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ORIGINAL ARTICLE

ASSESSMENT OF THE ROLE OF DEXAMETHASONE AS AN ADJUVANT IN SUPRACLAVICULAR BLOCK FOR UPPER LIMB SURGERIES

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ABSTRACT:
Background: Although providing shorter post-surgical analgesia, local anesthetics alone for Supraclavicular brachial plexus block provide good operative conditions. Steroids have powerful anti-inflammatory as well as analgesic property. One of the potent and highly selective glucocorticoid is Dexamethasone. Hence; we assessed the role of dexamethasone as an adjuvant in supraclavicular block for upper limb surgeries. **Material & Methods:** The present study was conducted in the department of orthopaedics and included all the patients that were admitted to the department from 2011 to 2014 who were planned to undergo below shoulder upper limb surgeries (both elective and emergency) under brachial plexus block. A total of 100 patients were included for the present study and were divided randomly into two study groups. Group A consisted of patients who received bupivacaine with dexamethasone while group B consisted of patients who received only bupivacaine. Both the groups consisted of 50 patients each. Sensory and motor blockade of radial, median, musculocutaneous, medial cutaneous nerve of arm and forearm, and ulnar nerves were assessed every 2 minute after completion of injection till 30 minutes and then every 30 min after the end of surgery till first 12 hrs, thereafter hourly until the block had completely worn off. The duration of sensory block was defined as the time interval between the onset of sensory block and the first postoperative pain. The duration of motor block was defined as the time interval between the onset of motor block and complete recovery of motor functions. After 30 minutes, if the block was considered to be adequate, surgery commenced. All the results were analyzed by SPSS software. **Results:** Mean age of the patients in group A and group B was 29.5 and 22.4 years respectively. Mean weight of the patients in the group A and group B was 58.3 and 62.1 kg respectively. 170 cm and 168.4 cm was the mean height of the patients in the group A and group B respectively. Mean duration of surgery in group A and group B was 166.5 and 155.2 minutes respectively. Non-significant results were obtained while comparing the two study groups. Mean duration time for the onset of the sensory block in group A and group B patients was 5.01 and 6.70 minutes respectively. Mena duration of analgesia in group A and group B patients was 840 and 280 minutes respectively. Statistically significant results were obtained while comparing the p-value for the mean analgesia time and motor block duration time in between the patients of the two study groups. **Conclusion:** Significant prolongation of the duration of analgesia and motor block in patients undergoing upper limb surgeries by the addition of dexamethasone to local anaesthetic drugs in brachial plexus block
Key words: Anaesthesia, Dexamethasone, Supraclavicular

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INTRODUCTION

Although providing shorter post-surgical analgesia, local anesthetics alone for Supraclavicular brachial plexus block provide good operative conditions. For achieving quick, dense and prolonged block, various adjuvants like opioids, clonidine, neostigmine, midazolam, etc. were added to local anesthetics in brachial plexus block, but the results are either inconclusive or associated with side effects.[1, 2] Steroids have powerful anti-inflammatory as well as analgesic property. They suppress inflammation through inhibition of phospholipase A2. Local application of methylprednisolone has been found to block transmission in nociceptive C-fibers but not in myelinated A-beta fibers.[3] The effect was reversible, suggesting a direct membrane action of steroids.3 Corticosteroids also suppress ectopic neuronal discharge.[4] One of the potent and highly selective glucocorticoid is Dexamethasone. Various studies have been done using dexamethasone 8 mg as an adjuvant to local anaesthetics mixture in

brachial plexus block resulting in variable effects on onset but prolonged duration of analgesia and motor block.[5- 7] Hence; we assessed the role of dexamethasone as an adjuvant in supraclavicular block for upper limb surgeries.

MATERIALS AND METHODS

The present study was conducted in the department of orthopaedics and included all the patients that were admitted to the department from 2011 to 2014 who were planned to undergo below shoulder upper limb surgeries (both elective and emergency) under brachial plexus block. Ethical approval was taken from the ethical committee of the institution and written consent was obtained from the patients after explaining them in written the entire research protocol. A total of 100 patients were included for the present study and were divided randomly into two study groups. Group A consisted of patients who received bupivacaine with dexamethasone while group B consisted of patients who received only bupivacaine. Both the groups consisted of 50 patients each. The inclusion criteria were defined as patients aged between 18 and 60 years of American Society of Anesthesiologists I to II physical status, who were planned to undergo below shoulder upper limb surgeries (both elective and emergency) under brachial plexus block. Patients who refused to give consent, pregnant women, history of local anesthetics allergy, peptic ulcer disease, diabetes mellitus, peripheral neuropathy and patients with contraindications for brachial plexus block like bleeding disorder, patients on anticoagulants, severe respiratory disease, neurological deficit involving brachial plexus local infection at the injection site were excluded from the study. In the pre-operative room, intravenous access was secured with 18-G cannula on the contralateral hand and baseline parameters such as heart rate, mean arterial pressure, oxygen saturation was observed and recorded. After proper explanation of technique, block was performed in supine position with head rotated to the contralateral side and upper limb to be anesthetized was abducted and extended along the side toward the ipsilateral knee as far as possible .Interscalene groove was indentified & landmark was confirmed by palpation of the subclavian artery where a mark was made approximately 1.5 to 2.0 cm posterior to the mid-clavicle point . The position of the needle was considered to be acceptable when an output current < 0.5 mA still elicited a slight distal motor response in forearm and hand. On negative aspiration for blood , a total volume of 40 ml solution (38 ml 0.25% bupivacaine + 2 ml dexamethasone or normal saline) was injected slowly.The intercostobrachial nerve (T2) was blocked with 5 mL of 2 % lignocaine with 1:200000 adrenaline to avoid tourniquet pain. Sensory and motor blockade of radial, median, musculocutaneous, medial cutaneous nerve of arm and forearm, and ulnar nerves (C5-T1 dermatomes) were assessed every 2 minute after completion of injection till 30 minutes and then every 30 min after the end of surgery till first 12 hrs, thereafter hourly until the block had completely worn off. Sensory blockade of each nerve was assessed by pinprick and evaluated using a 3-point scale: 2 = normal sensation, 1 = loss of sensation to pinprick, and 0 = loss of sensation to light touch. Motor block was tested by thumb abduction and wrist extension (radial nerve), thumb adduction and ulnar deviation of the hand (ulnar nerve), flexion of the elbow in supination (musculocutaneous), thumb opposition and wrist flexion (median nerve) and was measured using a 3- point scale where 2 = normal movement, 1 = paresis, and 0 = absent movement. Onset time of sensory block was defined as the time interval between the end of local anesthetic injection and loss of sensation to pinprick in all of the nerve distributions. Onset time of motor blockade was defined as the time interval between the end of local anesthetic injection and paresis (motor score = 1) in all of the nerve distributions. The duration of sensory block was defined as the time interval between the onset of sensory block and the first postoperative pain. The duration of motor block was defined as the time interval between the onset of motor block and complete recovery of motor functions. After 30 minutes, if the block was considered to be adequate, surgery commenced. All the results were analyzed by SPSS software. Chi-square test was used for the assessment of level of significance.

RESULTS

Graph 1 highlights the demographic details of the patients. Mean age of the patients in group A and group B was 29.5 and 22.4 years respectively. Mean weight of the patients in the group A and group B was 58.3 and 62.1 kg respectively. 170 cm and 168.4 cm was the mean height of the patients in the group A and group B respectively. Mean duration of surgery in group A and group B was 166.5 and 155.2 minutes respectively. **Table 1** shows the p-value for the comparison of various demographic details between group A and group B. Non-significant results were obtained while comparing the two study groups. **Graph 2** highlights the anaesthetic parameters for the patients in the two study groups. Mean duration

time for the onset of the sensory block in group A and group B patients was 5.01 and 6.70 minutes respectively. Mena duration of analgesia in group A and group B patients was 840 and 280 minutes respectively. **Table 2** shows the p-value for the comparison of anaesthetic parameters in between the two study group. Statistically significant results were obtained while comparing the p-value for the mean analgesia time and motor block duration time in between the patients of the two study groups.

Graph 1: Demographic details of the patients

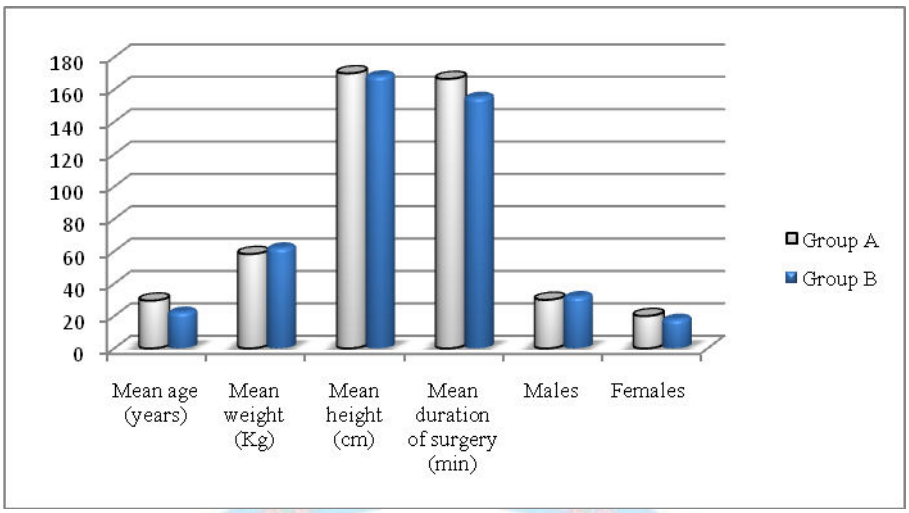

Table 1: P-value for the comparison of demographic details between the two study groups

Parameter	p-value
Mean age (years)	NS
Mean weight (Kg)	NS
Mean height (cm)	NS
Mean duration of surgery (min)	NS
Sex	NS

NS: Non significant, S: Significant

Graph 2: Anaesthetic outcome details of the patients undergoing surgeries in both the groups

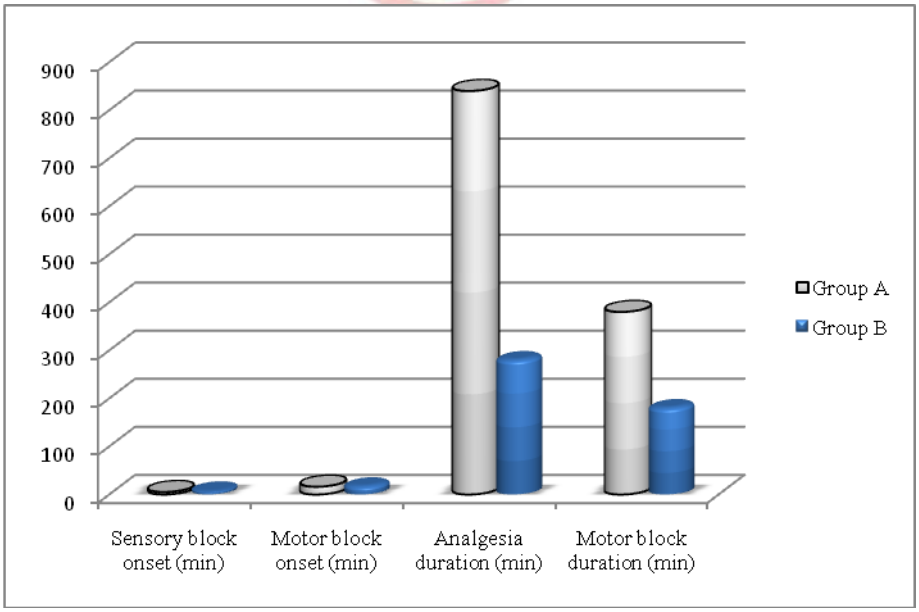

Table 2: p-value for the comparison of anaesthetic parameters in between the two study group

Parameter	p-value
Sensory block onset (min)	NS
Motor block onset (min)	NS
Analgesia duration (min)	S
Motor block duration (min)	S

NS: Non significant, S: Significant

DISCUSSION

One of the most preferred techniques for the upper limb surgeries is the Brachial plexus block. It has its own advantages by avoiding untoward effects of general anesthetic drugs and upper airway instrumentation. Various approaches of brachial plexus blocks have been described, but the supraclavicular approach is the easiest and most consistent method for anesthesia and perioperative pain management in surgery below the shoulder joint. In a supraclavicular approach, the brachial plexus is blocked where it is most compactly arranged at the level of nerve trunks and rapid onset can be achieved, with a high success rate for elbow, forearm, and hand surgery because all the branches of the brachial plexus can be reliably blocked.[8]

The mechanism of action of dexamethasone in prolonging peripheral neural blockade is not clearly understood. The block effect may be due to its local action and not a systemic one.[9-11] In brief, the prolongation of duration of sensory and motor blockade after perineural administration of dexamethasone may be secondary to its local action on nociceptive C fibers mediated via membrane associated glucocorticoid receptors and the up-regulation of the function of potassium channels in excitable cells.[12] Hence; we assessed the role of dexamethasone as an adjuvant in supraclavicular block for upper limb surgeries.

In the present study, we observed that mean analgesia time was significantly higher in Group A patients in comparison with group B patients. The mean onset of sensory and motor blockade was significantly earlier in Group A compared to Group B. This could be due to the synergistic action of local anesthetics and dexamethasone. Previous studies showed no significant reduction in onset of sensory and motor blockade in dexamethasone group compared to control group. This discrepancy could be due to the difference in the local anesthetic volume and technique of block.[11] Patil et al evaluated the quality and duration of postoperative analgesia by addition of buprenorphine to local anesthetic solution. They prospectively, randomized, double-blind control study was conducted on 50 healthy patients of ASA Grade I/II of age group 20-70 years scheduled for orthopedic and reconstructive surgery of upper limb under supraclavicular brachial plexus block. They observed that the mean duration of postoperative analgesia was significantly longer in Group B than in Group C. There was no difference between two groups on mean onset of sensory block. The mean duration motor block was significantly longer in Group B than in Group C. From the results, they concluded that Addition of 3 µg/kg buprenorphine to 0.5% bupivacaine for supraclavicular brachial plexus block prolonged duration of postoperative analgesia and sensory blockade without an increase in side effects.[13] Liu et al examined the analgesic effect of 3 doses of dexamethasone in combination with low concentration local anesthetics to determine the lowest effective dose of dexamethasone for use as an adjuvant in supraclavicular brachial plexus nerve block. They evaluated 89 adult patients who were scheduled for shoulder arthroscopy. They observed that the median analgesia duration of supraclavicular brachial plexus nerve block with 0.25% bupivacaine was 12.1 hours; and 1-, 2-, or 4-mg dexamethasone significantly prolonged the analgesia duration to 22.3, 23.3, and 21.2 hours, respectively. Dexamethasone also significantly extended the duration of motor nerve block in a similar trend. From the results, they concluded that Low-dose dexamethasone (1-2 mg) prolongs analgesia duration and motor blockade to the similar extent as 4-mg dexamethasone when added to 0.25% bupivacaine for supraclavicular brachial plexus nerve block.[14]

CONCLUSION

From the above results, the authors concluded that significant prolongation of the duration of analgesia and motor block in patients undergoing upper limb surgeries by the addition of dexamethasone to local anaesthetic drugs in brachial plexus block. However, further studies are advocated for the future exploration of this field.

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