

# Dexamethasone or Clonidine: Which is the Better Additive to Local Anaesthetic in Supraclavicular Blocks

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**Abstract:** Background: Different drugs have been used as adjuvants with local anaesthetics in brachial plexus blocks. Adjuvants with better quality and faster onset and minimal side effects are looked for. Numerous studies have demonstrated the improvement in quality of anaesthesia when using dexamethasone and clonidine as additives but no study has been done for comparing both these drugs thus far. Aim: To compare the anaesthetic efficacy of adding Dexamethasone or Clonidine as adjuvants to local anaesthetic in supraclavicular brachial plexus block. Method: This trial was conducted in Calicut Medical College on a group of fifty patients requiring elbow, forearm or hand surgeries. They were randomized into two groups of 25 each. The block was performed using nerve stimulator guidance. Group 1 received local anaesthetic solution 30 ml 0.25% Bupivacaine plus 8mg dexamethasone. Group 2 received the same local anaesthetic solution plus 0.150 mg Clonidine. The observed parameters were onset of sensory and motor blockade, the duration of analgesia and presence of any side effects. Results: Mean onset of sensory block was  $6.36 \pm 2.09$  and  $8.16 \pm 2.34$ , minutes in Group 1 and Group 2 respectively. Mean onset of motor block was  $8.16 \pm 2.17$  and  $9.96 \pm 2.45$  minutes in Groups 1 and Group 2 respectively. Mean duration of analgesia in Groups 1 and Group 2 were  $835.2 \pm 287.0$  and  $698.2 \pm 214.4$  minutes respectively. No major side effects were noted in both the groups. Conclusion: Dexamethasone is a better additive to local anaesthetic than Clonidine in supraclavicular block because it causes earlier onset of sensory block and longer duration of action.

## 1. Introduction

There are many advocates for upper limb plexus blocks than general anaesthesia in the present situation. Regional anaesthesia has many advantages in the fact that the side effects of general anaesthesia drugs, stress of laryngoscopy and intubation are all avoided. Regional anaesthesia also provides excellent post operative analgesia also. [1]

Supraclavicular brachial plexus block is a popular and widely employed regional nerve block technique for perioperative anaesthesia and analgesia for surgery of the upper extremity. The features of this block are rapid onset, predictable and good anaesthesia along with high success rate.[2] Nowadays different drugs have been used as adjuvants with local anaesthetics in supraclavicular blocks to improve the quality of anaesthesia. Various drugs like opioids (eg. Buprenorphine, Fentanyl) that have been used as additives were found to produce respiratory depression and psychomimetic effects.[3] Thus additives with minimal side effects are looked for.

Dexamethasone, a steroid, is a fluorinated derivative of prednisolone and an isomer of betamethasone and a readily available drug.[3] Studies using clonidine, a centrally acting selective  $\alpha_2$  adrenergic agonist, in central and peripheral blockade show that it is an analgesic when used with local anaesthetics in epidural, intrathecal or peripheral blocks.[3]

Many studies done previously have proved the advantages of using Dexamethasone and Clonidine as adjuncts to local anaesthetic in supraclavicular block, but no study has been done to compare these two additives. Keeping this in mind, this study is being done to compare the effects of these two additives in supraclavicular block.

## 2. Methods

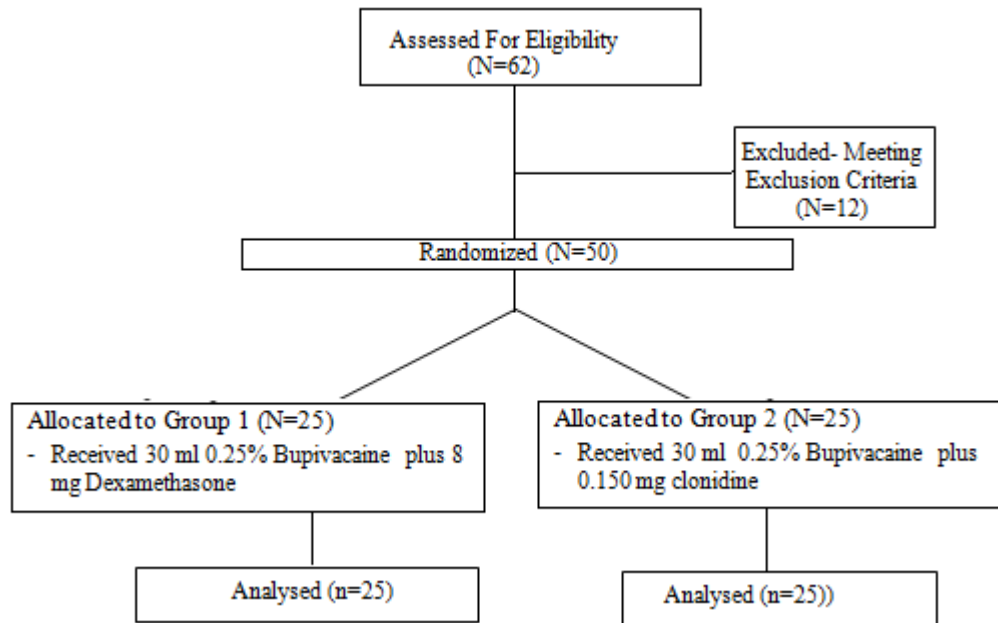
This was a prospective randomized study conducted in the operation theater of the tertiary referral centre in Calicut during the period 2011-13. Patients aged between 18-60 years, weighing between 30-80 kg, of physical status ASA I, II and presenting for forearm and hand surgeries were selected. Exclusion criteria included known allergy to local anaesthetics, dexamethasone or clonidine or having diabetes mellitus, hypertension or chronic obstructive pulmonary disease and coagulopathies. Failed and partial blocks were also excluded. Materials used were Stimuplex needle (Stimuplex A 5", 22G BBraun), nerve stimulator (BBraun), local anaesthetic solution containing 10 ml 2% lignocaine with 1:200000 adrenaline plus 20ml 0.25% bupivacaine, Inj Dexamethasone 8mg, Inj Clonidine 0.150mg. Approval from the institutional ethical committee was obtained. A detailed preoperative assessment was done and written informed consent was obtained. Patients were asked to be nil per mouth for 8 hours. The patients were randomized into 2 groups using computer generated random numbers by using winpepi software as Group 1 and Group 2. The patient was shifted into the operation theatre. Intravenous cannulation was done in the opposite arm using 18 g cannula and 0.9% normal saline. Anxiolysis obtained with Inj. midazolam. Monitors attached were 3 lead ECG, NIBP pulse oximeter for monitoring heart rate blood pressure and spo2. Supraclavicular block was then performed under nerve stimulator guidance. Midpoint of clavicle is palpated and 1 cm above the midpoint is the puncture point. Just below the midpoint we can feel the pulsation of the subclavian artery. Nerve localization was achieved by using a nerve locator (BBraun, Germany) which was connected to a 22 G, 50-mm insulated needle (Stimuplex, Braun, Germany). Proper needle placement is indicated by flexion of the digits with a current lesser than output lower than 0.5 milliamps. Group 1 received 30 ml 0.25% bupivacaine with 8mg Dexamethasone and Group 2 received the same local anaesthetic solution with 0.150mg Clonidine.

The block was analysed for onset of sensory block and duration of analgesia. The Onset of sensory block was calculated as the time in minutes between injection and complete abolition of pin prick response in 3 nerve areas (Median, Radial and Ulnar nerves). Onset of motor block was the time in minutes between the the drug injection and complete absence of voluntary movement of the limb. The average duration of surgery was 2 hours. Duration of analgesia was the time in minutes between onset of sensory

**Consort**

block and reappearance of pain as assessed by demand for rescue analgesia. Statistical analysis was done by t-test using the computer software SSPS. P values <0.05 was considered as statistically significant.

### 3. Results



The data collected from 50 patients included in the study were analysed.

Table 1 analyses the demographic data like age and weight between the 2 groups. There was no statistical difference between the 2 groups so both group were comparable with respect to age and weight.

Table 2 analyses the characteristics of the block. the onset of sensory and motor block was faster in group 1 6.36 mts and 8.16 mts when compared to group 2, 8.16 and 9.96 mts. p value 0.036 and 0.058but this was not statistically significant. The duration of analgesia was 835.2 mts in group1 and in group 2 the duration was 698.2 mts. P value was 0.072 and was also not statistically significant but the shorter mean duration of analgesia was statistically significant .

The cardiovascular parameters monitored were Nibp and heart rate . There were no incidences of hypotension or bradycardia in any of the groups

No major side effects were noted in both the groups. 3 patients in the second group complained of nausea during surgery which was relieved on giving Inj. Ondansetron 4mg IV. No side effects were reported by group 1 patients.

### 4. Discussion

Supraclavicular block is a very common procedure done in our institution for upper limb surgeries. It can be done by the

classical method, using nerve stimulator guidance, and using USG guided technique. Apart from using local anesthetic alone which provides good operative conditions it is limited by the short duration of analgesia. So many adjuvants have been added to the local anaesthetic to enhance the block quality. In our study we compared Clonidine versus dexametason and local anaesthetic .We found out that by adding dexamethasone to bupivacaine the duration of analgesia can be increased. The onset of sensory block and motor block was faster with Dexamethasone than clonidine but the results were not statistically significant. This finding is similar to many studies done previously.

Popping DM and coworkers did a study of randomized trials where clonidine was used as an adjuvant to local anaesthetics for peripheral nerve and plexus blocks. Twenty randomized placebo controlled trials (1054 patients,573 received clonidine) assessing the impact of adding clonidine(.03mg-0.3mg)to local anaesthetics for peripheral single injection nerve or plexus block in adults undergoing surgery without general anaesthesia .It concluded that clonidine increased the duration of analgesia in the post operative period.[5]

Asad Mohammed and colleagues reported in their study that Clonidine 100 microgram added to ropivacaine prolonged both anaesthesia and analgesia after brachial plexus block and decreased the post operative rescue analgesia requirement. The enhancing effect of Clonidine with Ropivacaine may be because of centrally mediated analgesia, alpha two receptor mediated vasoconstriction and inhibition of inflammatory responses.[6]

Chakraborty and others did a randomized controlled study on 70 patients who underwent upper limb surgery. Group 1 patients (35) received 25 ml 0.5% bupivacaine and 30µgm(0.2 ml) Clonidine and group 2 patients (35) received 25 ml 0.5% bupivacaine +0.2 ml saline. They concluded that addition of Clonidine to bupivacaine prolongs block and enhances brachial plexus blockade [7]

Santavara Kohli and others evaluated the effects of 2 different doses of Clonidine on the duration of sensory and motor block and analgesia time. In patients who underwent upper limb surgeries, 30 patients received 1 microgram/kg Clonidine and another 30 patients received 2 microgram/kg Clonidine along with 30 ml of 0.5% bupivacaine. They concluded that higher doses of Clonidine hastened onset and prolongs the duration of analgesia but with sedative potential. They also caution the use of high dose in old age, obese patients and pts with cardio respiratory illness [8]

Another study by A Kulkarni compared 0.5 ml (75µgm) Clonidine +25 ml 0.25% bupivacaine and 0.5 ml saline and 25 ml 0.25 % bupivacaine hastens the onset of sensory block and increases the duration of analgesia thereby offering better quality of intra operative analgesia without significant side effects other than sedation.[9]

Later on studies started comparing Clonidine with other drugs. More studies have been done comparing Clonidine and dexmedetomidine.

SS Swami and colleagues compared 1µgm/kg Clonidine and 1µgm/kg of dexmedetomidine with 0.25 % bupivacaine. The study revealed that dexmedetomidine prolongs the duration of sensory and motor block and enhances the quality of block when compared with Clonidine. The possible causes for the enhanced effects of dexmedetomidine could be due to vasoconstriction via  $\alpha_2$  receptors and vasoconstriction at the site of injection.[10] This was also supported by another study by K Jinjil and others who compared dexmedetomidine and Clonidine along with 0.25 % ropivacaine in USG guided supraclavicular blockade [11]

A study by Duma et al did not show any difference in analgesia even after the addition of clonidine 0.5 microgram/kg to bupivacaine. The reason for this difference could be due to anatomical differences in the brachial plexus sheath anatomy and probable variation in the spread of local anaesthetic after administration of the drug into the plexus. [12]

When we inject clonidine into the brachial plexus directly, it doesn't produce analgesia but it inhibits pain in A and C fibres in desheathed sciatic nerve. Different studies have shown that clonidine produces its long lasting effect directly on the pain nerve fibres due to some unexplained interaction between ion channels thereby increasing the threshold of action potential and blockade of nerve conduction. Analgesic effect of clonidine also could be due to alpha receptor mediated release of enkephalin-like substances. [13]

Various studies have been done using Dexamethasone as an adjuvant along with local anesthetic in supraclavicular brachial plexus block. The possible mechanism of action of

Dexamethasone as an adjuvant is due to its local action on nociceptive C fibers which is mediated via membrane associated glucocorticoid receptors and the up-regulation of potassium channels in excitable cells[14]

Study conducted by KC Cummings and others used Dexamethasone as an adjuvant to ropivacaine and bupivacaine and compared the effect of both. They found out that Dexamethasone prolonged interscalene block more with ropivacaine than bupivacaine [15]

Mijanur rehman and colleagues did a study assessing the efficacy of Dexamethasone along with 0.25% bupivacaine and found out that 8mg Dexamethasone along with 0.25% bupivacaine prolonged the duration of block but had no effect on onset time of sensory and motor block.[16]

This study is further supported by Vierra and others who concluded in their study that Dexamethasone significantly improves analgesic duration and reduces post operative opioid use. [17]

A systematic review was done by Christopher Noss and colleagues to find out the effectiveness of Dexamethasone as an additive to local anaesthetic in brachial plexus block. They came to a conclusion that Dexamethasone definitely prolongs the duration of analgesia regardless of the local anaesthetic and reduces the use of early post op opioid requirement.[18]

In one study by Shrestha BR, the onset of analgesia was 10-30 minutes in local anaesthetic group (mean  $18.15 \pm 4.25$ ) and 10-20 minutes (mean  $14.5 \pm 2.10$ ) in the local anaesthetic plus steroid group. The study showed a statistical significance upon statistical analysis. [19]

Ali Movafegh, Mehran Razazian, Fatemeh Hajimaohamadi in their study noticed that in both groups sensory and motor block onset was the same. [20]

In the present study, we analysed both Clonidine and dexamethasone as an adjuvant to bupivacaine and it was found that by adding dexamethasone, the onset of sensory and motor block was faster and also the duration of analgesia was significantly prolonged and thereby reducing the need for post op opioid use. This correlates with the study done by Vierra and colleagues and the other studies. Many other studies have also supported the fact that Dexamethasone used with bupivacaine prolongs the duration of analgesia.

Although our study showed the advantage of Dexamethasone over clonidine regarding duration of analgesia, we could get more accurate results if we could increase the sample size and collect some more data besides the ones presented in our study. We also suggest that further trials need to be done for comparing dexamethasone and Clonidine, including side effects, as adjuvants in supra clavicular brachial plexus block.

## 5. Conclusion

We can conclude Dexamethasone is a better additive to local anaesthetic than Clonidine in supraclavicular block because it causes earlier onset of sensory block and prolongs the duration of analgesia thus decreasing the Postop use of opioid analgesics.

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**Table 1: Demographic Data**

Data	Group 1	Group2	P value
AGE IN KG	34.44+-11.13	33.64+-11.71	>0.05
WEIGHT IN KG	57.04+-13.40	57.84+-11.94	>0.05

Values expressed as mean +-SD.

**Table 2: Assesment of Block**

	Group 1		Group 2		P Value
	Mean	SD	Mean	SD	
Onset of Sensory Block (min)	6.36	2.09	8.16	2.34	0.036
Onset of Motor Block (min)	8.16	2.17	9.96	2.45	0.058
Duration of Analgesia (min)	835.2	287.0	698.2	214.4	0.072

Values expressed as mean+- SD. p value less than 0.05 was considered to be statistically significant.