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Original Article

Anaesthesia Section

Dexmedetomidine versus Dexamethasone as an Adjuvant to 0.5% Ropivacaine in Ultrasound-guided Infraclavicular Brachial Plexus Block: A Randomised Controlled Study

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ABSTRACT

Introduction: Infraclavicular brachial plexus blocks provide effective surgical anaesthesia and postoperative analgesia for upper limb surgeries. The use of adjuvants with local anaesthetics has gained significant attention for enhancing block quality, prolonging the duration of analgesia, and reducing postoperative opioid requirements. Both dexmedetomidine and dexamethasone have emerged as promising adjuvants; however, their comparative efficacy in infraclavicular blocks remains under investigation.

Aim: To compare the efficacy of dexmedetomidine versus dexamethasone as adjuvants to 0.5% ropivacaine in ultrasound-guided infraclavicular brachial plexus block.

Materials and Methods: The present triple-blinded, randomised controlled trial was conducted on 58 American Society of Anesthesiologists (ASA) physical status I-II patients undergoing elective forearm surgery between August 2023 and October 2024 at PBMH, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India. Group I (n=29) received 20 mL of 0.5% ropivacaine with 8 mg dexamethasone, while Group II (n=29) received 20 mL of 0.5% ropivacaine with dexmedetomidine (1 µg/kg). The primary outcome was the duration of sensory block. Secondary outcomes included the onset of sensory and motor block, duration of motor block, time to first analgesic request, total analgesic requirements, haemodynamic parameters, and adverse effects. Data were analysed using unpaired t-tests and Mann-Whitney U tests for continuous variables, and Fisher's exact test for categorical variables. Repeated measures Analysis of Variance (ANOVA) was used for haemodynamic parameters ($p<0.05$ considered significant).

Results: The mean age was 38.83±11.57 years in Group I and 39.97±13.51 years in Group II, with comparable gender distribution (male/female: 15/14 vs. 12/17), Body Mass Index (BMI) (24.35±2.86 vs. 24.12±4.13 kg/m^2), and ASA status. Group II (dexmedetomidine) demonstrated a significantly faster onset of sensory block (7.69±2.09 vs. 9.83±1.98 minutes, $p<0.01$) and motor block (11.24±2.34 vs. 13.21±1.88 minutes, $p<0.01$). The duration of sensory block (792.8±170.8 vs. 610.3±89.38 minutes; $p<0.01$) and motor block (667.8±152.6 vs. 535.9±88.7 minutes; $p<0.01$) was significantly prolonged in the dexmedetomidine group. Time to first analgesic requirement was 883.4±159.5 versus 706.6±100.5 minutes ($p<0.01$), with 24-hour tramadol consumption of 135.69±57.64 versus 189.32±64.05 mg ($p<0.01$) in Groups II and I, respectively. Haemodynamic parameters remained stable in both groups, with no significant differences in adverse effects.

Conclusion: Dexmedetomidine (1 µg/kg) as an adjuvant to 0.5% ropivacaine in infraclavicular brachial plexus blocks provides a faster onset, prolonged duration of analgesia, and reduced postoperative analgesic requirements compared to dexamethasone (8 mg), with a comparable safety profile.

Keywords: Analgesia, Forearm, Pain, Postoperative analgesia, Regional anaesthesia, Ultrasonography

INTRODUCTION

Brachial plexus blocks are cornerstone techniques for the perioperative management of upper limb surgeries, providing effective surgical anaesthesia while contributing to multimodal pain control. These blocks create optimal surgical conditions through muscle relaxation and haemodynamic stability while offering prolonged postoperative analgesia [1].

The infraclavicular approach represents an evolution in brachial plexus block techniques, designed to minimise complications associated with supraclavicular blocks, such as pneumothorax [2]. This technique is particularly effective for forearm, hand, and elbow surgeries, providing comprehensive upper limb anaesthesia. Its advantages include extensive neural coverage, reduced complication rates, and the potential for extended analgesia when combined with appropriate adjuvants. Although technically challenging due to anatomical considerations, ultrasound guidance has significantly enhanced both safety and efficacy [3].

Local anaesthetics alone provide effective intraoperative anaesthesia but often result in limited postoperative analgesia. Ropivacaine has gained popularity in regional anaesthesia due to its favourable cardiotoxicity profile, improved safety margin, and longer-lasting effects compared to other local anaesthetics [3]. However, even with long-acting local anaesthetics, the duration of postoperative analgesia may be insufficient for adequate pain control following major upper limb surgeries. To enhance block quality and duration while reducing postoperative opioid requirements, various adjuvants have been explored, including opioids, alpha-2 agonists, corticosteroids, and other agents [4].

Dexamethasone, a glucocorticoid receptor agonist, enhances local anaesthetic efficacy by modifying ion channel activity and creating a localised acidic environment around nerve cells, thereby facilitating a more effective nerve signal blockade with reduced local anaesthetic requirements [4]. Dexmedetomidine, a selective α_2-adrenergic receptor agonist, has emerged as a valuable adjuvant in regional anaesthesia, offering potent analgesic, sedative, and anxiolytic effects without significant respiratory depression [5,6]. Its action on the central nervous system induces a calm and cooperative state, which is ideal for patients undergoing regional anaesthetic procedures, while potentially minimising postoperative discomfort and enhancing the overall recovery experience [7].

Despite extensive research on both adjuvants individually, specific comparative data remain limited, particularly for infraclavicular brachial plexus blocks. Recent studies by Iyengar SS et al., and Aliste J et al., have compared these adjuvants with varying results. While some studies suggest advantages with dexamethasone in terms of safety profile, absence of haemodynamic effects, and cost-effectiveness, others demonstrate superior analgesic efficacy and longer block duration with dexmedetomidine [8,9]. These variations in dosing regimens, assessment parameters, and conflicting findings highlight the need for standardised comparisons to determine the optimal adjuvant choice for infraclavicular blocks, particularly with regard to balancing efficacy and side effects [8,9].

In the era of ambulatory surgery and enhanced recovery protocols-where rapid discharge and minimal side effects are prioritised-understanding which adjuvant provides the optimal balance of efficacy and safety becomes crucial for clinical decision-making. Additionally, practical considerations such as cost, availability, and institutional protocols may influence adjuvant selection, making evidence-based recommendations essential for standardising clinical practice.

The present study aimed to compare the efficacy of dexmedetomidine versus dexamethasone as adjuvants to 0.5% ropivacaine in ultrasound-guided infraclavicular brachial plexus blocks. The primary objective was to compare the duration of sensory block between the two groups, as this represents the most clinically relevant endpoint for postoperative analgesia. Secondary objectives included evaluating differences in the onset of sensory and motor block, duration of motor block, time to first postoperative analgesic request, total 24-hour postoperative analgesic consumption, haemodynamic changes throughout the perioperative period, and the incidence and severity of adverse effects between the two groups.

MATERIALS AND METHODS

The present triple-blinded, randomised controlled trial was conducted from August 2023 to October 2024 at PBMH, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India. The study received approval from the Institutional Ethics Committee (IEC No: KIIT/KIMS/IEC/1224/2023) and was registered with the Clinical Trials Registry of India (CTRI/2023/08/056080). Written informed consent was obtained from all participants after providing detailed information regarding the study procedures and potential risks.

Sample size calculation: The sample size was calculated based on the study by Yaghoobi S et al., which reported a mean sensory block duration of 208.0±83.0 minutes with dexamethasone and 278.8±81.0 minutes with dexmedetomidine [10]. Assuming a power of 90% and a confidence level of 95%, the sample size was calculated using the following formula:

$n = 2 \times \{(Z_1\alpha/_2 + Z_1\text{-}\beta)^2 \times \sigma^2\} / \delta^2$

Where:

$Z_1\alpha/_2 = 1.96$ (for 95% confidence interval)

$Z_1\text{-}\beta = 1.28$ (for 90% power)

σ = pooled standard deviation ≈ 82 minutes

δ = expected difference in means = 70.8 minutes

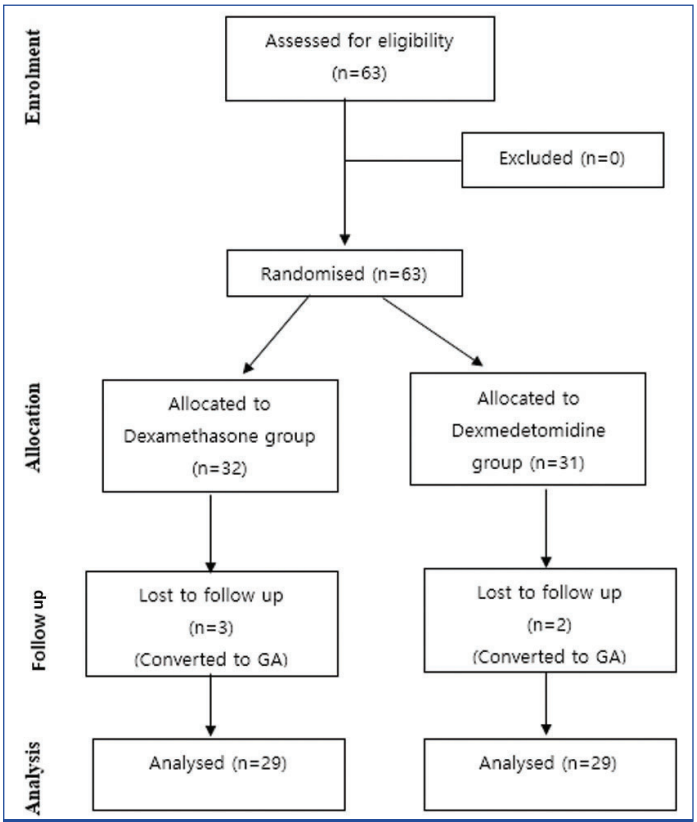
The total sample size came out to be 58 patients, with 29 patients in each group.

Inclusion criteria: Patients were eligible for inclusion if they were aged between 18 and 60 years, had an ASA physical status of I or II, were scheduled for elective forearm surgery, and had a body weight between 50 and 90 kg.

Exclusion criteria: Patients were excluded if they refused to participate or were unable to provide informed consent; had morbid obesity (BMI >40 kg/m^2); were pregnant or lactating; had known allergies to the study medications; had coagulopathies or were receiving anticoagulant therapy; had pre-existing peripheral neuropathy; had infection at the proposed injection site; or had severe cardiac, hepatic, or renal disease.

Study Procedure

A total of 63 patients were screened. Five patients were excluded due to block failure requiring conversion to general anaesthesia and were therefore omitted from the final analysis. The final analysis included 58 patients [Table/Fig-1].



[Table/Fig-1]: CONSORT (Consolidated Standards of Reporting Trials) flow diagram for enrolment, group allocation, follow-up, and analysis.
GA: General anaesthesia

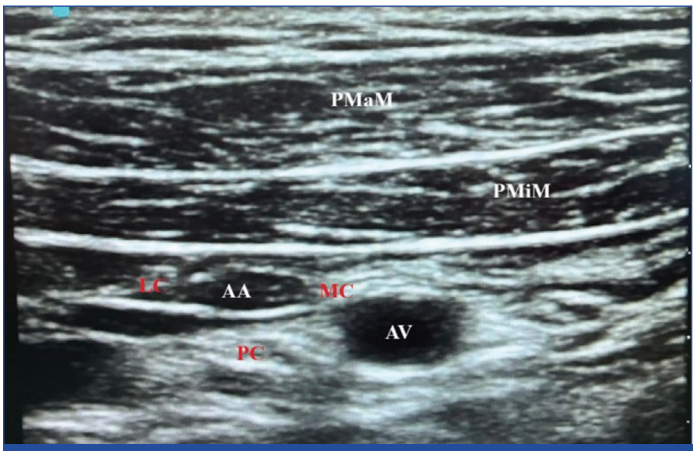
Randomisation and Blinding: A computer-generated randomisation sequence was created by an independent statistician who was not involved in the present study. Allocation concealment was maintained using sequentially numbered, sealed, opaque envelopes. The anaesthesia technician prepared the study medications in identical syringes labelled only with the patient's study number. This was a triple-blinded study in which the anaesthesiologist performing the block, the outcome assessor, and the patients were all blinded to group allocation. The randomisation code was broken only after completion of the statistical analysis.

Intervention Protocol

Pre-procedure preparation: Patients were kept nil per oral for eight hours prior to the procedure. In the block room, intravenous access was established using an 18G cannula. Standard monitoring included Electrocardiography (ECG), pulse oximetry, and non-invasive blood pressure monitoring. Baseline vital parameters were recorded. Patients were educated preoperatively about the Visual Analogue Scale (VAS) for pain assessment (0=no pain, 10=worst imaginable pain).

Block Technique: All blocks were performed by a single anaesthesiologist with more than 13 years of experience in ultrasound-guided regional anaesthesia. Using a SonoSite Edge II ultrasound system (FUJIFILM Sonosite, Inc.) with a 6-13 MHz linear probe, patients were positioned supine with the arm adducted and the head turned 45° to the contralateral side. After skin preparation with chlorhexidine and sterile draping, the skin at the needle entry point was infiltrated with 1 mL of 1% lidocaine. The block was then

performed using a 20-gauge, 100 mm block needle (Stimuplex Ultra 360; B. Braun Melsungen). The ultrasound-guided infraclavicular brachial plexus block technique adopted by Singh N et al., and Elyazed MMA and Mogahed M was followed [Table/Fig-2] [1,3].



[Table/Fig-2]: Sono-anatomy of the Block
AA: Axillary artery; AV: Axillary vein; PMaM: Pectoralis major muscle; PMiM: Pectoralis minor muscle; LC: Lateral cord; MC: Medial cord; PC: Posterior cord

Study medications [1]:

- Group I: 20 mL of 0.5% ropivacaine + dexamethasone 8 mg (2 mL)
- Group II: 20 mL of 0.5% ropivacaine + dexmedetomidine 1 µg/kg (diluted to 2 mL)

A total volume of 22 mL was injected incrementally with intermittent aspiration. While the cited reference used 30 mL of ropivacaine for supraclavicular blocks [1], we employed 20 mL for the infraclavicular approach, which represents standard practice for this technique and ensures adequate spread around the brachial plexus cords while minimising the total local anaesthetic dose. In the present study, Group I (dexamethasone) was regarded as the control group, as dexamethasone is a more established adjuvant with a well-documented safety profile in peripheral nerve blocks .

Outcome

Sensory block assessment: Sensory block was evaluated every two minutes using the pinprick method in the median, radial, ulnar, and musculocutaneous nerve distributions. Onset of sensory block was defined as the time required for complete loss of sensation in all nerve distributions of the forearm and hand following drug administration. The primary outcome was the duration of sensory block, measured from the time of drug administration until complete return of sensation in all nerve distributions [10].

Motor Block Assessment: Motor block was assessed every two minutes using a modified Bromage score:

0=no block (full arm and forearm flexion)

1=partial block (partial arm flexion with full forearm flexion)

2=near-complete block (inability to flex)

3=complete block (inability to flex both arm and forearm)

The onset of motor block was defined as the time from drug administration until achievement of a modified Bromage score of 3. The duration of motor block was measured from the time the score reached 3 until complete recovery to a score of 0 [10].

Postoperative Pain Management: VAS scores were assessed every two hours for up to 24 hours postoperatively. Rescue analgesia with intravenous tramadol at a dose of 1.5 mg/kg was administered when the VAS score was ≥4, with a minimum 12 hours interval between doses.

Other parameters:

- Haemodynamic monitoring: Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), and Mean Arterial Pressure (MAP) were recorded at baseline; at 5, 10, 30, 60, and 90 minutes; and at 6, 12, and 24 hours after block administration.
- Sedation assessment: Sedation was assessed using the Ramsay Sedation Score (1=anxious/agitated to 6=no response).
- Adverse events: Hypotension (SBP <90 mmHg or a >20% decrease from baseline), bradycardia (HR <50 bpm), nausea, vomiting, and complications such as pneumothorax, Local Anaesthetic Systemic Toxicity (LAST), haematoma, and neuropathy were noted and treated as per institutional protocols.
- Block failure was defined as the inability to achieve a modified Bromage score of 3 within 30 minutes, requiring supplemental general anaesthesia, opioids, or rescue blocks.

STATISTICAL ANALYSIS

Data were analysed using Statistica version 6 and GraphPad Prism version 8.4.3. Continuous variables were expressed as mean±standard deviation or median with interquartile range, as appropriate, while categorical variables were presented as percentages. The Mann-Whitney U test and unpaired t-tests were used for continuous variables, and Fisher's exact test was applied for categorical variables. Repeated measures ANOVA was used to evaluate haemodynamic parameters over time. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic characteristics: Both groups were comparable with respect to age, gender distribution, BMI, and ASA physical status, with no statistically significant differences observed [Table/Fig-3].

Parameter	Group I (n=29)	Group II (n=29)	p-value
Age (years)*	38.83±11.57	39.97±13.51	0.80
Gender (Male/Female)†	15/14 (51.72%/48.28%)	12/17 (41.38%/58.62%)	0.43
BMI (kg/m^2)*	24.35±2.86	24.12±4.13	0.97
ASA Status (I/II)†	18/11 (62.07%/37.93%)	22/7 (75.86%/24.14%)	0.40

[Table/Fig-3]: Demographic and baseline characteristics comparing age, gender, body mass index, and ASA physical status between the dexamethasone (Group I) and dexmedetomidine (Group II) groups.
Mann-Whitney U test was applied to compare age and BMI, while Fisher's exact test analysed categorical data such as gender and ASA status; *Data represented as mean±SD; †Data represented as number (percentage); p<0.05 is considered statistically significant; BMI: Body mass index; ASA: American society of anesthesiologists

Block characteristics: Group II demonstrated significantly faster onset times and longer durations of both sensory and motor blocks compared with Group I [Table/Fig-4].

Postoperative analgesia: Group II showed a superior analgesic profile, with fewer rescue analgesic doses (1.48±0.63 vs. 2.07±0.70; p <0.01) and lower cumulative tramadol consumption [Table/Fig-4]. VAS scores at various postoperative time points are shown in [Table/Fig-5].

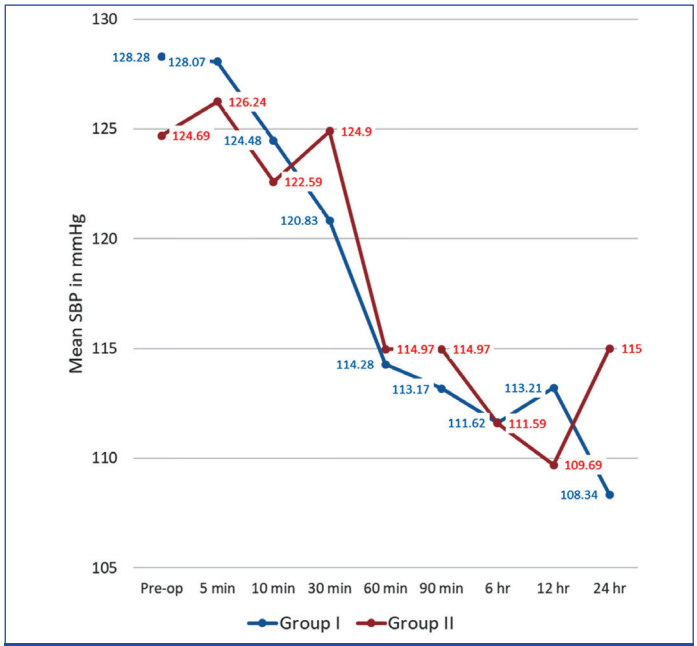
Parameter	Group I (n=29)	Group II (n=29)	p-value
Sensory block onset (min)	9.83±1.98	7.69±2.09	<0.01
Sensory block duration (min)	610.3±89.38	792.8±170.8	<0.01
Motor block onset (min)	13.21±1.88	11.24±2.34	<0.01
Motor block duration (min)	535.9±88.7	667.8±152.6	<0.01
Time to first analgesic (min)	706.6±100.5	883.4±159.5	<0.01
Total tramadol dose in 24 hours (mg)	189.32±64.05	135.69±57.64	<0.01
Number of rescue analgesia doses	2.069±0.7036	1.483±0.6336	<0.01

[Table/Fig-4]: Comparison of block characteristics and analgesia parameters
Unpaired t-test was applied to compare block characteristics; Mann-Whitney U test was applied to compare total Rescue Analgesia Dose, and Unpaired t-test was applied to compare analgesic requirement; Data represented as mean±SD; p<0.05 is considered statistically significant

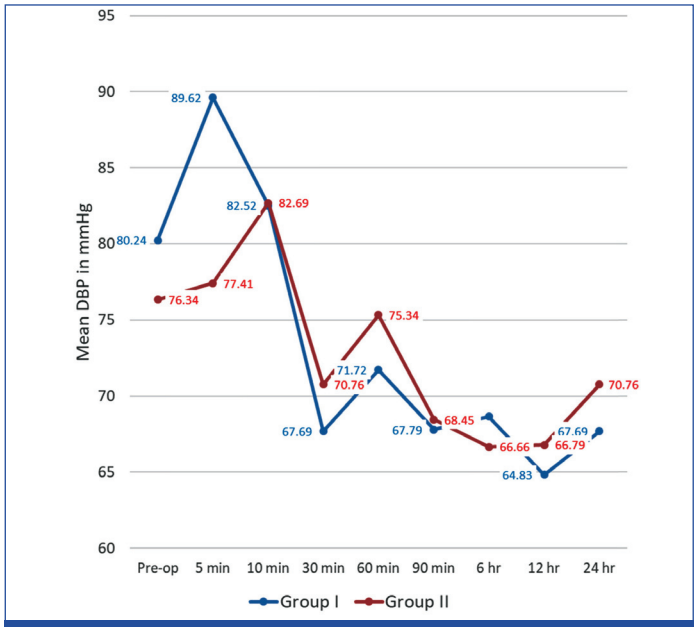
Time (hours)	Group I	Group II	p-value
2-6	0 (0, 0)	0 (0, 0)	0.99
8	0 (0, 1)	0 (0, 0)	0.02
10	2 (0, 2)	0 (0, 1)	0.08
12	1 (0, 2)	0 (0, 1.5)	0.45
14	0 (0, 4)	2 (0, 3)	0.85
16	0 (0, 1)	3 (0, 3)	<0.01
18	1 (0, 2)	1 (0, 4)	0.44
20	2 (1, 3)	0 (0, 1.5)	<0.01
22	4 (2, 4)	1 (0, 3)	<0.01
24	0 (0, 3)	2 (1, 3)	0.08

[Table/Fig-5]: Visual Analogue Scale (VAS) pain scores showing median values with interquartile ranges.
Mann-Whitney U test was applied to compare VAS scores; Data represented as Median (first, third quartile); p<0.05 is considered statistically significant

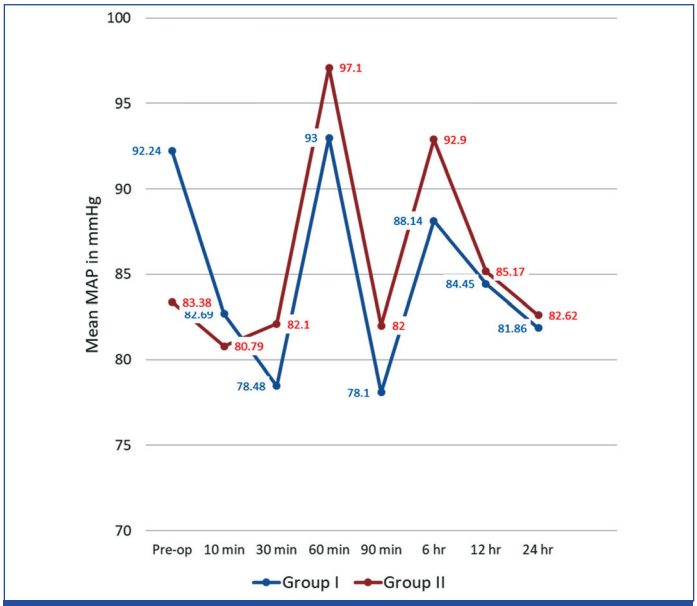
Haemodynamic stability: Both groups maintained comparable haemodynamic stability throughout the present study period. Minor variations in SBP, DBP, MAP, and HR were observed but were not clinically significant [Table/Fig-6-9].



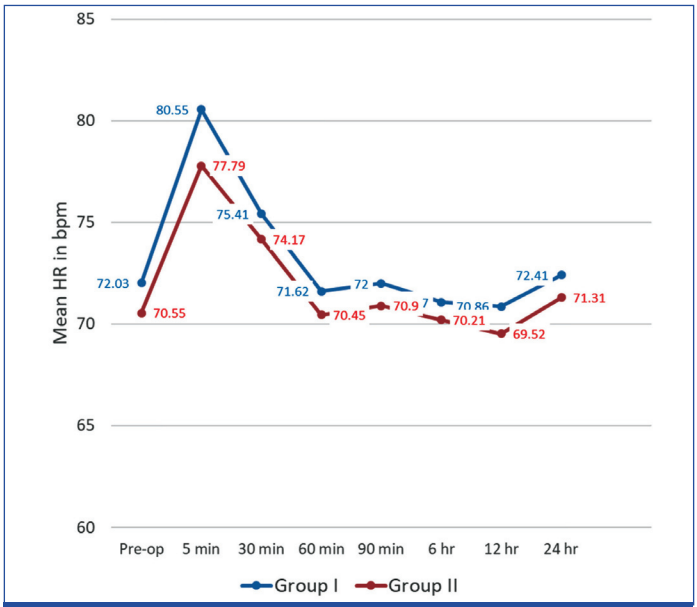
[Table/Fig-6]: Comparison of SBP between the groups.
Repeated measures ANOVA was applied to compare SBP



[Table/Fig-7]: Comparison of diastolic blood pressure (DBP) between the groups.
Repeated measures ANOVA was applied to compare DBP



[Table/Fig-8]: Comparison of mean arterial blood pressure (MAP) between the groups.
Repeated measures ANOVA was applied to compare MAP



[Table/Fig-9]: Comparison of heart rate (HR) between the groups.
Repeated measures ANOVA was applied to compare HR

Adverse effects: Although Group II showed a slightly higher incidence of bradycardia and sedation, the differences were not statistically significant [Table/Fig-10]. One patient in Group I had a sedation score of 3, while two patients in Group II had sedation scores of 3 and 4, respectively. All adverse events were mild and managed conservatively. No cases of pneumothorax, local anaesthetic systemic toxicity, or persistent neurological deficit were observed.

Complication	Group I (n=29)	Group II (n=29)	p-value
Bradycardia	1 (3.44%)	3 (10.34%)	0.6115
Nausea/Vomiting	1 (3.44%)	3 (10.34%)	0.6115
Sedation	1 (3.44%)	2 (6.89%)	0.9999

[Table/Fig-10]: Incidence of adverse effects, including bradycardia, nausea/vomiting, and sedation in both treatment groups.
Fisher's exact test was used to compare the adverse events; Data represented as a number (percentage); p<0.05 is considered statistically significant

DISCUSSION

Block Onset and Duration

The faster onset observed with dexmedetomidine (sensory: 7.69 vs. 9.83 minutes; motor: 11.24 vs. 13.21 minutes) is consistent with

findings from previous studies. Ammar A and Mahmoud KM reported similar results using dexmedetomidine at a dose of 0.75 µg/kg, achieving sensory block onset in 8.2±2.1 minutes compared with 10.5±2.3 minutes in the control group [11]. Iyengar SS et al., reported a sensory onset time of 8.5±1.8 minutes with dexmedetomidine compared with 10.2±2.1 minutes with dexamethasone in infraclavicular brachial plexus blocks [8]. The faster onset is likely attributable to dexmedetomidine's vasoconstrictive properties, which increase the local concentration of the anaesthetic at neural sites and enhance nerve blockade [6].

Regarding block duration, the present study results (sensory: 792.8 vs. 610.3 minutes; motor: 667.8 vs. 535.9 minutes) are consistent with the meta-analysis by Hussain N et al., which analysed 1,092 patients and reported a mean sensory block prolongation of 284 minutes with perineural dexmedetomidine [12]. Aliste J et al., directly compared these adjuvants in infraclavicular blocks and reported a sensory block duration of 820±180 minutes with dexmedetomidine 100 µg versus 650±140 minutes with dexamethasone 4 mg [9]. Ghazaly HF et al., demonstrated dose-dependent effects, with dexmedetomidine 100 µg providing 780±165 minutes of sensory blockade compared with 620±95 minutes with 50 µg [13].

Postoperative Analgesia

The superior analgesic profile of dexmedetomidine was reflected in a prolonged time to first analgesic request (883.4 vs. 706.6 minutes) and reduced 24-hour tramadol consumption (135.7 vs. 189.3 mg). These findings corroborate those of Elyazed MMA and Mogahed M, who reported a time to first analgesic request of 14.2±2.8 hours with dexmedetomidine compared with 11.5±2.1 hours with magnesium sulphate [3]. Singh N et al., observed similar results in supraclavicular blocks, reporting total 24-hour morphine consumption of 4.2±1.8 mg with dexmedetomidine versus 7.6±2.4 mg with dexamethasone [1].

The enhanced analgesic effect of dexmedetomidine likely results from dual mechanisms. Centrally, dexmedetomidine activates α_2-adrenoceptors in the locus coeruleus and spinal cord, thereby modulating pain transmission [14]. Peripherally, it blocks hyperpolarisation-activated cation currents (Ih currents) in C-fibres, as demonstrated by Brummett CM et al., in animal models [15]. Additionally, its vasoconstrictive effect delays local anaesthetic clearance, prolonging neural exposure and block duration [16].

Safety Profile and Adverse Effects

Both adjuvants demonstrated acceptable safety profiles. The slightly higher incidence of bradycardia observed with dexmedetomidine (10.3% vs. 3.4%) is consistent with the systematic review by Vorobeichik L et al., which reported an odds ratio of 3.1 for bradycardia associated with perineural dexmedetomidine [17]. However, all episodes were mild and responded promptly to atropine. Keplinger M et al., similarly reported transient bradycardia in 12% of patients receiving perineural dexmedetomidine, without serious sequelae [18].

The mild sedation observed (Ramsay Sedation Score 2-3) in 6.9% of patients receiving dexmedetomidine likely reflects systemic absorption. Marhofer P et al., demonstrated plasma concentrations of 0.3-0.5 ng/mL following perineural administration, which are sufficient to produce mild sedation but remain below levels associated with respiratory depression [19]. This phenomenon of "cooperative sedation" may be advantageous for anxious patients undergoing regional anaesthesia.

Clinical Implications

The findings of the present study suggest that dexmedetomidine offers significant advantages for procedures requiring prolonged postoperative analgesia. The approximately three-hour extension in analgesic duration and 28% reduction in opioid consumption have important implications for enhanced recovery protocols. Kumar S et al., reported reduced postoperative nausea and improved patient satisfaction scores with dexmedetomidine-enhanced blocks, further supporting its clinical utility [20].

However, dexamethasone continues to be valuable in specific clinical contexts. Its anti-inflammatory properties may benefit patients with inflammatory conditions, and its lack of haemodynamic effects makes it suitable for individuals with bradyarrhythmias. Additionally, cost considerations favour dexamethasone in resource-limited settings, as highlighted by the cost-effectiveness analysis conducted by Pehora C et al., [21].

Limitation(s)

The comparison of a fixed dose of dexamethasone (8 mg) with a weight-based dose of dexmedetomidine (1 µg/kg) may introduce bias; however, both dosing regimens represent standard clinical practice. The 24-hour follow-up period precluded assessment of persistent nerve blockade or rebound pain. Additionally, plasma drug concentrations were not measured, and dose-finding studies were not performed. Future research should focus on optimal dosing strategies, longer-term outcomes-including the development of chronic pain-and the potential benefits of combination adjuvant approaches. Head-to-head comparisons using equipotent doses and patient-centred outcomes would further refine clinical decision-making.

CONCLUSION(S)

The present study demonstrated that dexmedetomidine (1 µg/kg), when used as an adjuvant to 0.5% ropivacaine in ultrasound-guided infraclavicular brachial plexus blocks, provides superior clinical benefits compared with dexamethasone (8 mg). Patients receiving dexmedetomidine exhibited significantly faster onset of both sensory and motor blockade, along with prolonged durations of anaesthesia and postoperative analgesia. Both adjuvants exhibited acceptable safety profiles, with comparable haemodynamic stability and a low incidence of adverse effects. Although dexmedetomidine was associated with a slightly higher incidence of bradycardia and mild sedation, these differences were not statistically significant and were clinically manageable. Based on these findings, dexmedetomidine represents a superior adjuvant choice for procedures requiring prolonged postoperative analgesia and reduced opioid consumption. Nevertheless, dexamethasone remains a viable alternative in specific clinical contexts such as in patients with baseline bradycardia or in resource-limited settings. Ultimately, the choice of adjuvant should be individualised according to patient characteristics, surgical requirements, and institutional protocols.

REFERENCES

[1] Singh N, Gupta S, Kathuria S. Dexmedetomidine vs dexamethasone as an adjuvant to 0.5% ropivacaine in ultrasound-guided supraclavicular brachial plexus block. J Anaesthesiol Clin Pharmacol. 2020;36(2):238-43.
[2] Neal JM, Gerancher JC, Hebl JR, Ilfeld BM, McCartney CJL, Franco CD, et al. Upper extremity regional anesthesia: Essentials of our current understanding, 2008. Reg Anesth Pain Med. 2009;34(2):134-70.
[3] Elyazed MMA, Mogahed M. Comparison of magnesium sulfate and dexmedetomidine as an adjuvant to 0.5% ropivacaine in infraclavicular brachial plexus block. Anesth Essays Res. 2018;12(1):109-15.
[4] Albrecht E, Kern C, Kirkham KR. A systematic review and meta-analysis of perineural dexamethasone for peripheral nerve blocks. Anaesthesia. 2015;70(1):71-83.
[5] Carollo DS, Nossaman BD, Ramadhyani U. Dexmedetomidine: A review of clinical applications. Curr Opin Anaesthesiol. 2008;21(4):457-61.
[6] Abdallah FW, Brull R. Facilitatory effects of perineural dexmedetomidine on neuraxial and peripheral nerve block: A systematic review and meta-analysis. Br J Anaesth. 2013;110(6):915-25.
[7] Liu X, Li Y, Kang L, Wang Q. Recent advances in the clinical value and potential of dexmedetomidine. J Inflamm Res. 2021;14:7507-27.
[8] Iyengar SS, Pangotra A, Abhishek K, Sinha N, Rao NS, Singh VK, et al. The comparison of dexmedetomidine to dexamethasone as adjuvants to bupivacaine in ultrasound-guided infraclavicular brachial plexus block in upper limb surgeries. Cureus. 2023;15(7):e41668.

[9] Aliste J, Layera S, Bravo D, Fernández D, Jara Á, García A, et al. Randomized comparison between perineural dexamethasone and dexmedetomidine for ultrasound-guided infraclavicular block. Reg Anesth Pain Med. 2019;rapm-2019-100680.
[10] 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):766-71.
[11] Ammar A, 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):109-14.
[12] Hussain N, Grzywacz VP, Ferreri CA, Atrey A, Banfield L, Shaparin N, 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):184-96.
[13] Ghazaly HF, Aly AAA, Zaher ZZ, Hassan MM, Mahmoud AA. Comparison of the efficacy of two doses of dexmedetomidine as an adjunct to levobupivacaine in infraclavicular brachial plexus block: Prospective double-blinded randomized controlled trial. BMC Anesthesiol. 2022;22(1):338.
[14] Gertler R, Brown HC, Mitchell DH, Silvius EN. Dexmedetomidine: A novel sedative-analgesic agent. Proc (Bayl Univ Med Cent). 2001;14(1):13-21.
[15] Brummett CM, Hong EK, Janda AM, Amodeo FS, Lydic R. Perineural dexmedetomidine added to Ropivacaine for sciatic nerve block in rats prolongs the duration of analgesia by blocking the hyperpolarization-activated cation current. Anesthesiology. 2011;115(4):836-43.
[16] Masuki S, Dinenno FA, Joyner MJ, Eisenach JH. Selective α_2-adrenergic properties of dexmedetomidine over clonidine in the human forearm. J Appl Physiol (1985). 2005;99(2):587-92.
[17] 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):167-81.
[18] Keplinger M, Marhofer P, Kettner SC, Marhofer D, Kimberger O, Zeitlinger M. A pharmacodynamic evaluation of dexmedetomidine as an additive drug to ropivacaine for peripheral nerve blockade: A randomised, triple-blind, controlled study in volunteers. Eur J Anaesthesiol. 2015;32(11):790-96.
[19] Marhofer P, Brummett CM. Safety and efficiency of dexmedetomidine as adjuvant to local anesthetics. Curr Opin Anaesthesiol. 2016;29(5):632-37.
[20] Kumar S, Palaria U, Sinha AK, Punera DC, Pandey V. Comparative evaluation of ropivacaine and ropivacaine with dexamethasone in supraclavicular brachial plexus block for postoperative analgesia. Anesth Essays Res. 2014;8(2):202-08.
[21] Pehora C, Pearson AM, Kaushal A, Crawford MW, Johnston B. Dexamethasone as an adjuvant to peripheral nerve block. Cochrane Database Syst Rev. 2017;11(11):CD011770.

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