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**ORIGINAL RESEARCH**

# To evaluate effectiveness of dexamethasone as an adjuvant with levobupivacaine 0.5% in USG guided interscalene brachial plexus block for shoulder surgery

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**Abstract**

**Background:**
Effective pain management is crucial for patients undergoing shoulder surgery. The use of ultrasound-guided (USG) interscalene brachial plexus block (ISBPB) with local anesthetics is well-documented. Adding dexamethasone as an adjuvant to levobupivacaine may prolong analgesia and enhance patient outcomes.

**Materials and Methods:**
A randomized, double-blind clinical study was conducted with 60 patients scheduled for elective shoulder surgery under USG-guided ISBPB. Patients were divided into two groups: Group L (n=30) received 0.5% levobupivacaine (20 mL), while Group LD (n=30) received 0.5% levobupivacaine (20 mL) with 8 mg of dexamethasone. The primary outcomes assessed were the onset time of sensory and motor block, duration of analgesia, and total analgesic consumption within 24 hours. Secondary outcomes included patient satisfaction and the incidence of complications.

**Results:**
The addition of dexamethasone significantly improved block characteristics. Group LD demonstrated a faster onset of sensory block (6.8 ± 1.2 minutes vs. 9.5 ± 1.5 minutes in Group L; $p < 0.001$) and motor block (9.2 ± 1.5 minutes vs. 12.3 ± 1.8 minutes; $p < 0.001$). The duration of analgesia was significantly longer in Group LD (980 ± 120 minutes vs. 650 ± 95 minutes; $p < 0.001$). Total analgesic consumption was lower in Group LD (45 ± 10 mg vs. 85 ± 15 mg; $p < 0.001$). Patient satisfaction scores were higher in Group LD (9.2 ± 0.6 vs. 7.8 ± 0.8; $p < 0.05$). No significant complications were observed in either group.

**Conclusion:**
The addition of dexamethasone to levobupivacaine 0.5% in USG-guided interscalene brachial plexus block for shoulder surgery significantly enhances the onset and duration of sensory and motor block, prolongs postoperative analgesia, reduces analgesic requirements, and improves patient satisfaction without increasing adverse effects.

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**Keywords:**
Dexamethasone, Levobupivacaine, Interscalene brachial plexus block, Ultrasound-guided, Shoulder surgery, Postoperative analgesia.

## Introduction

Effective perioperative pain management is essential for enhancing surgical outcomes and improving patient recovery. Shoulder surgeries are often associated with significant postoperative pain, which can impair functional recovery and increase the need for systemic analgesics, leading to potential side effects (1). Regional anesthesia, such as the ultrasound-guided interscalene brachial plexus block (ISBPB), is a well-established technique to provide superior analgesia and reduce systemic opioid consumption (2,3).

Levobupivacaine, a long-acting amide local anesthetic, is commonly used in ISBPB due to its favorable safety profile and prolonged duration of action (4). However, its duration of analgesia may not always suffice to cover the entire postoperative pain period. To address this limitation, adjuvants such as dexamethasone have been explored for their ability to enhance the efficacy and prolong the analgesic effect of local anesthetics (5,6).

Dexamethasone, a corticosteroid with anti-inflammatory and analgesic properties, has shown promise in extending the duration of nerve blocks when used as an adjuvant (7). It is hypothesized that dexamethasone reduces perineural inflammation and modulates nociceptive transmission, leading to prolonged sensory and motor block durations (8). Despite numerous studies supporting the benefits of dexamethasone in regional anesthesia, its specific effects in combination with levobupivacaine in ISBPB for shoulder surgeries require further evaluation (9).

This study aims to assess the effectiveness of dexamethasone as an adjuvant to 0.5% levobupivacaine in ultrasound-guided ISBPB for patients undergoing shoulder surgery. The primary objective is to evaluate its impact on the onset and duration of sensory and motor block and postoperative analgesia, while secondary outcomes include patient satisfaction and safety profile.

## Materials and Methods

### Study Design and Setting

This prospective, randomized, double-blind study was conducted at a tertiary care hospital over six months.

### Inclusion and Exclusion Criteria

Patients aged 18–65 years, classified as ASA (American Society of Anesthesiologists) physical status I or II, and scheduled for elective shoulder surgery under ultrasound-guided interscalene brachial plexus block were included in the study. Patients with known allergies to local anesthetics or corticosteroids, a history of coagulopathy, severe pulmonary or cardiac disease, or infection at the injection site were excluded.

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 1, 2025

### Randomization and Group Allocation

Sixty patients were randomized into two groups using a computer-generated randomization table. Group L received 20 mL of 0.5% levobupivacaine, and Group LD received 20 mL of 0.5% levobupivacaine with 8 mg of dexamethasone. Both the patients and the anesthesiologists performing the assessments were blinded to group allocation.

### Procedure

The patients were positioned supine with the head turned to the contralateral side. After aseptic preparation, the interscalene brachial plexus was identified using a high-frequency linear ultrasound transducer. A 22-gauge needle was advanced under ultrasound guidance, and the drug solution was injected after confirming proper needle placement using hydrodissection.

### Outcomes Assessed

The primary outcomes were the onset times of sensory and motor blocks, the duration of analgesia, and the total postoperative analgesic consumption within 24 hours. The sensory block onset was assessed by pinprick testing in the C5–C7 dermatomes, while the motor block was evaluated using the modified Bromage scale. The duration of analgesia was defined as the time from block administration to the first request for rescue analgesia. Secondary outcomes included patient satisfaction and the incidence of adverse effects.

### Data Collection and Statistical Analysis

Data were recorded by an independent observer who was unaware of group allocation. The results were analyzed using SPSS software version 25. Continuous variables were expressed as mean ± standard deviation (SD) and compared using an independent t-test, while categorical variables were analyzed using the chi-square test. A p-value of $<0.05$ was considered statistically significant.

## Results

### Patient Characteristics

A total of 60 patients were included in the study, with 30 patients in each group (Group L and Group LD). The demographic and baseline characteristics, including age, gender, weight, and ASA classification, were comparable between the groups (Table 1).

### Block Characteristics

The addition of dexamethasone significantly improved the block characteristics. The mean onset time of sensory block in Group LD was 6.8 ± 1.2 minutes compared to 9.5 ± 1.5 minutes in Group L ($p < 0.001$). Similarly, the onset of motor block was faster in Group LD (9.2 ± 1.5 minutes) than in Group L (12.3 ± 1.8 minutes, $p < 0.001$). The duration of analgesia was significantly prolonged in Group LD (980 ± 120 minutes) compared to Group L (650 ± 95 minutes, $p < 0.001$) (Table 2).

### Analgesic Consumption and Patient Satisfaction

The total postoperative analgesic consumption within 24 hours was significantly lower in Group LD (45 ± 10 mg) compared to Group L (85 ± 15 mg, $p < 0.001$). Patient satisfaction

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 1, 2025

scores were also higher in Group LD (9.2 ± 0.6) than in Group L (7.8 ± 0.8, $p < 0.05$) (Table 3).

**Adverse Effects**

No significant adverse effects, such as infection, hematoma, or nerve injury, were observed in either group during the study period.

**Tables**

**Table 1.** Demographic and Baseline Characteristics of Patients

| Parameter | Group L (n = 30) | Group LD (n = 30) | p-value |
|---|---|---|---|
| Age (years) | 42.5 ± 10.2 | 43.8 ± 9.8 | 0.72 |
| Gender (M/F) | 18/12 | 16/14 | 0.62 |
| Weight (kg) | 65.8 ± 8.4 | 67.1 ± 7.6 | 0.68 |
| ASA I/II | 20/10 | 22/8 | 0.55 |

**Table 2.** Block Characteristics

| Parameter | Group L (n = 30) | Group LD (n = 30) | p-value |
|---|---|---|---|
| Onset of sensory block (min) | 9.5 ± 1.5 | 6.8 ± 1.2 | <0.001 |
| Onset of motor block (min) | 12.3 ± 1.8 | 9.2 ± 1.5 | <0.001 |
| Duration of analgesia (min) | 650 ± 95 | 980 ± 120 | <0.001 |

**Table 3.** Analgesic Consumption and Patient Satisfaction

| Parameter | Group L (n = 30) | Group LD (n = 30) | p-value |
|---|---|---|---|
| Analgesic consumption (mg) | 85 ± 15 | 45 ± 10 | <0.001 |
| Patient satisfaction score | 7.8 ± 0.8 | 9.2 ± 0.6 | <0.05 |

In summary, the addition of dexamethasone to levobupivacaine in USG-guided interscalene brachial plexus block significantly enhanced the block characteristics and patient outcomes (Tables 1–3).

**Discussion**

The results of this study demonstrate that the addition of dexamethasone to levobupivacaine in ultrasound-guided interscalene brachial plexus block (ISBPB) significantly enhances block characteristics, including faster onset, prolonged duration of analgesia, and reduced postoperative analgesic consumption. These findings are consistent with previous studies highlighting the role of dexamethasone as an effective adjuvant in regional anesthesia (1–3).

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 1, 2025

The faster onset of sensory and motor block in the dexamethasone group can be attributed to its anti-inflammatory properties, which reduce perineural edema and enhance local anesthetic penetration at the nerve site (4,5). This effect has been supported by prior studies where dexamethasone significantly shortened the time required for block onset in various peripheral nerve blocks (6,7).

The prolonged duration of analgesia observed in this study is in agreement with previous reports demonstrating that dexamethasone can extend the duration of local anesthetic effects by up to 50% (8). This mechanism is believed to involve a combination of reduced neural inflammation, inhibition of nociceptive neurotransmitters, and potential vasoconstrictive effects that decrease the systemic absorption of the local anesthetic (9,10).

Reduced postoperative analgesic consumption in the dexamethasone group is another key finding. Lower reliance on systemic analgesics can mitigate the risk of opioid-related side effects such as nausea, vomiting, and sedation, thereby improving patient recovery and satisfaction (11,12). Furthermore, the higher patient satisfaction scores in the dexamethasone group align with the enhanced analgesic efficacy and minimal need for rescue medications (13).

Importantly, the safety profile of dexamethasone as an adjuvant was confirmed in this study, with no significant increase in adverse effects such as infection, hematoma, or nerve injury. This is consistent with prior studies that have shown dexamethasone to be a safe adjunct when used in appropriate doses (14,15).

While the findings are promising, some limitations warrant consideration. The study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the results. Future multicenter studies with larger populations are recommended to validate these findings further. Additionally, the study only assessed short-term outcomes; hence, long-term effects of dexamethasone on nerve health were not evaluated.

## Conclusion

In conclusion, the addition of dexamethasone to levobupivacaine in USG-guided ISBPB significantly improves block characteristics, prolongs postoperative analgesia, reduces analgesic consumption, and enhances patient satisfaction without compromising safety. These findings reinforce the utility of dexamethasone as a valuable adjuvant in regional anesthesia for shoulder surgeries.

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ISSN: 0975-3583,0976-2833 VOL16, ISSUE 1, 2025

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