexmedetomidine (1ug/Kg) as adjuvant to Ropivacaine 0.5% 33 ml of comparison with clonidine (1ug/Kg) as an adjuvant

**Table 1: Frequencies**

| | Frequency | Percentage |
|---|---|---|
| Group C | 50 | 50 |
| Group D | 50 | 50 |
| **Total** | 100 | 100 |

**Table 2:** Demographic data

| | Group | Mean | SD | T value | *p* Value |
|---|---|---|---|---|---|
| Height | Group C | 167.22 | 5.883 | 0.216 | 0.830 |
| | Group D | 168.00 | 7.045 | | |
| Weight | Group C | 65.32 | 5.531 | 0.797 | 0.427 |
| | Group D | 66.28 | 6.478 | | |
| Age in years | Group C | 40.62 | 12.844 | 0.458 | 0.648 |
| | Group D | 41.72 | 11.090 | | |

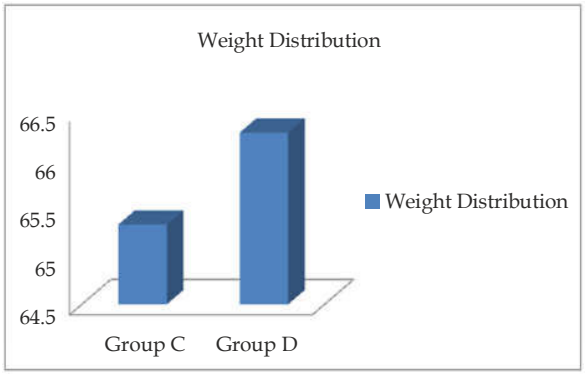


**Fig. 6:** Weight distribution

to Ropivacaine 0.5% 33 ml for brachial plexus block by supraclavicular approach.

Patients who were selected for the study were randomly allocated to 2 groups of 50 each by random number table or slip in box method, prepared by another anesthetist not otherwise involved in the study. Outside the operating room, namely:

Group C: 33 ml of 0.5% Ropivacaine plus 1 ug/ kg Clonidine

Group D: 33 ml of 0.5% Ropivacaine plus 1 ug/ kg Dexmedetomidine.

Hundred patients were divided in two equal groups of 50 each (Table 1).

**Table 3:** ASA Distribution

| | | | Group | | |
|---|---|---|---|---|---|
| | | | Group C | Group C | Total |
| ASA | I | Count | 40 | 34 | 74 |
| | | % | 80% | 68% | 74% |
| | II | Count | 10 | 16 | 26 |
| | | % | 20% | 32% | 26% |
| | **Total** | Count | 50 | 50 | 100 |
| | | % | 100% | 100% | 100% |

**Table 4:** Types of Surgeries

| Surgery | | Group | | Total |
|---|---|---|---|---|
| | | Group C | Group D | |
| Buttress Plating | Count | 2 | 3 | 5 |
| | % | 4% | 6% | 5% |
| Crif and K Wiring | Count | 13 | 8 | 21 |
| | % | 26% | 16% | 21% |
| Implant removal | Count | 3 | 1 | 4 |
| | % | 6% | 2% | 4% |
| Orif | Count | 4 | 5 | 9 |
| | % | 8% | 10% | 9% |
| ORIF with DCP plate | Count | 4 | 4 | 8 |
| | % | 8% | 8% | 8% |
| Orif with DCP plating | Count | 21 | 23 | 44 |
| | % | 42% | 46% | 44% |
| Radial head excision | Count | 1 | 3 | 4 |
| | % | 2% | 6% | 4% |
| TBW with K wiring | Count | 2 | 3 | 5 |
| | % | 4% | 6% | 5% |
| **Total** | Count | 50 | 50 | 100 |
| | % | 100% | 100% | 100% |

**Table 5:** Comparison of duration of surgery in two groups studied

| | Group | Mean | SD | T Value | P Value |
|---|---|---|---|---|---|
| DOS in mins | Group C | 119.40 | 18.671 | 0.970 | 0.334 |
| | Group D | 123.00 | 18.434 | | |

**Table 6:** Onset of sensory block between the study groups

| | Group | Mean | SD | T Value | P Value |
|---|---|---|---|---|---|
| Onset of sensory blocking in mins | Group C | 2.278 | .7002 | **6.377** | **0.000** |
| | Group D | 1.562 | .3741 | | |

**Table 7:** Onset of motor block between the study groups

| | Group | Mean | SD | T Value | P Value |
|---|---|---|---|---|---|
| Onset of Motor block in mins | Group C | 4.21 | 1.085 | 1.812 | 0.073 |
| | Group D | 4.58 | 98.8 | | |

The mean age of patients in Group C was 40.62 years and that in group D was 41.72 years. There was no statistically significant difference between the man ages of two groups. The mean height of patients in Group C was 167.72 cms and that in group D was 168.00 cms. There was no statistically significant differences between the mean height of two groups (Table 2 and Fig. 6).

Forty patients in group C came under ASA 1 category, where as 10 patients came under ASA II. In group D 34 patients belonged to ASA I category,

where as 16 patients belonged to ASA II category. The P value was found to be not significant (Table 3).

The mean time of onset block in this study in group C was 4.06 min and the mean onset of motor block group D was 4.46 min. there is no significant difference between the onsets of motor block in the two groups. Group C showed comparative earlier on set of motor block to Group D. However, P value suggests that there was no significant difference.

The mean duration of motor block in group C was 12.25 hours and the mean duration of motor block in Group D was 14 hours. This value showed that duration of motor block in Group D was that of group C. Statistically found to be highly significant.

The mean duration of sensory block in group C was 13.53 hours and the mean duration of sensory block in Group D was 15.95 hours. This value showed that duration of sensory block in Group D was longer than that of Group C. Statistically found to be highly significant (Table 6).

In group C, The mean duration of analgesia was 14.07 hours when compared to Group D having mean duration of 16.92 hours. Duration of analgesia was prolonged in Group D when compared with Group C. The *p* value was 0.000 which is statistically highly significant.

There was drop in heart rate in group D at interval of 20 mins and difference was found significant. P < 0.05 when compared to Group C. There was significant drop in the heart rate in group D at intervals of 25min, 30 min, 45 min, 60 min, 75 min, 90 min, 105 min, 120 min, 135min when compared to Group C. $p < 0.001$, these value suggest that there was significant drop in heart rate in Group D. However no patients developed bradycardia ie heart rate < 50 in either of the groups.

There was drop in systolic BP in Group D at interval of 30 min and 60 min differences was found highly significant $p < 0.001$ when compared to Group C. There was significant drop in the systolic BP in group D at intervals of 30 min, 60 min, 75 min, when compared to Group C ($p < 0.05$). These value suggest that there was significant drop in systolic BP in group D. however no patients developed i.e systolic BP < 90 mm of Hg in either of the groups (Tables 4-7).

**Discussion**

In our study we used 33 ml of 0.5% Ropivacaine for brachial plexus block because according to a study done by Hickeyet al.[13] It was found that 33 ml of a 0.5% ropivacaine solution used for performance of a subclavian perivascular block produced a rapid onset of sensory anesthesia with prolonged sensory and motor blockade.

In another study conducted by swami et al. who compared 1ug/kg Dexmedetomidine and 1 ug/kg clonidine as an adjuvant to bupivacaine 0.25% 35 ml in supraclavicular brachial plexus block. So we also choose same dose of dexmedetomidine and clonidine i.e 1ug/kg along with 0.5% ropivacaine 33 ml in supraclavicular brachial plexus block, to study block characteristics.[14]

In present study the mean time of onset of sensory block in Group C was 2.278 min and 1.562 min in Group D respectively. This difference in onset of sensory block was found to be statistically highly significant between the two groups.[15]

The mean duration of motor block in group C was 735 ± 74.4 mins and the mean duration of motor block in group D was 840 ± 49.80 mins. This value showed that duration of motor block in Group D was longer than that of Group C. Statistically found to be highly significant ($p < 0.001$).[16]

The mean sensory block in group C was 811.80 ± 75 mins and the mean duration of sensory block in group D was 957 ± 73.20 mins. This value showed that duration of sensory block in Group D was longer than that of group C. Statistically found to be highly significant ($p < 0.001$).[17]

In group C, the mean duration of analgesia was 844.20 ± 69.42 mins when compared to group D having mean duration of analgesia of 1015.20 mins. Duration of analgesia was prolonged in Group D when compared with group C. The *p* value was 0.000 which is statistically highly significant.[18]

**Conclusion**

In present study we found that dexmedetomidine 1ug/kg as adjuvant to 33 ml of 0.5% Ropivacaine produces a significantly faster onset of sensory block and a significantly longer sensory and motor block when compared to Clonidine 1 ug/kg Dexmedetomidine significantly reduces the number of rescue analgesic dosage requirements in postoperative 24 hrs and prolongs the duration of analgesia when compared to Clonidine. Onset of motor block was little faster with Clonidine but was statistically not significant.

To conclude, in our study we found that dexmedetomidine when added to Ropivacaine for Supraclavicular brachial plexus block shortens the onset time for sensory block and prolongs the duration of sensory and motor block. The

significantly prolonged duration of analgesia obviates the need for any additional analgesics. The added advantage of conscious sedation, hemodynamic stability and minimal side effects makes it a potential adjuvant for nerve blocks.

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