



EFFECT OF DEXAMETHASONE ADDED TO LIGNOCAINE AND BUPIVACAINE MIXTURE FOR SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK. A PROSPECTIVE RANDOMIZED, DOUBLE BLIND STUDY.

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(ABSTRACT) **Background:** Different substances have been utilized to alter the various characteristics of brachial plexus block. This study was done to access the effects of dexamethasone on supraclavicular brachial plexus block when added to a mixture of lignocaine and bupivacaine

Materials and methods: A total of 60 Patients were included in the study with ASA physical status of I and II, aged between 18-65 years and scheduled for elective or emergency orthopedic surgery. Patients were allocated randomly in 2 groups of 30 patients each. Group -1(Control) patients received mixture of 19ml lidocaine 1.5%, 19 ml bupivacaine 0.5% and 2ml normal saline(NS), while Group-2 (Cases) patients received same mixture of local anaesthetics but 2ml of NS were replaced with dexamethasone 2ml (8mg). The block was performed using a classic paraesthesia technique. Onset and duration of sensory and motor blockade were assessed at pre determined intervals while analgesia was assessed by VAS.

Results: The onset time of sensory and motor block in both groups was comparable statistically insignificant. Duration of sensory and motor block, and duration of Analgesia was moderately longer in Group2 and this difference was also statistically significant. The VAS Scores and motor block scores as assessed by Lovett rating score at different time intervals at 10, 20,30,60,90,120,150, and 180 min were significantly lower in Group2 than in Group 1(P<0.05).

Conclusion: In conclusion, addition of dexamethasone to mixture of lidocaine and bupivacaine in supraclavicular block results in prolonged duration of sensory and motor block and also improves quality of analgesia without affecting its onset.

KEYWORDS : Dexamethasone, Local anaesthetic, Analgesia, Supraclavicular block

Introduction

Supraclavicular Brachial Plexus block is the commonest anaesthetic technique for upper limb surgeries in our hospital. Apart from its advantages like avoiding dangers of general anaesthetic drugs, airway manipulation and instrumentation it provides good operating conditions and excellent perioperative analgesia. In our set up where we have long waiting list of trauma and elective cases to be operated in Orthopedics department of our hospital, this block is an excellent tool in the hands of anaesthesiologist for patients with poor general condition and not adequately prepared. It provides a safe and economical alternative in many such situations provided that it is given meticulously under expert and experienced supervision and requires very intensive perioperative care to avoid complication like pneumothorax.

Brachial Plexus block is a block of its roots, divisions and trunks and was performed first by Halsted in 1884(1). Supraclavicular approach of this block is provided at the trunk level where the plexus is placed most compactly and the block once successful at this level, provides excellent anesthesia at elbow, forearm and hand surgery. The compactness may explain the blocks historical reputation for providing a short latency, complete and reliable anaesthesia for upper extremity. (2,3).

The duration of local anaesthetic action can be prolonged by using various adjuvants like vasoconstrictors, opioids, clonidine, verapamil etc, but the results are either inconclusive or associated with side effects.(4,5,6). Intrathecal use of steroids has been associated with arachnoiditis but there is no evidence of neuritis when steroids are used in low concentration in peripheral nerve blocks. Steroids have anti inflammatory and analgesic property and there are many studies which have demonstrated such effects.(7,8,9). In our study we used dexamethasone as an additive to local anaesthetic mixture of lidocaine and bupivacaine to evaluate onset, duration of analgesia and quality of block in surgeries of hand, forearm and elbow.

Materials and Methods

This prospective randomized double blind study was conducted in the

Department of Anaesthesiology and Critical care at SKIMS Medical College Hospital Bemina Srinagar from January 2016 to December 2016. After Ethics committee approval and informed consent from patients 60 patients were taken up for orthopedic surgery of upper limb under supraclavicular brachial plexus block. Patients included in the study were of ASA physical status of I and II, of either sex, aged 18-65 years and scheduled for elective or emergency orthopedic surgery. Exclusion criteria included uncontrolled diabetes, renal and liver diseases, circulatory instability, peptic ulcer disease, those with allergy to local anaesthetics and patients on long term steroid therapy.

Patients were allocated randomly in 2 groups of 30 patients each. Group -1(Control) patients received mixture of 19ml lidocaine 1.5%, 19 ml bupivacaine 0.5% and 2ml normal saline(NS), while Group-2 (Cases) patients received same mixture of local anaesthetics but 2ml of NS were replaced with dexamethasone 2ml (8mg). A total volume of 40ml of mixture was used in each patient of either group. In the operating room multipara monitor was attached to patient and baseline heart rate, ECG, blood pressure, Spo2 and respiratory rate were recorded. A 20 gauge i.v cannulae was secured in opposite arm and injection ringer lactate was started. The arm to be anaesthetized was adducted and the hand extended along the side towards ipsilateral knee. Under all aseptic precautions landmark points such as midclavicular point, external jugular vein and subclavian artery pulsation were identified. About 2cms above the midclavicular point just lateral to subclavian artery pulsation, a 24 gauge 1.5 inch needle was introduced and directed caudally and medially until paraesthesia response was elicited. At this point 40 ml of mixture drug was injected in increments after negative aspiration for blood and air.

Sensory and motor blockade of radial, median, musculocutaneous and ulnar nerves were recorded at 10, 30, 60, 90, and 120 minutes, and half hourly thereafter. Sensory block was assessed with pin prick and compared with same stimulation on opposite hand. Onset time for sensory block was defined by time from injection to onset of dull sensation along any of the nerve distribution. Duration of analgesia was also assessed using Visual Analogue pain scale (VAS) between 0 and 10 with 0 representing no pain and 10 representing the worst

imaginable pain. Motor block of each nerve was evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve) and pronation and flexion of forearm and flexion of elbow in supination (musculocutaneous nerve). Motor block of each nerve was quantified using modified Lovett rating scale (LRS). Age, weight and duration of surgery were also recorded.

MODIFIED LOVETT RATING SCALE

6	Normal muscular force
5	Slight reduction of muscular force
4	Pronounced reduction of muscular force
3	Slightly mobility impairment
2	Pronounced mobility impairment
1	Almost complete paralysis
0	Complete paralysis

Duration of sensory block was defined as time interval between injection of local anaesthetic mixture and the first postoperative pain. Duration of motor blockade was defined as the time interval between the local anaesthetic administrations to complete recovery of motor function in all nerve distributions. Patients who complained of pain and discomfort during surgery or if the surgery got unduly prolonged and effects of block wore off were converted to General anesthesia, and were excluded from study. Post operatively CXR was done six hours after the administration of block or earlier if patient showed any clinical evidence of pneumothorax and findings were recorded and dealt appropriately. Statistical analysis was done with SPSS for windows version 16. For analysis of demographic data and comparison of groups Student's t-test and Mann-Whitney U test were performed. P<0.05 was considered to be significant.

Results

The comparison between two groups in terms of demographic profile was statistically insignificant (p>0.05)(Table 1&2)

The onset time of sensory and motor block in both groups was comparable statistically insignificant. Duration of sensory and motor block, and duration of Analgesia was moderately longer in Group2 and this difference was also statistically significant.(Table 3)

The VAS Scores and motor block scores as assessed by Lovett rating score at different time intervals at 10, 20,30,60,90,120,150,and 180 min were significantly lower in Group2 than in Group 1(P<0.05). The difference in VAS and Lovett rating score at above time intervals is depicted in figures.

Table 1-Patient demographics

Variable	Group1	Group2	p-value	Remarks
1.Age(years)	39.9±13.5	41.4±14.69	0.5120	Not significant
2.Weight(kgs)	64.63±7.499	66.65±7.31	0.2570	Not significant

Table 2-Duration of Surgery (DOS)

Variable	Group1	Group2	p-value	Remarks
3.DOS(min)	30.33±6.66	29.7±5.559	0.8132	Not significant

Table 3-Characteristics of supraclavicular block onset and duration of analgesia

Variable in min	Group1	Group2	p-value	Remarks
Onset time (SB)	27.80±3.137	27.15±3.124	0.450	Not significant
Onset time (MB)	38.70±4.66	38.60±3.14	1.00	Not significant
Duration of (SB)	130±20	159±20	<0.001	Significant
Duration of (MB)	98±33	135±20	<0.001	Significant
Duration of Analgesia	140±15	169±20	<0.001	Significant

(SB)- Sensory block, (MB)- Motor block, min-minutes

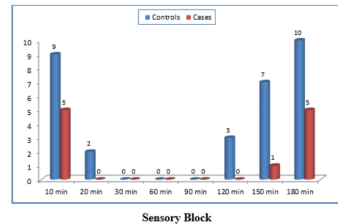
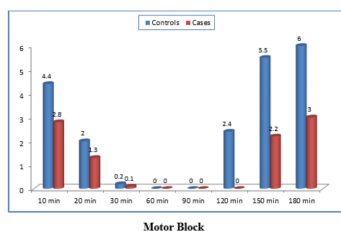


FIGURE -ONSET AND DURATION OF MOTOR AND SENSORY BLOCK

Discussion

Our study revealed that duration of sensory as well as motor block increased significantly by adding dexamethasone to local anaesthetic mixture of lidocaine and bupivacaine. The VAS scores (Sensory block scores) and Lovett rating scores (Motor block scores) were significantly lower in patients at 20 minutes from onset of block the dexamethasone group. Once the block got intensified there were no differences in these scores which start at 30 minutes and lasts upto 90 minutes as depicted in figures above. Such observations were also seen in studies conducted by Movofegh et al (10) and Golwala MP et al(11). Other studies have demonstrated that addition of dexamethasone to bupivacaine microspheres prolonged the duration of blockade of the peripheral nerves. (12)(13)(14)

Dexamethasone in bupivacaine microspheres also prolonged local analgesia when injected subcutaneously (15) and in intercostal nerve blockade. (16) Dexamethasone has also been found to enhance the analgesia of intravenous regional anaesthesia (IVRA) and reduce postoperative analgesic requirements (17). Glucocorticoids like dexamethasone, inhibit cytokine mediated pathways by binding to intracellular receptors and combining with glucocorticoid receptors, this complex then moves into nucleus of cells where it binds to specific DNA sequences to regulate gene transcription involved in the function of inflammatory response mediators. This result in the induction and repression of genes related to inflammatory processes.

Dexamethasone is one of the most effective ligands for glucocorticoid receptor activation there by having a strong anti-inflammatory effect. (18) These effects are, therefore mediated via the classical glucocorticoid receptor and are local effects rather than systemic since incorporation of dexamethasone has not been shown to alter kinetics of bupivacaine release from microcapsules (13). Action on glucocorticoid receptor alters the functioning of ion channels or produces local acidosis in the nerve cell, thereby reducing the concentration of local anaesthetic required for conduction failure or trapping the highly ionized bupivacaine molecule into the neuronal cell (12, 16). These events produce an extended action of local anaesthetics. Short term single dose of dexamethasone in 24 hours is safe as demonstrated in many studies (19), but at the same time may cause problems in diabetic patients and patients having chronic infections.

In conclusion, addition of dexamethasone 8mg to lidocaine 1.5% and bupivacaine 0.5% mixture in supraclavicular block results in prolonged duration of sensory and motor block and it is useful in situations such as hypertension and ischemic heart disease patients where drug such as epinephrine must be avoided. Further studies are required at biochemical level to know exact mechanism of action of dexamethasone.

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