



“A comparative study of dexmedetomidine vs clonidine as an adjuvant to 0.75% inj.ropivacaine in ultrasound guided supraclavicular brachial plexus block for upper limb surgeries”.

Dr. Jayanth Sharma M

Postgraduate Resident, Department of Anaesthesiology
Chhattisgarh Institute of Medical Sciences (CIMS), Bilaspur, India.

Dr. Milton Debbarma

Associate Professor, Department of Anaesthesiology
Chhattisgarh Institute of Medical Sciences (CIMS), Bilaspur, India.

Dr. Surbhi Banjare

Assistant Professor, Department of Anaesthesiology
Chhattisgarh Institute of Medical Sciences (CIMS), Bilaspur, India.

Date of Submission: 08-03-2026

Date of Acceptance: 20-03-2026

Abstract

Background

Supraclavicular brachial plexus block is commonly used for upper limb surgeries as it provides excellent anesthesia and postoperative analgesia. The addition of adjuvants to local anesthetics can improve the quality and duration of analgesia. This study compares dexmedetomidine and clonidine as adjuvants to 0.75% ropivacaine in ultrasound-guided supraclavicular brachial plexus block.

Methods

A prospective randomized comparative study was conducted on 60 patients undergoing elective upper limb surgeries under supraclavicular brachial plexus block. Patients were randomly divided into two groups of 30 each.

Group D: Ropivacaine + Dexmedetomidine

Group C: Ropivacaine + Clonidine

Parameters observed included onset and duration of sensory and motor block, duration of analgesia, rescue analgesia requirement, and complications.

Results

Dexmedetomidine group showed faster onset of sensory and motor block and significantly prolonged duration of analgesia compared to clonidine group. The time to first rescue analgesia was longer in Group D (approximately 10 hours) compared to Group C (approximately 5 hours). Requirement of rescue analgesia within 24 hours was lower in the dexmedetomidine group.

Conclusion

Dexmedetomidine is a superior adjuvant compared to clonidine when added to ropivacaine for supraclavicular brachial plexus block, as it prolongs

analgesia and reduces postoperative analgesic requirement without significant adverse effects.

Keywords: Dexmedetomidine, Clonidine, Ropivacaine, Supraclavicular Brachial Plexus Block, Ultrasound-Guided Regional Anesthesia

I. INTRODUCTION

Peripheral nerve blocks have attained a prominent role in modern anesthesia practice as they provide ideal operative conditions and excellent postoperative analgesia without any sedation or systemic side effects.[1]. Surgical procedures involving upper limb can either be with general anesthesia or regional anesthesia technique[2]. General anesthesia carries risks such as airway manipulation, hemodynamic instability, cognitive dysfunction, and post-operative nausea and vomiting[3]. Conversely, regional anesthesia not only decreases these complications but also offers benefits like superior post-operative pain relief, cost-effectiveness, decreased morbidity and mortality, and lower incidence of serious complications. Additionally, peripheral nerve blocks, a type of regional anesthesia, provide improved immediate postoperative pain control and allow for same-day discharge, facilitating outpatient surgery[3]. Initially, nerve blocks were conducted using the paraesthesia elicitation technique, which relied on landmark-based methods. However, this approach was associated with higher failure rates and an increased risk of nerve and surrounding structure injury[4]. The introduction of ultrasound has brought about significant advancements in brachial plexus blocks. With ultrasound, blocks can now be performed under direct vision, using smaller volumes of local anesthetics,



leading to enhanced safety and success rates. Ultrasonography emerged as a real-time imaging radiological tool, surpassing the paraesthesia and peripheral nerve stimulation techniques in importance. Its application for precise localization of nerve plexuses and vessels has revolutionized the field of regional anesthesia[5,6]. Many local anesthetic drugs have been utilized for brachial plexus blocks, with bupivacaine being the most common, despite its cardio-toxicity disadvantage[7]. In this study, we're employing ropivacaine, which shares similar properties with bupivacaine but exhibits lower lipid solubility and reduced cardio-toxicity. In our study, alpha-2 adrenergic agonists were selected for their sedative, analgesic, anti-hypertensive, and antiemetic properties. While clonidine exhibits partial agonistic activity at alpha-2 receptors[8], dexmedetomidine, more potent alpha-2 receptor agonist, boasts 10 times higher selectivity for alpha-2 receptors compared to clonidine[9].

II. OBJECTIVE:

This study is intended to compare the efficacy of clonidine and dexmedetomidine as an adjuvant to 0.75% Ropivacaine in terms of, onset and duration of sensory and motor block, duration of post operative analgesia in ultrasound guided supraclavicular brachial plexus block for upperlimb surgeries.

III. MATERIALS AND METHODS

This prospective randomized comparative study was conducted in the Department of Anesthesiology at Chhattisgarh Institute of Medical Sciences (CIMS), Bilaspur after obtaining institutional ethical committee approval and written informed consent from patients.

Study Population:

A total of 60 patients aged between 18–60 years belonging to ASA physical status I and II scheduled for elective upper limb surgeries were included in the study.

Exclusion Criteria

Patients with:

- Coagulation disorders
- Infection at injection site
- Allergy to drugs
- Severe cardiopulmonary disease
- Neurological disorders

were excluded from the study.

Group Allocation

Patients were randomly divided into two groups: Group RD (n = 30)

Ropivacaine 0.75% + Dexmedetomidine (1 µg/kg)
Group RC (n = 30)

Ropivacaine 0.75% + Clonidine (1 µg/kg).

- Pre-Anaesthetic check-up(PAC) was done in all the patients who underwent surgery.
- Following PAC advice was confirmed on the day of surgery
 - NPO status was confirmed for 8 hrs.
 - Xylocaine sensitivity test was confirmed.
 - Hydration Status
 - Local anesthetic drugs and USG machine with all necessary equipment and drugs needed for the administration of general anaesthesia and all emergency drugs was kept ready to manage any complications.
 - Base line vitals (HR,NIBP,SpO2) was recorded after connecting standard monitors; Electrocardiogram, SpO2 probe, non invasive blood pressure monitoring was continued intraoperative, i.v.access secured with20G/18G cannula in the opposite upper limb.

Ultrasound machine Alpinion model e-cube i7 with8-12MHZ linear probe was used, adjustment for depth, focus and brightness to give good quality image. Betadine solution used to decrease the air probe interface. Ultrasound transducer was placed firmly over supraclavicular fossa in the coronal oblique plane to obtain best possible view of subclavian artery and brachial plexus. Brachial plexus identified as compact group of nerves located over first rib, lateral and superficial to subclavian artery. The brachial plexus, appearing as hypoechoic oval structures, is observed posterior and superficial to the artery. Before inserting the needle, Color Doppler is used to ensure there are no major vessels in the needle's path. Using in-plane method,local anesthetic 2% lignocaine was injected in skin 1-2 cm from lateral side of probe. Using stimuplex(22G) needle preloaded with 0.75% Ropivacaine with additives in syringe keeping the needle tip and whole needle in vision, the needle was inserted inferior and lateral to subclavian artery to block C8T1, next the needle redirected above the subclavian artery to block C5C6. . To prevent accidental puncture of the brachial plexus, the needle should not initially penetrate deeper than 1 cm. Hydro dissection is employed to confirm proper needle placement and avoid inadvertent nerve puncture. Block achieved by 0.75% Inj. Ropivacaine 28ml with 1mcg/kg of inj. Clonidine diluted in 2ml of NS in RC group or 0.75% Inj. Ropivacaine 28ml with 1 mcg/kg of inj. Dexmedetomidine diluted in 2ml NS in RD group.



During injection, negative aspiration will be performed by every 3-4ml to avoid intravascular injection. A brief massage for one minute was performed for even drug distribution. After the completion of injection the needle was withdrawn completely and antiseptic pressure dressing was applied at the site of puncture.

Sensory block was assessed using pin-prick method and motor block was assessed using modified Bromage scale. Duration of analgesia was

defined as the time from completion of block to first request for rescue analgesia.

IV. OBSERVATIONS AND RESULTS:

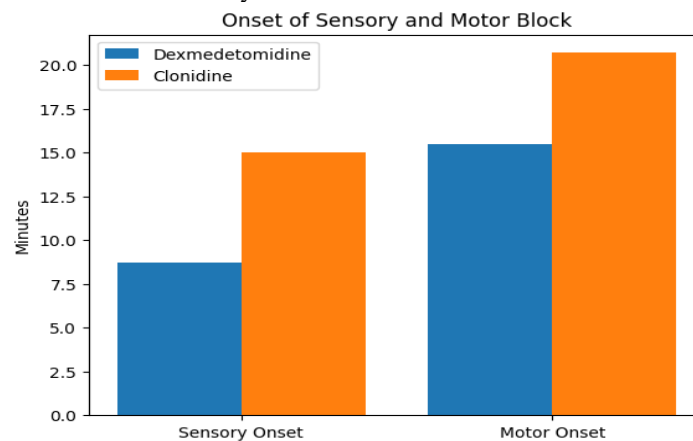
Demographic parameters such as age, sex, ASA grade, weight, height does not had any effect on block onset and analgesia effect.

Hemodynamic variables such as HR, SBP, DBP, SPO2 does not showed any significant difference.

Onset and duration of block and analgesia:

	Group D N=30	Group C N=30	Pvalue
Onset of Sensory Block(in min)	8.7±4.9	15± 6.1	<0.001
Duration of Sensory Block (in min)	495.3± 55.9	292±47.7	<0.001
Onset of Motor block (in min)	15.5±7.6	20.7± 11.2	0.042
Duration of motor block (in min)	483.5± 73.1	243.3± 11.2	<0.001
Duration of Analgesia (in min)	732 ± 152.3	406±46.4	<0.001

Figure 1: Comparison of onset time of sensory and motor block between dexmedetomidine and clonidine group.

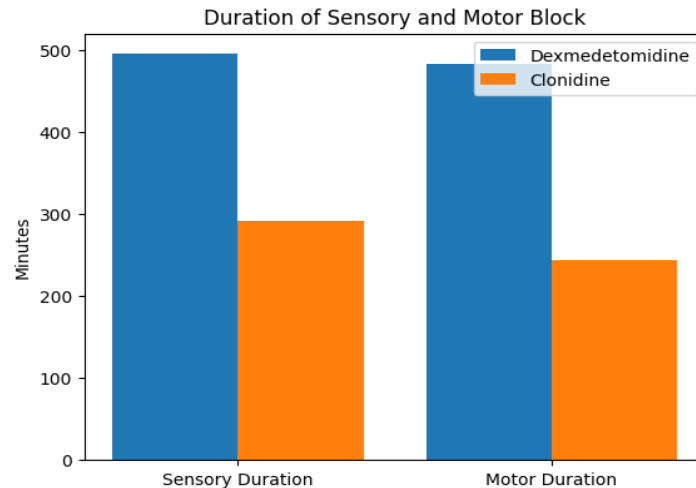


The key findings related to this study are onset and duration of sensory block, motor block, and analgesia, which were the primary outcomes of interest in this study. Comparing the two anesthetic drugs used in Group D and Group C. Notably, Group D demonstrated significantly faster onset times for both sensory block (8.7 ± 4.9 minutes vs

15 ± 6.1minutes, p<0.001) and motor block (15.5 ± 7.6 minutes vs 20.7 ± 11.2minutes, p=0.042) compared to Group C. This rapid onset indicates that the anaesthetic drug employed in Group D was able to establish surgical anaesthesia more quickly, which can be advantageous in facilitating prompt initiation of procedures.

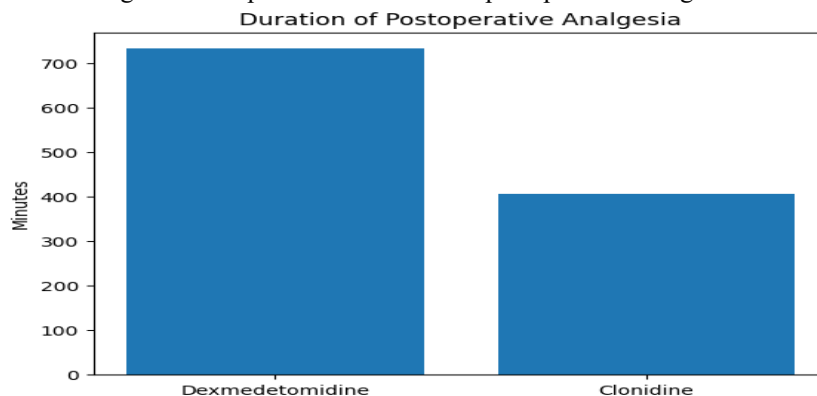


Figure 2: Comparison of duration of sensory and motor block between dexmedetomidine and clonidine groups.



Furthermore, Group D exhibited markedly longer durations of action for sensory block (495.3 ± 55.9 minutes or approximately 8 hours and 15 minutes vs 292.0 ± 47.7 minutes or 4 hours and 52 minutes, $p < 0.001$), motor block (483.5 ± 73.1 minutes or 8 hours and 3 minutes vs 243.3 ± 11.2 minutes or 4 hours and 3 minutes, $p < 0.001$).

Figure3: Comparison of duration of postoperative analgesia



Postoperative analgesia (732.0 ± 152.3 minutes or 12 hours and 12 minutes vs 406.0 ± 46.4 minutes or 6 hours and 46 minutes, $p < 0.001$). The extended durations of sensory and motor blockade provided by the Group D drug indicate prolonged surgical anaesthesia, potentially reducing the need for supplemental rescue analgesia or conversions to general anaesthesia. Crucially, the significantly longer duration of analgesia in Group D translates to superior postoperative pain control, which can enhance patient comfort and facilitate earlier mobilization and recovery.

V. DISCUSSION

The present study compared dexmedetomidine and clonidine as adjuvants to 0.75% ropivacaine in supraclavicular brachial

plexus block with respect to onset and duration of block and duration of analgesia.

In our study, the onset of sensory block was significantly faster in the dexmedetomidine group (8.7 ± 4.9 min) compared to the clonidine group (15 ± 6.1 min). Similar findings were reported by Jinjil K et al[10], who also observed a faster onset with dexmedetomidine (9.7 vs 12.9 min). The slightly earlier onset observed in our study may be due to the higher concentration of ropivacaine (0.75%) used compared to 0.25% in their study.

The onset of motor block was also significantly earlier in the dexmedetomidine group (15.5 ± 7.6 min) compared with the clonidine group (20.7 ± 11.2 min) ($p = 0.042$). These results are consistent with the findings of Kanvee V et al.[11], who reported faster motor block onset with dexmedetomidine (17.28 ± 2.70 min) compared to



clonidine (18.56 ± 2.12 min). The earlier onset in our study may be attributed to the higher concentration of ropivacaine used.

The duration of sensory block was significantly prolonged in the dexmedetomidine group (495.3 ± 55.9 min) compared to the clonidine group (292 ± 47.7 min) ($p < 0.001$). Similar results were reported by Shekhawat K et al[12], who also demonstrated longer sensory block duration with dexmedetomidine.

Likewise, the duration of motor block was significantly longer in the dexmedetomidine group (483.5 ± 73.1 min) compared with the clonidine group (243.3 ± 11.2 min) ($p < 0.001$), which is consistent with the findings of Swami S et al[13].

The duration of analgesia was also significantly prolonged in the dexmedetomidine group (732.0 ± 152.3 min) compared to the clonidine group (406.0 ± 46.4 min) ($p < 0.001$). Similar findings were reported by Sebastian D et al[14], who demonstrated prolonged analgesia with dexmedetomidine.

VI. CONCLUSION:

The faster onset and prolonged duration of sensory block, motor block, and postoperative analgesia in Dexmedetomidine make it a clinically advantageous option over clonidine for surgeries requiring extended anaesthesia and effective postoperative pain relief. The ability to achieve rapid surgical readiness and superior postoperative comfort could contribute to improved patient outcomes, optimized surgical scheduling, and potentially reduced healthcare costs due to decreased reliance on rescue analgesics and shorter hospital stays.

ABBREVIATIONS:

ASA – American Society of Anesthesiologists
DBP – Diastolic Blood Pressure
DOA – Duration of Action
HR – Heart Rate
IV – Intravenous
MAP – Mean Arterial Pressure
PAC – Pre-Anaesthetic Check-up
PNB – Peripheral Nerve Block
SBP – Systolic Blood Pressure
SpO₂ – Peripheral Oxygen Saturation
USG – Ultrasonography
VAS – Visual Analogue Scale

REFERENCES:

- [1]. Khanduri KC. Regional anaesthetic techniques for orthopaedic surgeries. *Med J Armed Forces Indian* 2008;64:109.
- [2]. Neal JM, Gerancher JC, Hebl JR, Ilfeld BM, mcartney CJ, Franco CD, Hogan QH. *Upper extremity regional anesthesia: essentials of our current understanding*, 2008. *Regional Anesthesia & Pain Medicine*. 2009 Feb 1;34(2):134-70.
- [3]. BERGEAT A, SCHAPPI B, BIASCA N, GERBER C. Patient-Controlled Analgesia After Major Shoulder Surgery: Patient-Controlled Interscalene Analgesia vs. Patient-Controlled Analgesia. *Survey of Anesthesiology*. 1998 Dec 1;42(6):354.
- [4]. Carty S Nicholls B ,Ultrasound guided regional anaesthesia,continuing education in anaesthesia,critical care and pain .Feb 2007-1-7(1);20-4.
- [5]. Sites BD, Brull R. Ultrasound guidance in peripheral regional anesthesia: philosophy, evidence-based medicine, and techniques. *Current Opinion in Anesthesiology*. 2006 Dec 1;19(6):630-9.
- [6]. Kapral S, Krafft P, Eibenberger K, Fitzgerald R, Gosch M, Weinstabl C. Ultrasound-guided supraclavicular approach for regional anesthesia of the brachial plexus. *Anesthesia and analgesia*. 1994 Mar 1;78(3):507-13.
- [7]. Stiles P, Prielipp. (springs 2009). *Anesthesia patients safety foundation*.2013:24;(1)
- [8]. Edward G Morgan, Maged S Mikhail, Micheal J Murray. *Peripheral nerve blocks*,4th ed. Chapter 17. In: *Clinical anaesthesiology*, New Delhi: Tata McGraw-Hill; 2009
- [9]. Raimo V, Juha M, Veijo S, Leena N, Virtanen R. Characterisation of selectivity, specificity and potency of dexmedetomidine as α_2 adrenoceptor agonist. *Eur J Pharmacol* 1988;150:9-14.
- [10]. Kavitha Jinjil, Vidhu Bhatnagar, P Swapna, Urvashi Tandon on Comparative evaluation of Alpha two agonists Dexmedetomidine with Clonidine as adjuvants to 0.25% Ropivacaine for Ultrasound Guided Supraclavicular Block . *International Journal of Healthcare and Biomedical Research* ;April 2015-3-3:20-31
- [11]. Vania Kanvee, Kena Patel, Mamta Dosh, Vania Mayur, Gandha Kapil on Comparative Study of Clonidine and Dexmedetomidine as an Adjuvant with Ropivacaine in Supraclavicular Brachial Plexus Block for Upper Limb Surgery . *Journal of Research in Medical and Dental Science* June 2015-3-2:127-130
- [12]. Kamlesh K Shkhawant ,Neena Jain, Amit kumar on comparison of clonidine and



- dexmedetomidine as an adjuvant to 0.375% of Ropivacaine in supra clavicular brachial plexus block. *Journal of medical science and clinical research* April 2018-06-04:1190-1197.
- [13]. Sarita S Swami, Varshali M Keniya, Sushma D Ladi, Ruchika Rao on Comparison of dexmedetomidine and clonidine (α_2 agonist drugs) as an adjuvant to local anaesthesia in supraclavicular brachial plexus block. *Indian Journal of Anaesthesia* ,June 2012-56-3:243-249.
- [14]. Don Sebastian ,Ravi M, Dinesh on comparison of dexmedetomidine and clonidine as adjuvant to Ropivacaine in supra clavicular brachial plexus nerve blocks .*Journal of dental and medical sciences* March 2015-14-03:91-97.