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Original Article

EFFECT OF INTRAVENOUS DEXAMETHASONE ON THE DURATION OF POSTOPERATIVE ANALGESIA IN UPPER LIMB SURGERY UNDER SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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ABSTRACT: Introduction: Supraclavicular brachial plexus block is commonly used for upper limb surgery but provides a limited duration of analgesia (<12 hours). This study aimed to evaluate the effect of intravenous dexamethasone on prolonging postoperative analgesia. Methods: A prospective descriptive study was conducted on 40 patients undergoing upper limb surgery at Thong Nhat Hospital (02–09/2025). Patients received an ultrasound-guided supraclavicular brachial plexus block with 20 ml of 0.5% ropivacaine combined with intravenous dexamethasone 8 mg. Outcomes included duration of anesthesia and analgesia, block quality, VAS scores, opioid consumption, and adverse events. Results: The mean duration of anesthesia and analgesia was 1018.1±216.8 minutes. Good block quality was achieved in 92.5% of patients. VAS scores were low during the first 6 hours, increased at 24 hours, and stabilized by 48 hours. Mean opioid consumption was 115±24.7 mg. No complications related to the block or dexamethasone were observed. Conclusion: Intravenous dexamethasone combined with ropivacaine significantly prolongs postoperative analgesia, reduces opioid requirements, and is safe for clinical practice.

Keywords: intravenous dexamethasone, brachial plexus block, postoperative analgesia.

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1. INTRODUCTION

Brachial plexus block is commonly used for anesthesia and postoperative analgesia in patients undergoing upper limb surgery. Its safety and effectiveness for both anesthesia and postoperative pain relief have been well established.

However, the analgesia provided by a single-shot plexus block is usually short, lasting less than about 12 hours after the block(2). This affects the quality of analgesia, patient satisfaction, and early postoperative recovery. Placing a catheter to prolong analgesia also has drawbacks: it increases the risk of infection, requires postoperative catheter care, raises costs, and causes discomfort for patients. For these reasons, adding adjuvant drugs to prolong the action of local anesthetics is generally preferred(2).

To prolong the action of local anesthetics, adrenaline, dexamethasone, dexmedetomidine, clonidine, and fentanyl are commonly added to the anesthetic solution(2). A meta-analysis by Ann-Kristin Schubert(9) of 43 randomized clinical trials examined adjuvants that prolong the analgesic effect of local anesthetics (dexamethasone, clonidine, morphine, magnesium sulfate, fentanyl, ketorolac, tramadol, dexmedetomidine) and concluded that dexamethasone was the most effective in prolonging analgesia, followed by clonidine and dexmedetomidine.

In addition, several recent studies have shown that intravenous dexamethasone prolongs the action of local anesthetics to a similar extent as perineural administration(8). Recent international studies focusing on intravenous dexamethasone combined with peripheral nerve blocks have consistently shown a marked prolongation of analgesia compared with other adjuvants(8).

In 2024, Eric Albrecht et al.(8) published a meta-analysis of 11 studies with 1145 patients and concluded that both intravenous and perineural dexamethasone prolonged postoperative analgesia by 4-6 hours compared with no dexamethasone. There was no statistically significant difference in the prolongation of analgesia between the perineural and intravenous routes.

Another meta-analysis, by Desai et al.(2), of 9 studies with 546 patients, also found no clinically significant difference between perineural and intravenous dexamethasone.

In Vietnam, studies on the effect of intravenous dexamethasone in prolonging nerve block duration have been published: Nguyen Van Toan et al.(1) and Pham Van Quynh et al.(6) both concluded that dexamethasone prolonged postoperative analgesia by 4-6 hours compared with a local anesthetic alone. However, such studies remain few.

We therefore posed the following research question: Does intravenous dexamethasone prolong analgesia after upper limb surgery under supraclavicular brachial plexus block? Our hypothesis was that dexamethasone prolongs analgesia after upper limb surgery under supraclavicular brachial plexus block.

2. SUBJECTS AND METHODS

2.1. Study design

Prospective descriptive study.

2.2. Study objective:

To determine the duration of sensory block and postoperative analgesia when intravenous dexamethasone is combined with ropivacaine for brachial plexus block.

2.3. Specific objectives:

To describe the clinical, surgical, and anesthetic characteristics of the patients.

To assess pain intensity using the VAS at 0h, 1h, 2h, 3h, 6h, 9h, 12h, 24h, and 48h after surgery.

To record the doses and types of opioids used during the first 48h after surgery.

To record complications after the block.

2.4. Study setting and period

Period: from February 2025 to September 2025.

Setting: Department of Surgery, Anesthesiology and Critical Care, Thong Nhat Hospital.

2.5. Study population:

A total of 40 patients undergoing upper limb surgery at the Department of Surgery, Anesthesiology and Critical Care who agreed to participate in the study.

2.6. Inclusion criteria:

All patients who underwent upper limb surgery with a supraclavicular brachial plexus block at the Department of Surgery, Anesthesiology and Critical Care from February to September 2025. Consent to participate in the study

Exclusion criteria

Contraindications to brachial plexus block, ropivacaine, or dexamethasone.

2.7. Sample size and sampling

Consecutive (total) sampling: 40 patients who met the inclusion criteria and none of the exclusion criteria.

Variable definitions

Age: quantitative variable, in years.

Sex: binary variable, with 2 values, male and female.

Height: quantitative variable, in cm; Weight: quantitative variable, in kg.

BMI: quantitative variable, calculated as Weight/(Height (m))2

ASA classification: qualitative variable, with values I, II, III, IV.

Time to perform the supraclavicular brachial plexus block: quantitative variable, in minutes.

Pain intensity: assessed using the VAS (Visual Analog Scale), from 0 (no pain) to 10 (severe pain), measured before the intervention, 30 minutes after injection, and at 6h, 12h, and 24h after injection.

Complications after the block: qualitative variable, including possible complications such as local anesthetic systemic toxicity, allergy, vascular puncture, ...

Opioid consumption in the first 48 hours after surgery: quantitative, in mg. Number of postoperative rescue opioid doses in 48 hours: quantitative, number of doses. Type of opioid used: qualitative.

Quality of anesthesia was assessed using the Abouleizh scale

Good: the patient was comfortable with no pain or only very mild pain and needed no additional analgesics throughout surgery.

Fair: the patient had mild pain requiring only intravenous fentanyl 50-100 mcg, and surgery continued.

Poor: the patient had severe pain, surgery could not proceed, and a different anesthetic technique was required.

2.8. Data collection methods and instruments

Patient preparation: patients enrolled in the study had a pre-anesthetic assessment 1 day before surgery and received an explanation of the study and gave consent to participate. Routine preoperative preparation was performed. On the day of surgery, a supraclavicular brachial plexus block was performed with 20ml of 0.5% ropivacaine under ultrasound guidance (ACUSON P500 ultrasound system, linear probe). Premedication consisted of midazolam 2mg and intravenous dexamethasone 8mg before the block. Sensory and motor function were monitored for 30 minutes after the block until the block was adequate for surgery. If the block was not adequate after 30 minutes, it was considered a failure and a different anesthetic technique was used.

VAS pain scores were assessed after the block and at 1 hour, 3 hours, 6 hours, 9 hours, 12 hours, 24 hours, and 48 hours. The time at which patients first reported pain with VAS >4 was recorded. The total postoperative opioid dose required was calculated.

2.9. Data analysis

Data were entered and analyzed using SPSS 16.0 statistical software. Qualitative variables are presented as counts and percentages, and normally distributed continuous variables as mean ± standard deviation. Statistical significance was set at $p<0.05$.

3. RESULTS

From 02/2025 to 09/2025, 40 patients at the Department of Surgery, Anesthesiology and Critical Care, Thong Nhat Hospital, met the selection criteria and were included in the study.

3.1. Characteristics of the study population

Table 1. General characteristics of the study population.

Characteristic	Value	
Age	(X̄±SD)	49.7±16.0
	≥65 years n(%)	5 (12.5)
	<65 years n(%)	35 (87.5)
Sex	Male n(%)	18 (45)
	Female n(%)	22 (55)
BMI	Underweight n(%)	1 (2.5)
	Normal n(%)	28 (70)
	Overweight and obese n(%)	11 (27.5)
ASA	I n(%)	26 (65)
	II n(%)	9 (22.5)
	III n(%)	5 (12.5)
Operative time (X̄±SD), min	84.75±18.53	

Comment: The study included 40 patients with a mean age of 49.7±16.0 years, most of whom were <65 years old (87.5%). The sex distribution was fairly balanced, with women accounting for 55%. Regarding BMI, most patients had normal body weight (70%); only 2.5% were underweight and 27.5% were overweight/obese. Most patients were ASA I (65%), and the remainder were ASA II (22.5%) and ASA III (12.5%). The mean operative time was 84.75±18.53 minutes, which is typical of routine upper limb surgery.

3.2. Block characteristics.

Table 2. Characteristics of the supraclavicular brachial plexus block.

Time	Minutes
Block performance time (X̄±SD)	6.5±4.4
Sensory onset time (X̄±SD)	5.5±1.9
Duration of anesthesia and postoperative analgesia (X̄±SD)	1018.1±216.8
Time to first rescue analgesic request (from block) (X̄±SD)	916.1±188.1

Comment: The mean block performance time was short (6.5±4.4 minutes), and the sensory onset time was 5.5±1.9 minutes, showing a rapid onset. In particular, the duration of anesthesia and analgesia was 1018.1±216.8 minutes (about 17 hours), well beyond the usual <12 hours with ropivacaine alone. The mean time to the first rescue analgesic request was 916.1±188.1 minutes (about 15 hours), demonstrating the marked analgesia-prolonging effect of dexamethasone.

3.3. Quality of intraoperative anesthesia

Table 3. Quality of anesthesia.

Level	n	%
Good	37	92.5
Moderate	3	7.5
Poor	0	0

Comment: The quality of anesthesia was good in most patients (92.5%), moderate in only 7.5%, and poor in none. This confirms the effectiveness of combining dexamethasone with ropivacaine for the block, ensuring optimal surgical conditions.

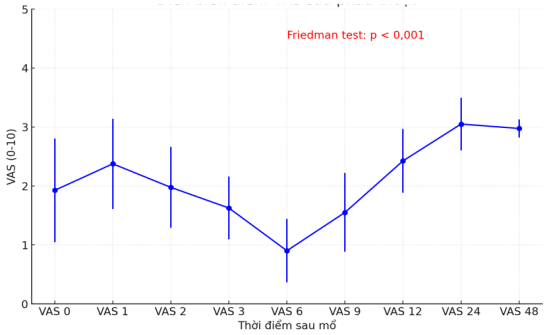


Figure 1. Changes in VAS scores. Friedman test: p<0.001.

Comment: VAS scores changed significantly over time (p<0.001). During the first 6 hours after surgery, VAS scores remained low, then rose markedly at 24 hours, reflecting the gradual wearing off of the local anesthetic. However, VAS scores stabilized again at 48 hours, indicating effective pain control with supplementary rescue analgesics.

Table 4. Pairwise comparison of VAS scores

	(X̄±SD)	(X̄±SD)	p value
VAS 0 and VAS 6	1.92±0.88	0.90±0.54	<0.001
VAS 6 and VAS 24	0.90±0.54	3.05±0.44	<0.001
VAS 24 and VAS 48	3.05±0.44	2.97±0.16	0.250

Comment: Pairwise comparisons showed that VAS scores decreased significantly from 0 to 6 hours ($p<0.001$) and rose again from 6 to 24 hours ($p<0.001$). The difference between 24 and 48 hours was not statistically significant ($p=0.25$), consistent with the clinical course shown in the VAS chart.

3.4. Opioid consumption.

In our study, 2 opioids were used: fentanyl (n=31, 77.5%) at a mean dose of 115±24.7 mg (range 100–200 mcg) and tramadol (n=9, 22.5%) at 200–400 mg. Morphine and sufentanil were not used.

3.5. Adverse effects

During the study, we observed no cases of needle puncture of the lung apex, a blood vessel, the epidural space, or the subarachnoid space, and no phrenic nerve block, recurrent laryngeal nerve block, or respiratory depression. No complications related to dexamethasone (hyperglycemia, infection...) were recorded.

4. DISCUSSION

Our results show that combining intravenous dexamethasone with a supraclavicular brachial plexus block using ropivacaine clearly prolongs anesthesia and postoperative analgesia. The mean duration of anesthesia and analgesia was 1018.1±216.8 minutes, considerably longer than reported for plexus blocks with a local anesthetic alone, which usually last only about 8–12 hours. This demonstrates the analgesia-enhancing effect of intravenous dexamethasone and is consistent with the trend reported in international studies.

Compared with previous studies, Eric Albrecht et al.(8) showed that intravenous dexamethasone 8-10mg can extend analgesia by 6–8 hours compared with controls. Our study recorded an even longer duration, possibly because the study population consisted mainly of older patients, upper limb surgery causes less prolonged pain, and 20 ml of 0.5% ropivacaine provides optimal analgesia.

In the study by Paul J Zufferey(3) et al., the analgesic duration of local anesthetics was also prolonged substantially when supplemented with intravenous dexamethasone (up to 11-16 hours). In addition, the incidence of postoperative nausea and vomiting was halved. This is consistent with our results.

Pham Van Quynh et al.(6) studied interscalene brachial plexus block with lidocaine combined with dexamethasone in upper limb surgery and also found that dexamethasone significantly prolonged analgesia (174.87±11.06 minutes in the dexamethasone group, longer than 87.75±17.13 minutes in the group without dexamethasone ($p<0.05$)). Nguyen Van Toan et al.(1) evaluated the effectiveness of levobupivacaine blocks with added dexamethasone in clavicle fixation surgery and found that the analgesic duration reached 1132.20±224.84 minutes in the dexamethasone group compared with 871.50±154.37 minutes in the group without dexamethasone. These findings further support the analgesia-prolonging effect of dexamethasone with ropivacaine and with other local anesthetics.

Regarding the quality of anesthesia, most patients achieved a good level (92.5%), only 7.5% a moderate level, and none a poor level. Postoperative VAS scores changed significantly over time ($p<0.001$): they decreased clearly in the first 6 hours but rose again at 24 hours, reflecting the wearing off of the local anesthetic and the need for supplementary analgesia. However, VAS scores were stable between 24 and 48 hours ($p=0.25$), indicating that after the period of increased pain, pain was effectively controlled with supplementary analgesics. The low mean opioid consumption (115±24.7 mg) is evidence that dexamethasone reduces analgesic requirements.

No complications related to the block or to dexamethasone were recorded throughout the study. This supports the safety of intravenous dexamethasone, which has the advantage over perineu-

ral injection of avoiding the risk of nerve injury or infection.

Clinically, adding intravenous dexamethasone is a simple, safe, and effective way to prolong postoperative analgesia and reduce opioid requirements, thereby improving recovery and patient satisfaction. The method is highly applicable, particularly in the context of postoperative care in Vietnam, where the use of catheters for continuous postoperative analgesia is still limited.

However, our study has several limitations: (1) the sample size was small (40 patients), so it lacks the power to generalize the results; (2) there was no direct control group receiving a block without dexamethasone; (3) the long-term effects of dexamethasone on postoperative functional recovery were not evaluated. Therefore, larger randomized controlled studies are needed to confirm the efficacy and safety of this method.

5. CONCLUSION

Intravenous dexamethasone combined with ropivacaine for supraclavicular brachial plexus block significantly prolongs postoperative analgesia, improves the quality of anesthesia, reduces opioid requirements, and does not increase complications. It is a safe, simple, and highly applicable method in clinical practice in Vietnam.

However, further controlled studies with large sample sizes are needed to confirm the efficacy and long-term safety of this method.

6. RECOMMENDATIONS

6.1. In clinical practice

Intravenous dexamethasone 8 mg should be considered as a routine addition to brachial plexus block for upper limb surgery to prolong analgesia, reduce opioid requirements, and improve postoperative recovery.

The intravenous route should be preferred over perineural injection because it is safe, easy to use, avoids the risk of local complications, and complies with current drug-use regulations.

6.2. In scientific research

Randomized controlled multicenter studies with larger sample sizes are needed to confirm the analgesia-prolonging effect of intravenous dexamethasone.

Studies directly comparing IV and PN dexamethasone in the Vietnamese setting are needed to determine the optimal approach, and to further evaluate long-term effects on functional recovery and postoperative quality of life.

Different doses of IV dexamethasone (4 mg, 6 mg, 8 mg) should be investigated to identify the optimal dose that ensures efficacy while minimizing adverse effects.

Studies combining dexamethasone with other adjuvants (e.g., dexmedetomidine, magnesium) should be considered to assess their potential synergy in prolonging analgesia.

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