



## Dexmedetomidine as an adjuvant to local anaesthetics in Supraclavicular brachial plexus block- a comparative study

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### ABSTRACT

Supraclavicular brachial plexus block provides surgical anaesthesia and analgesia of upper extremity. It is safe, effective, anaesthesia with good postoperative analgesia. This study was conducted to compare the postoperative analgesic efficacy and safety of dexmedetomidine for brachial plexus blockade along with bupivacaine and lignocaine. This prospective double blind study was conducted on 50 patients of age 18 to 60 years posted for various upper limb surgeries and randomly allocated into two equal groups of 25 each. Control group-C received solution of 42ml containing bupivacaine 0.5% 20 ml and lignocaine with adrenaline 2% (1:200000) 20ml plus 2 ml normal saline, dexmedetomidine group-D received solution of 42ml containing bupivacaine 0.5% 20ml and lignocaine with adrenaline 2% (1:200000) 20ml plus dexmedetomidine 50mcg (in 2 ml normal saline). Assessment of motor and sensory blockade, pulse, systolic blood pressure, respiration and side effects were noted every 5 minutes for first 30 minute and every 15 minute till end of surgery. Duration of analgesia and incidence of various complications following the procedure were observed. Results are analyzed using paired student t- test significance noted if p value is <0.005. It was observed that in the dexmedetomidine group the duration of motor and sensory blockade was longer with better hemodynamic stability and greater postoperative analgesia, which is statistically significant when compared to control group.

**Key words:** Bupivacaine, Lignocaine, Dexmedetomidine, Brachial Plexus Block

### INTRODUCTION

Dexmedetomidine is a new alpha2 adrenergic drug which is 8 times more selective for alpha2 adrenoreceptor compared to clonidine<sup>1</sup>. It has been used widely to improve the quality and duration of intrathecal and epidural anaesthesia<sup>2,3</sup>. It also widely used for sedation and analgesia in a mechanically ventilated ICU patients<sup>4</sup>.

Brachial plexus block are routinely used in modern day anaesthesia for all upper limb surgeries below the shoulder joint. It not only provides intra operative anaesthesia but also extend the analgesia in the post operative period without any major side-effects and by minimizing stress response<sup>5</sup>.

Both lignocaine and adrenaline used in this study to get a good volume of local anaesthesia and for effective blockade without increasing the toxicity<sup>6</sup>.

### EXPERIMENTAL SECTION

A prospective randomised control study was done after obtaining institutional ethical committee approval and informed consent of 50 patients of ASA I and II of either sex aged 18-60 years posted for elective orthopaedic surgery of upper limb below the shoulder joint.

A randomised list was prepared using mechanical randomisation and divided into two groups twenty five each.

Group C: Forty two ml of solution containing 20 ml of 2% lignocaine with epinephrine (1:200000) + 20 ml of 0.5% bupivacaine + 2ml of normal saline.

Group D: Forty two ml of solution containing 20 ml of 2% lignocaine with epinephrine (1:200000) + 20 ml of 0.5% bupivacaine + 2ml of normal saline containing 50 microgram of dexmedetomidine.

Patients with history of cardiac, respiratory, hepatic, renal failure and pregnant women and any contraindications to block(local anaesthesia allergy, local infection, and significant neurological disorder) and non cooperative patients are excluded.

No premeditation was given to the patients. After securing intravenous access with 20 gauge IV cannula in a non operating arm infusion of ringer lactate started.

After proper explanation of the technique patient were positioned supine with a small pillow under the shoulder. All monitors attached and basal heart rate, SPO2 and NIBP are noted. Injection site was painted and draped, landmark located one cm above the clavicle at the junction of inner 2/3 and outer 1/3 of clavicle, subclavian artery pulsation felt medial to this point. A 3cm long 22G needle with 10cc syringe filled with the respective mixture of local anaesthetic agent was inserted directing downwards forwards and medially till the parasthesia was elicited in the hand. Needle was fixed at that point, after negative aspiration drug is injected. All the patients were sedated with 1mg Midazolam.

Sensory block was assessed by pin prick test using a 3-point scale 0=normal sensation, 1=loss of sensation to pin prick (analgesia), 2=loss of sensation to touch (anaesthesia). Motor block was evaluated by thumb abduction (radial nerve) thumb adduction (ulnar nerve) thumb adduction opposition (median nerve) and flexion at the elbow (musculocutaneous nerve) on a 3-point scale for motor function (0=normal motor function, 1=reduced motor strength but able to move fingers, 2=complete motor block)

Sensory and motor block evaluated for every 5 minute after the injection and every 30 min after the surgery until they had resolved.

Onset time was defined as the time interval between the end of total local anaesthetic administration and complete sensory block (score 2) on all nerve territory. 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. Complete motor block was defined as absence of voluntary movement on the hand and forearm (score 0). 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. Heart rate, Non invasive blood pressure, arterial oxygen saturation are monitored every 5 minute intra operatively for first 30 min and every 15 minute till the surgery completed.

Pain was assessed using visual analogue scale (VAS 1-10). The time interval between the end of local anaesthetic administration and first analgesic request was noted as duration of analgesia. Nursing staff administered IV Supridol 100mg. Adverse events comprised hypotension, bradycardia, nausea and vomiting are noted.

All results are expressed as mean± Standard deviation. A paired student t-test was used. P-value<0.05 was considered significant.

## RESULTS

The study was conducted on 50 patients of age 18 to 60 years posted for various upper limb orthopaedic surgeries and randomly allocated into two equal groups 25 each.

The demographic data and surgical character were similar in each group (table 1).

**Table 1: Demographic data**

Demographic data	Group C	Group D
Age (years)	32.4±12.6	34.2±11.8
Weight (kg)	60.8±10.2	58.2±9.4
Gender (M:F)	15:10	17:8
Type of surgery (Bone: soft tissue)	18:7	16:9

Basal Heart Rate and Mean Arterial Pressure were comparable in both groups. HR and MAP at 15, 30, 45, 60, 90, 120 minutes were significantly lower in Group D compared to Group C ( $p < 0.05$ ) Figure 1 and Figure 2.

Figure 1: Comparison of Mean Arterial Pressure in both the groups

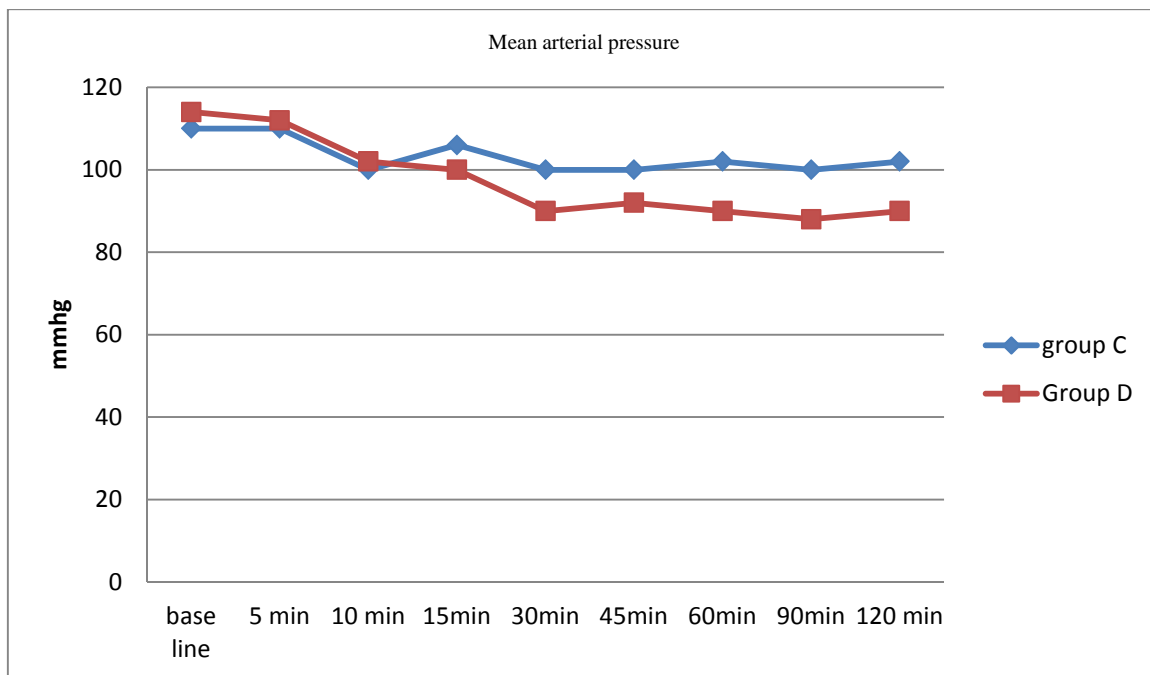


Figure 2: Comparison of heart rate in both the Groups

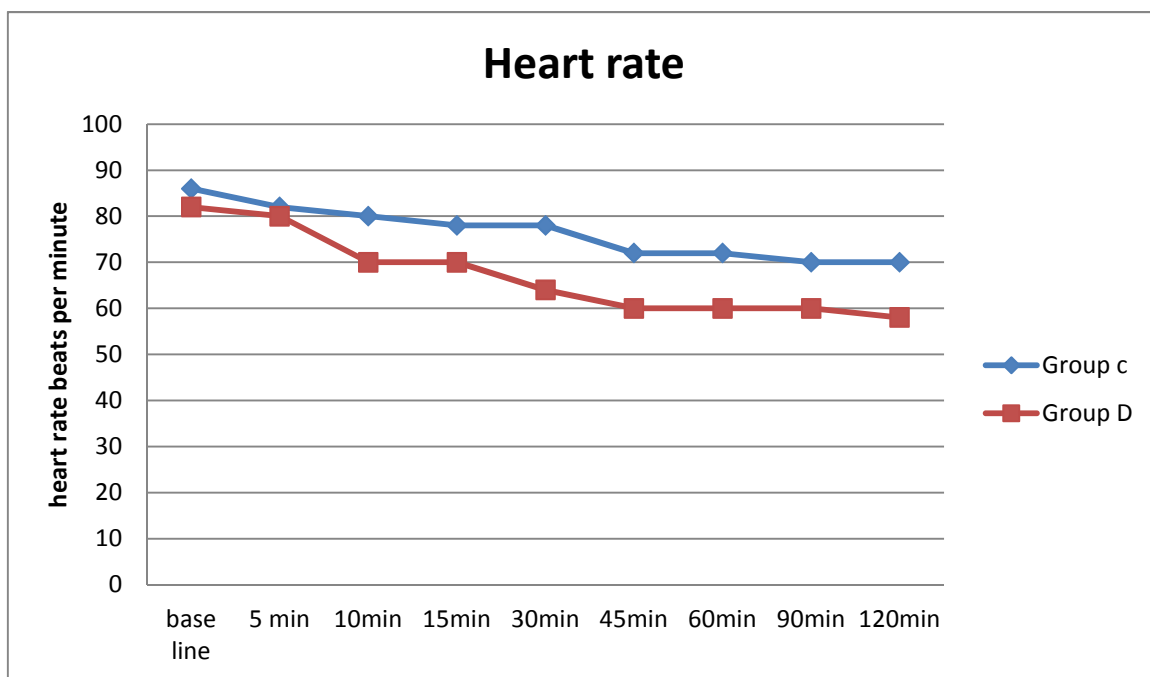


Table 2: Comparison of sensory, motor block, and duration of analgesia

Type of block		Group C	Group D	P value
Onset of time	Sensory (min)	10±2	9±1.5	>0.05
	Motor (min)	12±3	10±1	>0.05
Duration	Sensory (min)	360±30	640±45	<0.05
	Motor (min)	310±30	600±40	<0.05
Total duration of analgesia		400±45	700±65	<0.05

In our study time of onset of sensory and motor block were almost similar in both the groups. Duration of sensory and motor block were significantly prolonged in Group D compared to Group C ( $p < 0.005$ ). Duration of analgesia were also significantly prolonged in Group D compared to Group D ( $p < 0.005$  table 2).

### DISCUSSION AND CONCLUSION

Supraclavicular blocks are preferred at the level of brachial plexus trunks. Here almost the entire sensory, motor and sympathetic innervations of the upper extremities are carried in just three nerve structures (trunks) confined to very small surface area. Consequently, typical feature of this block include rapid onset, predictable and dense anaesthesia along with its high success rate<sup>7</sup>.

Various drugs such as opioids, clonidine, neostigmine, dexamethasone, Midazolam were used as adjuvants<sup>8,9</sup>.

The mechanism by which alpha-2 adrenoceptor agonists produce analgesia and sedation is not fully understand but is likely to be multifactorial. Peripheral alpha-2 agonists produce analgesia by reducing release of norepinephrine and causing alpha-2 receptor-independent inhibitory effects on the nerve fibre action potentials. Centrally, alpha-2 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 alpha-2 adrenoceptor in the locus coeruleus<sup>10,11</sup>.

A study by Brumett et al<sup>12</sup> showed that dexmedetomidine enhances duration of bupivacaine anaesthesia and analgesia of sciatic nerve block in rats without any damage to nerve. In addition they histopathologically evaluated and showed the nerve axon and myelin were normal in both groups were normal at 24 hours and 14 days. Same authors in one more study showed perineural dexmedetomidine added to ropivacaine for sciatic nerve block has enhanced blockade.

In our study time of onset of sensory and motor blockade are similar in both the groups. A study by Kaygusuz et al. found significant early onset of sensory blockade with dexmedetomidine group but the onset of motor blockade were similar in both the groups<sup>13</sup>. In our study sensory blockade was much longer than motor blockade which supports the observation by de Jong et al<sup>14</sup>. They said that, large fibers required a higher concentration of local anaesthetics than small fibers.

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