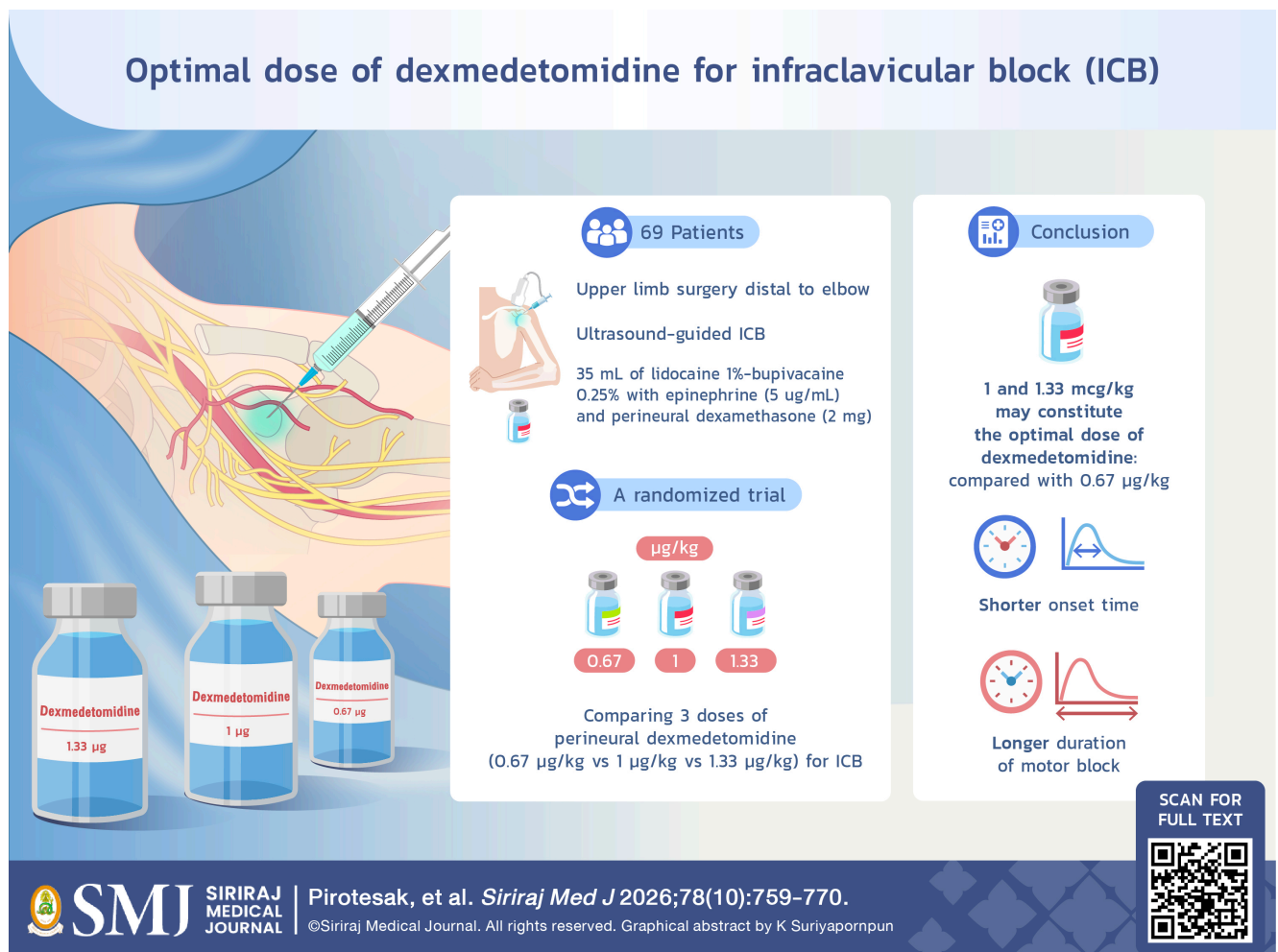


A Randomized Comparison among 0.67 µg/kg, 1 µg/kg and 1.33 µg/kg of Perineural Dexmedetomidine for Ultrasound-guided Infraclavicular Block

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ABSTRACT

Objective: This randomized trial compared three doses of perineural dexmedetomidine for ultrasound-guided infraclavicular block: 0.67 µg/kg (**D1**), 1 µg/kg (**D2**), and 1.33 µg/kg (**D3**), using an identical admixture of 35 mL of lidocaine 1%- bupivacaine 0.25%- epinephrine 5 µg/mL- perineural dexamethasone (2 mg). We hypothesized a stepwise 15% increase in motor block duration from D1 to D2 to D3.

Materials and Methods: Sixty-nine subjects were randomized to three dexmedetomidine doses. The primary outcome was motor block duration. Secondary outcomes included block onset, surgical anesthesia, analgesia and sensory block duration, and dexmedetomidine-related adverse events.

Results: Motor block duration was longer with D2 and D3 than D1 by omnibus ANOVA/post-hoc testing [18.6 (3.8) vs. 15.8 (3.8) hours, $P = 0.028$; and 18.6 (4.2) vs. 15.8 (3.8) hours, $P = 0.027$, respectively]. However, Kaplan-Meier log-rank analysis showed no intergroup difference ($P = 0.078$). No other differences were observed in sensorimotor block or analgesia duration. Onset was shorter with D2 and D3 than D1 (15 [15-20] vs. 20 [20-25] minutes; $P = 0.012$; and 15 [15-20] vs. 20 [20-25] minutes; $P = 0.007$, respectively), with no difference between D2 and D3. Surgical anesthesia and adverse event rates were similar.

Conclusion: With this ICB regimen, 1 and 1.33 µg/kg dexmedetomidine may statistically prolong motor block and shorten onset compared with 0.67 µg/kg. Given inconsistent statistical findings and the secondary outcome of onset, these results are exploratory. Further studies should examine perineural dexmedetomidine for other local anesthetic molecules, injectates, and doses greater than 1.33 µg/kg.

Keywords: Dexmedetomidine; brachial plexus block (Siriraj Med J 2026;78(10):759-770)

List of Abbreviations

ASA = American Society of Anesthesiologists

ICB = infraclavicular brachial plexus block

LA = local anesthetic

US = ultrasound

INTRODUCTION

The combination of perineural dexamethasone and perineural dexmedetomidine provides a valuable adjunct to local anesthetic (LA) for ultrasound (US)-guided infraclavicular block (ICB). In a previous trial, we found that, compared with perineural dexamethasone (2 mg) alone, combined perineural dexamethasone (2 mg)-dexmedetomidine (50 µg) results in a 26%-longer duration of sensorimotor block for ICB performed with adrenalized lidocaine 1%- bupivacaine 0.25%.¹ The optimal dose of perineural dexamethasone has been demonstrated to be 2 mg.² However, the optimal dose of dexmedetomidine (when combined with dexamethasone) remains unknown.

Consequently, in this randomized trial, we compared three different doses (0.67 µg/kg vs. 1 µg/kg vs. 1.33 µg/kg) of perineural dexmedetomidine for US-guided ICB performed with adrenalized lidocaine 1%- bupivacaine 0.25%- perineural dexamethasone (2 mg). We selected the duration of motor block as the primary outcome. Our research hypothesis was that the 1.33 µg/kg dose (**group D3**) would provide a 15%-longer duration of

motor block than the 1 µg/kg dose (**group D2**), which in turn would result in a 15%-longer motor block than the 0.67 µg/kg dose (**group D1**).

MATERIAL AND METHODS

The protocol used in the current study was identical to the one employed in our two previous trials.^{1,2} Prior to the submission of the project to the Ethics committee approval, an initial No Objection Letter (May 23, 2025) was obtained from Health Canada for the off-label use of perineural dexamethasone and perineural dexmedetomidine. After securing its approval (see below), we obtained an amended NOL from Health Canada (November 10, 2025).

Ethics committee approval (Research Ethics Board, McGill University Health Center) was secured on September 30, 2025. The protocol was registered on November 18, 2025 at www.ClinicalTrials.gov (NCT07249827) prior to patient recruitment. Sixty-nine patients undergoing upper limb surgery distal to the elbow were enrolled. The first subject was recruited on December 29, 2025. Written informed consent was obtained from all

participants. Inclusion criteria were: age between 18 and 75 years, American Society of Anesthesiologists (ASA) physical status I to III and body mass index between 18 and 35 kg/m². Exclusion criteria were: inability to consent to the study, coagulopathy, sepsis, hepatic or renal failure, pregnancy, breastfeeding, allergy to LA or dexmedetomidine, exposure to dexmedetomidine during the previous 48 hours preceding the study, chronic pain condition requiring the intake of opioids at home, prior surgery in the infraclavicular region, and pre-existing neuropathy.

After arrival in the induction room, standard ASA monitors were applied throughout the procedure. Patients were positioned supine with the surgical extremity by the side of the body. After skin disinfection and draping, the US transducer (3-12 MHz, Sonosite PX, Fuji Film), covered by a sterile sheath, was placed in a sagittal position medial to the coracoid process in order to obtain a short-axis image of the axillary artery. The skin and subcutaneous tissues were infiltrated with LA (3 mL of 1% lidocaine). Subsequently, a 21-gauge block needle (SonoPlex® 100 mm, Pajunk) was advanced until the tip was positioned dorsal to the axillary artery.^{1,2} The LA solution consisted of 35 mL of lidocaine 1%-bupivacaine 0.25% with epinephrine (5 µg/mL) and perineural dexamethasone (2 mg). In addition, a computer-generated randomization sequence was prepared by a research assistant who was not involved in the intervention or outcome assessment. Participants were allocated according to this sequence. Allocation concealment was maintained using sequentially numbered, sealed, opaque, and tamper-evident envelopes. The envelopes were opened by the same independent research assistant only after participant enrollment and allocation had been completed. Patients were randomized to receive the following doses of perineural dexmedetomidine: 0.67 µg/kg (D1); 1 µg/kg (D2); and 1.33 µg/kg (D3). We selected these doses because they correspond to 50 µg, 75 µg and 100 µg, respectively, for an average 75 kg-patient and are commonly used for brachial plexus blocks.³⁻⁵ The injectate was prepared by an investigator not otherwise involved in patient care nor patient assessment. Consequently, all the anesthesiologists, surgeons, nursing personnel and patients remained blinded to the dose of dexmedetomidine administered. Furthermore, all primary and secondary outcomes were recorded by blinded investigators.

Measurement of Primary Outcome

Similarly to our two previous trials,^{1,2} we selected the duration of motor block as the main outcome. Motor block duration was defined for patients with complete

sensorimotor blocks at 30 minutes (see below) as the temporal interval between the end of LA injection through the block needle and the return of movement to the hand and fingers.

Measurement of Secondary Outcomes

During the performance of the ICB, an investigator recorded the imaging time (defined as the temporal interval between the contact of the US transducer with the patient and the acquisition of a satisfactory picture) and the needling time (defined as the temporal interval between the skin infiltration and the end of LA injection through the block needle). Performance time was defined as the sum of imaging and needling times.^{1,2} The same investigator recorded the number of needle passes. The initial needle insertion counted as the first pass. Any subsequent needle advancement that was preceded by a retraction of at least 10 mm counted as an additional pass.⁶ The investigator also documented all complications occurring during the performance of the block (e.g., vascular puncture, paresthesia, pneumothorax, LA toxicity).

After the performance of the ICB, assessment of sensorimotor block was performed every 5 minutes (for 30 minutes) in the territories of the musculocutaneous, median, radial, and ulnar nerves. Sensory block was graded according to a 3-point scale using a cold stimulus: 0=no block, 1=analgesia (can feel touch, but not cold), 2=anesthesia (feels neither cold nor touch). Sensory blockade of the musculocutaneous, median, radial and ulnar nerves was assessed on the lateral aspect of the forearm, the volar aspect of the thumb, the lateral aspect of the dorsum of the hand and the volar aspect of the fifth finger, respectively.^{1,2} Motor block was also graded according to a 3-point scale: 0=no block (normal mobility and strength), 1=paresis (can move against gravity, but not against resistance), 2=paralysis (unable to move), using elbow flexion (musculocutaneous nerve), thumb abduction (radial nerve), thumb opposition (median nerve), and thumb adduction (ulnar nerve).^{1,2} A complete block was defined as a minimum composite score of 14 points (out of a maximum of 16 points) provided the sensory score was at least 7 out of 8 points. Thus, the onset time was defined as the time required to achieve a complete block. In turn, total anesthesia-related time was defined as the sum of performance and onset times. Furthermore, the level of procedural pain felt by the patient during the ICB was also recorded using an 11-point scale (0=no pain; 10=worst imaginable pain). Thirty minutes after the performance of ICB, the investigator documented possible side effects related to dexmedetomidine as follows: bradycardia (defined as a heart rate less than 50 beats

per minute), hypotension (defined as a mean arterial pressure less than 60 mm Hg), desaturation (defined as an oxygen saturation less than 90% on room air). The level of sedation was also evaluated using a 6-point Ramsay sedation scale.

During the surgery, an investigator recorded the presence of surgical anesthesia, defined as the ability to proceed with surgery without the need for intravenous narcotics, general anesthesia, rescue blocks or LA infiltration by the surgeon. However, in case of anxiety (as voiced by patients or determined by the treating anesthesiologists), subjects received a propofol infusion (25-75 µg/kg/min) intraoperatively, provided response to verbal stimulus was maintained.^{1,2} In patients with a failed block, the choice of anesthesia management was at the discretion of the anesthesiologist in charge. Depending on the clinical situation, management included an additional isolated nerve block (e.g., ulnar nerve block), administration of additional LA by the surgeon, or conversion to general anesthesia.

Postoperatively, patients were monitored in the Post Anesthesia Care Unit for two hours; all possible side effects related to dexmedetomidine (see above) were documented. Using a data sheet, patients with complete ICBs (i.e., minimum composite score ≥ 14 points at 30 minutes) were asked to record the duration of the sensory block (defined as the temporal interval between the end of LA injection through the block needle and the return of sensation to the hand and fingers), motor block (see above), and analgesia (defined as the temporal interval between the end of LA injection and the appearance of pain at the surgical site).^{1,2}

On postoperative day 2, an investigator collected the data sheet in person (inpatients) or by phone (outpatients). If the patient reported no pain after the block wore off, the investigator did not record an analgesic duration. Similarly, if the sensory or motor block wore off during the patient's sleep, the investigator did not record a sensory or motor block duration.

On postoperative day 7, an investigator contacted study subjects to enquire about persistent sensory (numbness) or motor (weakness) deficits.

Other recorded data

The medical chart was reviewed to collect demographic data (sex, age, weight, height, type of surgery) as well as experience level of the operator who performed the ICB. Independently of their status, operators were considered experts if, prior to the start of the study, they possessed an experience level equal or superior to 60 US-guided ICBs. Otherwise, they were considered trainees.⁷

Sample size calculation

Our experience with combined perineural dexamethasone (2 mg)- perineural dexmedetomidine (50 µg) for US-guided ICB reveals a motor block duration of 21.5 hours (SD = 2.7 hours).¹ The available literature suggests that perineural dexmedetomidine (without dexamethasone) may provide a dose-dependent prolongation in sensorimotor blockade.³⁻⁵ Thus, for the current study, we hypothesized that the D3 group (1.33 µg/kg) would provide a 15%-longer duration of motor block than the D2 group (1 µg/kg), which in turn would result in a 15%-longer motor block than the D1 group (0.67 µg/kg). A calculated sample size of 17 patients per group was required to provide a statistical power of 0.90 and a type I error of 0.05 (one-way ANOVA, GPowerMac version 3.1.9.6). Since block duration can only be calculated for successful blocks and since we anticipated a 90%-success rate with a 35 mL-volume,⁸ 19 subjects needed to be enrolled per group to account for block failure. Furthermore, since the duration of motor block cannot be accurately measured if blocks wear off during the patient's sleep (approximately 20% of cases), a total of 23 patients per group was enrolled to account for potential dropout. Therefore, the total sample size was 69 patients.

Statistical analysis

The statistical analysis was performed with the SPSS statistical software version 28 (IBM, Amonk, New York). For continuous data, the normality was first assessed with the Lilliefors test. Subsequently, the one-way ANOVA test was used to examine normal data and post hoc testing used Fisher's LSD. Data that did not have a normal distribution was analyzed with the Kruskal-Wallis and Dunn post-hoc test. In addition, to examine a possible dose-response relationship, formal tests of trend were utilized. Specifically, a Jonckheere-Terpstra test for trend was applied to non-normally distributed data, and a linear polynomial contrast within a one-way ANOVA was utilized for normally distributed continuous data. Categorical data was analyzed with the Chi square or Fisher's exact test and P values derived from these tests were adjusted using the Bonferroni method for multiple comparisons. While the one-way ANOVA was used to examine the primary outcome (duration of motor blockade), a secondary analysis was undertaken using Kaplan-Meier curves and log-rank tests. All P values presented are two-tailed and those less than 0.05 are considered significant.

RESULTS

The 69 patients were recruited from December 29, 2025 to June 10, 2026 (Fig 1). Demographic data and types of surgery are presented in Table 1.

The D2 and D3 group resulted in longer durations of motor block than the D1 group [18.6 (3.8) vs. 15.8 (3.8) hours; $P = 0.028$; and 18.6 (4.2) vs. 15.8 (3.8) hours; $P = 0.027$, respectively] as per (primary) the omnibus ANOVA/post-hoc test but not as per the (secondary) Kaplan-Meier log-rank test ($P = 0.078$). No other statistical differences were found amongst the three groups in terms of the duration of motor block, sensory block or analgesia (Table 2; Fig 2-4).

There were no intergroup differences in block performance (i.e., imaging/ needling/ performance times; procedural pain; number of needle passes; incidences

of vascular puncture/ pleural puncture/ paresthesia/ LA toxicity) (Table 2). Furthermore, parameters of block success (i.e., proportion of patients with a complete block at 30 minutes; incidence of surgical anesthesia) were also similar for the 3 groups (Table 2; Fig 5). However, both D2 and D3 groups resulted in shorter onset times (15 [15-20] vs. 20 [20-25] minutes; $P = 0.012$; and 15 [15-20] vs. 20 [20-25] minutes; $P = 0.007$, respectively) as well as shorter total anesthesia-related times [22.6 (6.1) vs. 27.3 (5.4) minutes; $P = 0.011$ and 23.4 (5.9) vs. 27.3 (5.4) minutes; $P = 0.033$, respectively) compared with the D1 group. No statistical differences were found between the D2 and D3 groups (Table 2).

For adverse events possibly related to dexmedetomidine, no intergroup differences were found in terms of bradycardia, hypotension, oxygen desaturation or level of sedation

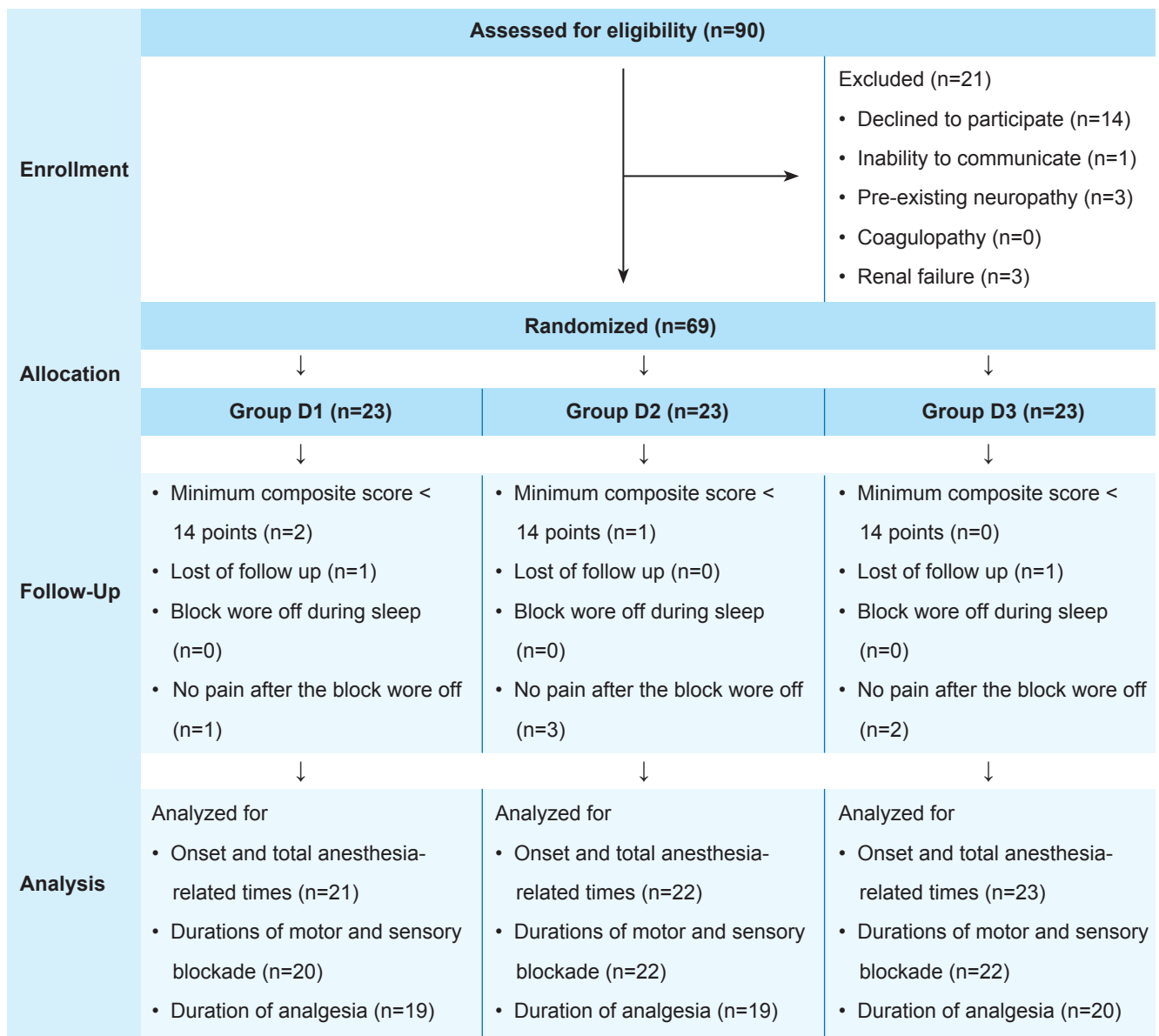


Fig 1. CONSORT diagram of the patient flow through the study.

TABLE 1. Patient characteristics and type of surgery.

	Group D1 (0.67 µg/kg, n=23)	Group D2 (1.0 µg/kg, n=23)	Group D3 (1.33 µg/kg, n=23)
Age in years, mean (SD)	42.3 (16.3)	46.1 (14.2)	49.2 (16.6)
Sex, n (%)			
Male	17 (73.9)	14 (60.9)	14 (60.9)
Female	6 (26.1)	9 (39.1)	9 (39.1)
BMI in kg/m², mean (SD)	25.6 (3.8)	27.6 (4.3)	25.2 (3.9)
ASA physical status, n (%)			
I	7 (30.4)	10 (43.5)	4 (17.4)
II	15 (65.2)	9 (39.1)	15 (65.2)
III	1 (4.3)	4 (17.4)	4 (17.4)
Type of surgery, n (%)			
Hand	21 (91.3)	14 (60.9)	15 (65.2)
Wrist	2 (8.7)	5 (21.7)	5 (21.7)
Forearm	0 (0.0)	4 (17.4)	3 (13.0)

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index.

TABLE 2. Block performance data, onset time, durations of sensorimotor block and postoperative analgesia, and side effects.

	Group D1 (n=23)	Group D2 (n=23)	Group D3 (n=23)	Omnibus testing* P values	Pairwise testing† P values	Test of trend‡ P values
Imaging time in seconds, median [IQR]	55 [26–108]	30 [24–60]	30 [15–58]	0.073		
Needling time in minutes, median [IQR]	4.1 [3.2–4.9]	3.9 [3.1–5.8]	4.6 [4.0–5.5]	0.240		
Performance time in minutes, median [IQR]	5.0 [4.2–6.6]	4.4 [3.9–6.8]	5.5 [4.4–5.9]	0.601		
Onset time in minutes, median [IQR]	20.0 [20.0–25.0] n=21	15.0 [15.0–20.0] n=22	15.0 [15.0–20.0] n=23	0.003	1 vs. 2 p=0.012 1 vs. 3 p=0.007	0.003
Total anesthesia-related time in minutes, mean (SD)	27.3 (5.4) n=21	22.6 (6.1) n=22	23.4 (5.9) n=23	0.025	1 vs. 2 p=0.011 1 vs. 3 p=0.033	0.033
Blocks with a minimum composite score of 14 points, n (%)	21 (91.3)	22 (95.7)	23 (100.0)	0.768		

TABLE 2. Block performance data, onset time, durations of sensorimotor block and postoperative analgesia, and side effects. (Continued)

	Group D1 (n=23)	Group D2 (n=23)	Group D3 (n=23)	Omnibus testing* P values	Pairwise testing† P values	Test of trend‡ P values
Surgical anesthesia, n (%)	23 (100.0)	22 (95.7)	22 (95.7)	>0.999		
Intraoperative sedation requirement, n (%)				0.249		
Propofol sedation	19 (82.6)	20 (87.0)	16 (69.6)			
No additional sedation	4 (17.4)	2 (8.7)	6 (26.1)			
Number of needle passes, median [IQR]	1 [1–2]	1 [1–2]	2 [1–2]	0.145		
Block-related pain (NRS 0–10), median [IQR]	2 [1–4]	2 [0–3]	2 [2–3]	0.590		
Operator's experience level, n (%)				0.922		
Expert	2 (8.7)	2 (8.7)	3 (13.0)			
Trainee	21 (91.3)	21 (91.3)	20 (87.0)			
Duration of motor block in hours, mean (SD)	15.8 (3.8) n=20	18.6 (3.8) n=22	18.6 (4.2) n=22	0.041	1 vs. 2 p=0.028 (-5.22 to -0.31) ^ε 1 vs. 3 p=0.027 (-5.23 to -0.33) ^ε	0.027
Duration of sensory block in hours, mean (SD)	17.7 (3.9) n=20	18.5 (4.7) n=22	19.5 (4.4) n=22	0.435		
Duration of analgesia in hours, mean (SD)	19.3 (5.0) n=19	22.4 (4.6) n=19	20.6 (4.5) n=20	0.138		
PACU Ramsay sedation score, median [IQR]	2 [2–2]	2 [2–2]	2 [2–2]	0.539		
Vascular puncture, n (%)	0 (0)	2 (8.7)	2 (8.7)	0.536		
Paresthesia, n (%)	0 (0)	3 (13.0)	2 (8.7)	0.357		
Pneumothorax, n (%)	0 (0)	0 (0)	0 (0)	>0.999		
LA systemic toxicity, n (%)	0 (0)	0 (0)	0 (0)	>0.999		
Bradycardia, n (%)	1 (4.3)	0 (0)	1 (4.3)	>0.999		
Hypotension, n (%)	3 (13.0)	5 (21.7)	5 (21.7)	0.740		
95% CI	(2.7-33.6)	(7.5-43.7)	(7.5-43.7)			

TABLE 2. Block performance data, onset time, durations of sensorimotor block and postoperative analgesia, and side effects. (Continued)

	Group D1 (n=23)	Group D2 (n=23)	Group D3 (n=23)	Omnibus testing* P values	Pairwise testing† P values	Test of trend‡ P values
Desaturation, n (%)	0 (0)	0 (0)	0 (0)	>0.999		
7-day non-surgical neurological deficit, n (%)	0 (0) n=22	0 (0) n=23	0 (0) n=21	>0.999		

Onset and total anesthesia-related times could only be tabulated for patients displaying a minimum sensorimotor composite score of 14 points. Thus, the exact sample size is listed in each corresponding cell.

Durations of sensorimotor block could only be tabulated for patients displaying a minimum sensorimotor composite score of 14 points, whose blocks did not recede during their sleep. Thus, the exact sample size is listed in each corresponding cell.

Duration of analgesia could only be tabulated for patients displaying a minimum sensorimotor composite score of 14 points who experienced pain when the block receded. Thus, the exact sample size is listed in each corresponding cell.

Residual neurological deficit was assessed at the 7-day follow-up; the number of patients assessed is listed in each corresponding cell.

Ramsay sedation scale: 1, anxious, agitated or restless; 2, cooperative, oriented and tranquil; 3, responsive to commands only; 4, brisk response to a light glabellar tap or loud auditory stimulus; 5, sluggish response to a light glabellar tap or loud auditory stimulus; 6, no response to a light glabellar tap or loud auditory stimulus.

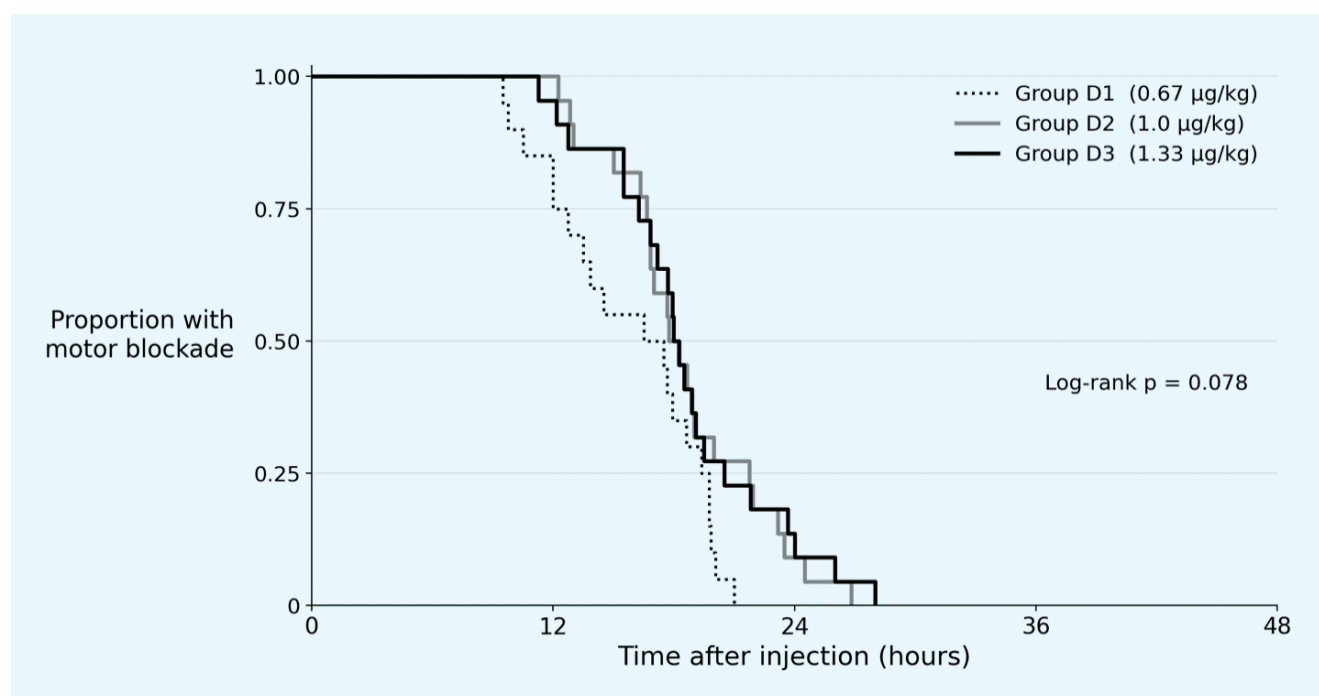
PACU, post-anesthesia care unit.

*One-Way ANOVA or Kruskal-Wallis test

†Dunn's test or Fisher's LSD

‡Linear polynomial contrast within a one-way ANOVA or Jonckheere-Terpstra test for trend

£ 95% confidence interval for the difference of the means

**Fig 2.** Kaplan-Meier survival plot for the duration of motor block. $p = 0.078$ (log-rank test)

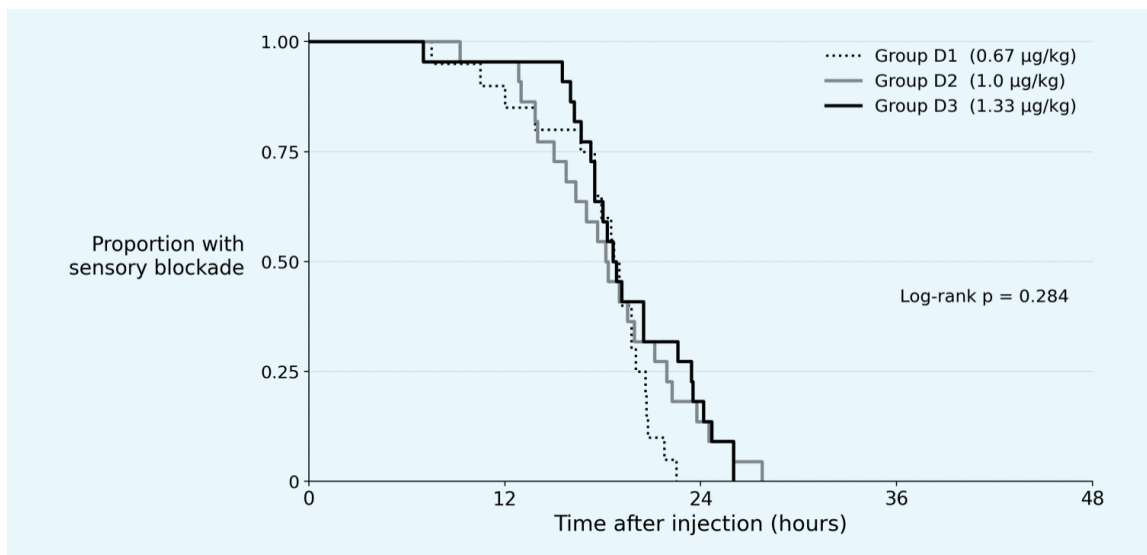


Fig 3. Kaplan-Meier survival plot for the duration of sensory block. $p = 0.284$ (log-rank test)

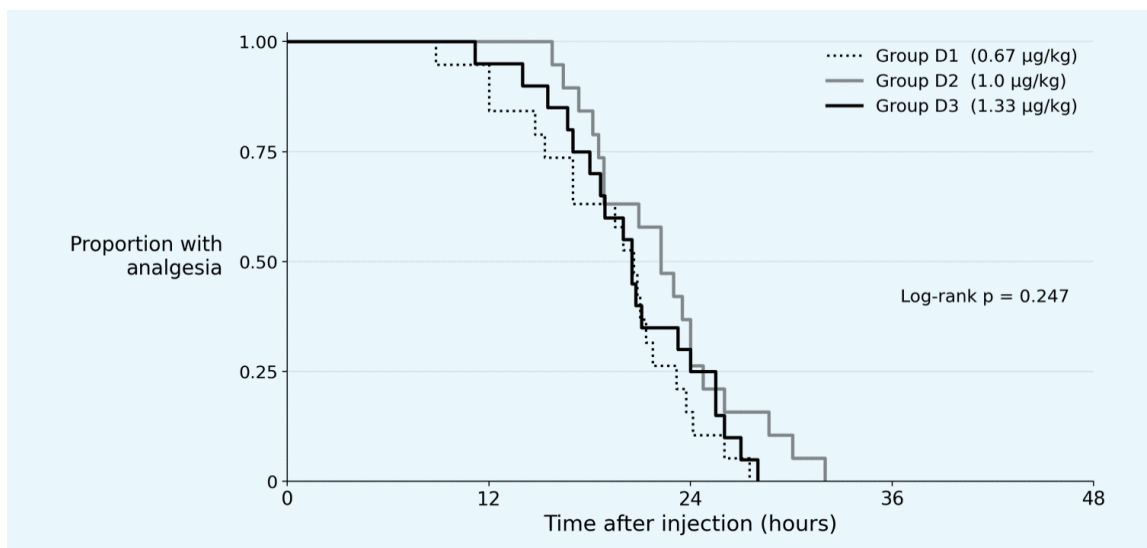


Fig 4. Kaplan-Meier survival plot for the duration of postoperative analgesia. $p = 0.247$ (log-rank test)

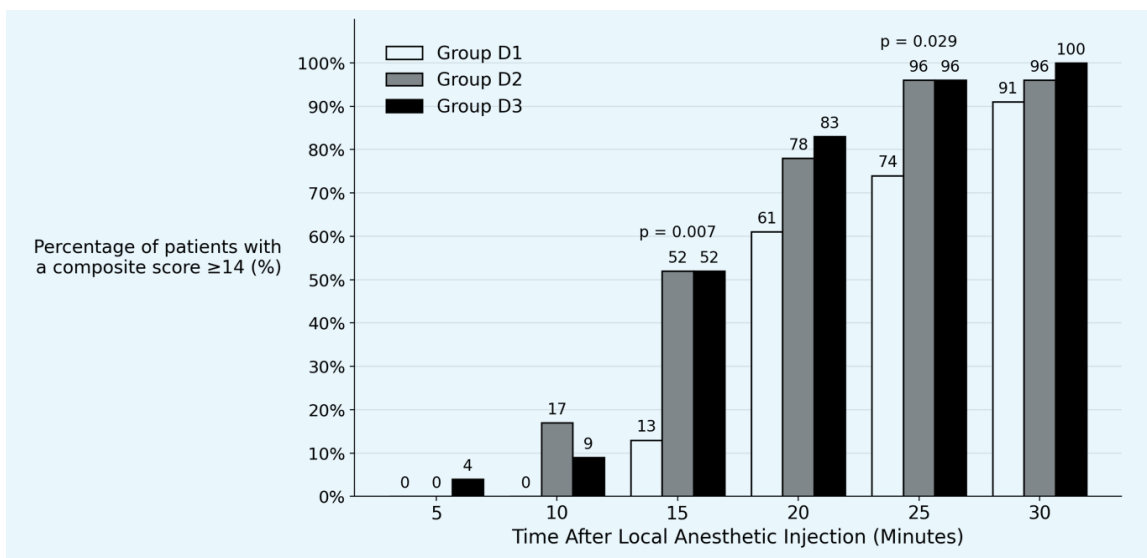


Fig 5. Percentage of patients with a minimum composite score of 14 points according to time, by group (D1, 0.67 µg/kg; D2, 1.0 µg/kg; D3, 1.33 µg/kg). Significant chi-square tests (exploratory analysis, unadjusted p values) for 15 min ($p = 0.007$) and 25 min ($p = 0.029$).

(Table 2). None of the subjects who displayed hypotension were symptomatic. The decrease in blood pressure was easily treated with 5 mg- boluses of intravenous ephedrine (until the mean arterial pressure was above 60 mmHg). No patient reported sensory or motor deficits at 7 days.

DISCUSSION

In this randomized trial, we compared three doses of perineural dexmedetomidine (0.67 µg/kg; 1 µg/kg and 1.33 µg/kg) for US-guided ICB performed with 35 mL of lidocaine 1%- bupivacaine 0.25%- epinephrine 5 µg/mL- dexamethasone 2 mg. We did not find a 15% stepwise increase in motor block duration among the three doses. Consequently, our research hypothesis was not demonstrated. Although the 1 µg/kg and 1.33 µg/kg doses did result in a statistically longer motor block than the 0.67 µg/kg dose as per the omnibus ANOVA/post-hoc test (Table 2), the Kaplan-Meier log-rank test for the same outcome fails to detect a significant difference ($P=0.078$, Fig 2). Thus, the differences in motor block duration (D2-D3 groups vs. D1 group) may not be robust across analytic approaches and should therefore be considered hypothesis-generating. Moreover, our results suggest that 1 µg/kg provides a similar onset to 1.33 µg/kg and a shorter onset time than 0.67 µg/kg. Because onset time constituted a secondary outcome, this finding should be considered exploratory for the time being.

Our choice of primary outcome deserves special mention. Similarly to our two previous trials,^{1,2} we selected motor block duration instead of sensory block or analgesic duration as the primary outcome because we reasoned that it best reflects the perineural action of dexmedetomidine. Analgesic duration inherently depends on the patient's consumption of pain killers and, more importantly, on the level of postoperative pain associated with the surgical procedure. For instance, in a recent trial, Samerchua et al⁹ observed that, in 21% of cases, patients undergoing forearm, wrist or hand surgery experienced no pain after the brachial plexus receded. From a methodological standpoint, the duration of sensory block may be less reliable if confounded by the presence of injury to small cutaneous nerves (e.g., superficial branches of the radial nerve at the level of the anatomical snuff box). In contrast, the duration of motor block remains independent of surgical procedure, analgesics and injury to cutaneous nerves.

The differences in block duration between the D1 group and the intervention group in our previous study¹ require discussion (Table 3). The senior investigators (JA, RJF, DQT) have authored both studies. In both protocols,

the doses of perineural dexmedetomidine (50 µg for the previous trial; and 0.67 µg/kg for patients whose average weight is 77.6 kg, i.e., 52 µg, in the current study) were similar. Furthermore, the LA admixture (35 mL of lidocaine 1%- bupivacaine 0.25%- epinephrine- dexamethasone 2 mg), the ICB technique (single-injection dorsal to the axillary artery), and the research methodology (including the definitions of onset time, complete block, surgical anesthesia, and analgesic/ sensorimotor duration) were also identical. Thus, the different block durations between the D1 group and the intervention group of our previous trial¹ could be explained by the fact that perhaps the absolute magnitude of the “dexmedetomidine effect” is variable. An alternative (untested) explanation stems from a difference in clinical practice. The two studies were conducted in different centers, i.e., Hospital Clínico Universidad de Chile (for the previous study) vs. the Montreal General Hospital (for the current trial). At the Montreal General Hospital, all patients were discharged the same day (vs. 70% for Hospital Clínico Universidad de Chile). Thus, we speculate that the difference between the two sets of results stems from the subjective recall of analgesic/ sensorimotor block resolution, which was perhaps less optimal in the current trial due to the outpatient status of all our study patients, and not from actual block performance. Our hypothesis is supported by the fact that all parameters that were recorded in the hospital (i.e., performance time; proportion of complete block/ surgical anesthesia; onset and total anesthesia-related times) are virtually identical between the two studies (Table 3). Consequently, the shortened onset time associated with the D2 and D3 groups remains reliable findings.

The incidence of hypotension also needs to be highlighted. Although we found no statistical differences amongst the three groups, the D2 and D3 groups both resulted in a 22%-incidence of hypotension, which was higher than one associated with the D1 group (13%). Consequently, we cannot rule out the possibility that the absence of statistical differences may stem from an underpowered sample size to detect said difference rather than a true absence of clinical effect.

Our protocol contains some limitations. First, our findings are specific to a LA admixture consisting of lidocaine 1%- bupivacaine 0.25%- epinephrine 5 µg/mL- dexamethasone 2 mg. Future trials should investigate if they apply to other LA molecules (e.g., bupivacaine 0.5% or ropivacaine 0.5%). Second, our results also depend on the LA volume (35 mL). Future studies are required to determine if they hold true for smaller (or larger) injectates. Third, in our study, trainees performed 87%-91% of the

TABLE 3. Comparison between the current and previous trials for infraclavicular block using 35 mL of lidocaine 1% – bupivacaine 0.25% – epinephrine 5 µg/mL – dexamethasone 2 mg – dexmedetomidine 50–52 µg.

	Current Trial N = 23	Previous Trial (Aliste et al. 2022) N = 25
Performance time (min)	Median [IQR] = 5.0 [4.2–6.6]	Mean (SD) = 5.6 (2.7)
Onset time (min)	Median [IQR] = 20.0 [20.0–25.0]	Mean (SD) = 20.0 (5.8)
Total anesthesia-related time (min)	Median [IQR] = 27.7 [23.8–31.2]	Mean (SD) = 25.4 (6.3)
Complete block, n (%)	21 (91)	23 (92)
Surgical anesthesia, n (%)	23 (100)	23 (92)
Number of passes	1 [1–2]	2 [1–3]
Procedural pain, NRS (0–10)	2 [1–4]	3 [0–7]
Operator's level of experience (expert/trainee)	2 / 21	1 / 24
Duration of motor block (hours)	15.8 (3.8)	21.5 (2.7)
Duration of sensory block (hours)	17.7 (3.9)	21.6 (3.6)
Duration of analgesia (hours)	19.3 (5.0)	25.5 (9.4)

Current trial corresponds to the 0.67 µg/kg dexmedetomidine group. Continuous data are median (IQR) or mean (SD); categorical data are n (%).

Abbreviation: NRS, numerical rating scale

ICBs. Thus, we cannot rule out the possibility that our results might have differed had experienced operators carried out 100% of the blocks. Finally, we only investigated 0.67 µg/kg, 1 µg/kg and 1.33 µg/kg of dexmedetomidine. Consequently, our findings should not be extrapolated to other doses of perineural dexmedetomidine, such as 1.5 µg/kg or 2 µg/kg.¹⁰ Further investigation is required to determine if doses > 1.33 µg/kg provide incremental benefits in terms of decreased onset time or increased block duration.

CONCLUSION

For ICB performed with 35 mL of lidocaine 1%-bupivacaine 0.25%- epinephrine 5 µg/mL- perineural dexamethasone (2 mg), 1 µg/kg and 1.33 µg/kg doses may result in a statistically longer motor block than the 0.67 µg/kg dose. Because this difference may not be robust across analytic approaches, this finding should be considered hypothesis-generating. Similarly, although 1 µg/kg 1.33 µg/kg provide a shorter onset time than 0.67 µg/kg, this finding should be considered exploratory

because onset time constituted a secondary outcome. Consequently, further investigation is required to confirm the increased motor block duration with the 1 µg/kg-1.33 µg/kg doses. Future studies should also examine perineural dexmedetomidine for other LA molecules, injectates, and doses greater than 1.33 µg/kg.

Data Availability Statement

The de-identified datasets supporting the findings of this study are not publicly deposited, as the informed consent obtained does not cover open data sharing. They are available from the corresponding author upon reasonable request and with the approval of the McGill University Health Centre Research Ethics Board. The trial was prospectively registered at ClinicalTrials.gov (NCT07249827; <https://clinicaltrials.gov/study/NCT07249827>).

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Conflict of Interest

The authors declare no competing interest.

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Author Contributions

Conceptualization and methodology, J.A., D.T., and R.J.F.; Validation, J.A., D.T., and R.J.F.; Formal analysis, J.A., D.T., and R.J.F.; Investigation, J.A., D.T., S.P., D.G.D., M.A., A. Alkhoutani, A. Amir, K.R., and J.F.A.; Resources, J.A., D.T., R.J.F., S.P., D.G.D., M.A., A. Alkhoutani, A. Amir, K.R., and J.F.A.; Data curation, J.A., D.T., R.J.F., S.P., D.G.D., M.A., A. Alkhoutani, A. Amir, K.R., and J.F.A.; Writing – original draft, J.A., D.T., R.J.F., S.P., and D.G.D.; Writing – review and editing, J.A., D.T., R.J.F., and S.P.; Visualization, J.A., D.T., and S.P.; Supervision, J.A. and D.T.; Project administration, J.A. and D.T. All authors have read and agreed to the final version of the manuscript.

Use of artificial intelligence

The authors declare that no artificial intelligence was used in this manuscript.

Institutional Review Board Statement

This study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board/Ethics Committee of Research Ethics Board, McGill University Health Center (Approval No. 2025-11084, approved on September 30, 2025).

Key Messages

• **What is already known on this topic** – Infraclavicular block with 35 mL of adrenalized lidocaine 1%- bupivacaine 0.25%- epinephrine 5 µg/mL- perineural dexamethasone (2 mg)- perineural dexmedetomidine results in a long-acting block.

The optimal dose of perineural dexmedetomidine remains unknown.

• **What this study adds** – This randomized trial compared 3 doses of perineural dexmedetomidine (0.67 µg/kg vs. 1 µg/kg vs. 1.33 µg/kg) for infraclavicular block. Our findings suggest that 1 µg/kg may constitute the optimal dose of dexmedetomidine: it results in a similar onset

to 1.33 µg/kg and provides a shorter onset time than 0.67 µg/kg.

How this study might affect research, practice, or policy

–A local anesthetic admixture containing lidocaine 1%- bupivacaine 0.25%- epinephrine 5 µg/mL- dexamethasone (2 mg)- dexmedetomidine (1 µg/kg) provides a useful strategy for infraclavicular blocks.

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