

**Original article:**

## **Comparison of Bupivacaine 0.25% and Bupivacaine 0.25% with Dexamethasone in axillary block for below elbow surgeries**

**\*Arunkumar J<sup>1</sup> , Gunaseelan<sup>2</sup> , Krishna prabu<sup>3</sup>**

<sup>1</sup>Post Graduate, <sup>2</sup> Assistant Professor, <sup>3</sup> Professor

Department of Anaesthesiology and Critical Care, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry

Corresponding author\*

---

### **ABSTRACT**

**Background:** Brachial plexus block provide a useful alternative to general Anaesthesia for upper limb surgeries. Aim of the study is to evaluate the duration of sensory blockade, duration of motor blockade, and duration of post-operative analgesia.

**Materials and methods:** A prospective, randomized single blinded study was undertaken in patients posted for below elbow surgeries under axillary block. 60 patients with ASA class I and II were randomly grouped into two groups. Group B received 30ml bupivacaine 0.25% and Group BD received combination of 28ml bupivacaine 0.25% and 2ml dexamethasone 8mg. 30ml solution is used for a single shot blockade of axillary brachial plexus. Onset of motor and sensory blockade, duration of motor and sensory blockade and also duration of post-operative analgesia were studied. Hemodynamic changes over time were recorded.

**Results:** Group BD patients had prolonged duration of sensory block ( $503 \pm 41.9$  vs  $303 \pm 27.4$ ) and motor block ( $474.7 \pm 43.4$  vs  $276.7 \pm 34.1$ ) and also duration of analgesia ( $547.3 \pm 48.87$  vs  $308.53 \pm 27.18$ ).

**Conclusion:** Addition of dexamethasone 8mg to bupivacaine 0.25% prolongs the duration of motor block, sensory block, analgesia and also reduces the requirements of rescue analgesics.

**Key words:** Brachial plexus, bupivacaine, dexamethasone.

---

### **INTRODUCTION**

Axillary block is a popular approach for below elbow surgeries as an alternative to supraclavicular block. This can be used alone as sole surgical anesthetic as a supplement to provide analgesia and muscular relaxation together by maintaining stable intraoperative hemodynamics and provide optimal pain relief. It have a major impact on patient outcome, including patient satisfaction and early mobilization.<sup>1</sup> Since many adjuvants have been used along with local anaesthetics.

Steroids have shown to reduce inflammation and also shown to have analgesic effects due to inhibition of phospholipids A<sub>2</sub> and blocks nociceptive C fibers.<sup>2</sup> Hence we preferred dexamethasone as an adjuvant in our study.

### **METHODS**

60 patients belonging to ASA I or II, with age between 18 and 65 years were recruited for randomized study. Hospital ethics committee approval and written informed from all patients were taken. The patients posted for below elbow surgeries were randomized into

two groups Group B: 30 subjects will receive 30ml Bupivacaine 0.25% and Group BD: 30 subjects will received 30ml of mixture of Bupivacaine 0.25% and Dexamethasone (8mg). patients who are known to have hypersensitivity reaction to local anaesthetics, patients with coagulopathies, patient who has local infection at the site of proposal puncture for axillary block, pregnant or lactating women are exclude from study. Detailed history, general physical examination and routine investigations were done prior to the day of surgery. Patients were premedicated with Tab. Ranitidine 150mg and Tab. Metoclopramide 10mg and Tab. Alprazolam 0.5mg previous night of surgery orally.

After patient shifted to operation room, large bore IV line secured. Standard monitoring like ECG, SPO<sub>2</sub>, and NIBP were connected and recorded. Under strict aseptic condition axillary artery is palpated in intramuscular groove between the coracobrachialis and triceps muscle. A 22 gauge needle was used, a skin wheel is raised over the proximal portion of the artery. The index and middle fingers of the non-dominant hand straddle the artery just below the point the needle is inserted in a slight cephalad direction. Stimulation frequency was set at 1Hz and intensity of the stimulating current was initially set to deliver at 1.5 mA and then was gradually decreased. The 22-gauge 5cm, insulated, stimuplex A needle. The position of needle was considered to be acceptable when an output current < 0.5 mA still elicited a motor response in forearm and hand. Negative

aspiration of blood, the needle should be kept in same position and the medication under study was injected slowly by ruling out the intravascular injection intermittently. The onset of anesthesia was evaluated by the pin prick with a 23 gauge needle. The time of onset was defined as the time between injection and complete loss of pinprick sensation. The temperature was tested by using the spirit soaked cotton on the skin. The time of onset of complete sensory blockade was recorded.

Heart rate, noninvasive blood pressure and oxygen saturation were monitored at an interval of 0 min, 5 min, 10 min, 15 min, 30 min, 45 min, 60 min, 90 min, and 2 hrs during the surgery. Duration of sensory block which is the time elapsed between the injection of drug and appearance of pain requiring analgesia and duration of motor block was also recorded.

Sensory block will be graded as Grade 0: Sharp pin felt, Grade 1: Analgesia, dull sensation felt, Grade 2: Anaesthesia, no sensation. Motor block will be determined according to a modified Bromage scale for upper extremities on a 3-point scale. 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.

Duration of motor block is from onset of motor blockade (Grade II) to the time patient could first move their fingers. Duration of sensory block is from onset of sensory

blockade(Grade II) to the time of sensory recovery (pin prick).Duration of analgesia from Grade I sensory block to the first demand of analgesia.

Postoperatively all the patients will be asked to mark their postoperative pain on 0-10 numerical scale [VAS], WHERE 0=no pain,

1-3=mild pain, 4-6=moderate pain, 7-9=severe pain, 10=worst imaginable pain. Diclofenac sodium intra muscular injection will be used as rescue analgesic whenever patients complained of pain. (First demand for analgesia)

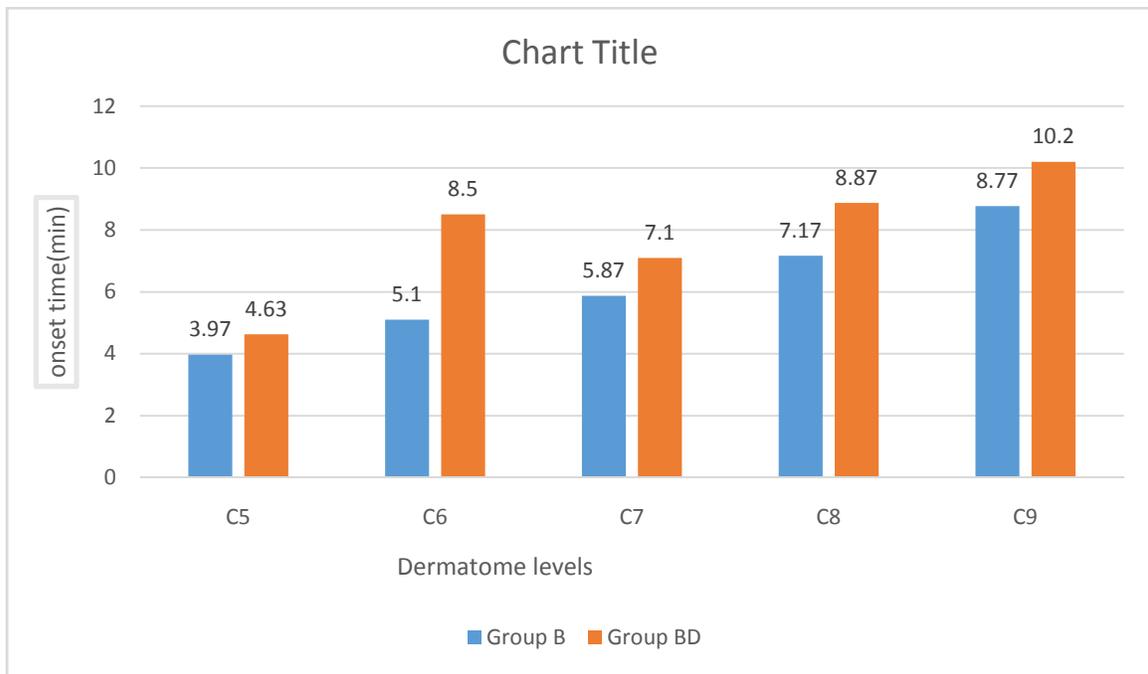
### STATISTICAL ANALYSIS

The data thus obtained was compiled and analyzed using Statistical Package for Social services. (SPSS version 20). Quantitative data was analyzed by using student 't' test. Qualitative data was analyzed using Chi – Square test. A p value of less than 0.05 was considered as statistically significant.

### RESULTS

#### TIME OF ONSET OF SENSORY BLOCK

There was no significant difference between the two groups in terms of onset of sensory block at all dermatomes C 5, C6 and T 1 ( $p>0.05$ ) where C7 and C8 shows significant difference ( $p<0.05$ ). In B group onset of sensory block was earliest in C5 dermatome 3.97 min whereas in BD group. (Fig 1)

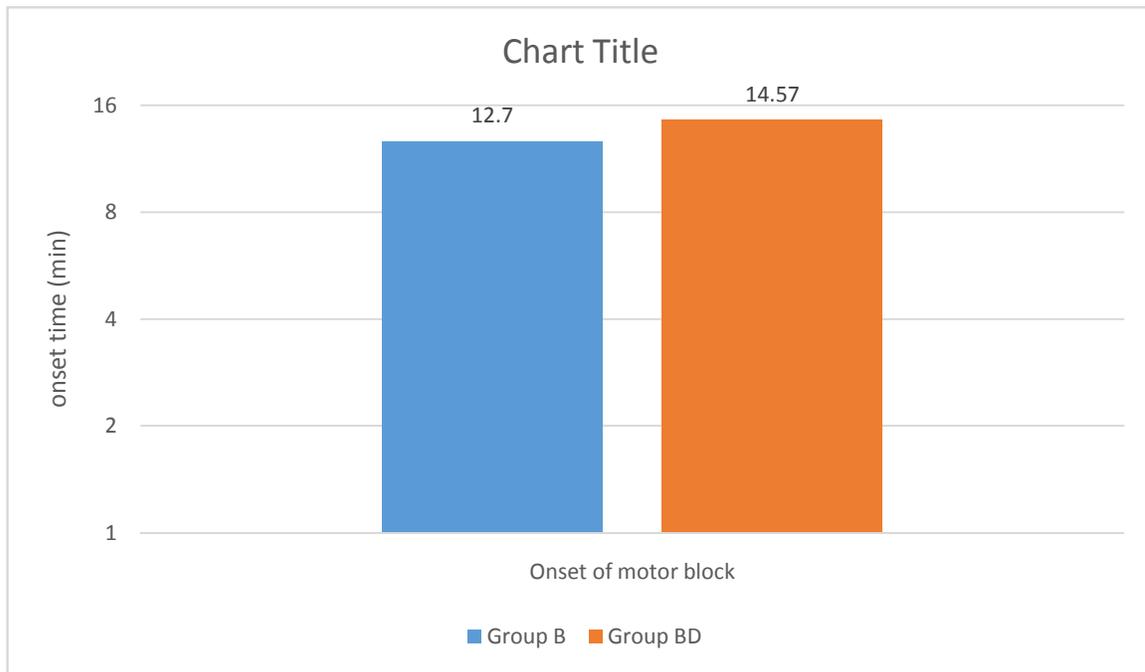


**Figure 1: Comparison of time of onset of sensory block**

### **TIME OF ONSET OF MOTOR BLOCK**

The mean onset of motor blockade in bupivacaine (B) group was  $12.7 \pm 2.42$  mins and mean onset of sensory blockade in bupivacaine-dexamethasone (BD) group was  $14.57 \pm 3.24$  mins there is no significant difference between onset of motor block in minutes in both group

(Fig 2).

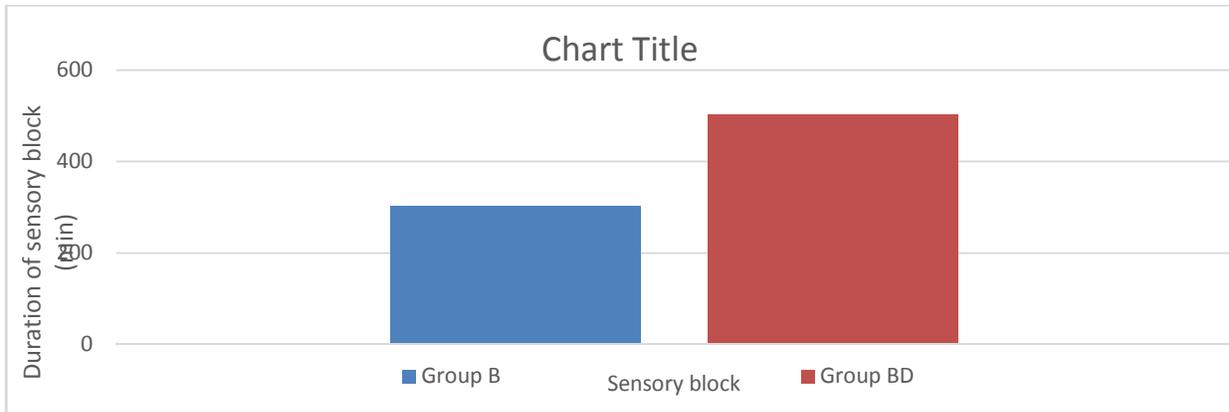


**Figure 2: Comparison of time of onset of motor block**

### **DURATION OF SENSORY BLOCKADE**

The duration of sensory block is significantly higher in group BD than group B. The sensory block ranged with credit limits of  $303.3 \pm 27.4$  in group B and  $503.3 \pm 41.9$  in group BD

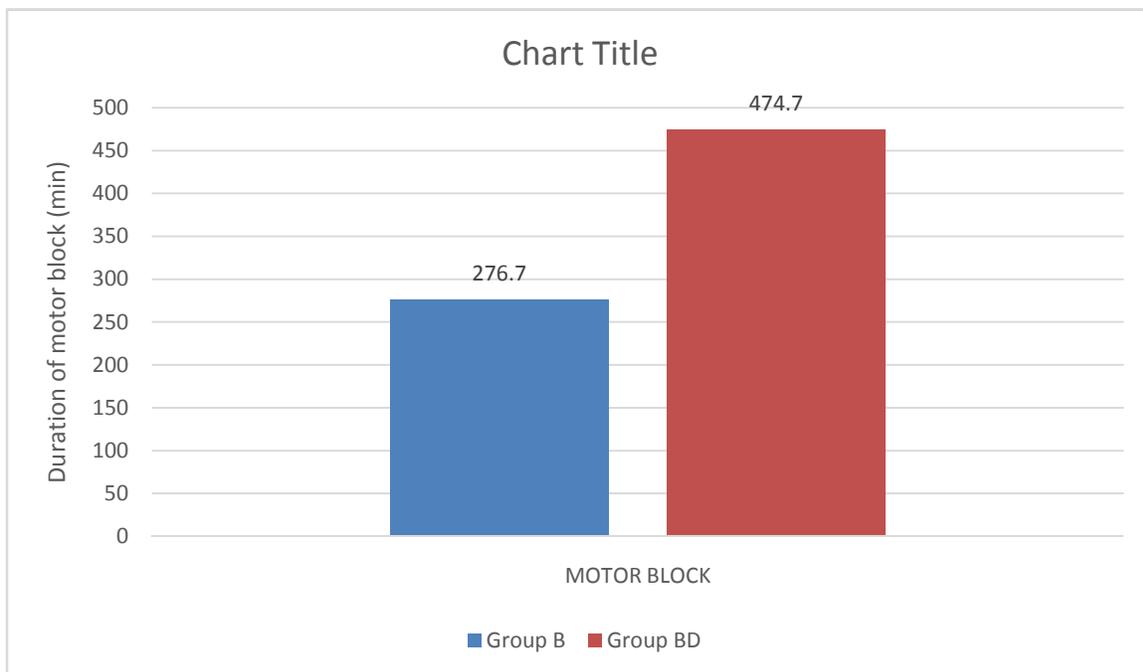
( $p = 0.0001$ ) which statistically significant (Fig 3)



**Figure 3: Mean value of duration sensory block**

### **DURATION OF MOTOR BLOCKADE**

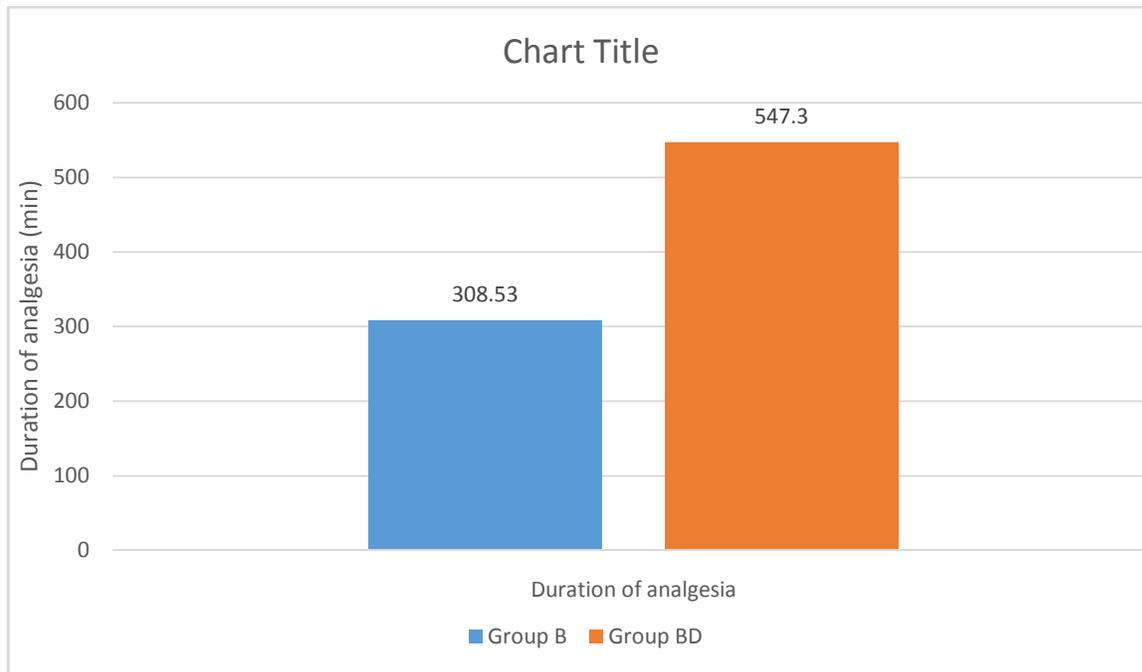
The duration of motor block is significantly higher in group BD than group B. The motor block ranged with credit limits of  $276.7 \pm 34.1$  in group B and  $474.7 \pm 43.4$  in group BD ( $p=0.0001$ )(Fig 4)



**Figure 4: Mean value of duration of motor block**

### DURATION OF ANALGESIA

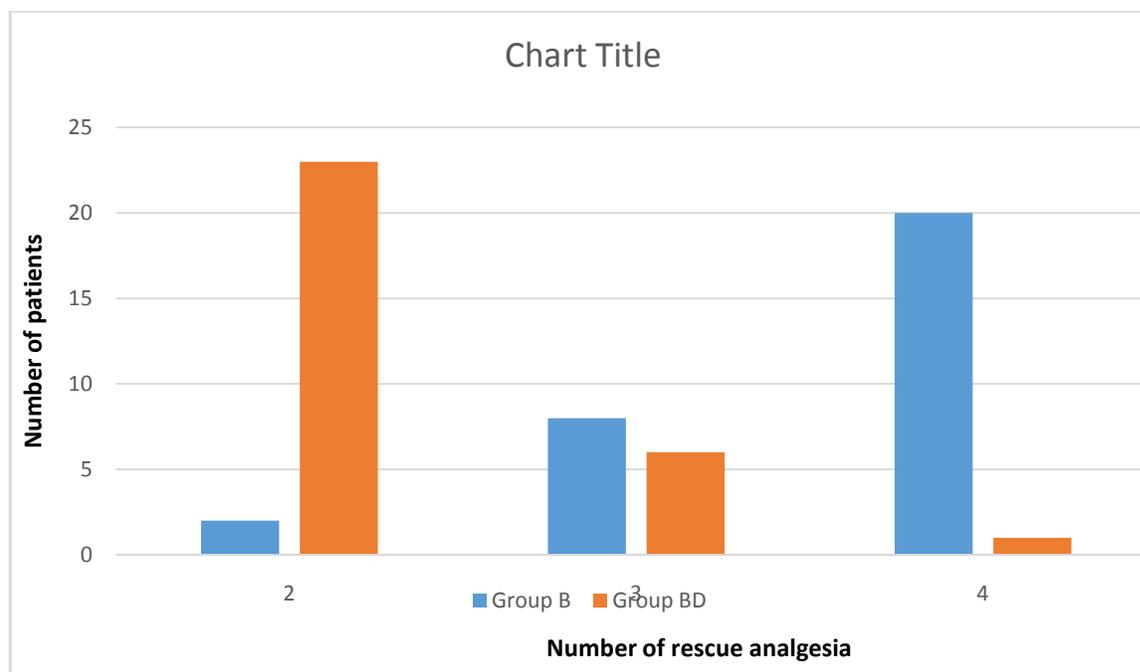
The duration of analgesia is significantly higher in group BD than group B. The duration of analgesia ranged with credit limits of  $312.6 \pm 23.6$  in group B and  $538.3 \pm 42.6$  in group BD ( $p=0.0001$ )(Fig 5)



**Figure 5: Mean value of duration of analgesia (min)**

### NUMBER OF POSTOPERATIVE RESCUE ANALGESIC

The distribution of the study group about number of rescue analgesic doses in 24 hours. The 95.2% patients of bupivacaine (B) group had received 4 rescue analgesics where as 92.0% of patient in bupivacaine-dexamethasone (BD) group received 2 rescue analgesics. The number of rescue analgesic is significantly higher in group B than group BD ( $p < 0.001$ ). (Fig 6)



**Figure 6: Number of postoperative rescue analgesic**

## DISCUSSION

Brachial plexus block has been emerged as a popular technique among the anesthetists for upper limb surgeries. This type of anesthesia avoids the untoward effects of general anesthesia like complications related to upper airway instrumentation. The research has also shown that this approach is attractive approach and effective in terms of cost, performance, margin of safety and also provides good post-operative analgesia. Many approaches of brachial plexus block are also described and the available literature has consistently shown that Axillary block is superior and easiest method for anesthesia and postoperative pain management.

Several drugs have been tried as anesthetics in brachial plexus block and Bupivacaine was consistently used for its longer duration of

action. Many drugs are in turn used to treat the side effects Bupivacaine also make the drug more effective for surgery and post-operative analgesia. Dexamethasone, being glucocorticoid, has emerged as a potent corticosteroid when used along with Bupivacaine. Many studies have successfully proved the usefulness of Dexamethasone as an effective analgesic. In a study by Shrestha, to evaluate the postoperative analgesia following supraclavicular brachial plexus block with Dexamethasone or Tramadol as an admixture to bupivacaine in an upper limb surgery was done. 60 patients randomly allocated to two groups with one receiving dexamethasone 8 mg and the other receiving Tramadol 2mg/kg as admixture to bupivacaine. Mean duration of postoperative analgesia in the Dexamethasone

group was 1028.00 minutes while in the tramadol group it was 453.17 minutes.<sup>3</sup>

Where as in this study post-operative duration of analgesia in Bupivacaine group was  $308.53 \pm 27.18$  minutes and  $547.3 \pm 48.87$  minutes in Bupivacaine – Dexamethasone group. The duration of analgesia is significantly higher in group BD than group B which was statistically significant. In a study by Yadav RK, effectiveness of addition of Dexamethasone versus Neostigmine to Lignocaine, adrenaline admixtures for Brachial plexus block in providing perioperative analgesia was done. 90 patients were divided into three groups group A [Lignocaine with adrenaline (1.5%)], group B [Lignocaine with adrenaline (1.5%)] +500µg Neostigmine, and group C (Lignocaine with adrenaline (1.5%) +4mg Dexamethasone) for brachial plexus block through supraclavicular approach. Mean Complete sensory block in  $10.6 \pm 3$ ,  $10.4 \pm 2.5$ , and  $8.9 \pm 2.2$ mins and Mean complete motor block in  $17.3 \pm 4.3$ ,  $17.2 \pm 4.0$  and  $14.7 \pm 3.5$  mins in group A, B and C respectively were achieved. Duration of analgesia was  $176.5 \pm 53.5$ ,  $225.7 \pm 53.3$  and  $454.2 \pm 110.7$  mins in group A, B and C respectively. Duration of analgesia in group C was statistically significant in comparison with other groups.<sup>4</sup>

Where as in this study onset of sensory block in bupivacaine (B) group is  $8.77 \pm 2.6$  mins and in bupivacaine-dexamethasone (BD) group is  $10.2 \pm 3.1$  mins. Where onset is prolonged by 1.2mins. mean complete motor block is  $12.7 \pm 2.6$  in bupivacaine (B) group and  $14.57 \pm 3.6$  in bupivacaine-

dexamethasone group (BD) where there is no statistically difference. Duration of analgesia in Bupivacaine group was  $308.53 \pm 27.18$  minutes and  $547.3 \pm 48.87$  minutes in Bupivacaine – Dexamethasone group which was statistically significant. Thus duration of analgesia is prolonged when dexamethasone is added to local anesthetics.

Another study was done by Shrestha, was conducted to compare the analgesic efficacy of local anesthetic with and without dexamethasone in supraclavicular brachial plexus block. Forty patients were divided in two groups of 20 each. In-group one, a brachial plexus block was done with 40-50 ml of local anesthetic with 1:200,000 adrenaline and in the other group the block was performed with the same amount of local anesthetics with dexamethasone. There was significant faster onset of action ( $18.15 \pm 4.25$  v/s  $14.5 \pm 2.1$ ,  $p < 0.05$ ) and prolonged duration ( $3.16 \pm 0.48$  v/s  $12.75 \pm 5.33$ ,  $p = 0.00$ ) of analgesia in the dexamethasone group than in the other group.<sup>5</sup> Where as in this study onset of sensory block in bupivacaine (B) group is  $8.77 \pm 2.6$  and in bupivacaine-dexamethasone (BD) group is  $10.2 \pm 3.1$ . Where onset is prolonged by 1.2mins mean complete motor block is  $12.7 \pm 2.6$  in bupivacaine (B) group and  $14.57 \pm 3.6$  in bupivacaine-dexamethasone group (BD) where there is statistically difference. Bupivacaine-dexamethasone (BD) group had delayed onset of action when compared to bupivacaine group (B) and prolonged duration of analgesia  $547.3 \pm 48.87$  minutes in Bupivacaine – Dexamethasone (BD) group is seen when

compared to Bupivacaine group  $308.53 \pm 27.18$  minutes.

Another prospective study was conducted by Pathak RG with the aims to compare effect of addition of dexamethasone to local anesthetic drugs on- onset of analgesia, onset of motor blockade, duration of analgesia, duration of motor blockade and complications/ side effects if any. The brachial plexus block was performed using supraclavicular approach and a mixture of adrenalized lignocaine and bupivacaine either alone or combined with dexamethasone was administered. Dexamethasone is selected as an adjuvant to local anesthetics in brachial plexus block. 50 patients were grouped into two. Group 1 (cases) – received 1.5% adrenalized xylocaine (20ml) and 0.5% bupivacaine (16ml) + dexamethasone 8mg(2ml). Group 2 (control) - received 1.5% adrenalized xylocaine (20ml) and 0.5% bupivacaine (16ml) + 0.9% normal saline (2ml). Mean onset of sensory block in group 1 in mins  $5.92 \pm 2.8$  mean onset of sensory block in group 2 in mins  $6.6 \pm 2.95$  mean onset of motor block in group 1 in mins  $15.8 \pm 5.6$  mean onset of motor block in group 2 in mins  $16.6 \pm 5.11$  mean duration of analgesia in group 1 in mins  $834 \pm 78.1$  mean duration of analgesia in group 2 in mins  $276 \pm 38.73$  mean duration of motor block in group 1 in mins  $376.4 \pm 39.99$  mean duration of motor block in group 2 in mins  $175.2 \pm 26.94$ .<sup>6</sup>

Where as in this study onset of sensory block in bupivacaine (B) group is  $8.77 \pm 2.6$  mins and in bupivacaine-dexamethasone (BD) group is  $10.2 \pm 3.1$  mins. Where onset is

prolonged by 1. 2mins.mean complete motor block is  $12.7 \pm 2.6$  in bupivacaine (B) group and  $14.57 \pm 3.6$  in bupivacaine-dexamethasone group (BD) where there is no statistically difference. Duration of analgesia in Bupivacaine (B) group was  $308.53 \pm 27.18$  minutes and  $547.3 \pm 48.87$  minutes in Bupivacaine – Dexamethasone (BD) group, duration of analgesia is significantly higher in group BD than group B.

In a study by Islam S M effect of dexamethasone added to local anesthetics on the onset and duration of supraclavicular brachial plexus block. Sixty adult patients undergoing various orthopedic surgeries on forearm and around the elbow under supraclavicular brachial plexus block were selected and divided into 2 groups of 30 each. 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 anesthetics with dexamethasone (8 mg). The mean onset time of sensory block was  $11.64 \pm 2.19$  minutes in group A and  $9.89 \pm 1.97$  minutes in group B and difference was statistically significant ( $p < 0.05$ ). Onset of motor block was  $13.32 \pm 0.98$  minutes in group A and  $11.09 \pm 1.28$  minutes in group B and difference was statistically significant. There was markedly prolonged duration of analgesia in group-B,  $11.87 \pm 0.53$  hours compared to group-A,  $3.43 \pm 0.49$  hours. The result was statistically highly significant.<sup>7</sup>

Where as in this study onset of sensory block in bupivacaine (BD) group is early  $8.77 \pm 2.6$  mins and bupivacaine-dexamethasone (BD) is delayed  $10.2 \pm 3.1$  mins. Onset of motor block

also delayed in case of bupivacaine-dexamethasone (BD) group  $14.57 \pm 3.6$  mins when compared to bupivacaine group (B)  $12.7 \pm 2.6$  mins and difference was statistically significant. Duration of analgesia in Bupivacaine group (B) was  $308.53 \pm 27.18$  minutes and  $547.3 \pm 48.87$  minutes in Bupivacaine – Dexamethasone (BD) duration of analgesia is significantly higher in group BD than group B.

The adverse effects were not reported in both the groups in this study. This study has shown that addition of 4 – 8 mg of Dexamethasone effectively and significantly prolongs the duration of analgesia. This study has also shown that the early onset of action in steroid group can be attributed to synergistic action with local anesthetic on blockage of nerve fibers. The prolongation of duration of block is the local effect of steroid than the systemic action. The effects are mainly mediated by glucocorticoid receptors. The blockade is not produced by the action of steroid alone. Hence

it should be used in addition to a local anesthetic.

## CONCLUSION

Axillary approach of brachial plexus block has been popular technique in delivery of anesthesia in patients undergoing below elbow surgeries. The elegance in the technique helps in safe delivery anesthesia and also assures prolonged analgesia by preventing the side effects of general anesthesia. Steroids are commonly used now a day to along with the local anesthetics due to their anti-inflammatory and analgesic effects. Dexamethasone being a potent corticosteroid is becoming popular for the regional blocks. This study has made an effort to compare the Bupivacaine alone with Bupivacaine – Dexamethasone. The study is methodologically elegant since it is randomized controlled study. This study shows that addition of dexamethasone 8mg to bupivacaine 0.25% prolongs the duration of motor block, sensory block, analgesia and also reduces the requirements of rescue analgesics.

## REFERENCE

1. Kothari D. Supraclavicular Brachial Plexus Block. *Indian J Anaesth*, 2003; 47(4):287-288.
2. Honorio T. Benzon. Epidural Steroids. In P. Prithvi Raj. Pain medicine, a comprehensive review. Mosby publications 1999; p.259 – 263.
3. Shrestha BR, Mahajan SK, Shrestha G, Goutham B, et al. Comparative study between tramadol and dexamethasone as an admixture to bupivacaine in supraclavicular brachial plexus block. *J Nepal Med Assoc* 2007; 46(168):158-64.
4. Yadav RK, Sah BP, Kumar P, Singh SN, et al. Effectiveness of addition of neostigmine or dexamethasone to local anesthetic in providing perioperative analgesia for brachial plexus block: A prospective, randomized, double blinded, controlled study. *Kathmandu University Medical Journal* 2008; 6(1):302-309.
5. Shrestha BR, Maharjan SK, Tabedar S et al. Supraclavicular brachial plexus block with and without dexamethasone - a comparative study. *Kathmandu Univ Med J (KUMJ)*. 2003; 1(3):158-60.
6. Pathak RG, Satkar AP, Khade RN. Supraclavicular brachial plexus block with and without Dexamethasone – A Comparative Study. *International Journal of Scientific and Research Publications* 2012; 2(12):1–7.

7. Islam SM, Hossain MHMD, MarufAA, et al. Effect of addition of Dexamethasone to local anesthetics in Supraclavicular brachial plexus block. JAFMC Bangladesh 2011; 7(1):11–14.
8. Cummings KC III., Napierkowski DE, and Parra-Sanchez I, et al. Effect of dexamethasone on the duration of interscalene nerve blocks with ropivacaine or bupivacaine. Br J Anaesth. 2011; 107:446-53.
9. Vieira PA, Pulai I, Tsao GC, Manikantan P, Keller B, Connelly NR. Dexamethasone with bupivacaine increases duration of analgesia in ultrasound-guided interscalene brachial plexus blockade. Eur J Anaesthesiol. 2010; 27(3):285-8.
10. Tandoc MN, Fan L, Kolesnikov S, Kruglov A, Nader ND (2011) Adjuvant dexamethasone with bupivacaine prolongs the duration of interscalene block: a prospective randomized trial. J Anesth. 25(5):704–709.
11. Biradar PA, Kaimar P, Gopalakrishna K. Effect of dexamethasone added tolidocaine in supraclavicular brachial plexus block: A prospective, randomised, double-blind study. Indian J Anaesth. 2013; 57:180-4.