

Evaluation of Addition of 50 µg of Dexmedetomidine to 10ML of 2% Lignocaine with Adrenaline and 10ML 0.5% Bupivacaine on Block Characteristics in Ultrasound Guided Supraclavicular Brachial Plexus Block

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Abstract

Introduction: Ultrasound has gained popularity in the last few years for peripheral nerve blocks which provides real time visualization of the nerves to be blocked and also reduces the volume of drug to be injected. **Aims and Objectives:** To study the effect of 50µg of Dexmedetomidine added to the local anaesthetics for ultrasound guided supraclavicular block in respect to onset, duration of sensory and motor block along with haemodynamic variables. **Materials and Methods:** This prospective randomized and double blind study was conducted in 60 ASA I and II patients scheduled for elective upperlimb surgeries under ultrasound guided Supraclavicular brachial plexus block were randomized into two groups. Group I patients received 0.5% bupivacaine (10ml) + 2% lignocaine with adrenaline (10ml) + dexmedetomidine (0.5ml-50mcg) and Group II patients received 0.5% bupivacaine (15ml) + 2% lignocaine with adrenaline (15ml) + normal saline (0.5ml) Onset and duration of Motor and sensory block were recorded. **Results:** Though sensory block was achieved earlier in group I, it was not statistically significant but motor block onset times was statistically significant in group I as compared to group II (p<0.05). Sensory and motor blockade duration were longer in group I than in group II (p<0.05). Intra-operative hemodynamics was significantly lower in group I (P < 0.05) without any appreciable side-effects. **Conclusion:** We conclude that dexmedetomidine added to bupivacaine- lignocaine with adrenaline in ultrasound guided supraclavicular brachial plexus block is extremely effective in reducing the time of onset and prolonging the duration of both sensory & motor blockade.

Keywords: Dexmedetomidine; Ultrasound; Supraclavicular Brachial Plexus Block.

Introduction

Among the various approaches of brachial plexus block, supraclavicular approach is considered easier and most effective for upper limb surgeries.

Kulenkamff performed the first supraclavicular brachial plexus block in 1912 [1].

Conventional peripheral nerve block techniques are highly dependent on surface anatomical landmarks for localization of the target nerve. It is therefore not surprising that regional anaesthetic techniques are associated with a reported failure rate of up to 20% presumably because of incorrect needle and/or local anesthetic spread. Ultrasound

for regional anaesthesia has gained popularity over the last few years. Ultrasound provides real time imaging guidance of nerves and spread of the drug during a nerve block which allows low volumes of drug keeping the toxicity levels in check.

Dexmedetomidine, an potent alpha-2 agonist provide sedation, analgesia, muscle relaxation & anxiolysis [2]. Pharmacologically Dexmedetomidine is an active s-enantiomer of medetomidine. The specificity of Dexmedetomidine for the alpha-2 receptor is 8 times that of clonidine, with an alpha-2 / alpha-1 binding affinity ratio of 1620:1 and hence, considered as the full agonist at alpha-2 receptors [3,4]. Various studies have shown that Dexmedetomidine prolongs the duration of sensory

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and motor block when used as an adjuvant to local anaesthetics for nerve blocks [5,6,7,8]. Our study was conducted to evaluate the efficacy of Dexmedetomidine as adjuvant to when added to 0.5% bupivacaine and 2% lignocaine with adrenaline.

Materials and Methods

After obtaining permission from institutional ethics Committee and written informed consent, 60 patients of American Society of Anesthesiologists (ASA) physical status I and II, aged between 18 - 60 years of both sexes undergoing elective orthopaedic surgeries of elbow, forearm and hand under ultrasound guided supraclavicular brachial plexus block were enrolled in the study.

Group I: Patients received 0.5% bupivacaine (10ml)+ 2% lignocaine with adrenaline (10ml) + Dexmedetomidine(0.5ml).

Group II: Patients received 0.5% bupivacaine (10ml)+ 2% lignocaine with adrenaline (10ml) + normal saline(0.5ml).

Exclusion criteria includes patient refusal, known hypersensitivity to local anaesthetics, pregnancy, hepatic, renal or cardiopulmonary abnormality, alcoholism, bleeding diathesis, local skin site infections were excluded from the study. Patients having a history of significant neurological, psychiatric, or neuromuscular disorders were also excluded. All the patients were kept nil per oral as per the fasting guidelines. On the day of surgery, in the operation theatre standard intra-operative monitors like ECG, pulse oximeter, non-invasive blood pressure were attached and baseline parameters were recorded. Intravenous (i.v) infusion of Ringers' lactate started and oxygen given at 3 L/min through a face mask. All patients received injection midazolam 0.05 mg/kg before procedure.

This procedure was done by using sonosite ultrasound machine with 13-6 MHz transducer by in-plane approach using 22G, 100mm needle. Under strict aseptic precautions Block was performed after real time visualization of the vessels, nerve & bone. The brachial plexus is seen as a cluster of hypoechoic nodules, lateral to the round pulsating hypoechoic subclavian artery lying on top of the hyperechoic first rib. Once brachial plexus is located Group I received 0.5% bupivacaine (10ml)+ 2% lignocaine with adrenaline (10ml) + Dexmedetomidine (0.5ml). Group II received 0.5% bupivacaine (10ml)+ 2%

lignocaine with adrenaline (10ml) + normal saline (0.5ml) inplane approach. During the procedure & thereafter, the patient was observed for any complications of the block & for the toxicity of the drugs injected.

Onset of Sensory and motor blockade were assessed every 3 minutes till loss of sensation and movements. Heart rate, blood pressure were recorded every 5min intraoperatively & then at an interval of every 30mins postoperatively. The duration of sensory block was defined as the time interval between the onset of sensory block and the first post-operative pain. The duration of motor block was defined as the time interval between the onset of motor block and complete recovery of motor functions. Onset of sensory block was assessed by spirit swab method. Assessment of motor block was done using the *Bromage* three point score:

- 0 Normal motor function with full flexion and extension of elbow, wrist and fingers,
- 1 Decreased motor strength with ability to move fingers and/or wrist only
- 2 Complete motor blockade with inability to move fingers].

Statistical Analysis

All recorded data were entered using MS Excel software and analysed using SPSS 20 version software for determining the statistical significance. Results were expressed as mean±standard deviation. Proportions were compared using Chi-square test. The student's 't' test was used to determine whether there was a statistical difference between the study groups. "P" value of > 0.05 was considered not to be statistically significant, <0.05 was considered to be statistically significant, a value of <0.01 was highly statistically significant & a "P" value of <0.001 was considered as extremely statistically significant.

Results

Patients in both the groups were comparable in age, sex and weight (Table 1). Though the mean onset time of sensory blockade was faster in group I (3.54±0.74) compared to that in group II (3.86±0.88). This difference was not statistically significant (p 0.111) (Table 2) (Figure 1). The onset of motor blockade was faster in Group I (5.4±1.12 min) than Group II (6.34±1.14) and the difference was statistically very significant with p value of

<0.001 (p<0.05) (Table 2). (Figure 2). The duration of sensory blockade was longer in Group 1 (616.23±62.05 min) than Group 2 (574.71±61.14) and the difference was statistically significant with p value of 0.006 (p<0.05)(Table 2)(Figure 3). The duration of motor blockade was longer in Group 1 (635.86±57.82 min) than Group 2 (562.80±66.79) and the difference was statistically significant with p value of <0.001 (Table 2) (Figure 4). Group 1 (Dexmedetomidine) had lower heart rate compared to the group 2. The difference was statistically significant (<0.05) at 360, 420, 480, 540 and 600 min,

but the fall in heart rate required no treatment. (Figure 5). Group 1 (Dexmedetomidine) had lower mean arterial pressure than baseline compared to the group 2. The difference was statistically significant (<0.05) at 60, 75, 90, 120, 150, 180, 210, 240, 300, 360, 420, 480, 540 minutes. But this fall in blood pressure required no treatment (Figure 6). Bradycardia was observed in 2 patients in group I whereas hypotension i.e. fall more than 30% of baseline was seen in 4 patients in group I and 2 patients in group II. No sedation was observed in both the groups.

Table 1: Demographic profile

	Group I	Group II	P value
Age	33.7±13.57	31.5± 13.76	0.53
Sex	Males	24	25
	Females	6	5
Weight	65.9±8.1	64±7.16	0.33

Table 2:

	Group I	Group II	t value	P value
Onset of Sensory	3.54±0.74	3.86±0.88	1.62	0.111
Onset of Motor	5.40±1.12	6.34±1.14	3.50	0.001
Duration of Sensory	616.23±62.05	574.71±61.14	2.82	0.006
Duration of Motor	635.86±57.82	562.80±66.79	4.89	0.001
Side Effects				
Hypotension	2(6%)	0		
Bradycardia	4(13%)	2(6%)		0.355

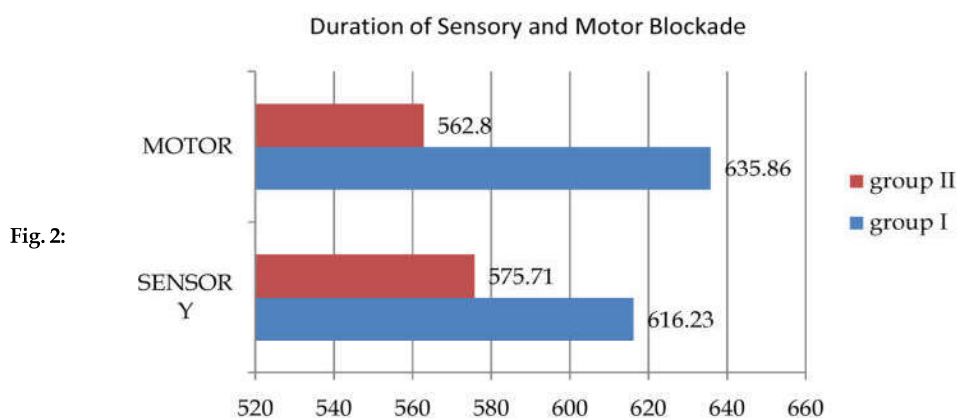
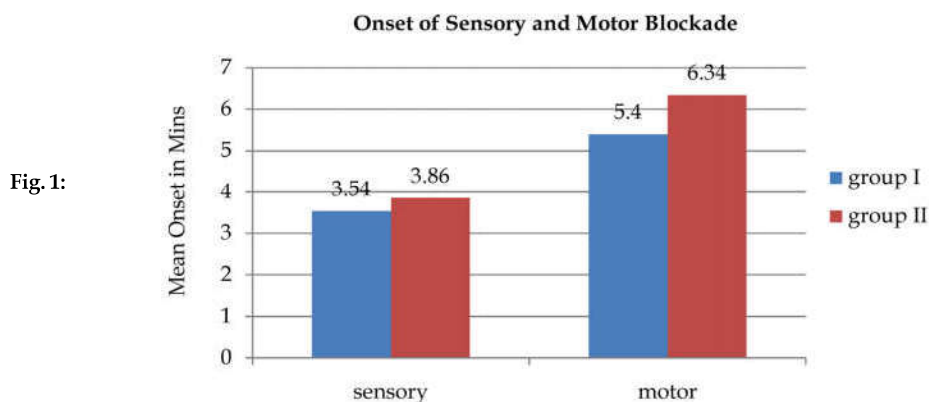


Fig. 3:

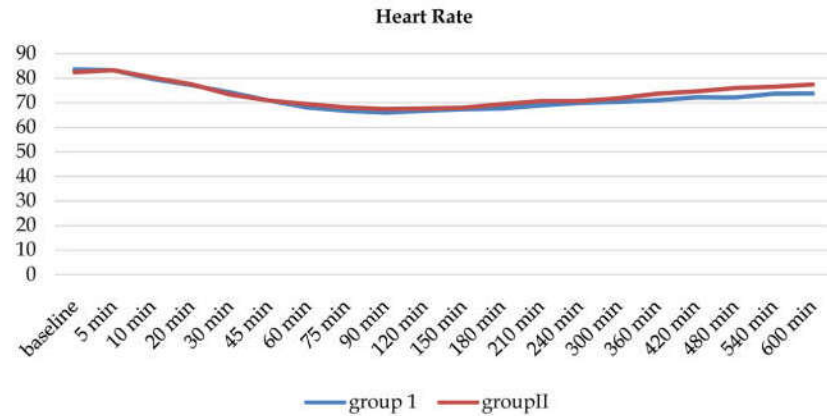
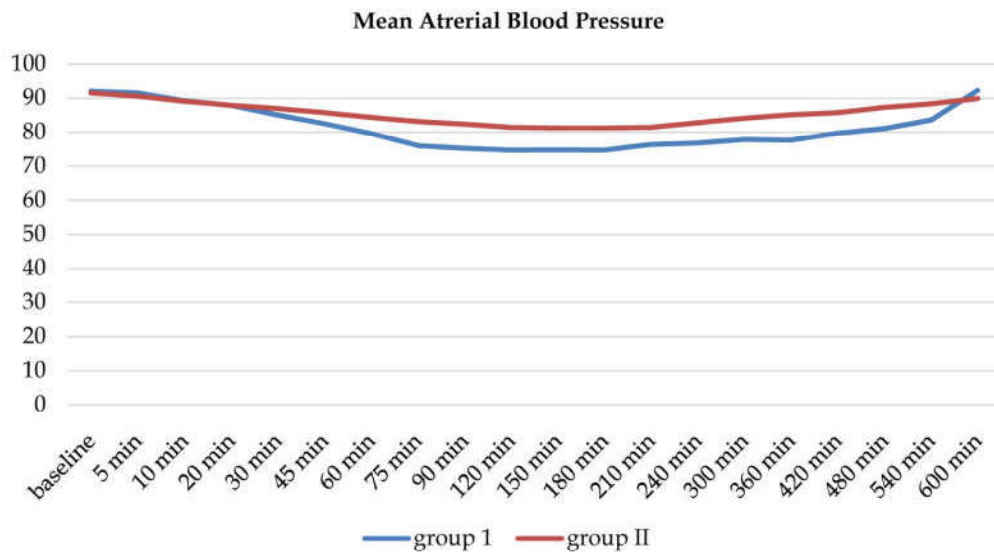


Fig. 4:



Discussion

Ultrasound has made its presence felt in regional anaesthesia practise particularly for peripheral nerve blocks as it allows real time visualisation of nerve plexus and deposition of the drugs around the nerve plexus reducing the margin of error for failures [9]. The volume of local anaesthetic required in such cases is lower than the one normally used in a blind or in an Electrical Nerve Stimulation (ENS) technique [10,11].

Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have a shorter duration of postoperative analgesia. Hence various drugs such as opioids [12], α -2 agonists [13], neostigmine, dexamethasone [14], midazolam [15], magnesium [16] etc., were used as adjuvants to local anesthetics in brachial plexus block to achieve quick, dense and prolonged block.

In our study, we added Dexmedetomidine which is a potent α 2 selective agonist to 0.5% bupivacaine and 2% lignocaine with adrenaline to evaluate onset and duration of sensory and motor block characteristics.

Rachana Gandhi, Alka Shah and Ila Patel [17] conducted a prospective double blind study to compare the postoperative analgesic efficacy and safety of dexmedetomidine (30µg) for brachial plexus blockade along with bupivacaine (0.25%). It was observed that in control group onset of motor and sensory blockade was faster, whereas, dexmedetomidine group have better hemodynamic stability and greater postoperative analgesia.

F.W. Abdallah & R. Brull [18] Conducted a study to study the whether perineural dexmedetomidine as a local anaesthetic (LA) adjuvant for neuraxial and peripheral nerve blocks can prolong the duration of analgesia compared with LA alone. Sensory block duration was prolonged by 150 min [$P < 0.00001$] with intrathecal dexmedetomidine.

Perineural dexmedetomidine used in BP block may prolong the mean duration of sensory block by 284 min ($P=0.05$), but this difference did not reach statistical significance. Motor block duration and time to first analgesic request were prolonged for both intrathecal and BP block.

A Study by Rajesh Meena [19] showed the efficacy of Dexmedetomidine as an Adjuvant to Bupivacaine in Supraclavicular Brachial Plexus Block. Dexmedetomidine is good adjuvant to local anesthetic agents, as its addition to bupivacaine was associated with prolonged sensory and motor blockade, mild sedation and prolonged analgesia. Satisfactory hemodynamic stability without observed immediate post-operative side effects are other significant qualities related to it.

In our study the onset of sensory blockade was faster in Dexmedetomidine Group 1 (3.54 ± 0.74 min) than clonidine Group 2 (3.86 ± 0.88) but the difference was not statistically significant, p value of $0.111 (>0.05)$.

The onset of motor blockade was faster in Group 1 (5.4 ± 1.12 min) than Group 2 (6.34 ± 1.14) and the difference was statistically significant with p value of <0.001 . The duration of sensory blockade was longer in Group 1 (616.23 ± 62.05 min) than Group II (574.71 ± 61.14) and the duration of motor blockade was longer in Group 1 (635.86 ± 57.82 min) than Group 2 (562.80 ± 66.79) and the differences were statistically significant with p value of <0.006 and <0.001 respectively.

Conclusion

We conclude that addition of 50 µg of Dexmedetomidine to local anaesthetics for ultrasound guided supra clavicular block hastens the onset of sensory and motor block and also prolongs the duration of sensory and motor block significantly without significant side effects.

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