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TO STUDY THE EFFECTS OF DEXAMETHASONE AS AN ADJUVANT WITH ROPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK IN UPPER LIMB SURGERIES

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ABSTRACT
Background: Dexamethasone has been found to prolong duration in animals and human studies. We used dexamethasone along with ropivacaine for supraclavicular brachial plexus block. **Aims:** We aimed at assessing the effect of Dexamethasone as an adjuvant with ropivacaine in supraclavicular brachial plexus block. **Methods:** Sixty ASA grade I and II patients, 18-60 years old, scheduled for upper limb surgeries under supraclavicular brachial plexus block, were included in this prospective study. The patients were randomly assigned to two groups, Group A which received ropivacaine 0.5% 30 ml+2ml NS and Group B which received ropivacaine 0.5% 30 ml+8 mg Dexamethasone. Onset and recovery time of sensory and motor block, duration of analgesia and quality of block were studied in both groups. **Results:** Dexamethasone provides early onset of sensory and motor block, prolongs the duration of sensory and motor block, prolongs effective analgesia when added to ropivacaine in supraclavicular brachial plexus block.

KEYWORDS: Dexamethasone, ropivacaine, supraclavicular block.

INTRODUCTION
Regional anaesthesia provides a safe and low cost technique with advantage of early ambulation and prolonged postoperative pain relief. It avoids pressure response of laryngoscopy and tracheal intubation and untoward effects of anaesthetic drugs used during general anaesthesia.[1] Brachial plexus blocks are amongst the most commonly performed peripheral neural blocks for upper extremity owing to their high success rate and their ability to provide prolonged postoperative pain relief. We have chosen supraclavicular approach due to its reliability and ease of performance.

Ropivacaine, a relatively new aminoamide local anaesthetic which has safer cardiac profile than bupivacaine, because of single S isomere and difference of propyl- and butyl- N- piperdine substitute[2] with similar clinical profile, is used here for supraclavicular block.[3] To prolong duration of surgical anaesthesia and postoperative analgesia various adjuvants have been used in clinical practice.[4,5] Dexamethasone has been found to prolong the block in human.[3,4,6] With this backgroung present study is carried out to evaluate the effects of addition of dexamethasone to local anaesthetic ropivacaine in supraclavicular brachial plexus block in upper limb surgeries.

MATERIAL AND METHODS
Patient selection: Inclusion criteria were age 18-60 years, either gender, under going any upper limb surgery, ASA grade I and II, weight 50-80kg while exclusion criteria were patient refusal, allergy to local anaesthetics, extremes of age, uncontrolled systemic diseases, history of drug or alcohol abuse, pregnant women, significant neurological disease in upper limb and patient having bleeding disorder or on anticoagulant therapy. After Ethical committee approval, written and informed consent was obtained. ASA grade I and II patients aged 18-60 years, of either gender undergoing any upper limb surgery were randomly divided into 2 groups of 30 patients each. Group A: Inj. Ropivacaine 0.5%30ml+2ml NS and Group B: Inj. Ropivacaine 0.5%30ml+8mg Dexamethasone. Total volume-32 ml.

In the operation theatre, patient was monitored for blood pressure, heart rate and peripheral oxygen saturation before the procedure and baseline values were recorded. Intravenous access was established using appropriate size of cannula in a suitable vein. The patient was given premedication in the form of, Inj. Ondensatron (0.1mg/kg) intravenously. Patient was given supraclavicular block on paraesthesia or pulsation. Onset of Sensory block was assessed every 2 min by atraumatic pin prick test in the areas innervated by radial, ulnar, and median nerves and compared with the same stimulation on contralateral hand. Sensory blockade was graded as Grade 0-Sharp pain felt, Grade 1 -Dull sensation felt, Grade 2- No sensation felt. The following points had been observed and noted.

Sensory: Onset time was defined as time from the completion of local anesthetic administration to no sensation felt on any of the nerve distribution**. Duration of effective sensory block** was defined as time between the completion of local anesthetic administration and starting of recovery of sensation in any of the nerve distribution. **Complete wearing off of sensory block** was from the completion of local anesthetic administration to complete resolution of sensory block (normal sensation) in any of the nerve distribution.

Motor: Similarly, onset of motor block was evaluated by asking the patient to move the forearm against resistance and to flex the forearm. It was graded by four point scale: Grade 0: complete movement of fingers and wrist, Grade 1: Reduced movement of fingers and wrist, Grade 2: Only elbow movement, Grade 3: No movement of fingers, wrist and elbow. The following points were observed and noted. **Onset time** was considered from the completion of local anesthetic administration to no movement of fingers, wrist and elbow**. Duration of effective motor blockade** was defined as time between the end of local anesthetic administration and starting of recovery of movement at elbow, wrist or fingers. **Complete wearing off of motor blockade** was from the completion of local anesthetic administration to complete resolution of movement at elbow, wrist and fingers.Any untoward effects during course of surgery were observed and treated accordingly. Episode of perioperative hypotension was treated with Inj Mephentermine 6mg I.V. in incremental doses. Bradycardia was treated with Inj Atropine 0.6mg i.v. Respiratory depression and desaturation were and treated with 100% oxygenation and mask ventilation. Injection Diclofenac 1.5 mg/kg intramuscularly given when VAS ≥4. Vital parameters were noted at regular intervals along with pain score for 16 hrs. All the data were filled up in profoma and were statistically analyzed by applying unpaired t- test for analysis in both groups for various parameters.[7] The results were considered significant if P value<0.05 and highly significant if P value<0.0001.

OBSERVATIONS AND RESULTS

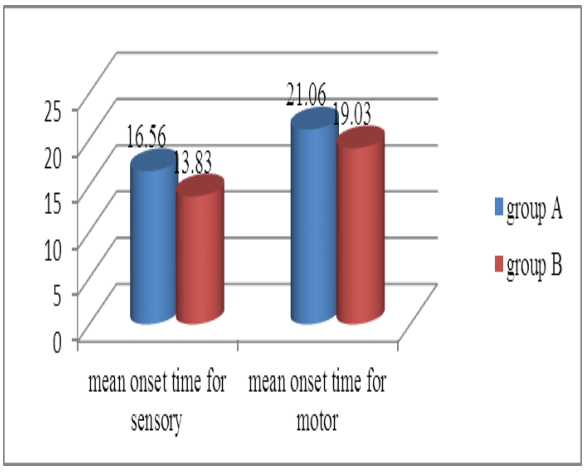
There was no statistically significant differences among the patients in both the groups with respect to age, weight, sex ratio, duration of surgery, type of surgery and ASA physical status.

Table no.1 Demographic data

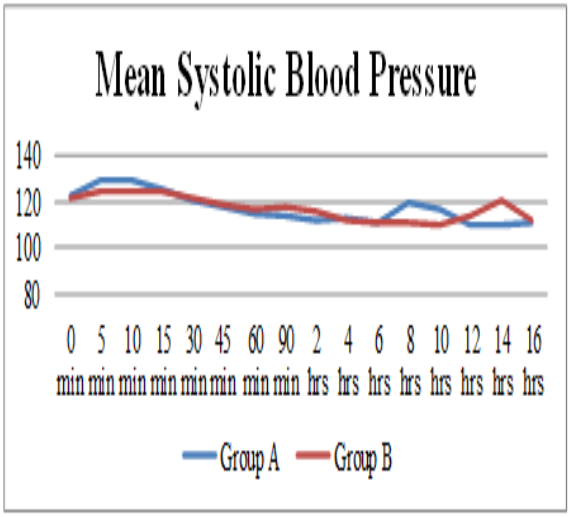
Variables	Group A	Group B
1) Age in yrs (Mean)	38.73 ±13.48	38.9 ±14.53
2) Weight in kg(Mean)	54.33 ± 5.21	55.3 ± 4.38
3) Sex ratio (M:F)	26:4	24:6

Table no.2 showing mean onset time of sensory and motor block,duration of sensory and motor block and effective analgesia.

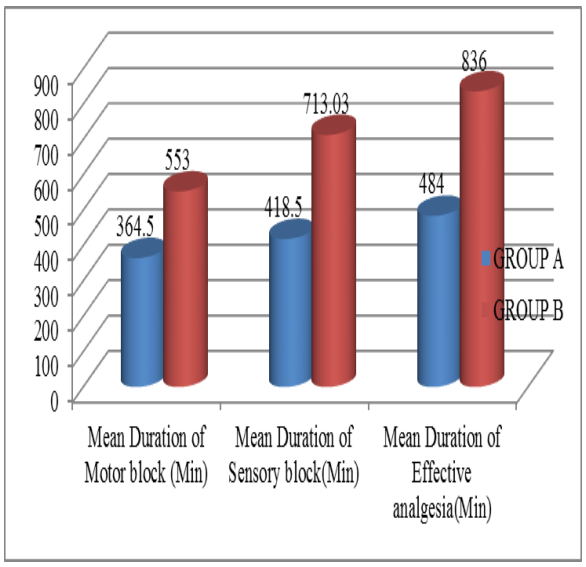
	Group A	Group B
Onset of Sensory blockade(Mean±SD) mins	16.56±1.04	13.83±1.82
Onset of motor blockade(Mean±SD) mins	21.06±1.08	19.03±2.02
Duration of sensory blockade(Mean±SD) mins	418.5±30.6	713.03±42.24
Duration of motor blockade(Mean±SD) mins	364.5±25.87	553±44.34
Duration of effective analgesia in mins	484±49.66	836±49.66



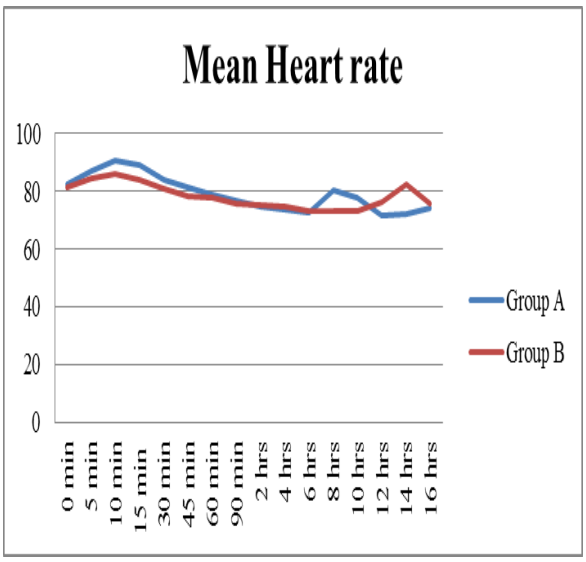
Graph 1 showing mean onset time for sensory and motor blockade



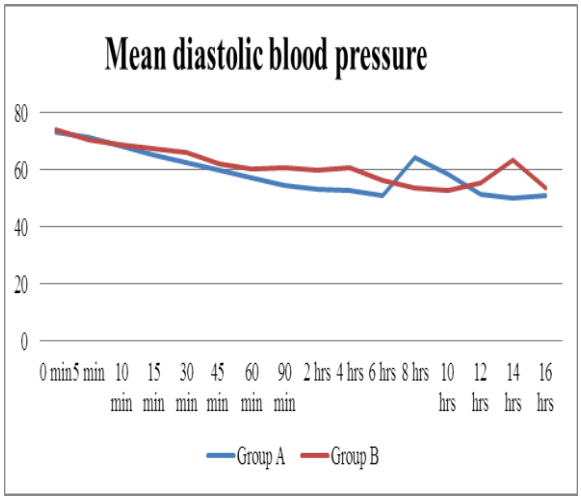
Graph2showing mean systolic pressures in both groups



Graph: 3 showing mean duration of sensory, motor and effective analgesia



Graph: 4 showing mean heart rate in both groups



Graph: 5 showing mean diastolic blood pressure in both groups

Graph 4 shows mean heart rate per minute at different time interval. The reduction in heart rate within 15-60 minutes after the effect of block was established. Mean heart rate was similar in both groups which were statistically not significant (P value > 0.05). **Graph** 2 shows systolic blood pressure in mm of Hg at different time interval. There was no significant difference in the mean systolic blood pressure in both groups (P value > 0.05) at any point of observation. As seen in **Graph 5** there was no significant difference in the mean diastolic blood pressure in both groups (P value > 0.05) at any point of observation.

DISCUSSION

Brachial plexus block is a reliable regional anaesthetic technique and a suitable alternative to general anaesthesia for upper limb surgery. The supraclavicular approach provides the most complete and reliable anaesthesia as it provides anaesthesia of the entire distal upper extremity in the most consistent, time efficient manner of the many brachial plexus technique.[8] Performed at the trunk level, where the trunks are more compact, results in rapid onset, dense effect, complete and reliable anaesthesia.

Dexamethasone, a derivative of synthetic glucocorticoid, is preferred because of its highly potent anti-inflammatory property.[6] Mechanism of analgesia might be mediated by their anti inflammatory and immunosuppressive effect. It causes skin vasoconstriction on topical application which decreases absorption of local anaesthetic agent and there by prolongs the duration of action.[6] Another theory is steroids binds to intracellular receptors and modulate nuclear transcription by inhibiting K channel nociceptive c fibers. Perineural glucocorticoid is eventually absorbed and exerts systemic effects and intravenous steroids shown to improve postoperative pain and also decreases postoperative nausea and vomiting.[4]

All patients were demographically similar in both groups. Duration of surgery was also similar in both groups and was statistically not significant. The onset of sensory block was faster with Ropivacaine and Dexamethasone combination as compared to Ropivacaine alone. The mean onset time was 13.83±1.82 min with Ropivacaine and Dexamethasone combination while it was 16.56±1.04min with Ropivacaine which was statistically highly significant($P < 0.0001$). The onset of motor blockade was also significantly faster with Ropivacaine and Dexamethasone combination and was 19.03 ± 2.02 min while it was 21.06 ± 1.08 min with Ropivacaine ($P < 0.0001$). The early onset of action might be due to the synergistic action of dexamethasone with local anaesthetic agents in blocking the nerve fibre[6] which was similar to study.[6] It was also seen in this study[6] that the mean onset time of sensory block was 14.65±3.31 mins and 17.5±4.2 mins in group of ropivacaine and dexamethasone combination and plain ropivacaine respectively. The mean onset time of motor blockade was also similar 18.01±4.5 min with dexamethasone group and 20.67±3.03mins with plain group.

In another study[3] they also observed faster onset time of both sensory (4.5 min) and motor block (6.6 min) with Dexamethasone – Ropivacaine combination as compared to control group which was 4.5 min and 6.8 min respectively. The trend was faster as compared to our study, might be because of difference in method of calculation. They had calculated sensory onset time from the time of injection of local anaesthetic to dull sensation and motor onset time from the time of injection of local anesthetic to decreased motor strength. In study[9] also similar results were found when dexamethasone was added to lidocaine with adrenaline. In study[10] addition of dexamethasone to mepivacaine showed no difference. In present study, Ropivacaine with Dexamethasone has significantly longer duration of sensory block as compared with Ropivacaine plain. The mean duration of effective sensory block was 713.03 ± 42.24 min (11.88 ± 0.70 hr) with Ropivacaine and Dexamethasone combination while it was 418.5 ± 30.60 min (6.98 ± 0.51 hr) with Ropivacaine plain which was highly significant ($P < 0.0001$).Similarly the duration of effective motor block was also significantly longer with Ropivacaine – Dexamethasone combination as compared to Ropivacaine plain. It was 553 ± 44.34 min (9.21 ± 0.74 hr) with Ropivacaine and Dexamethasone combination and 364.5 ± 25.87 min (6.07 ± 0.43hr) with Ropivacaine alone which was highly significant ($P < 0.0001$).This is similar to study[6] in which duration of effective sensory blockade was 12.3 ± 0.40 hrs with Ropivacaine and Dexamethasone combination while it was 7.5 ± 0.55 hr with Ropivacaine alone. Duration of effective motor blockade was 8.2 ± 0.50 hr with Ropivacaine and Dexamethasone as compared with Ropivacaine plain which was 6.4 ± 0.30 hr. Both the duration of effective sensory and motor blockade was highly significant. In study[3], similar results were observed. The duration of sensory blockade was significantly longer with Ropivacaine and Dexamethasone group (10.17 ± 1.13 hr) as compared to Ropivacaine plain (6.5 ± 0.6 hr). Similarly, the duration of motor blockade was also longer in dexamethasone group (8.35 ± 0.81 hr) as compared to control group (7.42 ± 0.78 hrs). In another study[4], when Dexamethasone was added with other local anaesthetic agents, it also significantly prolonged the duration of effective sensory and motor blockade. The duration of effective sensory block was 242 ± 47 min with Lidocaine and Dexamethasone group while 98 ± 33 min with Lidocaine Plain. Similarly the duration of effective motor block was 310 ± 81 min and 130 ± 31 min with dexamethasone and control group. In present study, effective analgesia was significantly longer with addition of Dexamethasone to Ropivacaine and was 836 ± 49.66 min (13.83 ± 0.83hr) as compared to 484 ± 49.66 min (8.07 ± 0.83hr) with Ropivacaine alone. The results were statistically highly significant ($P < 0.0001$). Our result was similar to study[6] where postoperative analgesia with Dexamethasone and Ropivacaine combination was 14.5 ± 0.30 hr while was 8.3 ± 0.40 hr with Ropivacaine alone ($P < 0.0001$) which was highly significant. In another study[3], they also found the longer duration of analgesia with Ropivacaine and Dexamethasone combination(21.3 hrs) than in control group(10.24 hrs). In another study[5], Dexamethasone significantly prolonged the duration of analgesia of both Ropivacaine and Bupivacaine.Use of single dose of perineural Dexamethasone 8mg seems to be safe in adults and adverse effects are probably extremely rare and minor in nature and observed the negligible blood level after intercostals nerve block combined with local anesthetics. The safe dose of dexamethasone 4-12 mg via intravenous, perineural and epidural routes are described.[11] In present study, the intra operative pulse rate, systolic blood pressure and diastolic blood pressure remained stable after 15-60 min of administration of drugs which suggests that satisfactory was achieved. There was no significant difference in both the group at any time interval during monitoring. Similarly, in other studies[3,4,6] they also found no significant hemodynamic changes at any time interval during monitoring. Rescue analgesic was given when patient developed VAS score ≥ 4. In majority of patients, it was achieved at around 8 hr with Ropivacaine plain and 13 hr with Ropivacaine and Dexamethasone combination. Results were clinically comparable and difference between both the groups was statistically highly significant ($P < 0.0001$). R. Mageswaran[12] et al also observed similar trends of VAS. No significant intra-operative and post-operative complications like pneumothorax, intra-arterial or intravascular placement of drug, nausea and vomiting, neurotoxicity or cardio toxicity were found in either group. Similarly, other studies[3,4,6] observed no significant complications in their results.

SUMMARY AND CONCLUSION

To conclude-addition of Dexamethasone 8mg to Ropivacaine (0.5%) 30 ml significantly fastens the onset

of both sensory and motor block, provides longer duration of effective sensory and motor block and prolongs the duration of effective postoperative analgesia in Supraclavicular brachial plexus block in upper limb surgeries.

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