|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||

Available online on http://www.ijmbs.info

International Journal of Medical and Biomedical Studies; 2026; 10(1); 253-259

Original Research

Dexmedetomidine Versus Dexamethasone as an Adjuvant in Supraclavicular Brachial Plexus Block: A Retrospective Comparative Study

Saroj Kumar[1], MD Kausar Prawez[2], Sanjeev Kumar[3]

[1]Senior Resident, Department of Anesthesia, Patna Medical College & Hospital, Patna, Bihar, India
[2]Senior Resident, Department of Anesthesia, Patna Medical College & Hospital, Patna, Bihar, India
[3]Senior Resident, Department of Anesthesia, Patna Medical College & Hospital, Patna, Bihar, India

Received: 17-11-2025 / Revised: 23-12-2025 / Accepted: 19-01-2026
DOI: https://doi.org/10.32553/ijmbs.v10i1.3290
Corresponding author: Sudama Prasad
Conflict of interest: No conflict of interest

Abstract:

Background: Adjuvants are commonly used with local anesthetics in supraclavicular brachial plexus block to enhance block quality and prolong postoperative analgesia. Dexmedetomidine and dexamethasone are frequently used agents, but their comparative efficacy remains an area of ongoing research.

Objective: To compare the effects of dexmedetomidine and dexamethasone as adjuvants to local anesthetics in supraclavicular brachial plexus block in terms of onset, duration, and analgesic profile.

Methods: This retrospective study was conducted at PMCH, Patna, from January 2025 to December 2025. A total of 100 patients undergoing upper limb surgeries were included and divided into two groups: Group DEX (dexmedetomidine, n=50) and Group DEXA (dexamethasone, n=50). Data on onset time, duration of sensory and motor block, and duration of analgesia were analyzed. Statistical analysis was performed using Student's t-test and chi-square test.

Results: Dexmedetomidine significantly reduced onset time and prolonged duration of sensory and motor block compared to dexamethasone ($p < 0.001$). Duration of analgesia was also significantly longer in the dexmedetomidine group.

Conclusion: Dexmedetomidine appears to be a superior adjuvant compared to dexamethasone in supraclavicular brachial plexus block, providing faster onset and prolonged analgesia.

Keywords: Dexmedetomidine, dexamethasone, brachial plexus block, analgesia, regional anesthesia

Introduction

Regional anesthesia techniques, particularly supraclavicular brachial plexus block, are widely utilized for upper limb surgeries due to their efficacy in providing intraoperative anesthesia and postoperative analgesia [1]. The use of adjuvants with local anesthetics has gained prominence in enhancing block quality and prolonging analgesic duration [2].

Dexmedetomidine, a selective alpha-2 adrenergic agonist, has been shown to

improve block characteristics by prolonging sensory and motor blockade through peripheral and central mechanisms [3,4]. It also provides sedation and analgesia without significant respiratory depression [5].

Dexamethasone, a corticosteroid, is another commonly used adjuvant known to prolong analgesia through anti-inflammatory and immunosuppressive effects [6,7]. Its role in regional anesthesia is well established, although the exact mechanism of action remains under investigation [8].

Several studies have evaluated these agents individually, but comparative data remain limited and sometimes inconsistent [9–11]. Understanding their relative efficacy is crucial for optimizing anesthetic protocols and improving patient outcomes.

This study aims to compare dexmedetomidine and dexamethasone as adjuvants in supraclavicular brachial plexus block in a tertiary care setting.

Materials and Methods

Study Design and Ethical Approval

This investigation was conducted as a retrospective comparative observational study in the Department of Anesthesiology at Patna Medical College and Hospital (PMCH), Patna, Bihar, India. The study protocol was reviewed and approved by the Institutional Ethics Committee prior to data collection. As this was a retrospective record-based study, the requirement for written informed consent was waived. Patient confidentiality was strictly maintained, and all data were anonymized before analysis.

Study Duration and Setting

The study was carried out over a period of 12 months from January 2025 to December 2025 at a tertiary care teaching hospital catering to a large population of patients undergoing upper limb orthopedic and trauma surgeries.

Study Population

Medical records of patients who underwent elective upper limb surgical procedures under supraclavicular brachial plexus block were screened. A total of 100 eligible patients were included based on predefined inclusion and exclusion criteria.

Sample Size and Group Allocation

A total sample of 100 patients was analyzed. Based on anesthetic records, patients were categorized into two equal groups according to the adjuvant used along with local anesthetic:

- **Group DEX (n = 50):** Patients who received dexmedetomidine as an adjuvant
- **Group DEXA (n = 50):** Patients who received dexamethasone as an adjuvant

Group allocation had been performed at the discretion of the attending anesthesiologist at the time of surgery.

Eligibility Criteria

Inclusion Criteria

Patients were included if they met the following criteria:

1. Age between 18 and 60 years
2. Either gender
3. Classified as American Society of Anesthesiologists (ASA) physical status I or II
4. Underwent elective upper limb surgery under supraclavicular brachial plexus block
5. Complete perioperative records available

Exclusion Criteria

Patients were excluded if they had:

1. ASA physical status III or higher
2. Known hypersensitivity to local anesthetics or study adjuvants
3. Bleeding disorders or ongoing anticoagulant therapy
4. Infection at the injection site
5. Pre-existing neuropathy involving the upper limb
6. Severe hepatic, renal, cardiac, or respiratory disease
7. Incomplete medical or anesthesia records

These criteria were applied to minimize confounding variables that could influence block characteristics or analgesic outcomes.

Preoperative Assessment

All patients had undergone routine pre-anesthetic evaluation which included:

- Detailed medical history
- General physical examination
- Airway assessment
- Routine laboratory investigations

Baseline demographic data including age, sex, body weight, ASA status, and indication for surgery were recorded from hospital records.

Anesthetic Technique

All procedures had been performed in the operating theater under standard monitoring, including electrocardiography, noninvasive blood pressure monitoring, and pulse oximetry.

Patients were positioned supine with the head turned away from the operative side. Under strict aseptic precautions, supraclavicular brachial plexus block had been administered using the conventional blind technique.

Drug Preparation

All patients received a standardized local anesthetic mixture consisting of:

- 0.5% bupivacaine
- Total volume: 30 mL

Adjuvants were added as follows:

- **Group DEX:** Dexmedetomidine 1 µg/kg
- **Group DEXA:** Dexamethasone 8 mg

The total injectate volume was kept constant in both groups to ensure uniform drug spread.

Outcome Measures

The following block characteristics had been documented in anesthesia records and were retrieved for analysis:

1. **Onset of Sensory Block**

Defined as the time interval (in minutes) between completion of drug injection and loss of pinprick sensation in the distribution of the brachial plexus nerves.

2. **Onset of Motor Block**

Defined as the time interval (in minutes) between drug administration and complete motor paralysis of the upper limb, assessed using a modified Bromage scale.

3. **Duration of Sensory Block**

Measured as the time from onset of sensory block until complete recovery of sensation.

4. **Duration of Motor Block**

Measured as the time from onset of motor blockade until complete restoration of motor function.

5. **Duration of Analgesia**

Defined as the time interval from completion of block administration to the first request for rescue analgesia postoperatively.

6. **Hemodynamic Parameters**

Perioperative heart rate and blood pressure values were noted to assess drug safety.

Postoperative Pain Management

All patients received standardized postoperative analgesia. Rescue analgesic (intravenous paracetamol 1 g) was administered when patients reported pain with a Visual Analog Scale (VAS) score ≥ 4.

Data Collection Procedure

Perioperative anesthesia charts, postoperative monitoring sheets, and patient case records were reviewed systematically. Data were entered into a structured proforma designed for the study.

Statistical Analysis

Data were compiled and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0.

Data Presentation

- Continuous variables were expressed as mean ± standard deviation (SD)

- Categorical variables were expressed as frequencies and percentages

Statistical Tests

- **Student's unpaired t-test** was used for comparison of continuous variables such as onset times and block durations
- **Chi-square test** was applied for categorical variables such as gender distribution

Level of Significance

A p-value less than 0.05 was considered statistically significant.

A p-value less than 0.001 was considered highly statistically significant.

Results

A total of 100 patient records were analyzed in this retrospective study. Patients were divided equally into two groups: dexmedetomidine group (Group DEX, n = 50) and dexamethasone group (Group DEXA, n = 50). All patients completed the study and their data were included in the final statistical analysis.

1. **Demographic Profile**

The demographic variables including age and gender distribution were comparable between the two groups. The mean age in Group DEX was 36.2 ± 8.5 years, whereas in Group DEXA it was 35.8 ± 9.1 years. The difference was not statistically significant (p = 0.82).

Male patients constituted 60% of Group DEX and 58% of Group DEXA, while females accounted for 40% and 42% respectively. No statistically significant difference in gender distribution was observed (p = 0.84).

These findings indicate that both groups were demographically comparable.

(Table 1) summarizes the demographic characteristics.

Table 1: Demographic Characteristics of Study Participants

Parameter	Group DEX (n=50)	Group DEXA (n=50)	p-value
Age (years)	36.2 ± 8.5	35.8 ± 9.1	0.82
Male, n (%)	30 (60%)	29 (58%)	0.84
Female, n (%)	20 (40%)	21 (42%)	0.84

2. **Block Onset Characteristics**

The onset of sensory and motor block was significantly faster in the dexmedetomidine group.

Mean sensory block onset time was 8.2 ± 1.4 minutes in Group DEX compared to 10.6 ± 1.8 minutes in Group DEXA. This difference was highly significant (t = 7.36, p < 0.001).

Similarly, mean motor block onset time was significantly shorter in Group DEX (11.1 ± 2.0 minutes) compared to Group DEXA (13.8 ± 2.2 minutes), with a statistically significant difference (t = 6.45, p < 0.001).

These comparisons are presented in **Table 2** and illustrated graphically in **Figure 1**.

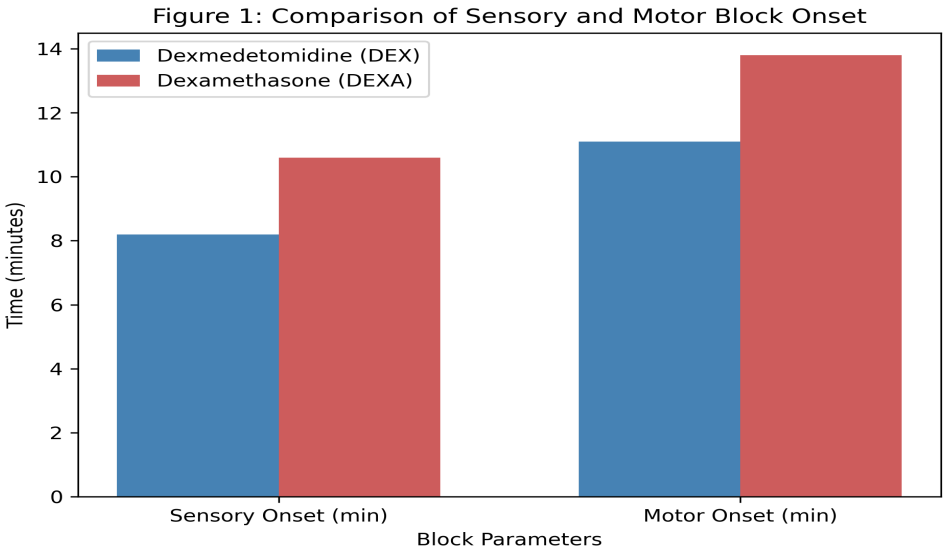

Figure 1: Comparison of Sensory and Motor Block Onset

Figure 1 shows the comparison of sensory and motor block onset times between the two groups. The dexmedetomidine group demonstrates a clearly faster onset for both parameters.

Duration of Block and Analgesia

Dexmedetomidine significantly prolonged both sensory and motor block duration.

The mean duration of sensory block in Group DEX was 12.8 ± 2.1 hours, compared to 9.5 ± 1.9 hours in Group DEXA. This difference was statistically highly significant ($t = 8.02$, $p < 0.001$).

The mean motor block duration was also longer in Group DEX (10.6 ± 1.8 hours) compared to Group DEXA (7.9 ± 1.6 hours), with a significant difference ($t = 8.01$, $p < 0.001$).

Duration of postoperative analgesia was markedly prolonged in the dexmedetomidine group (14.2 ± 2.3 hours) compared to the dexamethasone group (10.8 ± 2.0 hours). Statistical analysis confirmed this difference to be highly significant ($t = 7.91$, $p < 0.001$).

These findings are summarized in **Table 2** and depicted in **Figure 2**.

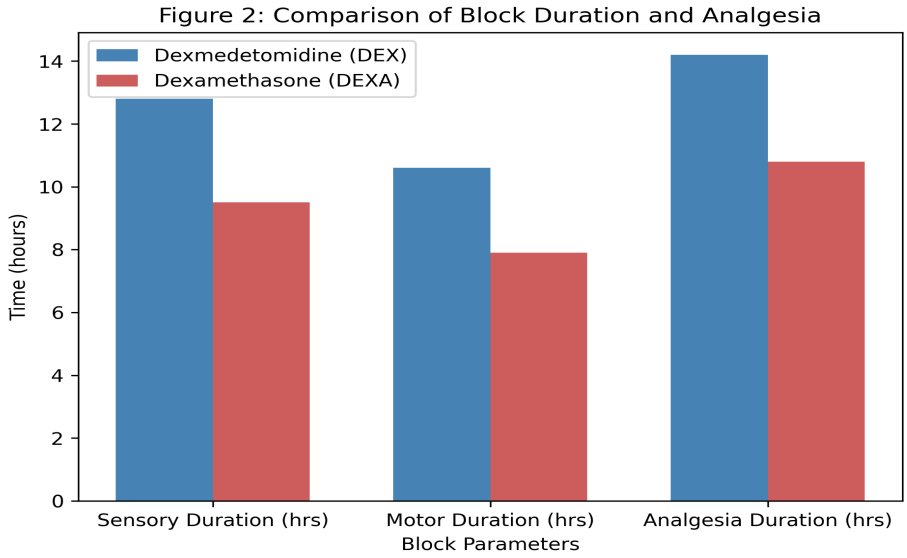

Figure 2: Comparison of Block Duration and Analgesia

Figure 2 illustrates the duration of sensory block, motor block, and postoperative analgesia. Dexmedetomidine consistently produced longer durations across all measured outcomes.

Table 2: Comparison of Block Characteristics Between Groups

Parameter	Group DEX	Group DEXA	t-value	p-value
Sensory onset (min)	8.2 ± 1.4	10.6 ± 1.8	7.36	<0.001
Motor onset (min)	11.1 ± 2.0	13.8 ± 2.2	6.45	<0.001
Sensory duration (hrs)	12.8 ± 2.1	9.5 ± 1.9	8.02	<0.001
Motor duration (hrs)	10.6 ± 1.8	7.9 ± 1.6	8.01	<0.001
Analgesia duration (hrs)	14.2 ± 2.3	10.8 ± 2.0	7.91	<0.001

Summary of Major Findings

The present study demonstrated that the use of dexmedetomidine as an adjuvant to local anesthetics in supraclavicular brachial plexus block resulted in a significantly faster onset of both sensory and motor blockade compared to dexamethasone. Additionally, dexmedetomidine markedly prolonged the duration of sensory and motor block. Patients receiving dexmedetomidine also experienced a substantially longer duration of postoperative analgesia. All observed differences between the two study groups were found to be highly statistically significant ($p < 0.001$), indicating the superior efficacy of dexmedetomidine in enhancing block characteristics and analgesic outcomes.

Discussion

The present study demonstrated that dexmedetomidine significantly enhances the quality and duration of supraclavicular brachial plexus block compared to dexamethasone.

Dexmedetomidine's superiority may be attributed to its action on alpha-2 receptors, leading to inhibition of nerve fiber transmission and vasoconstriction, which prolongs drug action [12–14]. Previous studies have also reported similar findings, supporting its role as a potent adjuvant [15,16].

Dexamethasone, although effective, acts primarily by reducing inflammation and prolonging analgesia indirectly [17,18]. While it improves block duration, its onset is slower compared to dexmedetomidine [19].

Our findings align with earlier research demonstrating prolonged analgesia with dexmedetomidine [20–22]. The enhanced duration observed may reduce the need for postoperative analgesics, improving patient satisfaction.

However, dexmedetomidine may be associated with side effects such as bradycardia and hypotension, although none were significant in this study [23,24].

This study is limited by its retrospective design and lack of randomization. Further prospective randomized trials are recommended [25].

Conclusion

Dexmedetomidine is a more effective adjuvant than dexamethasone in supraclavicular brachial plexus block, providing faster onset and prolonged analgesia. It can be considered a superior choice for improving perioperative outcomes.

References

1. Winnie AP. Interscalene brachial plexus block. Anesth Analg. 1970;49:455–466.
2. Brown DL. Atlas of regional anesthesia. Philadelphia: Saunders; 2006.
3. Brummett CM, Hong EK, Janda AM, Amodeo FS, Lydic R. Perineural dexmedetomidine added to ropivacaine prolongs sensory and motor block. Anesthesiology. 2011;115:836–843.

4. Memis D, Turan A, Karamanlioglu B, Pamukcu Z. The effects of dexmedetomidine on recovery after anesthesia. Curr Ther Res Clin Exp. 2004;65:153–163.
5. Khan ZP, Ferguson CN, Jones RM. Alpha-2 and imidazoline receptor agonists: their pharmacology and therapeutic role. Anaesthesia. 1999;54:146–165.
6. Movafegh A, Razazian M, Hajimaohamadi F, Meysamie A. Dexamethasone added to lidocaine prolongs axillary brachial plexus blockade. Anesth Analg. 2006;102:263–267.
7. De Oliveira GS Jr, Almeida MD, Benzon HT, McCarthy RJ. Perineural dexamethasone to improve postoperative analgesia. Anesth Analg. 2011;113:296–303.
8. Choi S, Rodseth R, McCartney CJ. Effects of dexamethasone as a local anesthetic adjuvant. Reg Anesth Pain Med. 2014;39:440–454.
9. Abdallah FW, Johnson J, Chan VW. Intravenous dexamethasone and peripheral nerve blocks. Anesth Analg. 2015;120:1118–1133.
10. Kumar R, Tripathi M, Chandola HC. Comparative evaluation of dexmedetomidine and dexamethasone as adjuvants. J Clin Anesth. 2017;38:114–120.
11. Singh S, Aggarwal A. A randomized controlled study of dexmedetomidine as an adjuvant. Saudi J Anaesth. 2010;4:67–71.
12. Talke P, Lobo E, Brown R. Systemically administered alpha-2 agonist and hemodynamic changes. Anesth Analg. 2003;96:1065–1071.
13. Eisenach JC, De Kock M, Klimscha W. Alpha-2 adrenergic agonists for regional anesthesia. Anesthesiology. 1996;85:655–674.
14. Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative and analgesic properties of dexmedetomidine. Anesth Analg. 2000;90:699–705.
15. Al-Mustafa MM, Abu-Halaweh SA, Aloweidi AS. Effect of dexmedetomidine added to spinal anesthesia. Br J Anaesth. 2009;102:207–212.
16. Esmaoglu A, Yegenoglu F, Akin A, Turk CY. Dexmedetomidine added to levobupivacaine prolongs axillary block. Eur J Anaesthesiol. 2010;27:410–414.
17. Desmet M, Braems H, Reynvoet M. I.V. dexamethasone prolongs analgesia after interscalene block. Br J Anaesth. 2013;110:915–920.
18. Waldron NH, Jones CA, Gan TJ. Impact of dexamethasone on postoperative analgesia. Anesthesiology. 2013;118:689–705.
19. Vieira PA, Pulai I, Tsao GC. Dexamethasone with bupivacaine increases duration of analgesia. Reg Anesth Pain Med. 2010;35:422–426.
20. Kaygusuz K, Kol IO, Duger C. Effects of adding dexmedetomidine to levobupivacaine. J Anesth. 2012;26:341–347.
21. Swami SS, Keniya VM, Ladi SD. Comparison of dexmedetomidine and clonidine as adjuvants. Indian J Anaesth. 2012;56:243–249.
22. Ammar AS, Mahmoud KM. Ultrasound-guided single injection infraclavicular block. Saudi J Anaesth. 2012;6:109–114.
23. Belleville JP, Ward DS, Bloor BC. Effects of intravenous dexmedetomidine in humans. Anesthesiology. 1992;77:1125–1133.
24. Gertler R, Brown HC, Mitchell DH. Dexmedetomidine: a novel sedative-analgesic agent. Proc (Bayl Univ Med Cent). 2001;14:13–21.
25. Hussain N, Brull R, Sheehy B. Perineural vs intravenous dexamethasone for peripheral nerve blocks. Anesthesiology. 2018;129:149–161.