



## Research Article

# Retrospective comparison of anesthetic effects of bupivacaine and bupivacaine + dexmedetomidine in infraclavicular brachial plexus block in upper limb surgery

Şahan Şahinkaya <sup>a,\*</sup> , Elif Başağan Moğol <sup>b</sup> , Leman Gökçenur Aydın <sup>b</sup> , Selcan Akesen <sup>b</sup> 

<sup>a</sup> Department of Anesthesiology and Reanimation, Gemlik State Hospital, Bursa, Türkiye

<sup>b</sup> Department of Anesthesiology and Reanimation, Faculty of Medicine, Uludağ University, Bursa, Türkiye

## ABSTRACT

**Background:** The objective of this study was to evaluate the anesthetic efficacy of dexmedetomidine as an adjuvant to bupivacaine in infraclavicular brachial plexus blocks administered for surgical procedures involving the hand and forearm.

**Materials and Methods:** 84 patients, aged between 18-70 years, who underwent elective hand and forearm surgery in between January 2021 and July 2021, had American Society of Anesthesiologists (ASA) classification I-II, and were anesthetized with ultrasound-guided infraclavicular brachial plexus block were included in the study. Group B (n=42): 20 ml bupivacaine 0.5%+20 ml SF, Group B+D (n=42): 20ml bupivacaine 0.5% + 1 mcg/kg dexmedetomidine diluted to a volume of 20 mL was selected from the patients who underwent block. Demographic information of the patients were taken from the preoperative anesthesia evaluation form and recorded. From the information recorded in the patient follow-up form, peak heart rate, mean arterial pressure, oxygen saturation percentage, Visual Analogue Scale (VAS) scores, pinprick test score and Bromage score were recorded as study data.

**Results:** Compared to group B, the onset time of sensory and motor blockade was statistically significantly earlier and the duration of sensory block, motor block and analgesia was statistically significantly longer in group B+D (p<0.05). In Group B+D, VAS score was statistically significantly lower at 10th, 20th, 8th and 12th hours (p<0.05).

**Conclusions:** The addition of 1 mcg/kg dexmedetomidine to 20 ml of 0.5% bupivacaine in infraclavicular brachial plexus block was found to significantly accelerate the onset of sensory and motor block, and to extend the duration of motor block, sensory block, and postoperative analgesia.

## ARTICLE INFO

### Article history:

Received – July 10, 2025  
Revision requested – August 17, 2025  
Revision received – September 3, 2025  
Accepted – September 8, 2025

### Keywords:

Retrospective comparison  
Infraclavicular block  
Bupivacaine  
Dexmedetomidine



This is an open access article distributed under the CC BY licence.

© 2025 by the Authors.

**Citation:** Şahinkaya Ş, Başağan Moğol E, Aydın LG, Akesen S. Retrospective comparison of anesthetic effects of bupivacaine and bupivacaine + dexmedetomidine in infraclavicular brachial plexus block in upper limb surgery. *Chall J Perioper Med.* 2025; 3(3):88–94.

## 1. Introduction

Brachial plexus blocks are frequently administered for anesthesia and analgesia in patients undergoing arm, forearm, and hand surgeries. By eliminating the need for general anesthesia and its associated risks—such as airway complications, postoperative nausea and vomit-

ing—these regional techniques facilitate earlier oral intake, mobilization, and discharge [1].

Brachial plexus blocks can be performed at four distinct anatomical levels: the interscalene groove, the subclavian sheath (supraclavicular region), the infraclavicular fossa, and around the axillary artery. Among these, the infraclavicular approach is preferred for anesthesia

\* Corresponding author. E-mail address: sahinkayasahan@gmail.com.tr (Ş. Şahinkaya)

or analgesia in surgeries involving the forearm, wrist, hand, and fingers. Compared to the infraclavicular block, the axillary approach often fails to anesthetize the axillary and musculocutaneous nerves, as these branch off at higher levels. Similarly, the interscalene and supraclavicular approaches are typically insufficient for achieving complete anesthesia in the distribution of the ulnar nerve [2]. In addition, the incidence of tourniquet pain is lower in infraclavicular block [3]. The infraclavicular block does not require abduction of the arm at the shoulder and can be performed in any arm position, making it an ideal site for catheter placement for continuous local anesthetic infusion [4].

Although the use of peripheral nerve catheters has increased in recent years, single-injection peripheral nerve blocks remain the most commonly employed technique among anesthesiologists [5]. Local anesthetic agents such as bupivacaine, levobupivacaine and ropivacaine are used in brachial plexus blocks. Long-acting local anesthetics alone can provide analgesia for up to 9-14 hours [5]. Bupivacaine is a widely used long-acting local anesthetic agent. The dose of bupivacaine administered can be increased to prolong the block duration or shorten the block onset time. However, due to the increased incidence of seizures and cardiac arrest related to the dose of bupivacaine administered, researchers have turned to the use of adjuvant agents that shorten the block onset time and prolong the block duration instead of this approach [6].

The limited duration of analgesia provided by peripheral nerve blocks may necessitate the use of systemic analgesics, increasing the risk of opioid-related side effects and potentially contributing to the development of chronic pain [7]. There are many adjuvant agents used to enhance the analgesic effect of local anesthetic agents such as clonidine, magnesium, opioids, vasoconstrictor agents and steroids [8]. Dexmedetomidine is an agent with selective  $\alpha$ -2 agonist effect in the central nervous system. Recently, it has been used as an adjuvant agent in general anesthesia and regional anesthesia applications to provide sedation in intensive care. Many studies have reported that dexmedetomidine prolongs the duration of nerve block when administered perineurally with local anesthetics [9-11].

The primary aim of this study was to compare the onset times and durations of motor and sensory block in infraclavicular brachial plexus blocks performed with bupivacaine alone versus a combination of bupivacaine and dexmedetomidine in patients undergoing upper extremity surgery. Secondary objectives included the duration of analgesia, evaluation of differences in hemodynamic responses and the incidence of side effects between the two groups.

## 2. Materials and Methods

The study was conducted following the approval of the Uludağ University Medical Research Ethics Committee (Decision No: 2021-10/41, dated July 28, 2021). In this retrospective study, a total of 84 patients who underwent hand and/or forearm surgery between January 1 and July

1, 2021; ASA I-II, aged 18-70 years, and whose anesthesia was performed with ultrasound-guided infraclavicular brachial plexus block were included. Patients with ASA 3-4, those under 18 years of age, those over 70 years of age, pregnant women, those who had to switch to general anesthesia because sufficient sensory and motor blockade could not be achieved surgically after peripheral blockade, and those whose anesthesia records did not provide the necessary data for the study were excluded from the study.

After being taken to the operating room, the patients underwent ECG, pulse oximetry, and noninvasive arterial blood pressure monitoring. It was determined from patient file notes that, to perform ultrasound-guided infraclavicular block under sterile conditions before surgery, the USG probe was placed in the sagittal plane, just 1 cm anterior to the intersection between the coracoid process and the clavicle. After visualizing the subclavian artery and the lateral, medial, and posterior cords of the surrounding brachial plexus, the tip of the blocking needle (22 Ga. x 2 inch (50 mm) 30° Curved Insulated Echogenic Needle with Extension Set) was directed in-plane toward the posterolateral aspect of the subclavian artery at the 8 o'clock position. After aspiration, the "U"-shaped spread of the local anesthetic around the subclavian artery was monitored on the USG screen.

Demographic information (name-surname, protocol number, weight, height, age, body mass index, comorbidity, ASA score) and peak heart rate (HR), arterial blood pressure (BP), oxygen saturation percentage (SpO<sub>2</sub>), onset time of motor and sensory block, duration of motor and sensory block, and duration of analgesia were recorded from the peroperative anesthesia evaluation form.

### 2.1. Statistical analysis

The analyses of the study were performed with SPSS 21.0 package program. Categorical variables were presented as number, percentage, continuous numerical variables were presented as mean  $\pm$  standard deviation and median values. Pearson Chi-square test and Fisher's Exact test were used to compare categorical variables between groups. The conformity of continuous numerical variables to normal distribution was evaluated by Shapiro Wilk test. The independent samples t test was used to compare the numerical variables that conformed to the normal distribution between two independent groups, and the Mann Whitney U test was used to compare the numerical variables that did not conform to the normal distribution between two independent groups. Box and line graphs were used for visualization of nonparametric data and linear graphs were used for visualization of measurements made at different times. Statistically, a p value less than 0.05 was accepted as the significance limit.

## 3. Results

In this study comparing the intraoperative and postoperative characteristics of dexmedetomidine (group B+D) adjuvantly added to bupivacaine (group B)

in infra-clavicular brachial plexus block in upper extremity surgery, the results of a total of 84 patients, 42 B and 42 B+D, were evaluated. Gender, comorbidity and ASA score distribution were similar between the groups ( $p=1.0$ ,  $p=1.0$ ,  $p=0.746$ , respectively) (Table 1).

There was no statistically significant difference between the groups in terms of age, height, body weight and BMI ( $p>0.05$ ) (Table 2).

Compared with group B, mean arterial pressure in group B+D was statistically significantly lower at 10, 20, 30, 60 and 120 minutes ( $p < 0.05$ ). Compared with group B, heart rate in group B+D was statistically significantly

lower in all measurements at 10 min and later ( $p<0.05$ ). There was no statistically significant difference in peripheral oxygen saturation between the groups ( $p > 0.05$ ) (Table 3).

Compared to Group B, the VAS scores in Group B+D were statistically significantly lower at 10 and 20 minutes, as well as at 8 and 12 hours postoperatively ( $p < 0.05$ ). Furthermore, Group B+D demonstrated a significantly shorter onset time for both sensory and motor block, and a significantly longer duration of sensory block, motor block, and analgesia compared to Group B ( $p < 0.05$ ) (Table 4).

**Table 1.** Distribution of gender, ASA score and comorbidities between study groups.

Variables	B (n = 42)		B+D (n = 42)		p
	Number	Percent	Number	Percent	
<b>Gender</b>					
Male	39	92.9	39	92.9	1.000
Female	3	7.1	3	7.1	
<b>ASA score</b>					
1	35	83.3	35	83.3	1.000
2	7	16.7	7	16.7	
<b>Comorbidity</b>					
No	36	66.7	37	88.1	0.746
Yes	6	14.3	5	11.9	
Hypertension	4	9.5	4	9.5	1.000
Coronary artery disease	4	9.5	0	0	0.116
Diabetes mellitus	2	4.8	1	2.4	0.557

**Table 2.** Distribution of age, height, body weight and body mass index between study groups.

	B (n = 42)		B+D (n = 42)		p
	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median	
Age (year)	39.88 $\pm$ 15.41	38.5	38.29 $\pm$ 15.79	35.5	0.601
Length (cm)	173.69 $\pm$ 7.71	175.0	174.60 $\pm$ 7.66	174.5	0.591*
Weight (kg)	75.67 $\pm$ 16.86	75.0	79.17 $\pm$ 13.43	80.0	0.296*
Body Mass Index (kg/m <sup>2</sup> )	25.64 $\pm$ 3.86	25.54	25.60 $\pm$ 3.78	25.46	0.962*

#### 4. Discussion

Inadequate management of postoperative pain is associated with increased morbidity and mortality, reduced quality of life, and elevated hospital costs due to prolonged hospitalization and higher complication rates [12]. The use of peripheral regional anesthesia provides significant benefits in the postoperative period, including lower pain scores, early hospital discharge, and reduced use of additional analgesics, including opioids [13].

The duration of analgesia provided by single injection nerve blocks is limited to 6-8 hours, even if long-

lasting local anesthetic drugs (e.g. bupivacaine or ropivacaine) are used [11,14]. Increasing the dose of local anesthetic may prolong the duration of analgesia, but may also increase the risk of local anesthetic systemic toxicity [15].

Continuous peripheral nerve blocks have been associated with a reduction in rebound pain and improved postoperative analgesia compared to peripheral nerve blocks performed with a single injection. However, secondary block failure rates have been reported to be as high as 20-50% due to catheter displacement, occlusion or interruption, fluid leakage and infusion pump malfunction [16].

In recent years, researchers have focused on topical, neuraxial, perineural or intravenous adjuvants (opioids, dexamethasone and  $\alpha$ -2-agonists) in order to accelerate the onset of sensory and motor block, prolong the duration of analgesia, improve the quality of nerve block, reduce the dose of local anesthetic and thus its side effects [11,17].

In a study by Ammar et al. [18], which parallels our research, 60 patients undergoing ultrasound-guided infraclavicular block were randomly assigned into two

groups. One group received 30 ml of 0.33% bupivacaine with dexmedetomidine at a dose of 0.75 mcg/kg, while the other received 30 ml of 0.33% bupivacaine alone. Their prospective and randomized study revealed that dexmedetomidine significantly accelerated the onset of sensory and motor block, prolonged the duration of analgesia, increased the duration of both sensory and motor blocks, reduced pain scores, and decreased the need for supplementary opioids.

**Table 3.** Distribution of mean arterial pressure, heart rate and peripheral oxygen saturation between study groups.

MAP (mmHg)	B (n = 42)		B+D (n = 42)		p
	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median	
Pre-Block	103.79 $\pm$ 17.42	104.5	101.79 $\pm$ 17.34	101.5	0.599*
0 min	106.43 $\pm$ 16.71	107.0	118.88 $\pm$ 97.18	104.5	0.687
10 min	100.57 $\pm$ 15.61	100.0	91.83 $\pm$ 15.53	91.5	0.012*
20 min	97.38 $\pm$ 15.18	98.0	86.98 $\pm$ 16.02	87.5	0.003*
30 min	97.36 $\pm$ 15.14	98.5	84.74 $\pm$ 14.10	87.5	<0.001*
60 min	95.52 $\pm$ 15.91	96.0	86.19 $\pm$ 13.34	87.0	0.009
120 min	95.02 $\pm$ 14.75	95.0	87.12 $\pm$ 14.27	88.0	0.015*
4 hour	96.81 $\pm$ 15.88	98.5	90.10 $\pm$ 15.26	90.0	0.052*
8 hour	96.40 $\pm$ 15.87	99.0	92.38 $\pm$ 14.57	93.0	0.230*
12 hour	100.29 $\pm$ 15.56	101.0	98.45 $\pm$ 16.39	100.0	0.600*
<b>Pulse (rate/min)</b>					
Pre-Block	84.67 $\pm$ 13.38	86.0	82.07 $\pm$ 12.34	81.5	0.358*
0 min	87.36 $\pm$ 13.50	88.5	88.50 $\pm$ 13.52	86.5	0.699*
10 min	83.29 $\pm$ 10.98	85.0	73.69 $\pm$ 12.86	70.0	0.001
20 min	80.14 $\pm$ 10.22	81.0	68.52 $\pm$ 12.50	67.0	<0.001
30 min	78.93 $\pm$ 8.84	79.5	67.19 $\pm$ 11.01	67.0	<0.001
60 min	78.19 $\pm$ 9.55	80.0	68.05 $\pm$ 11.20	65.0	<0.001
120 min	78.38 $\pm$ 9.34	78.5	68.31 $\pm$ 15.23	65.0	<0.001
4 hour	80.69 $\pm$ 8.64	80.5	72.10 $\pm$ 9.80	70.0	<0.001
8 hour	80.60 $\pm$ 10.31	82.0	75.14 $\pm$ 10.32	72.0	0.015
12 hour	82.52 $\pm$ 12.12	82.5	77.00 $\pm$ 10.93	75.0	0.015
<b>SpO<sub>2</sub> (%)</b>					
Pre-Block	96.98 $\pm$ 2.17	97.0	97.02 $\pm$ 1.89	97.0	0.996
0 min	97.33 $\pm$ 1.98	97.5	97.67 $\pm$ 3.23	98.0	0.809
10 min	97.26 $\pm$ 2.00	97.5	97.10 $\pm$ 1.74	97.5	0.561
20 min	97.45 $\pm$ 1.80	98.0	97.02 $\pm$ 2.12	98.0	0.425
30 min	97.62 $\pm$ 1.75	98.0	97.24 $\pm$ 2.14	98.0	0.371
60 min	97.43 $\pm$ 1.74	98.0	95.26 $\pm$ 13.72	97.0	0.528
120 min	97.57 $\pm$ 1.58	98.0	97.40 $\pm$ 1.53	97.5	0.494
4 hour	97.31 $\pm$ 1.60	97.0	97.14 $\pm$ 1.34	97.0	0.570
8 hour	97.17 $\pm$ 1.78	97.0	96.88 $\pm$ 1.35	97.0	0.314
12 hour	97.55 $\pm$ 1.64	98.0	97.21 $\pm$ 1.55	97.0	0.215

MAP: Mean arterial pressure; HR: Heart rate; SpO<sub>2</sub>: Peripheral oxygen saturation.

**Table 4.** Distribution of VAS score, sensory block and motor block onset time/duration, duration of analgesia and duration of operation between study groups.

VAS score	B (n = 42)		B+D (n = 42)		p
	Mean ± SD	Median	Mean ± SD	Median	
Pre-Block	5.55 ± 1.48	6	5.57 ± 1.77	6	0.931
0 min	4.71 ± 1.45	5	4.21 ± 2.02	5	0.377
10 min	2.71 ± 2.18	3	0.88 ± 1.53	0	<0.001
20 min	1.29 ± 1.86	0	0.14 ± 0.52	0	<0.001
30 min	0 ± 0	0	0 ± 0	0	-
60 min	0 ± 0	0	0 ± 0	0	-
120 min	0 ± 0	0	0.02 ± 0.15	0	0.317
4 hour	0.26 ± 0.70	0	0.07 ± 0.34	0	0.133
8 hour	0.83 ± 1.21	0	0.31 ± 0.98	0	0.003
12 hour	1.81 ± 1.40	2	0.69 ± 1.37	0	<0.001
<b>Variables</b>					
Sensory block onset time (min)	21.19 ± 8.03	20	15.24 ± 6.34	15	0.001
Motor block onset time (min)	23.81 ± 7.64	30	16.90 ± 7.49	20	<0.001
Sensory block duration (min)	520.48 ± 166.73	500	645.71 ± 129.3	700	<0.001
Motor block duration (min)	606.90 ± 128.36	690	649.76 ± 114.03	700	0.010
Analgesia duration (min)	580.71 ± 121.88	555	645.00 ± 127.26	700	<0.001
Operation time (min)	103.45 ± 53.58	100	101.67 ± 57.15	90	0.546

VAS: Visual analog scale.

In a prospective, randomized, and double-blind study, Mirkheshti et al. [19] assigned 111 patients undergoing ultrasound-guided infraclavicular block into three groups. They added either 100 mcg dexmedetomidine, 5 ml ketorolac, or 5 ml saline to 25 ml of 1.5% lidocaine. Their findings demonstrated that the onset of motor block was faster and the durations of sensory and motor block were longer in the dexmedetomidine group. Additionally, the duration of analgesia was significantly prolonged in patients receiving dexmedetomidine compared to those receiving saline. However, the time to first analgesic requirement was longer in the ketorolac group than in the dexmedetomidine group. Consistent with these findings, our study also showed that the addition of dexmedetomidine to local anesthetic in infraclavicular block resulted in a faster onset and prolonged duration of both sensory and motor block, as well as extended analgesia duration.

In a prospective study in which they randomized 80 patients randomly divided into 2 groups and applied dexmedetomidine added to 30 ml of 0.5% ropivacaine and 30 ml of 0.5% ropivacaine at a dose of 1 mcg/kg, Das et al. [20] found that the onset of sensory and motor block was faster and the duration of sensory and motor block was longer in the dexmedetomidine group compared to the control group, similar to this study, but they applied supraclavicular block instead of infraclavicular block.

The mechanism by which alpha 2 adrenergic receptor agonists produce analgesia and sedation is not fully understood but is likely to be multifactorial. Peripherally,  $\alpha$ -2 agonists produce analgesia by reducing norepineph-

rine release and causing  $\alpha$ -2 receptor-independent inhibitory effects on nerve fiber action potentials. Centrally,  $\alpha$ -2 agonists produce analgesia and sedation by inhibition of substance P release in the nociceptive pathway at the dorsal root neuron level and activation of  $\alpha$ -2 adrenoceptors in the locus coeruleus [21].

Intraoperative analgesia is also important to keep hemodynamics stable throughout surgery. Inadequate analgesia may result in increased heart rate or mean arterial pressure, increased myocardial O<sub>2</sub> consumption and consequent myocardial damage. Dexmedetomidine improves perioperative hemodynamic stability in tachycardic and hypertensive patients. However, due to its bradycardia and hypotension effects, it may have unfavorable consequences in patients with congestive heart failure with rate-dependent cardiac output or impaired conduction [22,23]. In a meta-analysis by Vorobeichik et al. [24], which included 34 studies and data from 2,007 patients, the perineural use of dexmedetomidine as an adjuvant in brachial plexus blocks was shown to accelerate the onset of sensory and motor block and prolong the duration of analgesia as well as sensory and motor block. However, an increased incidence of bradycardia was also reported. The variability in dexmedetomidine's effects across different levels of the brachial plexus was attributed to differences in systemic absorption and neuraxial spread. The authors suggested that a dose of 50–60 mcg may provide optimal prolongation of sensory block with minimal hemodynamic side effects. Notably, no neurotoxicity or neurologic complications were reported in any patient.

Similarly, in a meta-analysis of 18 studies examining dexmedetomidine as an adjuvant in brachial plexus blocks, Hussain et al. [10] reported prolonged durations of analgesia and motor and sensory blocks, along with decreased opioid consumption and fewer opioid-related side effects. Nonetheless, a higher frequency of reversible bradycardia was observed.

In another meta-analysis by Schnabel et al. [11], which included 46 studies and 3,149 patients comparing local anesthetics alone, local anesthetics combined with perineural dexmedetomidine, and systemic dexmedetomidine in peripheral nerve blocks, it was concluded that perineural dexmedetomidine significantly prolonged analgesia duration but was also associated with an increased risk of bradycardia and hypotension.

It was considered interesting that systemic and perineural dexmedetomidine did not differ in terms of the risk of intraoperative bradycardia and hypotension, and it was emphasized that the level of evidence for this conclusion was very low. There was also no difference in the effect of systemic or perineural use of dexmedetomidine on the duration of analgesia.

In a meta-analysis of 3332 patients from 57 randomized trials, Hai et al. [25] investigating the optimal perineural dose of dexmedetomidine to prolong the duration of analgesia in brachial plexus block, found that 30-50µg dexmedetomidine as an adjuvant provided longer analgesic duration than local anesthetic alone and did not increase the risk of bradycardia and hypotension. In our study in which we added dexmedetomidine perineurally at a dose of 1mcg/kg, we found no statistically significant difference in the frequency of hypotension and bradycardia between the groups.

The potential neurotoxic effects of dexmedetomidine in humans have not been extensively studied. However, in animal models of spinal anesthesia [26] and sciatic nerve block [27], dexmedetomidine did not show toxicity and was potentially neuroprotective when combined with lidocaine [26] and bupivacaine [27]. No neurotoxic effect was found in our study.

The positive effects of dexmedetomidine, such as prolonged duration of motor and sensory block, should be carefully weighed against the increased risks of sedation, bradycardia and hypotension. While prolonged duration of motor block may be desirable in some surgeries, the use of dexmedetomidine in lower limb blocks may delay postoperative recovery and increase the risk of falls. Sedation, bradycardia and hypotension are dose-dependent and transient, but these side effects may preclude its use in high-risk patients who may be more easily affected by changes in heart rate and blood pressure and in procedures performed in the sitting position. Patients should be closely monitored [17,24].

## 5. Conclusions

In this retrospective study, the perineural addition of 1 mcg/kg dexmedetomidine to 20 ml of 0.5% bupivacaine in infraclavicular brachial plexus blocks for hand and forearm surgeries was associated with a shorter onset time of sensory and motor block, as well as prolonged

durations of sensory block, motor block, and analgesia. This technique also resulted in increased patient and surgeon satisfaction, without any observed adverse hemodynamic effects. These findings suggest that the use of dexmedetomidine as an adjuvant to local anesthetics may significantly enhance block quality and support its routine clinical application in infraclavicular brachial plexus blocks.

---

### Acknowledgements

None declared.

### Funding

The authors received no financial support for the research, authorship, and/or publication of this manuscript.

### Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this manuscript.

### Data Availability

The datasets created and/or analyzed during the current study are not publicly available, but are available from the corresponding author upon reasonable request.

### Ethics Approval and Consent to Participate

This study was approved by the ethics committee of Uludağ University Medical Research Ethics Committee (Decision No: 2021-10/41, dated July 28, 2021). Written informed consent was obtained from the participants. All methods were performed in accordance with relevant guidelines and regulations.

---

### Author Contributions

**Şahan Şahinkaya:** conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing – original draft, writing – review & editing, visualization, supervision, project administration, funding acquisition.

**Elif Başağan Moğol:** conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing – original draft, writing – review & editing.

**Leman Gökçenur Aydın:** investigation, resources, data curation.

**Selcan Akesen:** conceptualization, methodology, writing – original draft, writing – review & editing.

---

## REFERENCES

- Chin KJ, Singh M, Velayutham V, Chee V. Infraclavicular brachial plexus block for regional anaesthesia of the lower arm. *Anesth Analg.* **2010**;111(4):1072.
- Macfarlane A, Anderson K. Infraclavicular brachial plexus blocks. *Cont Educ Anaesth Crit Care Pain.* **2009**;9(5):139–143.
- Sandhu NS, Manne JS, Medabalmi PK, Capan LM. Sonographically guided infraclavicular brachial plexus block in adults: A retrospective analysis of 1146 cases. *J Ultrasound Med.* **2006**;25(12):1555–1561.
- Marhofer P, Greher M, Kapral S. Ultrasound guidance in regional anaesthesia. *Br J Anaesth.* **2005**;94(1):7–17.
- Brummett CM, Norat MA, Palmisano JM, Lydic R. Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rats. *Anesthesiology.* **2008**;109(3):502–511.

6. Casati A, Putzu M. Bupivacaine, levobupivacaine and ropivacaine: Are they clinically different?. *Best Pract Res Clin Anaesthesiol.* **2005**;19(2):247–268.
7. Sreeja R, Mathew A, Velayudan M. Effect of added alpha 2 agonists with local anaesthetic in infraclavicular brachial plexus block: A comparative study between dexmedetomidine and clonidine. *Anesth Essays Res.* **2020**;14(4):638–643.
8. Yaghoobi S, Shahamat H, Alizadeh A, Khezri MB. Comparing postoperative analgesic effect of dexmedetomidine or dexamethasone added to lidocaine through infraclavicular block in forearm surgery. *Clin J Pain.* **2019**;35(9):766–771.
9. Song JH, Shim HY, Lee TJ, Jung JK, Cha YD, Lee DI, et al. Comparison of dexmedetomidine and epinephrine as an adjuvant to 1% mepivacaine in brachial plexus block. *Korean J Anesthesiol.* **2014**;66(4):283–289.
10. Hussain N, Grzywacz VP, Ferreri CA, et al. Investigating the efficacy of dexmedetomidine as an adjuvant to local anesthesia in brachial plexus block: A systematic review and meta-analysis of 18 randomized controlled trials. *Reg Anesth Pain Med.* **2017**;42(2):184–196.
11. Schnabel A, Reichl SU, Weibel S, Kranke P, Zahn PK, Pogatzki-Zahn EM, et al. Efficacy and safety of dexmedetomidine in peripheral nerve blocks: A meta-analysis and trial sequential analysis. *Eur J Anaesthesiol.* **2018**;35(10):745–758.
12. Lovich-Sapola J, Smith CE, Brandt CP. Postoperative pain control. *Surg Clin North Am.* **2015**;95(2):301–318.
13. Reisli R, Akkaya ÖT, Arıcan Ş, Can ÖS, Çetingök H, Güleç MS, et al. Akut postoperatif ağrının farmakolojik tedavisi: Türk Algoloji-Ağrı Derneği klinik uygulama kılavuzu. *Agri.* **2021**;33:1–51. (in Turkish)
14. Lomate PA, Mane MV. Efficacy of multimodal analgesia with perineural buprenorphine or dexmedetomidine for surgeries performed under ultrasound-guided infraclavicular brachial plexus block. *J Anaesthesiol Clin Pharmacol.* **2020**;36(1):66–71.
15. Safa B, Flynn B, McHardy PG, Kiss A, Haslam L, Henry PD, et al. Comparison of the analgesic duration of 0.5% bupivacaine with 1:200,000 epinephrine versus 0.5% ropivacaine versus 1% ropivacaine for low-volume ultrasound-guided interscalene brachial plexus block: A randomized controlled trial. *Anesth Analg.* **2021**;1129–1137.
16. Desai N, Kirkham KR, Albrecht E. Local anaesthetic adjuncts for peripheral regional anaesthesia: A narrative review. *Anaesthesia.* **2021**;76(Suppl 1):100–109.
17. Rao S, Rajan N. Dexmedetomidine as an adjunct for regional anesthetic nerve blocks. *Curr Pain Headache Rep.* **2021**;25(2):8.
18. Ammar AS, Mahmoud KM. Ultrasound-guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery: A prospective randomized controlled trial. *Saudi J Anaesth.* **2012**;6(2):109–114.
19. Mirkheshti A, Saadatniaki A, Salimi A, Rasi M, Memary E, et al. Effects of dexmedetomidine versus ketorolac as local anesthetic adjuvants on the onset and duration of infraclavicular brachial plexus block. *Anesth Pain Med.* **2014**;4(3):17620.
20. Das B, Lakshme Gowda M, Sharma M, Mitra S, Chauhan R. Supraclavicular brachial plexus block using ropivacaine alone or combined with dexmedetomidine for upper limb surgery: A prospective, randomized, double-blinded, comparative study. *Rev Esp Anesthesiol Reanim.* **2016**;63(3):135–140.
21. Esmoğlu A, Yegenoglu F, Akin A, Türk CY. Dexmedetomidine added to levobupivacaine prolongs axillary brachial plexus block. *Anesth Analg.* **2010**;111(6):1548–1551.
22. Laycock H, Bantel C. Objective assessment of acute pain. *J Anesth Clin Res.* **2016**;7(6):1000630.
23. Bahraini A, Banerjee O, Ra J. Bradycardia resulting in cardiac arrest in a critically ill patient receiving dexmedetomidine. *Trauma Case Rep.* **2021**;36:100548.
24. Vorobeichik L, Brull R, Abdallah FW. Evidence basis for using perineural dexmedetomidine to enhance the quality of brachial plexus nerve blocks: A systematic review and meta-analysis of randomized controlled trials. *Br J Anaesth.* **2017**;118(2):167–181.
25. Cai H, Fan X, Feng P, Wang X, Xie Y. Optimal dose of perineural dexmedetomidine to prolong analgesia after brachial plexus blockade: A systematic review and meta-analysis of 57 randomized clinical trials. *BMC Anesthesiol.* **2021**;21(1):233.
26. Zhang H, Zhou F, Li C, et al. Molecular mechanisms underlying the analgesic property of intrathecal dexmedetomidine and its neurotoxicity evaluation: An in vivo and in vitro experimental study. *PLoS One.* **2013**;8(2):e55556.
27. Tüfek A, Kaya S, Tokgöz O, Firat U, Evliyaoğlu O, Çelik F, et al. The protective effect of dexmedetomidine on bupivacaine-induced sciatic nerve inflammation is mediated by mast cells. *Clin Invest Med.* **2013**;36(2):1–8.