



## Original Research Article

## Dexamethasone an adjuvant in brachial plexus block : Supraclavicular approach: An observational randomised double blind clinical study

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## ABSTRACT

**Background** : Brachial plexus blockade via supraclavicular approach for upper limb surgery can significantly reduce pain, decreases the need for post operative analgesics, decreases the incidence of nausea and vomiting, increases patient satisfaction and allows for faster discharge from hospital when compared with general anesthesia.

Aim is to study the use of an adjuvant Dexamethasone with local anesthetic bupivacaine and lignocaine with adrenaline for the onset of sensory block, onset of motor block and the duration.

**Materials and Methods:** This is a prospective, comparative and observational study of 60 patients who were divided randomly into two groups with each 30 patients:

GROUP C received 15 ml of bupivacaine 0.5%, 15ml of 2% lignocaine with adrenaline and 2ml of normal saline to a total volume of 32ml.

GROUP D received 15 ml of bupivacaine 0.5%, 15ml of 2% lignocaine with adrenaline and 2ml of Dexamethasone to a total volume of 32ml.

**Statistical Analysis** : Cross tabs, Independent Samples t test, Repeated Measure ANOVA were used. SPSS for windows (version 17.0) was employed for data analysis.

**Results** : Demographic parameters like age, weight, height, BMI were comparable between the two groups with p value >0.05

We observed that, onset of both sensory and motor block was earlier in group D and duration of sensory block and motor block was more in group D. Also, there was less requirement of rescue analgesics in group D.

**Conclusion:** Dexamethasone added to the routine local anesthetic bupivacaine and 2% lignocaine and adrenaline is an efficient and safe choice for rapid onset and increases the duration of oth sensory and motor block in brachial plexus block.

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### 1. Introduction

There are many approaches to block brachial plexus and among them supraclavicular approach has a high success rate for elbow, forearm, and hand surgery.

Local anaesthetics provide analgesia for 4-6 hours only. Hence, increasing the duration of local anesthetic action is preferred for good surgical anesthesia and analgesia.

Many investigators used adjuvant drugs like clonidine,<sup>1</sup> opioids,<sup>2</sup> ketamine<sup>3</sup> and midazolam<sup>4</sup> but the search for an ideal adjuvant still continues.

Perineural steroids like dexamethasone as adjuvant to local anaesthetics give good post operative analgesia. They reduce inflammation and relieve pain by blocking transmission of nociceptive C-fibres and suppressing ectopic neural discharge<sup>5</sup> Corticosteroids have analgesic effect when combined with local anaesthetics.<sup>6,7</sup> Dexamethasone is known to prolong the block duration in animal and human studies<sup>8-10</sup> but the mechanism behind the prolongation of

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peripheral nerve blockade is not clear.

Dexamethasone microspheres has anti-inflammatory action which is responsible for analgesic effects<sup>11</sup> and can be reversed by administration of a specific glucocorticoid receptor antagonist.<sup>11,12</sup> These are mediated through the classic glucocorticoid receptor and have local effects of dexamethasone.

## 2. Aims

This study was done to compare the effectiveness of adding dexamethasone to bupivacaine and lignocaine with adrenaline in supraclavicular approach for brachial plexus block.

## 3. Objectives

### 3.1. Primary objectives

1. To study the effect of addition of dexamethasone for the onset of sensory and motor block.
2. To study the effects of addition of dexamethasone to local anesthetics on duration of sensory and motor block.

## 4. Materials and Methods

A comparative prospective observational double blind clinical study of patients coming for upper limb elective surgeries to Apollo BGS Hospital, Mysore.

The study was undertaken after obtaining ethical committee clearance and informed consent.

60 patients, ASA 1 and 2 of age group 18 to 60 years posted for orthopedic, plastic and reconstructive upper limb surgeries lasting more than 30 minutes were included in this study. Patients with uncontrolled diabetes mellitus, hypertension, peripheral neuropathy and known allergy to local anaesthetic drugs were excluded from the study.

### 4.1. Procedure

A pre-anesthetic evaluation was done and patients evaluated with complete hemogram, complete blood counts, random blood sugar, ECG and chest X-ray. Patients were kept nil per oral overnight.

Intravenous access was secured with 20 gauge cannula in the non operating limb. Patients monitored with ECG, oxygen saturation and blood pressure.

Under absolute aseptic precautions, parts painted and draped and block given by blind technique using a 20 gauge intravenous cannula and the needle fixed once the paresthesia elicited, and respective drug injected depending on whether the patient allotted to Group C or Group D.

Group C received 15 ml of 0.5% bupivacaine, 15ml of 2% lignocaine with adrenaline (1:200,000) and 2ml of normal saline to a total volume of 32ml.

Group D received 15 ml of 0.5% bupivacaine, 15ml of 2% lignocaine with adrenaline (1:200,000) and 2ml of Dexamethasone (8 milligrams) to a total volume of 32ml.

The effects of anesthetic agents on the following parameters were observed: The sensory block recorded once every 5 minutes for the first 30 minutes using pin prick

1. Onset time of sensory blockade, Sensory block (time between injection to abolition of pinprick response)

Grade I: Complete analgesia

Grade II: Partial analgesia with dermatome sparing

Grade III: No analgesia

2. Onset time of paralysis (complete motor block): (time of injection to time of complete loss of movement)

Motor block evaluated by thumb abduction, thumb adduction, thumb opposition and flexion at the elbow.

Grade 5: Normal movement

Grade 4: movement against resistance but lesser than normal power

Grade 3: Patient can move against resistance

Grade 2: When patient can move along gravity but not against resistance

Grade 1: Slight flickering movement

Grade 0: Complete motor paralysis

3. Duration of sensory blockade (in minutes) was taken from the onset of action to the return of pinprick response

4. Duration of motor blockade (in minutes) was taken from the onset of paresis to the recurrence of motor movements.

5. Number of rescue analgesics in 24 hours

Rescue analgesia diclofenac sodium 75mg IM was given when visual analogue score<sup>13</sup> > 4

Post operative incidence of side effects like hypotension, bradycardia, hypoxia etc. were monitored.

## 5. Results

Number of rescue analgesics were significantly less in first 24hrs in group D which was statistically significant.

Side effects like hypotension, bradycardia or post operative nerve paralysis were not observed.

## 6. Discussion

Brachial plexus block usual procedure for upper limb surgeries. Anesthetic agents like lignocaine and bupivacaine gives good analgesia and relaxation but with limited duration.

Many adjuvants like midazolam, clonidine have been tried to increase the duration and analgesia. Glucocorticoids have analgesic property which increases the onset and prolongs the duration of sensory and motor block.

15mL 0.5% bupivacaine and 15ml 2% lignocaine with adrenaline with the addition of 2 ml dexamethasone (8 mg) was given in group D and 15 mL 0.5% bupivacaine and 15ml 2% lignocaine with adrenaline with addition of 2mL 0.9%

**Table 1:** Table showing demographic data between the groups C and group D

	Group C	Group D	P value
Age	40.2 ± 11.4	36.8 ± 13.4	0.298
Gender	18:12	23:07	0.422
Weight	61.3±7.2	59.5 ±7.4	0.338
Mean duration of surgery	163.28+/-5.36	161.55+/-5.37	0.558

**Table 2:**

	Group C In minutes	Group D In minutes	p value	Inference
Mean onset of sensory blockade	9.7±1.3	8.5±2.5	0.006	Earlier onset of sensory blockade seen in group D
Mean onset of motor block	14.8±1.7	12.2±2.5	0.000	Earlier onset of motor blockade seen in group D
Mean duration of sensory block	294.3±27.9	822.2±78.4	0.00	More in group D than group C
Mean duration of motor block	226.5±24.8	512.4±43.3	0.00	More in group D than group C

normal saline was given in group C

The drugs were calculated irrespective of the patients body weight.

Demographic parameters of both the groups were comparable.

Shrestha BR et al<sup>14</sup> conducted a study of 40 patients to compare analgesic efficacy of local anaesthetic with and without dexamethasone in supraclavicular brachial plexus block. A mixture of lidocaine 2% with 1:200,00 adrenaline and bupivacaine 0.5% for a total volume of 40-50 ml of local anaesthetic was used. Dexamethasone 4-8mg was added to the local anaesthetic solution in the steroid group. Onset of action was 10-30 minutes in local anaesthetic group (mean 18.15 ± 4.25) and 10-20 minutes (mean 14.5 ± 2.10) in the local anaesthetic + steroid group which was statistically significant. Regarding the duration of action the local anaesthetic group had an analgesia time of 2.30 – 4.0 hours (mean 3.16 ± 0.48) and in the steroid group 8.0 – 2 hours (mean 12.75 ± 5.33). Statistical analysis revealed a significant difference (p = 0.00). They concluded that, addition of dexamethasone for brachial plexus block significantly prolongs the duration of analgesia without any unwanted effects.

In our study, the mean onset time of sensory block (in minutes) was 8.3 ± 2.5 in group D and 9.9 ± 1.4 in group C (p value = 0.006) Group D had an earlier onset of sensory block.

Similar results were found in studies conducted by Shrestha BR et al,<sup>14</sup> Islam SM et al<sup>15</sup> and Dr. Siddharth M et al<sup>16</sup>

In 2011, Islam SM,<sup>15</sup> et al. conducted a prospective study of 60 patients to evaluate the effect of dexamethasone added to local anaesthetics on the onset and duration of supraclavicular brachial plexusblock. In group-A patients

received 35 ml of mixture of lignocaine 2%, bupivacaine 0.5% while in group-B patients received the same amount of local anaesthetics with dexamethasone (8 mg). He mean onset time of sensory block was 11.64±2.19 minutes in group A and 9.89±1.97 minutes in group B and difference was statistically significant (p<0.05). Onset of motor block was 13.32±0.98 minutes in group A and 11.09±1.28 minutes in group B and difference was statistically significant (p<0.05). There was markedly prolonged duration of analgesia in group-B, 11.87± 0.53 hours compared to group-A, 3.43±0.49 hours. The result was statistically highly significant (p<0.001). They concluded that addition of dexamethasone as an adjuvant to local anaesthetics in brachial plexus block results in significantly early onset and markedly prolonged duration of analgesia without any unwanted effects.

In our study, mean onset of motor block in group D was 12.1± 2.6 minutes and 13.9 ±1.6 minutes in group C (p value=0.00). Group D had early onset of motor block.

Similar results were observed in studies conducted by Islam SM et al,<sup>15</sup> Prashant A Biradar et al<sup>17</sup> and Dr. Mijanur Rahaman Shaikh et al<sup>18</sup>

In 2013, Prashanth A Biradar et al<sup>17</sup> did a study on 60 patients to evaluate the effect of dexamethasone added to lidocaine on the onset and duration of supraclavicular brachial plexus block. 1.5% lidocaine (7 mg/kg) with adrenaline (1:200,000) and 2 ml of normal saline (group C, n=30) or 1.5% lidocaine (7 mg/kg) with adrenaline (1:200,000) and 2 ml of dexamethasone (8 mg) (group D, n=30). The onset of sensory and motor blockade (13.4±2.8 vs. 16.0±2.3 min and 16.0±2.7 vs. 18.7±2.8 min, respectively) were significantly more rapid in the dexamethasone group than in the control group (P=0.001). The duration of sensory and motor

blockade ( $326 \pm 58.6$  vs.  $159 \pm 20.1$  and  $290.6 \pm 52.7$  vs.  $135.5 \pm 20.3$  min, respectively) were significantly longer in the dexamethasone group than in the control group ( $P=0.001$ ). They concluded that addition of dexamethasone to 1.5% lidocaine with adrenaline in supraclavicular brachial plexus block speeds the onset and prolongs the duration of sensory and motor blockade

In our study, duration of motor block in group D and group C were  $512.4 \pm 43.3$  min and  $226.4 \pm 23.6$  respectively and was found to be statistically significant (p value-0.00).

Similar results were observed in by Shrestha BR et al,<sup>14</sup> Islam SM et. al<sup>15</sup> and BT Arish et al<sup>19</sup>

Dr. Mijanur Rahaman Shaikh et al<sup>18</sup> conducted a study on 60 patients to evaluate the effect of dexamethasone added to bupivacaine in supraclavicular brachial plexus block. Group A (n=30) –received 38 mL 0.25% bupivacaine and 2 mL dexamethasone (8 mg). Group B (n=30) –received 38 mL 0.25% bupivacaine and 2 mL 0.9% normal saline. They observed that onset times of sensory and motor block were similar in the two groups. Duration of sensory ( $1091.11 \pm 107.42$  vs  $605.37 \pm 58.60$ ) and motor blockade ( $846.67 \pm 102.09$  vs  $544.07 \pm 55.40$ ) were significantly longer in the group A (dexamethasone group) than in the group B (control group). They concluded that addition of 8 mg dexamethasone to bupivacaine 0.25% solution in supraclavicular brachial plexus block prolongs the duration of sensory and motor blockade, reduces the requirement of rescue analgesic in postoperative period but has no effect on the onset time of sensory and motor block.

In our study, the duration of sensory block in group D and group C were  $822.2 \pm 77.2$  min and  $294.3 \pm 26.8$  respectively. In study by Vieira PA et al<sup>20</sup> the duration of sensory block was 24.28 hours. Even Shrestha BR et al<sup>14</sup> and Islam SM et al<sup>15</sup> had similar results.

Group D required significantly less number of rescue analgesics in first 24 hours of postoperative period (p value < 0.001). Similar results were seen in studies of Dr. Mijanur Rahaman Shaikh et al<sup>18</sup> and Vieira PA et al<sup>20</sup>

Side effects like bradycardia, hypotension, respiratory depression or anaphylaxis to drugs were not seen in either of the groups.

## 7. Conclusion

5% bupivacaine and 2% lignocaine and adrenaline with dexamethasone 8 mg as an adjuvant not only has a rapid onset but also prolongs the duration of sensory and motor block in supraclavicular brachial plexus block via paresthesia method.

## 8. Limitations

Paresthesia Technique was employed as ultrasound technique was not available.

Late follow ups were not possible

## 9. Source of Funding

None.

## 10. Conflict of Interest

None.

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