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Ultrasound Guided Supraclavicular Block: A Comparison between Levobupivacaine with Dexamethasone and Levobupivacaine Alone

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ABSTRACT

Background: Dexamethasone as an adjuvant to bupivacaine for supraclavicular brachial plexus block prolongs motor and sensory blockade. However, the effect of dexamethasone when added to levobupivacaine has not been well studied. This study was conducted to find out analgesic efficacy of dexamethasone as adjuvant to levobupivacaine in supraclavicular brachial plexus block. **Methods:** Ultrasound guided SCBP block was given to sixty patients, randomly assigned into two groups. Group S (thirty patients) received 2 mL normal saline with 25 mL levobupivacaine (0.5%) and Group D (thirty patients) received 2 mL of dexamethasone (8 mg) with 25 mL of levobupivacaine (0.5%), respectively. Time for the first rescue analgesia, number of rescue analgesics required in 24 h and different block characteristics was assessed. Chi square test and Student's t test were used for statistical analysis. **Results:** Time for request of the first rescue analgesia was 396.13 ± 109.42 min in Group S and 705.80 ± 121.46 min in Group D ($P < 0.001$). The requirement for rescue analgesics was more in Group S when compared to Group D. The onset of sensory and motor block was faster in Group D when compared to Group S. The mean duration of sensory and motor block was significantly longer in Group D than Group S. **Conclusions:** The addition of dexamethasone to levobupivacaine in SCBP blockade prolonged time for first rescue analgesia and reduced the requirement of rescue analgesics with faster onset and prolonged duration of sensory and motor block.

Keywords: Supraclavicular Block, Levobupivacaine, Dexamethasone.

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INTRODUCTION

Peripheral neural blockade is now a well-accepted component of post-operative pain management. Supraclavicular approach of brachial plexus block provides not only intraoperative anaesthesia but also postoperative analgesia without any toxicity.[1]

New local anaesthetics like ropivacaine and levobupivacaine have the benefits of reduced cardiac toxicity and have more effects on sensory compared to motor nerve fibres. Levobupivacaine has less systemic toxicity than bupivacaine.[2] Its limiting factors are delayed onset, patchy incomplete analgesia and limited duration of postoperative analgesia. Why dexamethasone would prolong regional Anaesthesia is a subject of debate. Steroids produce vasoconstriction and reduce the absorption of local Anaesthetics. A more attractive theoryholds that dexamethasone increases the activity of potassium channel on nociceptive fibres, decresing their activity.[3-5] The present study was done to study the impact of dexamethasone (8 mg) as adjuvant to levobupivacaine in ultrasound guided supraclavicular brachial plexus block.

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MATERIALS & METHODS

A randomized prospective study was conducted in a tertiary care hospital after approval of the institutional Ethics Committee. Patients with ASA Grade I / II status and with age limit of 16 to 65 years of both sexes posted for upper limb surgery were included in present study. Patients refused to give informed consent, obese & short neck patients, patients having severe cardiopulmonary problem and coagulopathy, known history of allergy to study drug, local infection of site for block and patients having neuropathy and drug abuse and operative time more than two hours were excluded.

Pre-anaesthetic evaluation was done on the day before surgery. The procedure of block along with possible complications was explained to the patients and the written consent was taken. All patients were given oral alprazolam 0.5 mg and ranitidine 150 mg night before the surgery with overnight fasting.

Sixty patients were divided randomly into two groups (group S, n=30 and group D, n=30) in computer generated programme. Drugs were loaded by an independent anaesthetist who was neither involved in administration of block nor in data collection. All the necessary equipments and drugs needed for administration of general anaesthesia and for resuscitation were kept ready to manage failed block or any toxicity.

Heart rate, blood pressure (SBP, DBP, MAP) and oxygen saturation and ECG were monitored. Ultrasound guided brachial plexus block was performed with supraclavicular approach. Group- S (30) received: 25ml 0.5% Levobupivacaine plus 2 ml normal saline (Total 27 ml).

Group –D (30) received: 25 ml 0.5% Levobupivacaine plus 2 ml. Dexamethasone (8 mg) (Total 27 ml).

To prevent anxiety, Midazolam 0.05 mg/kg IV was used for sedation after the block was given.

Sensory blockade was assessed by pin prick method at each minute after completion of block. Sensory onset was defined as dull sensation to pin prick. Full sensory block was defined as complete loss of sensation to pinprick. Grading of sensory block was done as follows. Grade-0: Sharp pain felt. Grade- 1: dull sensation felt. Grade 2: no sensation felt. Motor block was monitored by thumb adduction (ulnar nerve), thumb abduction (radial nerve), thumb opposition (median nerve) and flexion of elbow and pronation of forearm (mosculocutaneous nerve) using a Lovett rating scale.[6] The block was considered as failed block when at least two of the three nerves (radial, ulnar, musculocutaneous) were not affected even after 30 min after performing the block. They all were given general anaesthesia to complete the surgery.

Quality of the operative condition was monitored in the following scale: Grade 4: no complaint-(Excellent), Grade 3: minor complaint-(Good), Grade 2: complaint requiring analgesics. (Moderate), Grade 1: patient given General anaesthesia. (Unsuccessful).[6]

The intra-operative and post-operative analgesia was assessed by an anaesthesiologist who was not involved in the drug preparation. Postoperative analgesia was monitored as per a numeric rating scale of 0 to 10 at every hour.[6] Inj. Tramadol 100 mg intravenously was given as rescue analgesia at the numeric rating scale of 5. Side-effect like nausea, vomiting, convulsion, dryness of mouth,respiratory problems, pneumothorax, in introperative period and neuropathy in the post-operative period was observed.

Statistical Analysis:

Based on primary end point of the study, ' time needed for first rescue analgesia' with α error 0.05 and power of the study(1-β) = 80% , sample size was calculated to be 28. The patient data and characteristics, the time of onset and duration of block were categorized and analyzed appropriately using student's unpaired 't' test and chi-square test. A 'p' value of <0.05 was considered as statistically significant and a 'p' value of <0.001 as statistically highly significant.

RESULTS

Demographic data like age, sex, weight and duration of surgery between two groups were statistically not significant (p>0.05) [Table 1].

Table 1: Demographic Parameters

Parameters	Group S	Group D	P value
Age (Year)	38.17 ± 11.72	39.77 ± 11.61	0.757
Gender (M/F)	21/9	20/10	0.78
Weight (Kg)	64.23 ± 7.92	63.77 ± 6.74	0.764
ASA status (I/II)	27/3	26/4	1.0
Duration of surgery in hours	122.4 ± 8.4	124.8 ± 9.2	0.296

Table 2: Brachial plexus block characteristics

Variables	Group S (in minutes)	Group D (in minutes)	P Value
Sensory block-onset	7.20±1.73	4.30 ±1.32	<0.001
Motor block-onset	9.03±1.73	6.03±0.96	<0.001
Sensory block-duration	178.60±30.26	420.73±80.87	<0.001
Motor block-duration	150.70±32.32	306.93±70.24	<0.001
Analgesia-duration	396.13±109.42	705.80±121.46	<0.001

The mean of sensory block onset time in the group S was 7.20±1.73 minutes and in group D, was 4.30±1.32 minutes. The mean of motor block onset time was 9.30±1.73 minutes and 6.03±0.96 minutes in the group S and group D respectively. This difference in both group S and group D was very highly significant (p<0.001) [Table 2].

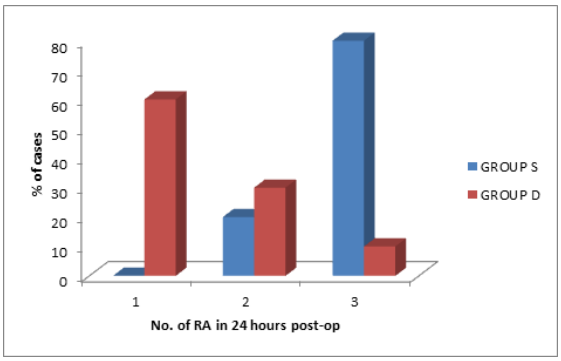

Figure 1: Number of rescue analgesics (RA) in post-operative for 24 hours.

The mean of sensory block duration was 178.60±30.26 minutes and 420. ±73±80.87 minutes

in the group S and group D respectively and the mean of motor block duration was 150.70±32.32 minutes and 306.93±70.24 minutes in the group S and group D respectively. The difference between duration of motor block in both group S and D was very highly significant (p<0.001).

The mean duration of total analgesia was 396.13±109.42 minutes and 705.80±121.46 minutes in the group S and group D respectively, which was also very highly significant (p<0.001) .

[Figure 1] shows that in group D, 60% of patients were given only 1 rescue analgesic dose and 30% of patients were given 2 where as only 10% of patients were given 3 rescue analgesic doses in post-operative 24 hours. In group S, 80% of patients required 3 and 20% of patients were given 2 rescue analgesic doses in post-operative 24 hours. This difference in both group was statically highly significant (p<0.001).There was no case of failed block. Quality of operative condition in both groups were excellent.

Pulse rate, systolic BP, diastolic BP, O2 saturation was recorded pre-operatively, at 0 min, 15 min, 45min, 60min, 75min, 90min, 105min, 120min, 4 hours, 8 hours, 12 hours and 24 hours and found that there was no statistically significant difference between two groups. There was no untoward events happened during intra and postoperative period.

DISCUSSION

Many adjuvants like clonidine, tramadol, dexemedetomidine and neostigmine with local anaesthetics have been studied in brachial plexus block. But each drug has its own side effect. So newer adjuvants like dexamethasone was used with levobupivacaine in brachial plexus block in present study.

Our study showed early onset of motor and sensory block in group D in comparison to group S (p<0.001). The early onset of action might be due to synergistic action of dexamethasone with local anaesthetics like levobupivacaine.

Duration of motor and sensory block in group D was prolonged compared to group S (P<0.001). Postoperative analgesia was also prolonged in group D compared to group S (P<0.001). The number of rescue analgesia requirement were also lower in Group D in comparison to group S (P<0.001) [Table 2]. Jasminka Persec et al used low-dose dexamethasone as adjuvant with levobupivacaine and concluded that dexamethasone provided prolonged post-operative analgesia in comparison to levobupivacaine alone.[7] Srinivasa Rao Nallam et al concluded that the adjuvant like dexamethasone in both low and high doses when added to levobupivacaine significantly prolonged the sensory and motor block duration in interscalene block.[8]

Santosh et al in his study opined that addition of dexamethasone to ropivacaine in brachial plexus block prolonged motor and sensory blockade as compared to ropivacaine alone.[9] Knezevic et al opined that dexamethasone provided better postoperative pain relief in brachial plexus block. But dexamethasone produced late onset of sensory and motor block, with prolongation of motor block duration. They again concluded that smaller doses of dexamethasone (4-5 mg) were as equally effective as higher doses of dexamethasone (8-10 mg).[10]

Choi et al found that perineural administration of dexamethasone with (30-40ml) of local anaesthetics prolonged sensory and motor block characteristics but high volume of local anaesthetics may have prolonged the duration of action.[11] In our study we have used low volume(25ml) of local anaesthetic in supraclavicular brachial plexus block, so dexamethasone may have played a role. Ghada et al opined that as compared to adjuvants like midazolam and epinephrine, use of dexamethasone with bupivacaine had produced rapid onset of sensory and motor block and requires longer time for demand of rescue analgesia.[12]

Leu et al concluded that low-dose dexamethasone (1-2 mg) prolonged duration of analgesia and motor blockade to the similar extent as 4-mg dexamethasone when used with 0.25% bupivacaine for brachial plexus block.[13] Nigam et al found that the use of dexamethasone (8 mg) as adjuvant to isobaric bupivacaine in brachial plexus block prolonged not only duration of motor and sensory block but also extended the postoperative analgesia.[14]

Biradar et al concluded that adding 8 mg of dexamethasone to lidocaine in brachial plexus block produced faster onset of block with increased duration of analgesia.[15] Sarita et al found that the use of dexamethasone with levobupivacaine increased the duration of the block compared to prilocaine.[16] Lotfy et al in his study concluded that the use of dexamethasone as adjuvant to low volumes of isobaric bupivacaine in brachial plexus block significantly decreased the onset time and increased the duration of sensory and motor block.[17]

Noss et al concluded that dexamethasone increased the duration of postoperative analgesia in brachial plexus block.[18] Kishore et al opined that dexamethasone was a better adjuvant in comparison to clonidine when added as adjuvant with isobaric bupivacaine in brachial plexus block.[19]

The safety of perineural administration of dexamethasone still has some concerns. In animal studies dexamethasone reduced the bloodflow to normal nerves for four hours after topical applicationIntrafascicular injection of dexamethasone can produce harmful effects on nerve fibres but there were no report available regarding long term effects on peripheral nerves.[20]

Dexamethasone has minimal side effects in comparison to other adjuvants like clonidine,

dexmedetomidine and opioids. Systemic toxicity from a single dose of dexamethasone is unlikely. It is effective and widely administered intravenously by anaesthesiologist for prophylaxis against postoperative nausea and vomiting. So dexamethasone may be a preferred adjuvant to levobupivacaine in comparison to others. The limitation of present study was that we have not studied the incidence of steroid-induced hyperglycemia and also long term follow up was not done. So late onset neuropathy couldnot be detected It is advisable to establish continous follw up using survey questionnaires and checking periodically for a longer period.

CONCLUSION

This procedure is indicated for surgery of forearm, upperarm, elbow and hand. Supraclavicular brachial plexus block can provide successful pain therapy in first 24 hour of surgery after which patient can take oral analgesic. From the present study, we concluded that, dexamethasone (8mg) when used as an adjuvant to levobupivacaine had not only produced faster onset of sensory and motor block but also increased the duration of sensory and motor block which provided quality analgesia in intra and post-operative period.

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