Original Research Article

Effect of intravenous dexamethasone on the duration of action of supraclavicular block

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Abstract

Background: Supraclavicular block is a popular and widely employed regional nerve block of the upper extremity. Duration of action and possible variations in it can be a limiting factor for use of this technique. Dexamethasone can be used intravenously to prolong the duration of supraclavicular brachial plexus block. **Aim:** To evaluate the effect of intravenous Dexamethasone on duration of supraclavicular brachial plexus block. Material and Methods: The study was carried out in total 50 patients in two groups of 25 each. The patients were randomly allocated in two groups by sealed envelopes techniques as follows. Group C–Supraclavicular block with 0.5% Bupivacaine 15 ml.+2% Xylocaine adrenaline 15 ml. and Normal Saline as placebo in 10 cc syringe IV. Group D – Intravenous Dexamethasone0.2 mg/kg just before the beginning of block and supraclavicular block with 0.5% Bupivacaine 15 ml. + 2% Xylocaine adrenaline 15 ml. **Results:** The mean total duration of sensory block was significantly higher in dexamethasone group as compared to control group. (11.84 vs 7.58 hours; p value < 0.001). The mean total duration of motor block in dexamethasone group was 10.12 ± 0.88 hours and control group was 6.30 ± 0.82 hours. The difference in duration of two groups was 3.82 hours. Motor block duration is significantly higher in dexamethasone group. P value (<0.001). **Conclusion:** Intravenous Dexamethasone significantly prolongs duration of sensory and motor blockade in supraclavicular brachial plexus block. Intravenous administration of dexamethasone should be considered to achieve increased duration of analgesia.
Key Word: supraclavicular brachial plexus block, Intravenous Dexamethasone, duration, sensory block, motor block

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INTRODUCTION

Supraclavicular block is a popular and widely employed regional nerve block of the upper extremity. It is the easiest and the most consistent method for anaesthesia and perioperative pain management in surgery distal to the shoulder joint.[1,2,3] Duration of action and possible variations in it can be a limiting factor for use of this technique. To increase the duration of block various adjuvants are used. There are certain disadvantages with these adjuvants. Drugs like morphine, pethidine, clonidine, dexmeditomedine, butorphenol are commonly used with local anaesthetics. They are associated with side effects like psychokinetic effects, heavy sedation and respiratory depression so better alternative were searched for Intravenous dexamethasone is one of them. Dexamethasone is a synthetic glucocorticoid that acts as an anti-inflammatory and immunosuppressant drug. It inhibits the release of inflammatory mediators such as interleukins and cytokines–facilitating the release of anti-inflammatory meditators, so decreasing the post-operative pain. It produces analgesia by blocking transmission of nociceptive myelinated C fibres and suppressing ectopic neuronal discharge.[4,5] Dexamethasone can be used intravenously in prolonging analgesia upto 24 hours.[6,7] Prolonged blockade just adequate for procedure and good intra and postoperative analgesia without prolonged postoperative motor blockade can be an ideal situation. With this background and keeping in this mind we evaluated the effect of intravenous Dexamethasone on duration of supraclavicular brachial plexus block.

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MATERIAL AND METHODS

This prospective double blinded randomized placebo-controlled trial study was conducted in tertiary care hospital attached to medical college. After obtaining approval of the hospital, academic and ethics committee and written informed valid consent, study was undertaken in 50 American Society of Anaesthesiologists (ASA) grade 1 and 2 patients undergoing various orthopaedic surgeries on upper limb under supraclavicular brachial plexus block.

Sample Size: The study was carried out in total 50 patients in two groups of 25 each. The patients were randomly allocated in two groups by sealed envelopes techniques as follows.

Group C – Supraclavicular block with 0.5% Bupivacaine 15 ml. + 2% Xylocaine adrenaline 15 ml. and Normal Saline as placebo in 10 cc syringe IV.

Group D – Intravenous Dexamethasone0.2 mg/kg just before the beginning of block and supraclavicular block with 0.5% Bupivacaine 15 ml. + 2% Xylocaine adrenaline 15 ml.

Inclusion criteria

- Patients of both genders
- Age group 18-70years
- ASA group 1 and 2
- Upper limb surgery distal to elbow joint (both, elective and emergency) in supine position.

Exclusion criteria

- Patient not willing for participation
- Allergy to local anaesthetic drugs
- Any bleeding disorder and patient on anticoagulant
- Neuro-deficit involving brachial plexus
- Local infection at the injection site

METHODOLOGY

Written informed consent was obtained from all patients. Procedure was explained in his/her mother tongue. Standard monitors, 3 lead electrocardiogram, non-invasive blood pressure and pulse oximeterwereattached. Intravenous access was established. Randomly selected patients in Group C received supraclavicular block with 15 cc of 2% Xylocaine with Adrenaline and 15 cc of 0.5% Bupivacaine under all aseptic precautions with USG Guided technique. Before this block they received Normal saline 10 cc. intravenously. Group D patients received IV Dexamethasone 0.2 mg/kg just before the block. Supraclavicular block with 15 cc of 2% Xylocaine with Adrenaline + 15 cc of 0.5% Bupivacaine under all aseptic precautions with USG Guided technique was given.

Anaesthesia Technique: On arrival in operative room base line heart rate, blood pressure and oxygen saturation was recorded. An intravenous line was secured in the unaffected limb and ringer lactate was started. All the patients received USG guided supraclavicular brachial plexus block by supraclavicular approach by an experienced anaesthesiologist different from the one assessing the patient intra and post operatively. Both were blinded to the treatment groups. During the procedure, with high frequency 6-to 13-MHz linear ultrasound probe the puncture was done in the plane from lateral to medial. Real time ultrasound imaging during supraclavicular brachial plexus can facilitate nerve localization and needle placement and examine the pattern of local anaesthetic spread. Sensory block was assessed by pin prick using 27 G needle at one minute interval up to 25 min then every 30 min up to end of surgery. Assessment of sensory block was done at one minute interval after completion of drug injection in the dermatomal areas corresponding to median nerve, radial nerve, ulnar nerve and musculocutaneous nerves till complete sensory blockade.

Sensory block grading was done according to the following scale:

Grade 0: Sharp pain felt

Grade 1: Analgesia, dull sensation felt

Grade 2: No sensation felt

Sensory onset was considered when there is a dull sensation to pinprick along the distribution of any of the above mentioned nerves. Complete sensory block was considered when there is complete loss of sensation to pin prick. Assessment of Motor block was done at one minute interval after completion of drug injection till complete motor blockade. Motor onset was considered as partial motor block i.e. ability to flex finger extend wrist and finger. Complete motor block was considered as inability to move elbow, wrist and fingers.

Motor block was measured by assessing the following motor functions:

1. Flexion at the elbow (musculo-cutaneous nerve)
2. Extension of the elbow and wrist (radial nerve)
3. Opposition of thumb and index finger (median nerve)
4. Opposition of thumb and small finger (ulnar nerve)

For onset of motor block assessment modified Bromage motorscale was used. Hemodynamic monitoring was done throughout the procedure. All patients received Midazolam IV 1 mg. as sedation, when complete blockade achieved. Duration of motor block post operatively was assessed every 30 min. by asking the

patients move their finger and to see whether they were able to raise their hand or not. Periodic reconfirmation of sensory action was done every 30 min. Postoperative follow-up was done in the recovery and ward.

Statistical analysis: Data were compiled systematically and Student's t-test, Chi-square test were used to analyzed the data. $P < 0.05$ was considered as significant and $P < 0.0001$ as highly significant. The entire data was statistically analyzed using Statistical Package for Social Sciences (SPSS ver21.0, IBM Corporation, USA) for MS Windows.

RESULTS

The mean ± SD of age of cases studied in Group D and Group C was 41.56±12.57 years and 41.48±14.24 years respectively. The minimum–maximum age range in Group D and Group C was 17-65 years and 18-70 years respectively. The distribution of mean age of cases studied did not differ significantly between two study groups (P-value>0.05). Of 25 cases studied in Group D, 12 (48%) were males and 13 (52%) were females. Of 25 cases studied in Group C, 16 (64%) were males and 9 (36%) were females. The sex distribution of cases studied did not differ significantly between two study groups (P-value>0.05). The mean ± SD of duration of surgery among the cases studied in Group D and Group C was 123.60±45.29 mins and 124.80±39.59 mins respectively. The mean±SD of time to sensory onset among cases studied in Group D and Group C was 4.08±1.52 mins and 3.64±0.76 mins respectively. The mean ± SD of time to motor onset among cases studied in Group D and Group C was 6.04±1.72 mins and 5.64±0.86 mins respectively. The distribution of mean duration of surgery and mean time to sensory and motor onset among the cases studied did not differ significantly between two study groups (P-value>0.05). The mean ± SD of time to complete sensory block among cases studied in Group D and Group C was 7.60±2.10 mins and 7.88±0.67 mins respectively. The mean ± SD of time to complete motor block among cases studied in Group D and Group C was 10±2.39 mins and 9.60±0.82 mins respectively. The distribution of mean time to complete sensory and motor block among cases studied did not differ significantly between two study groups (P-value>0.05).

Table 1: Inter-group comparison of mean total duration of sensory block.

Total Duration of Sensory Block (hours)	Group D (n=25)		Group C (n=25)		P-value
	Mean	SD	Mean	SD	
Total Duration of Sensory Block	11.84	1.11	7.58	0.93	0.001***

The mean ± SD of total duration of sensory block among cases studied in Group D and Group C was 11.84±1.11 hours and 7.58±0.93 hours respectively. The minimum – maximum total duration of sensory block in Group D and Group C was 9-13 hours and 6-9 hours respectively. The distribution of mean total duration of sensory block among cases studied is significantly higher in Group D compared to Group C (P-value<0.001).

Table 2: Inter-group comparison of mean total duration of motor block.

Total Duration of Motor Block (hours)	Group D (n=25)		Group C (n=25)		P-value
	Mean	SD	Mean	SD	
Total Duration of Motor Block	10.12	0.88	6.30	0.82	0.001***

The mean ± SD of total duration of motor block among cases studied in Group D and Group C was 10.12±0.88 hours and 6.30±0.82 hours respectively. The minimum-maximum total duration of motor block in Group D and Group C was 8-11 hours and 5-8 hours respectively. The distribution of mean total duration of motor block among cases studied is significantly higher in Group D compared to Group C (P-value<0.001).

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. Many approaches of brachial plexus block are also described and the available literature has consistently shown that supra clavicular block is superior and easiest method for anesthesia and post-operative pain management. Several drugs have been tried as anesthetics in brachial plexus block and when plain Bupivacaine was a sole anaesthetic in brachial plexus block, it produces block with the relative longer duration of action and also it has its own unfavorable properties like cardiac toxicity and slower onset of action. The comparison of time for onset of motor block showed no statistically significant difference between control group and dexamethasone group, time for onset of motor block (5.64 vs 6.04 minutes, P value- 0.303).Addition of xylocaine can be the common factor among two groups for similar onset of blockade. Similarly, no statistically significant difference was seen between control group and dexamethasone group with respect to achieving complete motor block (9.60 vs 10.00 minutes, P value- 0.434). The mean total duration of motor block in dexamethasone group was 10.12±0.88 hours. The mean total duration of motor block in control group was 6.30±0.82 hours. Difference in duration of motor block in Dexamethasone and control group was 3.82 hours. Dexamethasone group showed significantly higher duration of block than control group, the difference was statistically highly significant.

(P<0.001) This difference can give more liberty to operating surgeon to change procedure or refine the technique if required. Urgent or unanticipated modifications of plan of anaesthesia can be avoided with adjuvants and in our study intravenous dexamethasone. Prolongation in motor duration is not too long, avoiding discomfort of patient in post-operative period. This is especially true in young anxious patients worried about the disability. Total duration of sensory block in dexamethasone group was 11.84±1.11 hours and in control group 7.58±0.93 hours. The distribution of mean total duration of sensory block among cases studied is significantly higher in group D as compared to group C. Difference in total duration of sensory block among two groups was 4.26 hours which is statistically highly significant (P value < 0.001). Prolonged sensory blockade allows last stages of surgery without any addition, supplementations of analgesia or anaesthesia (e.g. skin closure). Same thing is applicable in cases with complicated dressings. Faraj W *et al*[8] found that intravenous dexamethasone group experienced longer motor block compared with Control groups. Dexamethasone had reduced pain scores, reduced postoperative opioid consumption, and improved satisfaction compared with Control. Parveen *et al*[9] noted that IV dexamethasone significantly prolongs the analgesic duration of single-shot supraclavicular brachial plexus block with ropivacaine.Kumar S *et al*[10]observed that addition of dexamethasone (8 mg) to ropivacaine in supraclavicular brachial plexus approach significantly and safely prolongs motor blockade and postoperative analgesia (sensory) that lasted much longer than that produced by local anesthetic alone. Pathak *et al*[11]also observed that addition of dexamethasone to local anaesthetic drugs in brachial plexus block significantly prolongs the duration of analgesia and motor block in patients undergoing upper limb surgeries and is remarkably safe and cost effective method of providing post-operative analgesia. Movafegh *et al*[5]found that the duration of surgery and the onset times of sensory and motor block were similar in the two groups. The duration of sensory (242±76 versus 98±33 min) and motor (310±81 versus 130±31 min) blockade were significantly longer in the dexamethasone than in the control group (p<0.01).In the study by Vieira PA *et al*,[12] dexamethasone prolonged median sensory (1457 vs. 833 min, P<0.0001) and motor (1374 vs. 827 min, P<0.0001) blockade compared with the control. Biradar PA *et al*[13]also observed duration of sensory and motor blockade (326±58.6 vs. 159±20.1 and 290.6±52.7 vs. 135.5±20.3 min, respectively) to be significantly longer in the dexamethasone group than in the control group (P=0.001). Ribeiro KS *et al*[14] in their study observed that duration of analgesia in the dexamethasone group was 27.1±13.4 hours and was significantly higher as compared to the control group, in which it was 13.9 ± 11.3 hours (p<0.05).

CONCLUSION

Intravenous Dexamethasone significantly prolongs duration of sensory and motor blockade in supraclavicular brachial plexus block. Intravenous administration of dexamethasone should be considered to achieve increased duration of analgesia.

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