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Original Research Article

Comparative study of Bupivacaine 0.5% versus Bupivacaine plus Dexmedetomidine in supraclavicular brachial block for elective upper limb surgeries.

Dr. Kirwale Yogesh Sambhaji[1] (PG Student), Dr. Divya Gautam[2] (Assistant Professor) & Dr. Ravneet Singh Bhusari[3] (Associate Professor)

Dept. of Anaesthesiology, Government Medical College, Datia[1,2&3]

Corresponding Author: Dr. Divya Gautam

Abstract

Background : Supraclavicular brachial block is commonly used anaesthetic technique for upper limb surgeries and Bupivacaine is commonly used local anesthestic for block. There is always been search for ideal adjuvants with bupivacaine to fasten the onset of block and prolong the duration of block and analgesia. Recently Dexmedtetomidine is on of the most commonly studied adjuvants to bupivacaine, but result varies significantly in different studies. So we decided to conduct a study to see the effects of adding Dexmedetomidine as an adjuvant to bupivacaine in supraclavicular block.

Methods: In this prospective randomized study, after ethical committee approval and informed consent, 60 ASA I & II patients undergoing elective surgeries on the upper limb will be given supraclavicular block using peripheral nerve stimulator. Group B (n=30) will receive 30 mL 0.5% bupivacaine + 1 mL normal saline and Group BD will receive 30 mL 0.5% bupivacaine + 1 µg/kg dexmedetomidine. Patients will be observed for, onset of motor and sensory block, duration of motor and sensory block, duration of analgesia, hemodynamic changes and any adverse events.

Results: Onset time for sensory block (Mean ± SD) in BB group was 14.27 ± 1.36 and in BD group was 11.60 ± 2.63. Onset time for motor block (Mean ± SD) in BB group was 16.23 ± 1.92 and in BD group was 13.00 ± 1.98. Total duration of sensory block (Mean ± SD) in BB group was 557.1 ± 27.43 and in BD group was 791.03 ± 46.03. Total duration of motor block (Mean ± SD) in BB group was 511.33 ± 27.01 and in BD group was 733.07 ± 46.42. Duration of analgesia (Mean ± SD) in Group BB was 654.53 ± 27.38 and Group BD was 873.17 ± 48.9. It shows that addition of Dexmedetomidine in Bupivacaine significantly fasten the onset of sensory and motor block and prolonged the duration of sensory block, motor block, duration of analgesia.

Conclusion: In our study we found that Dexmedetomidine with 0.5% Bupivacaine is superior than the plain 0.5% bupivacaine for supraclavicular brachial plexus block. It shortens the onset times for sensory and motor blocks and prolongs their duration. It significantly prolong duration of analgesia and reduces the need for additional analgesia. The added advantage of conscious sedation, hemodynamic stability, and minimal side effects makes it a potential adjuvant for nerve blocks.

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Keywords: Bupivacaine, Dexmedetomidine, supraclavicular, brachial, limb & surgeries.

Study Design: Comparative Study.

Introduction

Supraclavicular brachial block is commonly used anaesthetic technique for upper limb surgeries and Bupivacaine is commonly used local anesthestic for block.

There is always been search for ideal adjuvant to bupivacaine to provide faster onset , long duration of block and long and adequate analgesia without affecting hemodynamic stability.

There are many opiod and non-opiod adjuvants has been studied as adjuvant to bupivacaine like Fentanyl, Buprenorphine, Tramodol, Dexamethasone , Clonidine etc.

Dexmedetomidine is a $\alpha 2 > \alpha 1$(8>1) agonist. It is sedative & analgesic and its use in peripheral nerve blocks has been recently described.

There are some studies done on Dexmedetomidine with Bupivacaine in supraclavicular block, but results are variable in different studies.

In most of the studies Dexmedetomidine as an adjuvant fasten the onset of both sensory and motor block , prolong the duration of block & duration of analgesia but values varies significantly in different studies.

In this study, we investigated whether adding dexmedetomidine to bupivacaine 0.5% for supraclavicular brachial plexus block would affect the sensory and motor blocks and duration of analgesia.

Aim:

To compare the efficacy of Bupivacaine versus Bupivacaine with Dexmedetomidine in supraclavicular block for upper limb surgeries.

Objectives: Primary Objective

Duration of analgesia .

Secondary objectives

1. Onset of sensory and Motor Block .
2. Duration of sensory and motor block .
3. Side Effects.

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Material and Methods

Study design: Observational study.

Sample size : 60 . Slowins formula n= N / (1+Ne2) where N = 72 (last 3 yr data)

e = 5% (0.05) is margin error, n = 72/1+72 (0.05 x 0.05) = 60

60 ASA I & II patients undergoing elective surgeries on the upper limb was given supraclavicular block using peripheral nerve stimulator (PNS) . 60 patients devided in two groups by alternate method.

Group BB : (n=30) received o.5 % Bupivacaine 2.5 mg/kg + 1 mL normal saline (Total Volume - 30 ml)

Group BD : (n=30) received 0.5% Bupivacaine 2.5 mg/kg + Dexmedetomidine 1µg/kg . (Total volume - 30 ml).

Local anesthetic injected when muscle twitch occures at current intensity of ≤ 0.8 mA in PNS. Patients having partial effect were not considered for the study.

Sensory block : Assesed by Pin prick test using a 3-point scale .

Onset : The time interval from local anesthetic injection and the complete sensory block (score 2 for all nerves).

Duration: The time from onset of block to the complete resolution of sensory block (Score 0).

Motor block : Assesed by Modified Bromage scale on a 3-point scale .

Onset : The time interval from local anesthetic injection to the Bromage score 2 .

Duration : The time interval from onset of block to the complete resolution of motor block (score 0) .

Analgesia : Assesed by Visual Analogue score (VAS) .

Duration : Measured from time of local anesthestic injection to the pt. requesting analgesia (VAS score : 4) .

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Result:

Table 1: Demographic characteristics : P- value < 0.05 is significant.

Demographic parameter	Group BB (Mean ± SD)	Group BD	Total (Mean ± SD)	P- value
Mean age	40.13 ± 11.96	36.1 ± 12.89	38.12 ± 12.49	0.214
Mean Weight	57.33 ± 4.41	56.63 ± 4.82	56.98 ± 4.6	0.560
Gender (M / F)	23/7	18/12	41/19	0.165
ASA grade (1/2)	26/4	29/1	55/5	0.161

- Significance of difference between mean values of Age and Weight distributions in two groups was evaluated by 'Unpaired-t-test'. P-Value was > 0.05. The difference between mean values of these variables was not significant and any variations in study outcomes are unlikely to be influenced by age and weight distributions in two groups.

- A Pearson Chi-Square test was used to assess whether the two groups had significant differences in the Gender and ASA grade distributions in two groups. P-value was > 0.05, indicating no statistically significant difference in Gender and ASA grade distribution between the two groups. Any variations in study outcomes are unlikely to be influenced by Gender and ASA grade distributions in two groups.

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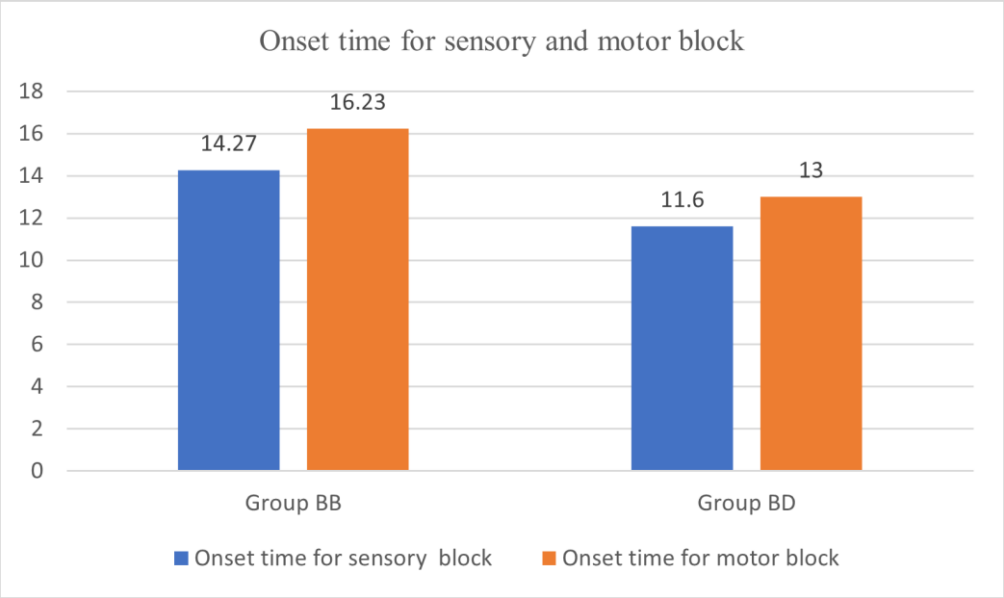
Table 2: Onset time of sensory Block (OTSB) & Onset time of motor block. (OTMB

Parameter	Group BB (Mean ± SD)	Group BD (Mean ± SD)	t- value	P-value
OTSB (Mins)	14.27 ± 1.36	11.60 ± 2.63	4.925	< 0.001
OTMB (Mins)	16.23 ± 1.92	13.00 ± 1.98	6.410	< 0.001



Onset time for sensory block (Mean ± SD) in BB group was 14.27 ± 1.36 and in BD group was 11.60 ± 2.63, which Significantly faster than BB group.

Onset time for motor block (Mean ± SD) in BB group was 16.23 ± 1.92 and in BD group was 13.00 ± 1.98 . Onset of motor block was faster in BD group and difference between two groups was significant.

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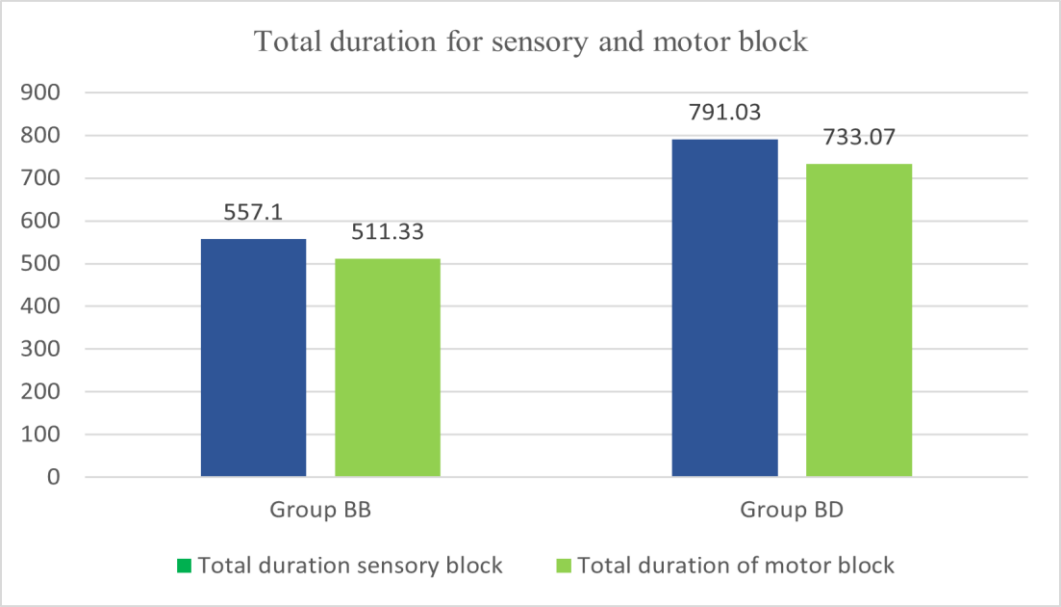
Table 3 : Total Duration of Sensory block (TDSB) & Total duration of Motor block (TDMB)

Parameter	Group BB (Mean ± SD)	Group BD (Mean ± SD)	t- value	P-value
TDSB (Mins)	557.1 ± 27.43	791.03 ± 46.03	-23.912	< 0.001
TDMB (Mins)	511.33 ± 27.01	733.07 ± 46.42	-22.612,	< 0.001



Total duration of sensory block (Mean ± SD) in BB group was 557.1 ± 27.43 and in BD group was 791.03 ± 46.03. Duration was prolonged in BD group which was statistically Significant.

Total duration of motor block (Mean ± SD) in BB group was 511.33 ± 27.01 and in BD group was 733.07 ± 46.42 . duration was significantly prolonged in BD group.

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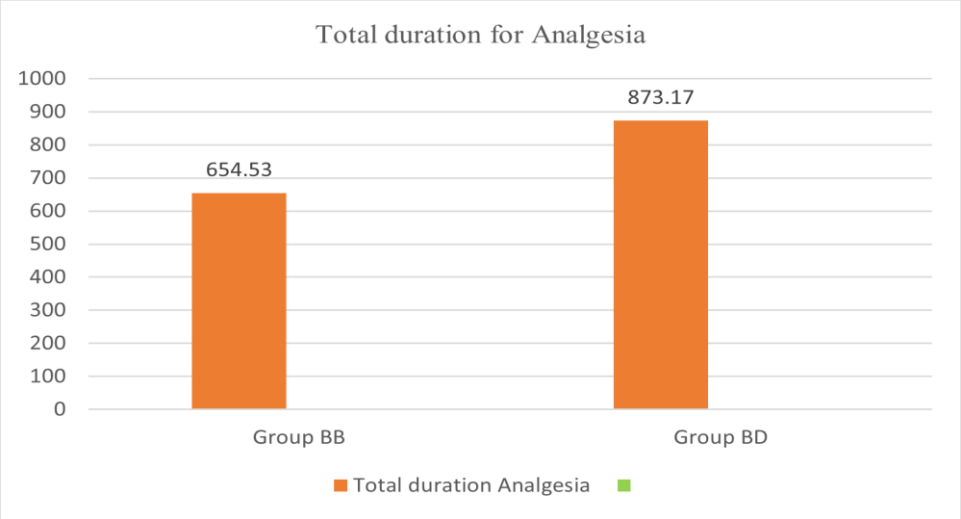
Table 4 : Duration of analgesia

Parameter	Group BB (Mean ± SD)	Group BD (Mean ± SD)	t- value	P-value
Duration of analgesia (Mins)	654.53 ± 27.38	873.17 ± 48.9	-218.633	< 0.001



Duration of analgesia (Mean ± SD) in Group BB was 654.53 ± 27.38 and Group BD was 873.17 ± 48.9. Difference between outcomes of two groups was statistically significant .

It shows that addition of Dexmedetomidine in Bupivacaine significantly prolonged the duration of analgesia.

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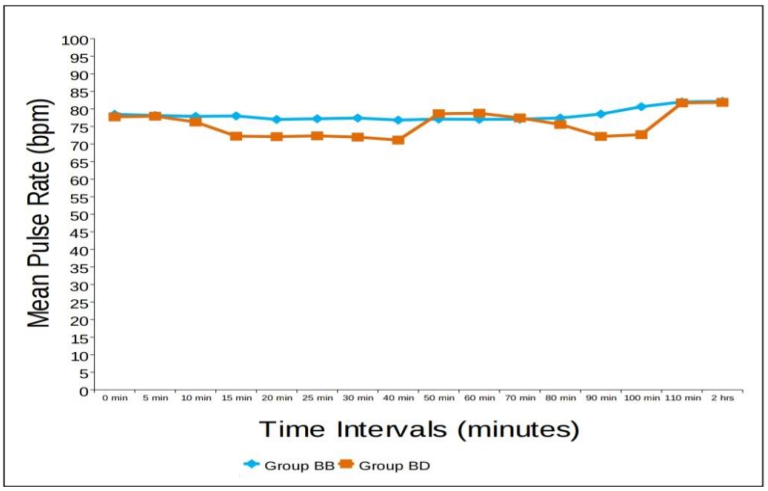

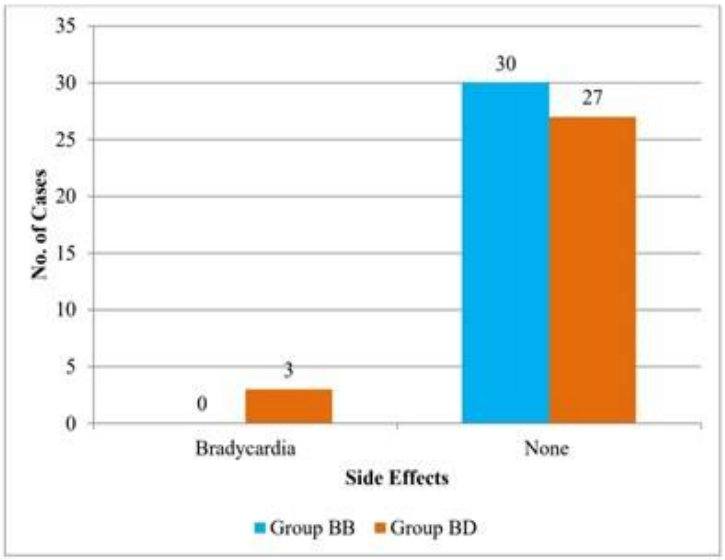

Side effects: Pulse rate (PR):

There was a drop in intraoperative pulse rate in BD group, but was not significant. Bradycardia observed in Three patients and managed by inj. Atropine 0.6 mg iv. Post-op pulse rate was comparatively stable.

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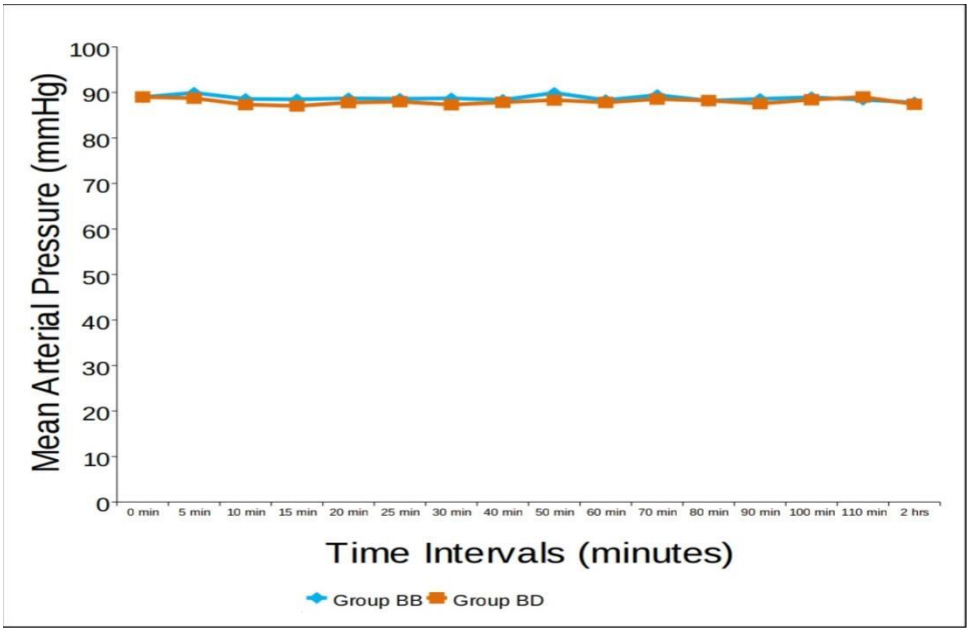

Other vital signs: Mean Arterial Pressure (MAP) :

There were not significant changes observed on MAP in Intraoperative & Post-operative period. Hypotension observed in only One patient in BD Group and managed by Inj. Mephentermine iv.

ECG: Sinus bradycardia in Three patients in BD Group. Otherwise - Within Normal Limit (WNL)

Respiratory Rate (RR) & SPO2: No significant changes. Within normal range in Intra-op & Post-op period

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Discussion

Dexmedetomidine is highly selective a α2 > α1(8>1) agonist is thus decreasing the unwanted side effects of α1 receptors.

Presynaptic activation of α2 adrenoceptor in central nervous system (CNS) inhibits the release of norepinephrine, terminating the propagation of pain signals and their postsynaptic activation inhibits sympathetic activity, thereby decreasing HR and BP in some pt.

In the study of Nazia Nasir 2016 et al, Mean duration of sensory block was 698 mins but in Tripathi et al 2016, Mean duration of sensory block was 502 mins with same dose of drugs in both the groups. (0.25 % Bupivacaine + 1µg/kg dexmedetomidine)

In study of Nazia Nasir 2016 et al, Pulse rate in Dexmedetomidine group (1µg/kg ≈ 60 µg) decreased but no case of bradycardia was observed with no significant change in MAP , but in Rachna gandhi et al , 2012 two cases of bradycardia and two cases of hypotension observed even if the dose is less in second study. (30 µg).

In our study we found that onset was faster , duration of block & analgesia was longer and pulse rate was significantly lower in Dexmeditomidine group, which is concurrent with previous studies.

Baroreceptor reflex and HR response to a pressor agent is well preserved with the use of dexmedetomidine, thus hypotension and bradycardia are easily treatable conferring hemodynamic stability.

Prolong effect of Dexmedetomidine is attributed to its vasoconstrictive effect at the site of injection and delaying absorption of local anesthetic.

Limitation:

Sedation score was not compared in two groups.

As USG guided nerve block facility is currently not available , block was given by using peripheral nerve stimulator.

Conclusion

In our study we found that Dexmedetomidine with 0.5% Bupivacaine is superior than the plain o.5% bupivacaine for supraclavicular brachial plexus block. It shortens the onset times for sensory and motor blocks and prolongs their duration. It significantly prolong duration of analgesia and reduces the need for additional analgesia. The added advantage of conscious sedation, hemodynamic stability, and minimal side effects makes it a potential adjuvant for nerve blocks.

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