

## Comparison of Dexmedetomidine and Clonidine as an Adjuvant to Levobupivacaine and Levobupivacaine with Placebo in Supraclavicular Brachial Plexus Block: Prospective Randomized Double Blind Study.

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**Abstract:** Brachial plexus block is most commonly used regional anesthesia technique for upper limb surgeries. While giving regional anesthesia, when an adjuvant drug is added to local anaesthetic solution than the onset, duration of sensory and motor block and postoperative analgesia period is variably modified. We compared effects of alpha 2 agonist dexmedetomidine and clonidine added to levobupivacaine in this study. It has advantage of reducing complications associated with general anesthesia and provides post operative analgesia as well. Aims: To, study and compare the onset and duration of sensory and motor block, duration of analgesia on using levobupivacaine with clonidine and dexmedetomidine added as adjuvants. Settings and Design: Prospective randomized double blind study. Methods and Material: We included seventy five patients of either sex between age of 20 to 70 years with ASA class 1 and 2 undergoing an elective surgery of upper limb surgery under supraclavicular brachial plexus block. They were divided into 3 groups of 25 each in randomized double blinded method. Effect of study drugs were assessed and analyzed. Normal saline was taken as placebo. Statistical analysis used: Data are presented as mean  $\pm$  SD. Patients characteristic data were analyzed with one way ANOVA for continuous variables. To assess any significant association ANOVA test and Tukey test were used. Statistical analysis was done using SPSS 20 (IBM SPSS Statistics). p-Value <0.05 was considered significant. Results: Demographic variables were comparable in all three groups. The onset and duration of sensory and motor block and duration of analgesia was found to be statistically significant between all the groups ( $p < 0.05$ ). Conclusions: This study concludes that dexmedetomidine with levobupivacaine is a better adjuvant in comparison to clonidine with levobupivacaine and levobupivacaine alone in surgeries of upper limb requiring brachial plexus block.

**Keywords:** Supraclavicular block, Levobupivacaine, Dexmedetomidine, Clonidine.

### I. Introduction

Regional anesthesia is being increasingly used modality in recent era in view of better perioperative analgesia, facilitating early discharge, reduced cost of hospitalization, better patient satisfaction and lesser complications. It also reduces complications associated with general anesthesia like trauma during laryngoscopy and intubation, altered hemodynamics, avoids polypharmacy, sore throat, reduces incidence of postoperative nausea and vomiting. Brachial plexus block can be a anesthesia technique of choice in special situations like emergency surgeries, upper limb surgeries in full stomach patients, difficult intubation and in high risk patients with cardiopulmonary disease.

Peripheral nerve block as an anesthetic technique plays an important role in modern regional anesthesia. Upper limb surgeries below the shoulder joint are mostly performed under peripheral blocks such as brachial plexus block<sup>1</sup>, axillary block. Peripheral nerve blocks not only provide intra-operative anesthesia, but also extend analgesia in the post-operative period without major systemic side-effects by minimizing stress response and using minimal anesthetic drugs.<sup>2</sup>

Various approaches to brachial plexus block like interscalene, supraclavicular, infraclavicular, axillary, midhumeral, lateral approach as mentioned in literature.

Levobupivacaine is a local anesthetic with long duration of action, having similar pharmacology to bupivacaine, however, it has a wider safety margin and was shown to possess less cardiotoxicity in comparison with bupivacaine.<sup>3</sup> The decreased toxicity of levobupivacaine is attributed to its faster protein binding rate.<sup>4</sup> Alpha 2 agonist have been used widely as an adjuvant in view of their sedative, analgesic, perioperative sympatholytic in cardiovascular stabilizing effects with reduced analgesic requirement.<sup>22</sup> These agents can be safely administered via intrathecal, epidural and intravenous route either alone or combined with other drugs prolonging the duration of anaesthesia and density of block. The use of clonidine, a partial  $\alpha_2$  adrenoceptor agonist, in peripheral nerve blocks, has been reported to be safe and beneficial (prolongs the duration of anesthesia and analgesia).<sup>5-6</sup> Dexmedetomidine is also a  $\alpha_2$  receptor agonist, and its  $\alpha_2/\alpha_1$  selectivity is 8 times

more than clonidine. It has been reported to improve the quality of intrathecal and epidural anesthesia.<sup>7-8</sup> The anesthetic and the analgesic requirement gets reduced to a huge extent by the use of these two adjuvants (i.e. dexmedetomidine and clonidine) because of their analgesic properties and augmentation of local anesthetic effects.<sup>9,10</sup>

In this study we have compared anesthetic and analgesic effects of clonidine and dexmedetomidine as an adjuvant to levobupivacaine and levobupivacaine alone in supraclavicular brachial plexus block using nerve stimulator guidance.

## **II. Subjects And Methods**

This prospective interventional randomized double blind controlled study was carried out in the department of anesthesiology of our institution. After approval from institutional ethical committee we included seventy five patients of either sex aged 20 – 70 years of ASA status 1 and 2 undergoing elective upper limb surgery. A written informed consent was signed by all the patients involved in the study.

These patients were randomly assigned into 3 groups of 25 patients each by using a computer generated table of random numbers.

**Group A (n=25):** received 28 ml levobupivacaine 0.5% .

**Group B (n=25):** received 28 ml levobupivacaine 0.5% plus 1 mcg/kg clonidine.

**Group C (n=25):** received 28 ml levobupivacaine 0.5% plus 1 mcg/kg dexmedetomidine.

All the solutions will be diluted with isotonic normal saline to make a total volume of 30 ml.

Patient refusal to consent , any contraindication to regional block and sensitivity to study drug were the main exclusion criteria of the study. All the patient included in study were checked preoperatively and advised tablet alprazolam 0.25 mg night before and two hours prior to surgery with sips of water. All the patients selected for study were briefed about the procedure with its advantages and disadvantages.

Study solution was prepared by anesthetist who was not participating in study. After taking the patient in operation theatre and securing intravenous line with 18 G med cath in non dependent hand, infusion of Ringer lactate was started at 15 ml/hr. Standard anesthesia monitoring including non invasive blood pressure, heart rate, electrocardiogram and pulse oximetry was attached and baseline vitals were recorded. In the operation theatre patients were not given any intravenous sedation.

Peripheral nerve block was performed with respective study drug under nerve stimulator guidance after local infiltration of 1 ml of 2% lignocaine subcutaneously. Immediately after injecting the drugs, the patients were asked every 5 min about the pain relief, loss of pin prick sensation and ability to move the upper limb to assess the onset and quality of analgesia, sensory and motor block respectively. The assessment was made for a maximum of 30 min and if no block was established, it was labeled as a “failed” block and general anesthesia was given.

**Sensory block was assessed by pinprick with a 25 G hypodermic needle and grading was done as follows:-**

**Sensory block was graded as-**

**Grade 0:** Sharp pin felt

**Grade 1:** Analgesia, dull sensation felt

**Grade 2:** Anaesthesia, no sensation felt.

Motor block was assessed by bromage 3 point score

**Grade 0:** Normal motor function with full flexion and extension of elbow, wrist and fingers

**Grade 1:** Decreased motor strength with ability to move the fingers only

**Grade 2:** Complete motor block with inability to move the fingers

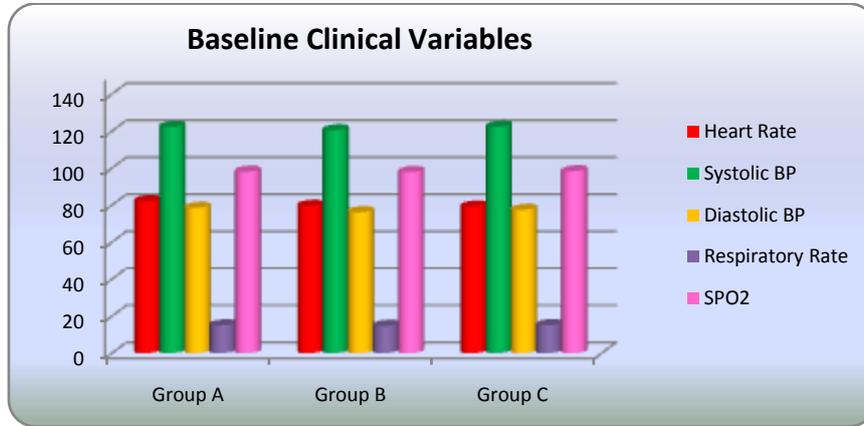
Patients were monitored throughout perioperative period for any inadvertent complications. After shifting the patients outside the operation theatre, pain score was recorded at 1, 6, 12 and 18 hrs. Injection diclofenac 75 mg given intramuscularly as rescue analgesia when visual analogue score ( VAS ) was less than 3. Visual analogue **scale** : 0 point for no pain to 10 point for worst unimagined pain.

## **III. Results**

Seventy five patients were assessed for eligibility from January 2015 to May 2016. As per demographic variable, they all were comparable. [table 1]. Observations are presented as Mean ± Standard Deviation.

**Table 1 : Demographic Variables**

	Group A	Group B	Group C	p Value
Age (years)	35.20±12.35	36.84±10.32	35.34±9.60	0.839
Weight (kg)	66.48±6.83	68.24±5.36	66.08±6.52	0.436
Duration of Surgery (minutes)	77.60±17.02	78.40±12.55	78.20±15.93	0.982
Male : Female	14 : 11	15 : 10	15 : 10	
ASA grade I/II	21:4	22:3	21:4	



**Figure 1:** showing baseline vital parameters of all three groups.( p > 0.05)

There were no statistically significant difference in pre operative heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate and oxygen saturation in all 3 study groups.(p > 0.05) [Figure 1]

**2. Onset and duration of sensory and motor block and duration of analgesia**

**Table 2:** Onset and duration of sensory and motor block and duration of analgesia

	Group A	Group B	Group C	ANOVA	P Value (Tukey's test)		
					A&B	A&C	B & C
Onset of Sensory Block (min)	10.24±0.66	8.84±0.85	8.24±0.77	0.000	<0.05	<0.05	<0.05
Onset of Motor Block (min)	11.80±0.912	10.04±0.73	9.36±0.95	0.000	<0.05	<0.05	<0.05
Duration of Sensory Block(min)	578.80±26.50	689.20±25.48	799.60±25.74	0.000	<0.05	<0.05	<0.05
Duration of Motor Block (min)	478.40±23.21	587.20±21.70	693.20±22.308	0.000	<0.05	<0.05	<0.05
Duration of analgesia(min)	749.20±23.07	844.40±20.83	959.60±16.70	0.000	<0.05	<0.05	<0.05

There was significant difference in onset of sensory and motor block, duration of sensory and motor block and duration of analgesia among 3 groups (p < 0.05).

**3.Intensity of Sensory Block**

**Table 3**

S No	Group	Grade 0	Grade 1	Grade 2	Total
1	A	0	10	15	25
2	B	0	7	18	25
3	C	0	3	22	25

Intensity of sensory block was higher in group 3 than group 1 and 2.

**4. Intensity of motor block**

**Table 4**

S No	Groups	Grade 0	Grade 1	Grade 2	Grade 3	Total
1	Group A	0	0	11	14	25
2	Group B	0	0	8	17	25
3	Group C	0	0	4	21	25

Intensity of motor block was higher in group 3 than group 1 and 2

#### IV. Discussion

Brachial plexus block is commonly used anesthesia technique in upper limb surgeries. Various adjuvant like dexmedetomidine and clonidine are used along with local anesthetics. Brachial plexus block provides better surgical and post operative anesthesia and analgesia with less adverse effects. Clonidine in neuraxial techniques affects mainly synaptic adrenergic receptors. Four mechanisms have been proposed, which have centrally mediated analgesia;  $\alpha_2$ -adrenoceptor mediated vasoconstrictive effects, attenuation of the response and direct action on the peripheral nerve<sup>11</sup>. Dexmedetomidine; a highly selective,  $\alpha_2$ -adrenergic agonist; has analgesic, sedative, anaesthetic sparing effects when used in systemic route<sup>12</sup> and it is approximately eight-times more selective towards the  $\alpha_2$  adrenoceptor than clonidine. The onset and duration of sensory and motor block and duration of analgesia was found to be statistically significant between all the groups ( $p < 0.05$ ). Thus dexmedetomidine not only fastens the onset and duration of sensory and motor blocks when added as an adjuvant, it also hastens the early onset as compared to clonidine.

These results are consistent with the studies of Bernard & Macaire<sup>13</sup> they found that clonidine decrease the onset of sensory and motor block as compared to bupivacaine and lidocaine alone.

Memis *et al*<sup>14</sup>. in their study showed that addition of dexmedetomidine to lignocaine for intravenous regional anesthesia improves both the quality of anesthesia as well as intraoperative and postoperative analgesia.

Aliye Esmaoglu *et al*<sup>15</sup>, Bajwa SJ *et al*<sup>16</sup>, Rachana gandhi *et al*<sup>17</sup> and Kenan Kaygusuz *et al*<sup>19</sup>, found dexmedetomidine to decrease the time of onset of sensory & motor block as compared to bupivacaine alone.

Santvana Kohli *et al*<sup>21</sup>. Aboesdira MA *et al*<sup>18</sup> showed that the quality of anesthesia was significantly better in the Dexmedetomidine group compared to the Clonidine group. Saumya Biswas *et al*<sup>20</sup> also demonstrated that addition of dexmedetomidine to levobupivacaine prolonged the duration of sensory and motor blockade along with increased duration of post-operative analgesia.

Contrary to our study, Sarita S Swami *et al*<sup>22</sup> found that no significant difference was seen in the onset of block with dexmedetomidine and clonidine when added as an adjuvant. Singh S *et al*<sup>23</sup> conducted a comparative study of clonidine and dexmedetomidine as adjuvant to 0.25% bupivacaine in supraclavicular brachial plexus block for duration of action and haemodynamic changes. Their findings was that dexmedetomidine significantly prolonged the duration of action and significant decrease in haemodynamic parameters, but did not require any active intervention for the same. Harshavardhana H S *et al*<sup>24</sup> did a study aiming to test the hypothesis that dexmedetomidine produces a better analgesia, motor block and post operative analgesia when added as an adjuvant to ropivacaine 0.5% in supraclavicular brachial plexus block compared with clonidine. He found that dexmedetomidine prolonged the duration of sensory and motor block and enhances the quality of block as compared with clonidine when used as an adjuvant to ropivacaine in peripheral nerve block and concluded that dexmedetomidine when added to ropivacaine for brachial plexus block is a better adjuvant compared to clonidine. dexmedetomidine has faster onset, prolonged duration of sensory and motor block and increased duration of analgesia as compared with clonidine when used as an adjuvant to ropivacaine in peripheral nerve block.

#### V. Conclusion

To conclude, dexmedetomidine has faster onset, prolonged duration of sensory and motor block and increased duration of analgesia as compared with clonidine when used as an adjuvant to levobupivacaine in peripheral nerve block.

#### Acknowledgements

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**Conflict of interest:** None

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