

**THE EFFECT OF CLONIDINE ON LIDOCAINE INDUCED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK**Shrinivas Kulkarni<sup>1</sup>, Chaitra<sup>2</sup>, Gurudatt C. L<sup>3</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: BACKGROUND:** Brachial plexus nerve blocks (BPB) are the most common nerve blocks used for upper limb surgeries. Techniques using only Local Anaesthetics (LA) have limited duration of post-operative analgesia. Clonidine has been used to prolong the duration of LA s for neuraxial blocks. Hence the effect of clonidine on Lidocaine induced BPB was studied. **METHODS:** 60 patients of American Society of Anesthesiologists (ASA) class I and II were randomly divided into 2 groups. Group L given 30 ml of Lidocaine with adrenaline 1.5% with 0.6 ml of normal saline and the Group C given 30 ml of same LA with 0.6 ml of 90mcg of Clonidine. All the patients' supraclavicular BPB was given using Winnies' peri-vascular approach. The primary outcome was onset, duration of sensory and motor blockade. The secondary outcomes were motor block duration, opioid supplementation, and BPB complication. **RESULTS:** There was no statistically significant difference in the onset of sensory and motor block, motor blockade quality and overall quality of block. Duration of sensory and motor blockade was prolonged in groups with Clonidine. No adverse events / hemodynamic instability noted in either group. Sedation scores were higher in Clonidine group. No patients required any intervention. **CONCLUSIONS:** 90µg Clonidine added to Lidocaine 1.5% with adrenaline produces prolongation of both the duration of sensory and motor blockade with minimal adverse effects.

**KEYWORDS:** Supraclavicular Brachial Plexus Block, Clonidine, Lidocaine.

**INTRODUCTION:** There are many advantages<sup>1</sup> of brachial plexus block for upper limb surgeries over general anesthesia like effective analgesia with good motor blockade, awake patient, extended post-operative analgesia, early ambulation, resumption of oral feed, avoiding poly pharmacy and no airway manipulation. Orthopedic procedures of forearm and hand are well suited for regional anesthetic techniques.

Various approaches of brachial plexus block have been used for upper limb surgeries and among them supraclavicular and infraclavicular techniques are more popular as they produce complete anesthesia of all the branches of brachial plexus, as the narrowest part of the plexus is encountered by these techniques.<sup>1,2</sup>

Lidocaine with adrenaline is one of the most common drugs used for brachial plexus block because of its faster onset and dense blockade. Only drawback of Lidocaine is short duration of action and lack of post-operative analgesia. Many drugs have been used as adjuvants like Opioid, Tramadol and Neostigmine to local anesthetics for plexus block in an attempt to prolong the duration of block and analgesia.

Most of these adjuvants have side effects, Clonidine has been added to local anesthetic for brachial plexus, intercostals and peribulbar blocks,<sup>3-6</sup> because most of the studies have showed that clonidine prolongs the duration of block and provides good analgesic effect.<sup>4-9</sup>

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Not many studies have been done in India regarding the use of Clonidine as an adjuvant along with local anesthetic for brachial plexus block. Hence a study was conducted to know the effect of Clonidine as an adjuvant along with Lidocaine for supraclavicular brachial plexus block to know its effectiveness in improving the quality of block and also the duration of post-operative analgesia as the primary outcome and secondary outcome being any side effects of the Clonidine.

**METHODOLOGY:** The study was undertaken during the period from November 2010 to July 2012 and after obtaining ethical committee clearance as well as informed consent from all patients. 60 patients aged between 18-70 years with ASA class I and II, posted for elective upper limb orthopedic surgeries (forearm and hand) were selected and grouped randomly into two equal groups L and C.

Randomization was done using simple opaque sealed envelope method. Group L received 30 ml of 1.5% Lidocaine with adrenaline 1:200000 + 0.6 ml of normal saline and Group C received 30 ml of 1.5% Lidocaine with adrenaline 1:200000 + 0.6 ml of Clonidine (90 microgram).

Patients with known hypersensitivity to study drugs, infection at the site of block, known coagulopathy or on anticoagulants, morbidly obese, neurological, psychiatric or neurovascular disorders, pregnant and lactating were excluded from the study.

All patients included in the study were pre-medicated with tablet Alprazolam 0.5 mg and Ranitidine 150 mg orally at night before the day of surgery and were kept nil orally 6 hours or solids.

On arrival of patients in the operating room, a 20 gauge intravenous cannula was inserted and lactated ringer was started. All patients were pre-medicated with I.V 1 mg Midazolam and 15 mg Pentazocin half an hour before giving the block.

The patients were connected to Star plus of Larsan and Toubro multi parameter monitor to record heart rate (HR), non-invasive measurement of systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), continuous electrocardiogram (ECG) monitoring and hemoglobin oxygen saturation (SpO<sub>2</sub>). The baseline blood pressure and heart rate were recorded.

Analysis and plans to summarize results: All the patients were given supraclavicular BPB using the study drugs by subclavian perivascular approach as described by Winnie<sup>10</sup> with parasthesia at the fingers as the end point. After the block, the onset and duration of the sensory, motor block and quality of the block were noted. The study drugs were prepared by an anesthesiologist who was not involved with the study. Patient and observer were kept blind for the drug. Any hypersensitivity reaction for the study drugs, evidence of pneumothorax and other events were also monitored.

**DEFINITIONS OF STUDY PARAMETERS:** Onset of sensory blockade was assessed as loss of pinprick sensation using the blunt needle at dermatomes C5 to T1. Onset time is the time from the completion of injection of study drug to first loss of pinprick sensation in any of these dermatomes.

Onset time of motor blockade is defined as the time from the completion of injection of study drug to first loss of motor power in C5 to T1 dermatomes. Complete motor blockade is defined as time from the completion of injection of study drug to complete paralysis of the muscles of the hand.

Duration of sensory blockade is the time from the onset of sensory blockade till the patients' complains of pain at the site of surgery and rescue analgesia was given. Duration of motor blockade is the time from the onset of motor blockade to complete recovery of motor power.

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The assessment of motor blockade was done by using LOVETT RATING SCALE, (6 - Normal muscular force, 5 - Slightly reduced muscular force, 4 - Pronounced reduction of muscular force, 3 - Slightly impaired mobility, 2 - Pronounced mobility impairment, 1 - Almost complete paralysis, 0 - Complete paralysis). For statistical purpose 0, 1 and 2 were considered as paralysis. 3, 4 and 5 were considered as paresis and 6 as no motor blockade.<sup>10,11</sup>

Assessment of sedation was done by using the RAMSAY SEDATION SCALE Score Response 1. Anxious or restless or both 2. Cooperative, orientated and tranquil 3. Responding to commands 4. Brisk response to stimulus 5. Sluggish response to stimulus 6. No response to stimulus.<sup>10,11</sup>

**QUALITY OF OVER ALL BLOCK:** An overall assessment of quality of block was made by three point scale as, 0- complete failure, 1- unsatisfactory block (inadequate analgesia, inadequate relaxation, patients requiring general anesthesia because of restless), 2- satisfactory block (complete sensory and motor blockade)

**ADVERSE EFFECTS:** Signs of cardiovascular system toxicity like changes in HR, BP, rhythm and signs of central nervous system stimulation were noted. Also looked for hypersensitivity reaction to the Clonidine and for the evidence of pneumo-thorax, nausea, vomiting, purities, jerking movements and Horner's syndrome.<sup>12</sup> Hypotension is defined as mean arterial pressure less than 30% of the baseline. For statistical analysis complete failure and unsatisfactory blocks were considered as failures and compared with satisfactory block. When the patient complained of pain at the operative site, inj. Diclofenac 75 mg was given. Patients were followed up for 24 hrs. for any side effects.

**STATISTICAL ANALYSIS:** The results of the study were statistically analysed between the two groups using independent-samples t-test.  $p < 0.05$  is considered as statistically significant,  $p > 0.05$  is considered as statistically not significant. All the statistical calculations were done through SPSS 16.0 (2007) for windows.

**SAMPLE SIZE CALCULATION:** The important outcome variable studied is the duration of sensory blockade and analgesia. Other variable outcome included duration of motor blockade, quality of block and other side effects. The necessary sample size was calculated to detect a 25% change in duration of sensory blockade and a standard deviation of 33% of the mean, while giving the trial a power of 80% for  $\alpha < 0.05$ . Based on this the minimum number of patients required in each group were 25. Considering the dropouts, 30 patients in each group were selected.

**RESULTS:** There were no statistically significant difference in the demographic profile of patients in either of the groups in terms of age, male to female ratio, weight, and duration of surgery ( $p > 0.05$ ). (Table-1).

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Sl. No.	Variables	Group L	Group C	P-value
1	Age (years)	34.76±9.33	34.06±9.30	0.772
2	Sex (M/F)	20(66.7%)/10	19(63.3%)/11	0.787
3	Weight (kg)	59.46±10.98	59.76±5.95	0.896
4	Duration of the surgery	60±15 min	62±10 min	0.527

**Table 1: Demographic characteristics of the study population (Mean ± SD)**

In both the group L and C onset of sensory block was earlier in C-5 dermatome, 2.03 and 2.06 min respectively which was not significant statistically.

Onset of motor block was 2.43 min in group A and 2.53 min in group B. The complete motor blockade was achieved in 8.39 min in group without clonidine and 8.82 min in group with Clonidine. There was no significant difference between the two groups of patients for paresis or paralysis of either shoulder ( $p>0.05$ ) or hand ( $p>0.05$ ).

There was no statistically significant difference between the two groups regarding the number of patients developing complete paralysis of all the muscle groups of the upper limb. Two patients in each groups had partial block, accounting for 6.66% in each group. All these 4 patients were excluded from the study.

The duration of sensory and motor block was statistically significant in both the groups. The mean sensory block duration was 172 min in group without Clonidine whereas in group with Clonidine it was 373 min. The mean duration of motor block was 162 min in group without Clonidine whereas in group with Clonidine it was 350 min. which was statistically significant ( $p<0.05$ ). (Table-2).

Sl. No.	Parameter	Group L (without Clonidine)	Group C (with Clonidine)
1	Sensory block onset(min)	2.03 ±1.12	2.06±1.08
2	Motor block onset(min)	2.43±1.81	2.53±1.83
3	Motor block quality	(93.33%) Paralysis	(93.33%) Paralysis
4	Overall Satisfactory quality of block	(93.33%)	(93.33%)
5	Sensory block duration/ analgesia(min)	172.96±15.47	373.57±91.17
6	Motor block duration(min)	162.14±22.54	350.35±88.16
7	Adverse events	Nil	Nil
8	Hemodynamic intervention	Nil	Nil

**Table 2 : P Values of sensory block duration & motor block duration was highly significant  
P=0.000**

Incidence of pneumothorax, hematoma, accidental intravascular injection, post block nausea, vomiting, convulsions, neuralgia were nil in either group. Post block parameters were also normal in both groups requiring no intervention.

**DISCUSSION:** We hypothesized that Clonidine will produce rapid onset and prolonged duration of sensory blockade, duration of motor blockade, duration of analgesia and better quality of block, when

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combined with local anesthetics like Lidocaine. Activation of post synaptic alpha2 receptors in the substantia gelatinosa of the spinal cord is the presumed mechanism by which Clonidine produces analgesia.<sup>1,4</sup>

Alpha 2-Adrenoceptors are located on primary afferent terminals (both at peripheral and spinal endings), on neurons in the superficial laminae of the spinal cord, and within several brainstem nuclei implicated in analgesia, supporting the possibility of analgesic action at peripheral, spinal, and brainstem sites.<sup>1,4</sup> Clonidine does produce a minor degree of nerve conduction blockade at high concentrations, however with some preference for C-fibres. This conduction blockade may underlie, in part, the enhancement of peripheral nerve block when this agent is added to local anesthetics.

In our study, the drugs selected for brachial plexus block were Clonidine and Lidocaine. Since 1980, Clonidine has been used as an adjuvant to local anesthetics in various regional techniques to extend the duration of block.<sup>11</sup> Various studies have shown the analgesic effect of clonidine when given intrathecally and epidurally.<sup>12</sup> Only a few studies support the use of Clonidine for peripheral nerve blocks.<sup>4, 8, 13</sup>

The duration of analgesia, when only local anesthetics are used is very short and do not extend into post-operative period. Various drugs have been tried as adjuvant to local anesthetics for prolonging the analgesia and improving the quality of block. The effectiveness of Clonidine for supraclavicular brachial plexus block has not been investigated in India, as very few studies have been done regarding the same. Hence we selected Clonidine as an adjuvant to Lidocaine in our study.

The exact dose of the Clonidine for either beneficial or harmful effects for BPB still remains unknown.<sup>11</sup> Various studies have been carried out to know the minimum concentration of Clonidine that prolongs the duration of analgesia without any side effects.

Jean Marc Bernard et al<sup>14</sup> compared three doses of clonidine 30, 90 and 300µg added to 400 mg of Lidocaine for axillary brachial plexus block. Although the study showed a dose dependent prolongation of the analgesic effect, increasing dose of Clonidine was also accompanied by a greater number of adverse effects like hypotension, bradycardia and increased sedation. Thus the authors opine that the clinically used dose of Clonidine is 30 and 90µg. They also opine that the 90µg of Clonidine will have minimal side effects but prolong the duration of analgesia. Francois J Singelyn et al<sup>13</sup> showed that the minimum dose of Clonidine required to significantly prolong the duration of analgesia and anesthesia of axillary brachial plexus block was 0.5µg/kg, as this dose of Clonidine may be used without side effects. Adnan T et al used Clonidine as adjuvant to Lidocaine in axillary brachial plexus block in patients with chronic renal failure. They found that 150µg of Clonidine was very effective in prolonging the duration of analgesia but produced prolonged sedation.

A pilot study was also conducted in our hospital in 10 patients using Clonidine 30 and 90 µg. No adverse effects were observed in both the groups. The duration of analgesia was more prolonged with 90 µg compared to 30 µg. Hence 90 µg of clonidine was selected for our study.

The onset of sensory block in our study was studied at various dermatome levels. The onset of sensory block was earlier in C- 5 dermatome compare to T-1 dermatome- in both the groups. There was no statistically significant difference between two groups regarding the onset of sensory block.

Which was also found with studies conducted by Francois J Singelyn et al<sup>13</sup> and Jean J Eledjam et al<sup>15</sup> using Lidocaine and mepivacaine respectively. Similar observation was found in the studies conducted by Duma et al<sup>16</sup> and Erlacher W et al. Where the onset time was prolonged as long acting

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local anesthetics were used unlike intermediate acting local anesthetics like Lidocaine which was used in our study.

The duration of analgesia with Clonidine was statistically significant with p-value 0.000. Jean J Eledjam et al. Francois J Singelyn et al.<sup>13</sup> Adnan et and Iskandar et al in their studies also the duration of analgesia was significantly prolonged. All these studies showed a longer duration of analgesia with Clonidine which compares with our study.

There was no statistically significant difference between the two groups regarding onset of motor blockade and in the time taken for complete motor blockade. Similar observation was found by T Adnan et al Duma et al where there was no statistically significant difference between the groups with and without Clonidine regarding the onset of motor block which compares with our study.

There were two patients in each group who had both partial motor and sensory blockade due to sparing of a few dermatomes. All these four patients were given general anesthesia and were excluded from the study.

Duration of motor blockade was statistically significant. In the study carried out by Susmitha Chakraborty et al and Erlacher W et al the duration of motor blockade was prolonged in Clonidine group compared with group without Clonidine which compares with our study.<sup>15</sup>

There was no statistically significant difference between two groups in terms of overall quality of blockade.

In our study no patient in either groups had decrease in mean arterial pressure. But 2 patients in Clonidine group had decreased heart rate. In Dorothee et al study bradycardia occurred in Clonidine group. In T Adnan et al study both bradycardia and hypotension occurred in Clonidine group.

In Shivinder Singh et al study bradycardia was noted in Clonidine group. But in all the above study the hemodynamic changes were not statistically significant. Sedation in our study was assessed by Ramsay sedation scale. Sedation scores were higher in Clonidine group, but it was not statistically significant.

The incidence of hematoma, pneumothorax, accidental intravascular injection, post block nausea and vomiting, convulsion and neuralgia were nil in both the groups. Other parameters like ECG, SpO<sub>2</sub> were within normal limits in both the groups. No patients in either group required any interventions.

**CONCLUSION:** Clonidine produced longer duration of sensory blockade. Duration of analgesia is significantly prolonged in Clonidine group than in group without Clonidine. Hence it can be concluded that 90µg Clonidine added to Lidocaine with adrenaline can be a useful adjuvant for supraclavicular brachial plexus for prolonging the duration of analgesia with minimal side effects.

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