

# Dexamethasone added to levobupivacaine prolongs ultrasound-guided interscalene brachial plexus blockade: a prospective, randomized, controlled study

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## Objectives

This study aimed to evaluate the effect of the addition of dexamethasone to levobupivacaine on the duration of analgesia in forearm surgeries under ultrasound-guided interscalene brachial plexus block.

## Patients and methods

This prospective randomized controlled, double-blind clinical trial was conducted on 60 patients who underwent elective forearm surgeries under ultrasound-guided interscalene brachial plexus block. Patients in the levobupivacaine group (group L) received 25 ml of 0.5% levobupivacaine plus 2 ml of normal saline 0.9%. Patients in the levobupivacaine dexamethasone group (group LD) received 25 ml of 0.5% levobupivacaine plus 2 ml of dexamethasone (8 mg). The onset of sensory and motor block, duration of the sensory block, time to first analgesic request, the number of failed block, total morphine consumption, side effects, and complications were recorded and compared.

## Results

Onset of sensory block and motor block was significantly earlier in group LD compared with group L. Duration of sensory block and time to first analgesic request were significantly longer in group LD compared with group L. Total morphine consumption was significantly lower in group LD in comparison with group L. The number of failed blocks was nonsignificantly lower in group LD. The incidence of side effects and complications was low and comparable in both groups.

## Conclusion

Addition of dexamethasone to levobupivacaine significantly shortens the onset of sensory and motor block, prolongs the duration of analgesia, decreases the 24 h morphine consumption, and prolongs the time to first analgesic request with minimal side effects.

## Keywords:

dexamethasone, interscalene brachial plexus block, levobupivacaine

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## Introduction

Interscalene block (ISB) provides excellent but time-limited anesthesia and analgesia for shoulder surgery [1,2]. Various adjuvants have been used to prolong the block duration of local anesthetics [3]. Corticosteroid adjuvants have been found to prolong the block duration when added to local anesthetics [4,5]. However, its mechanism of action is not clearly understood. It may have a local effect on the nerve [6], or it may have an anti-inflammatory action [7]; they may alter the function of potassium channels in the excitable cells through glucocorticoid receptors [8]. Dexamethasone prolongs the effect of peripheral nerve block when added to local anesthetics [9]. We aimed to evaluate the effect of mixing dexamethasone with levobupivacaine on the duration of analgesia provided by means of ISB.

## Patients and methods

This study was conducted in Benha University Hospitals between September 2014 and April 2015 after local ethical committee approval and written informed consent from patients were obtained. This prospective, randomized, controlled, double-blind clinical trial was conducted on 60 patients of ASA physical status I and II between 18 and 65 years of age who underwent elective forearm surgeries under ultrasound-guided interscalene (ISB) brachial plexus block. They were randomly allocated using computer-generated randomization program into two equal groups:

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Group L (the control group), for which 25 ml of 0.5% levobupivacaine plus 2 ml of normal saline 0.9% were used for ISB.

Group LD, for which 25 ml of 0.5% levobupivacaine plus 2 ml of dexamethasone (8 mg) were used for ISB.

Sealed envelopes containing group allocation were opened before the blocks were performed.

Exclusion criteria were as follows: patient refusal, known allergy to the local anesthetic, coagulopathy, local infection, having peripheral neuropathy, being uncooperative, and BMI greater than 35 kg/m<sup>2</sup>.

On arrival to the operation theater, an intravenous cannula was inserted, and oxygen was administered at the rate of 2–4 l/min through nasal prongs. Oxygen saturation (SpO<sub>2</sub>), noninvasive blood pressure, heart rate, and ECG were monitored. Patients had received intravenous midazolam (0.05 mg/kg) before the block was administered.

Under complete aseptic condition, patients were positioned in the semilateral position with the neck extended. After skin infiltration with lidocaine 1%, a 5 cm 22-G insulated needle was inserted in-line with the ultrasound probe (2–13 MHz) in the transverse plane using a Philips HD11 XE ultrasound machine (Philips Medical Systems, Bothell, Washington, USA). The nerve roots were identified between the anterior and the middle scalene muscles. The local anesthetic was then injected.

After the end of the procedure, patients were monitored at every 5 min interval until 30 min for the development of sensory and motor block.

The measured parameters included the onset of the sensory block (the time from the end of ISB procedure until complete loss of sensation using the pin prick test), duration of the sensory block [the time from maximum sensory block until a visual analogue scale (VAS) score of  $\geq 4$ ], the motor blockade recorded according to the modified Bromage scale (0 = no paralysis, 1 = wrist flexion, 2 = elbow flexion, 3 = complete block), the duration of the motor blockade (the time from the end of ISB procedure until the time when no motor weakness could be detected), time to first analgesic request (the time from maximum sensory block until the patient's first analgesic request), and number of failed block (block was considered failed when sensory anesthesia was not achieved within 30 min).

Any side effects such as Horner's syndrome, ipsilateral diaphragmatic paralysis, difficulty in swallowing, hoarseness of voice, or any complications such as

pneumothorax, vascular or nerve injury, intra-arterial injection, epidural or spinal injection were noted and documented.

Pain evaluation was carried out using VAS (0 = no pain and 10 = unbearable pain). When VAS was 4 or greater or when the patient demanded analgesia, intravenous morphine (0.1–0.2 mg/kg) was given. Total morphine given to each patient during the first 24 h of the postoperative period was recorded.

If any patient complained of discomfort/pain intraoperatively they were managed with supplemental intravenous morphine (0.1–0.2 mg/kg) and propofol (1–2 mg/kg).

### Statistical analysis

- (1) Data were analyzed using SPSS, version 16 (SPSS Inc., Chicago, Illinois, USA).
- (2) Quantitative data were presented as a mean and SD and were analyzed using Student's *t*-test.
- (3) Qualitative data were presented as number and percentages and were analyzed using the  $\chi^2$  and Z-tests.
- (4) A *P*-value less than 0.05 was considered statistically significant, whereas a *P*-value less than 0.01 was considered statistically highly significant.
- (5) Sample size was calculated according to a pilot study from the first eight patients at  $\alpha$ -error 0.05 and 80% power. Assuming 30% increase in the duration of sensory block, 30 patients were required for each group.

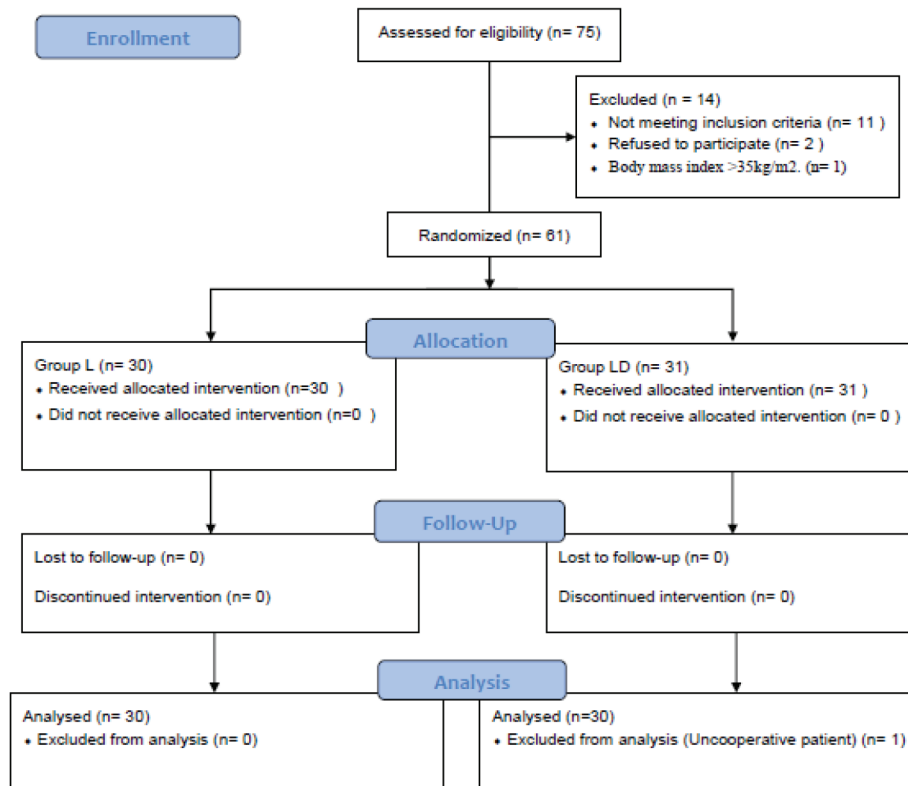
### Results

A total of 75 patients were screened during the study period. Of them, 11 patients did not match the inclusion criteria, two patients refused to participate, and one patient was excluded as he had BMI greater than 35 kg/m<sup>2</sup>. A total of 61 patients were included in the study, but one more patient was excluded shortly after that because he was uncooperative. Therefore, 60 patients completed the study protocol (Fig. 1).

Demographic variables and duration of surgery were comparable in both groups (Table 1).

Onset of sensory block and motor block was significantly earlier in group LD compared with group L. Duration of sensory block and time to first analgesic request were significantly prolonged in group LD compared with group L. Total morphine consumption was significantly lower in group LD in comparison with group L. The number of failed block was nonsignificantly lower in group LD (Table 2).

Figure 1



Consort flow diagram.

Table 1 Demographic variables and duration of surgery

Item	Group L	Group LD	P-value
Age (years)	47.43 ± 12.4	49.8 ± 10.9	0.43
Weight (kg)	71.8 ± 10.1	75.1 ± 13.31	0.28
Sex (♂ : ♀)	17 : 13	14 : 16	0.4
ASA (I : II)	21 : 9	23 : 7	0.5
Duration of surgery (min)	83.1 ± 9.51	78.9 ± 8.56	0.07

Data were presented as mean and SD except for age, sex, and ASA, which were presented as numbers.

Table 2 Intraoperative and postoperative parameters

Item	Group L	Group LD	P-value
Onset of sensory block (min)	13.1 ± 2.11	11.5 ± 3.3	0.03
Onset of motor block (min)	17.2 ± 2.71	15.9 ± 2.3	0.04
Duration of sensory block (min)	176.4 ± 32.3	482.1 ± 84.6	<0.001
Time to first analgesic request (min)	179.9 ± 40.2	498.3 ± 43.5	<0.001
Number of failed block [n (%)]	5 (16.7)	2 (6.7)	0.2
Total morphine consumption (mg)	13.6 ± 2.76	3.45 ± 0.64	<0.001

Data were presented as mean and SD except for number of failed block, which was presented as numbers and percentages.

The incidence of side effects and complications was low and comparable in both groups (Table 3).

## Discussion

The present study demonstrated that addition of dexamethasone to levobupivacaine prolonged the duration of sensory block in ultrasound-guided interscalene brachial plexus block. This finding is generally consistent with those of Movafegh *et al.* [9], who concluded that the addition of dexamethasone to lidocaine 1.5% solution prolongs the duration of sensory and motor blockade, and Cummings *et al.* [10], who documented that dexamethasone prolongs analgesia from ISBs using ropivacaine or bupivacaine. Moreover, Dar *et al.* [11] studied the effect of the addition of dexamethasone to ropivacaine in supraclavicular brachial plexus block and reached the same finding. As regards the onset of sensory block and motor block, our study demonstrated that addition of dexamethasone to a local anesthetic decreases the onset of both sensory and motor block. These findings are almost similar to those of Dar *et al.* [11], who noticed early onset of sensory and motor block when dexamethasone was mixed with local anesthetic, and Shrestha *et al.* [12], who found significantly faster onset and longer duration of analgesia in the dexamethasone group than in the other group.

As regards the total analgesic consumption and time to first analgesic request, our study noticed that total

**Table 3 Incidence of side effects and complications**

Side effects/complications	Group L [n (%)]	Group LD [n (%)]	P-value
Horner's syndrome	8 (26.7)	6 (20)	0.54
Diaphragmatic paralysis	7 (23.3)	6 (20)	0.7
Difficulty in swallowing	2 (6.7)	1 (3.3)	0.55
Hoarseness of voice	1 (3.3)	2 (6.7)	0.5
Pneumothorax	0	0	0
Vascular or nerve injury	0	1 (3.3)	0.3
Intra-arterial injection	0	0	0
Epidural or spinal injection	0	0	0

Data were presented as numbers and percentages.

morphine consumption was significantly lower and the time to first analgesic request was significantly longer in the dexamethasone group. In a systematic review by Noss *et al.* [13], they showed that dexamethasone reduces the analgesic consumption when added to the local anesthetic. Moreover, Vieira *et al.* [14] concluded that the addition of dexamethasone to bupivacaine during ISB prolongs sensory block and reduces the opioid use.

Many studies [2,15–17] reported minor complications during their procedures, such as Horner's syndrome, diaphragmatic paralysis, difficulty in swallowing, hoarseness of voice, and vascular injury, but the incidence of complications in our study was less. This may be due to two reasons: first, the use of ultrasound guidance for nerve localization, and, second, the relatively low dose of local anesthetics used.

## Conclusion

Addition of dexamethasone to levobupivacaine during ultrasound-guided interscalene brachial plexus block significantly shortens the onset of sensory and motor block, prolongs the duration of analgesia, decreases the 24 h analgesic consumption, and prolongs the time to first analgesic request with minimal side effects.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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