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Original Research Paper

Anaesthesiology

A RANDOMISED COMPARATIVE CLINICAL STUDY OF 0.5% ROPIVACAINE WITH DEXMEDETOMIDINE VERSUS 0.5% ROPIVACAINE WITH DEXAMETHASONE FOR SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK IN PATIENTS UNDERGOING UPPER LIMB ORTHOPAEDIC SURGERIES

Dr. Suyash Garg Post Graduate 3rd year resident, KMMCH.

Dr . Neha Chaudhary Senior resident ARTEMIS HOSPITAL, Gurgaon

ABSTRACT

Aim-To compare the efficacy and safety of 0.5% Ropivacaine in combination with Dexmedetomidine or Dexamethasone for providing anaesthesia and analgesia in patients undergoing upper limb orthopedic surgeries by using the supraclavicular brachial plexus block technique. **Methods**-Prospective, randomized, double-blind study, consisting of 100 patients of ASA grade I and II, of either gender, aged between 18 and 60 years, who underwent upper limb orthopedic surgeries under supraclavicular brachial plexus block. They were randomly allocated into two groups of 50 each. "Group A received 0.5% Ropivacaine (30 ml) with Dexmedetomidine (50 mcg) and Group B received 0.5% Ropivacaine (30 ml) with dexamethasone (8 mg) as adjuvants to local anaesthetics. **Results-** The mean onset time of sensory and motor blockade was shorter in Group A than in Group B ($p<0.03$). The mean duration of sensory and motor blockade and analgesia were significantly longer in Group A than in Group B ($p<0.05$). The hemodynamics parameters were stable in both groups. No major complications were observed in any group. **Conclusion-** The addition of Dexmedetomidine to 0.5% Ropivacaine was better than addition of Dexamethasone to 05% ropivacaine for supraclavicular brachial plexus block improves the quality and duration of the block without any major adverse effects.

KEYWORDS :

INTRODUCTION:-

The brachial plexus block is a widely used regional nerve block technique for perioperative anaesthesia and analgesia in upper limb surgeries. Among the various approaches to the brachial plexus block, the supraclavicular block is known to provide effective surgical anaesthesia and postoperative analgesia for procedures involving the shoulder, arm, and forearm. However, the duration of the block is limited by the pharmacokinetics of the local anaesthetic agent used. Consequently, various additives, such as opioids, clonidine, neostigmine, and midazolam, have been employed to enhance the quality and duration of the block, but their results have been inconclusive or associated with side effects

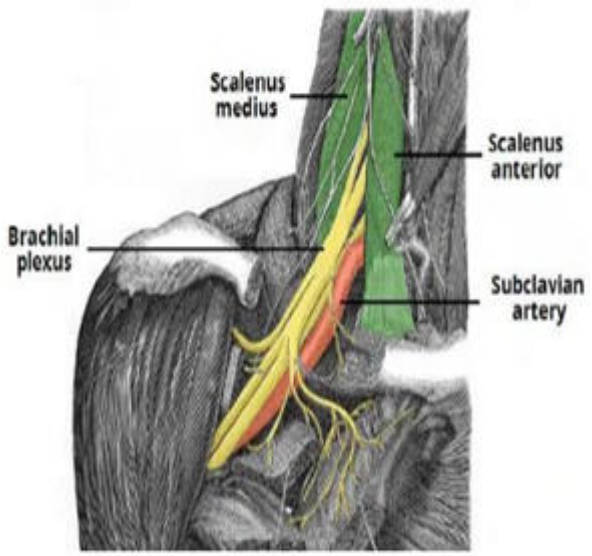
Dexmedetomidine, a highly selective α2-adrenergic receptor agonist, exhibits sedative, analgesic, and anxiolytic properties while simultaneously suppressing sympathetic nervous activity. It maintains stable hemodynamics and has minimal effects on respiration, which makes it a valuable adjuvant in regional anaesthesia. However, its clinical use demands careful dose regulation, as excessive administration may lead to bradycardia, hypotension, or deep sedation.

Studies using 50 mcg of dexmedetomidine with local anaesthetics in brachial plexus blocks have shown varied outcomes regarding the onset of anaesthesia but have consistently demonstrated prolonged analgesia and extended duration of both sensory and motor blockade. The current study focuses on the effect of adding 50 mcg of dexmedetomidine to ropivacaine on the motor and sensory blockage.

Steroids possess strong "anti-inflammatory and analgesic properties. They inhibit inflammation by blocking phospholipase A2. When applied locally, steroids block transmission in C-fibers but not in myelinated A-beta fibers, suggesting a direct membrane action. This effect is reversible. Additionally, corticosteroids suppress ectopic neuronal discharge. The perineural injection of glucocorticoids alongside local anaesthetics has been reported to affect the onset and duration of motor and sensory block.

Studies utilizing "dexamethasone 8mg as an adjuvant to the local anaesthetic mixture in brachial plexus block have shown varying effects on the onset of anaesthesia but consistently prolonged the duration of analgesia and motor block. In this context, the current study aims to evaluate the effect of adding 8 mg dexamethasone to 0.5% ropivacaine in the supraclavicular brachial plexus block on the onset and duration of motor and sensory block.

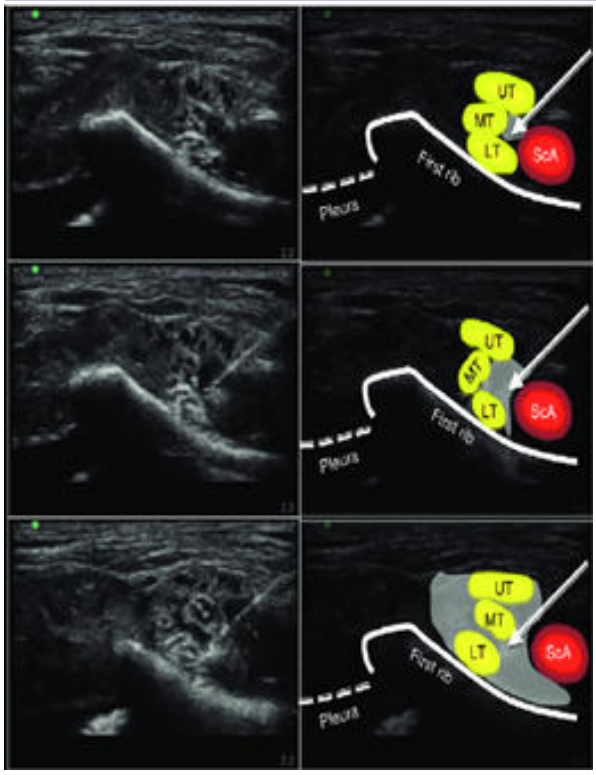
Rationale for the Study Upper limb is orthopaedic surgeries often involve significant postoperative pain, which can hinder recovery and rehabilitation. Effective pain management is crucial for these patients to facilitate early mobilization and improve overall outcomes. While ropivacaine alone provides adequate anaesthesia, the potential benefits of combining it with dexmedetomidine or dexamethasone to enhance and prolong analgesia deserve investigation.



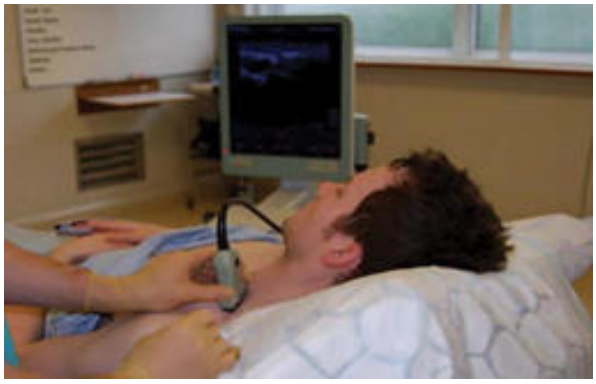
Anatomy of supraclavicular brachial plexus

AIM:

To conduct a randomized comparative clinical trial to evaluate the efficacy of 0.5% ropivacaine with dexmedetomidine versus 0.5% ropivacaine with dexamethasone for supraclavicular brachial plexus block in patients undergoing upper limb orthopedic surgeries. Specifically, the study will compare the onset and duration of sensory and motor block, the quality of postoperative analgesia, the total analgesic consumption, and the incidence of any" adverse effects.



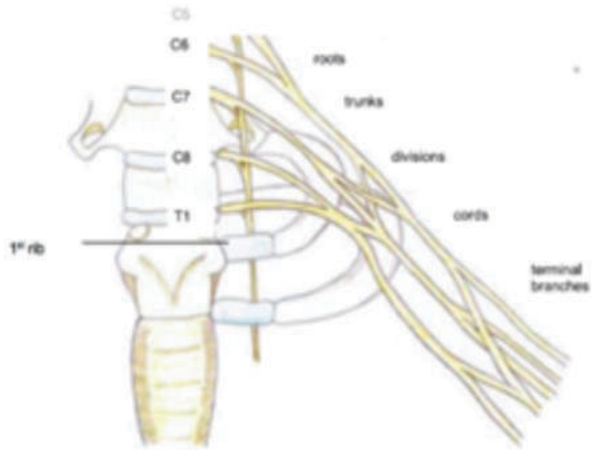
Ultrasound Image Of Supraclavicular Block



Positioning And Location

	Group	N	Mean	SD	Median	'P' value
Age(yrs)	A	50	30.90	10.39	28	0.985
	B	50	30.94	10.43	26	
Height(cm)	A	50	161.44	5.68	163	0.532
	B	50	160.74	5.48	162	
Weight(kg)	A	50	61.24	5.22	62	0.608
	B	50	60.70	5.27	61	
BMI	A	50	23.46	1.00	23.56	0.957
	B	50	23.45	0.84	23.51	

Demographically showing no statistically significant difference between the groups in respect to patients age, height, weight, BMI



Anatomy of the brachial plexus showing the arrangements of the roots, trunks, divisions, cords, and terminal branches

METHODS:-

Source Of Data: Patients meeting the inclusion criteria undergoing upper limb orthopaedic surgeries at K.M. Medical College and Hospital, Mathura, were enrolled in the study after providing written informed consent, from October 2024 to September 2025 (1 year).

Method Of Data Collection:
The study aimed to prospectively include patients undergoing upper limb orthopaedic surgeries in a comparative, randomized, double-blinded study design.

Study Population:
Patients attending PAC clinic of KM medical college and hospital, Mathura meeting the following inclusion and exclusion criteria.

Inclusion Criteria:

1. Age: Patients aged between 18 and 65 years.
2. ASA Classification: Patients classified as American Society of Anaesthesiologists (ASA) physical status I or II.
3. Surgery Type: Patients scheduled for elective upper limb orthopaedic surgeries requiring supraclavicular brachial plexus block.
4. Consent: Patients who have given written informed consent to participate in the study.
5. Cooperation: Patients who are cooperative and able to understand and comply with the study protocol and follow-up procedures.

Exclusion Criteria:

1. Allergy or Hypersensitivity: Known allergy or hypersensitivity to Ropivacaine, Dexamethasone, or any other local anaesthetic agent.
2. Infection: Local infection at the injection site or systemic infection.
3. Coagulopathy: Known bleeding disorders or patients on anticoagulant therapy.
4. Neurological Disorders: Pre-existing neurological deficits or peripheral neuropathy in the affected limb.
5. Respiratory Disorders: Severe respiratory conditions that contraindicate the use of a brachial plexus block.
6. Cardiac Conditions: Uncontrolled or severe cardiovascular diseases.
7. Pregnancy: Pregnant or breastfeeding women.
8. Substance Abuse: History of substance or alcohol abuse.
9. Other Medications: Use of any medication that could interfere with the study drugs or outcomes, such as other corticosteroids or analgesics.
10. Inability to Comply: Patients who are unable to understand the study procedures or comply with follow-up visits.

Patient Positioning: The patient is typically positioned supine with the head turned away from the side to be blocked. The arm is placed by the side, and the shoulder is slightly depressed.

Landmark Identification: Using anatomical landmarks, the anesthesiologist identifies the midpoint of the clavicle and palpates the subclavian artery. This area corresponds to the location of the brachial plexus trunks.

Ultrasound Guidance: The use of ultrasound allows for real-time visualization of the brachial plexus, subclavian artery, and surrounding structures. A high-frequency linear transducer is placed in the supraclavicular fossa to locate the brachial plexus.

Needle Insertion: A needle is inserted in-plane or out-of-plane to the ultrasound transducer, directed towards the brachial plexus. Care is taken to avoid vascular puncture and" pneumothorax.

Injection of Anaesthetic: Once the needle is correctly positioned, a small test dose of local anaesthetic is injected to confirm proper placement. Following this, the full dose of 0.5% ropivacaine, with dexmedetomidine or dexamethasone, is administered incrementally, with frequent aspiration to avoid intravascular injection.

ASSESSMENT OF SENSORY AND MOTOR BLOCKADE

Motor and sensory blockade of the radial, median, musculocutaneous, medial cutaneous nerves of the arm and forearm, and ulnar nerves (C5-T1 dermatomes) were observed every 2 minutes after the injection of local anaesthesia (ropivacaine ± dexmedetomidine/dexamethasone) until 30 minutes had passed, then every 30 minutes after surgery completion for the first 12 hours, and hourly until the block had completely worn off. Sensory blockade for each nerve was assessed using a pinprick test and evaluated on a 3-point scale: 2 = normal sensation, 1 = loss of sensation to pinprick, and 0 = loss of sensation to light touch. Motor block was tested by thumb abduction and wrist extension (radial nerve), thumb adduction and ulnar deviation of the hand (ulnar nerve), elbow flexion in supination (musculocutaneous), "thumb " opposition, and wrist flexion (median nerve), measured on a 3-point scale: 2 = normal movement, 1 = paresis, and 0 = absent movement".

The start time of sensory block was defined as the time between the end of the local anaesthetic injection and the loss of sensation to pinprick in all nerve distributions. The onset time of motor blockade was the time between the end of the local anaesthetic injection and the occurrence of paresis (motor score = 1) in all nerve distributions. The duration of sensory blockade was the interval from the onset of sensory block to the first postoperative pain. The duration of motor block was the time from the onset of motor block to the complete recovery of motor functions. The anesthetist was blinded to the group allocation and drugs used for sensory and motor blockade.

The criteria for a "successful block were assessed by the loss of pinprick sensation" and muscle paresthesia in common peripheral nerves within approximately 30 minutes. "Patients with unsuccessful blocks were excluded from the study" Surgery commenced 30 minutes after achieving a successful block. Each patient was monitored for common complications associated with local anaesthetic or the block technique.

POSTOPERATIVE CARE

They were monitored for complications such as bradycardia, Horner's syndrome, and pneumothorax. The beginning of first postoperative pain and complete recovery of motor response in the forearm and hand were recorded for all patients. Injection diclofenac sodium / Tramadol (rescue analgesic) 75 mg was administered when the Visual Analogue Scale score was ≥30 mm. The number of rescue analgesics administered to each patient during the first 24 hours postoperatively was documented.

No of inj. Diclofenac in first 24 hrs	GroupA		Group B	
	No.	%	No	%
1	46	**92.00**	0	**0.00**
2	4	**8.00**	44	**88.00**
3	0	**0.00**	6	**12.00**

	Group	N	Mean	SD	Median	'p' value*
Onset time of sensory block (min)	A	50	10.14	2.98	10	0.03
	B	50	12.11	3.41	12	
Onset time of motor block (min)	A	50	13.55	4.02	17	0.02
	B	50	17.24	3.84	14	
Duration of surgery (min)	A	50	118.26	17.35	120	0.624
	B	50	120.02	18.40	122	
Duration of sensory block (min)	A	50	754.42	40.22	760	<0.001
	B	50	656.70	54.22	624	
Duration of motor block (min)	A	50	844.20	35.84	845	<0.001
	B	50	702.52	32.14	704	
Time for 1ST rescue analgesic(in hrs)	A	50	17.44	2.41	18	<0.001
	B	50	13.54	1.98	14	

RESULTS

1) The requirement of post-operative rescue analgesic in both the patient groups was compared, in group A (dexmedetomidine group) required less number of diclofenac sodium injection than patients in group B(dexamethasone group) in first 24 hours of postoperative period and the difference is statistically highly significant (p value < 0.001)

2) There is no significant difference between the groups regarding the start of sensory block (p = 0.030). Similarly, there is minor difference between the groups in terms of the onset of motor block (p = 0.02).

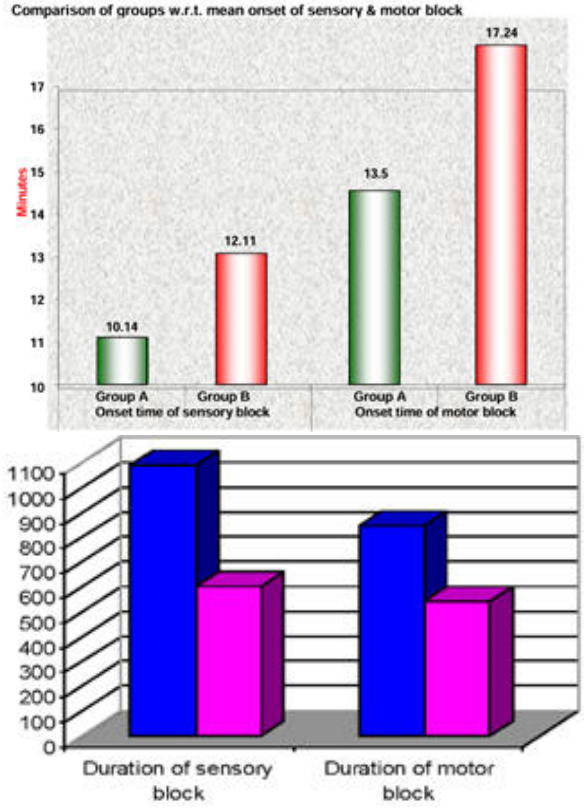
3) However, Group A (dexmedetomidine group) had significantly longer duration of sensory and motor blockade compared to Group B (dexamethasone group). The difference in block durations between Group A and Group B is statistically highly significant (p < 0.001).

4) No incidence of adverse effects like seizure, bradycardia, pneumothorax, hypotension and dysrhythmia was seen in any of the groups

5) No significant difference between the groups in respect to

heart rate, SBP, DBP, SPO2 status was seen.

6) Additionally there is no statistically significant difference between the groups concerning the duration of surgery (Chi-square test; $p > 0.05$).



DISCUSSION

Pain is an inseparable companion of human existence. Although significant advances in perioperative pain management, many patients still suffer from inadequate pain control. "Surgical pain is a universal experience affecting all patients during the perioperative period, causing various harmful effects on both the body and mind. This exacerbates the fear of surgery in patients and their relatives. Therefore, it becomes a moral obligation for physicians, including anaesthesiologists and surgeons, to provide adequate postoperative analgesia to suppress adverse physiological responses to pain and improve the quality of patient care during surgery".

Regional nerve blocks offer "effective surgical anaesthesia and postoperative analgesia. Additionally, they avoid the unwanted effects associated with anaesthetic drugs used during general anaesthesia, laryngoscopy, and tracheal intubation. The supraclavicular brachial plexus block is a popular and widely used technique for anaesthesia and analgesia in upper extremity surgeries. While local anaesthetics alone can provide good operative conditions for the supraclavicular brachial plexus block, they often result in a shorter duration of postoperative analgesia. Adjuvant drugs such as opioids, clonidine, neostigmine, and midazolam, when combined with local anaesthetics in brachial plexus blocks, can produce a quick, dense, and" prolonged block but may be associated with adverse reactions.

"Dexmedetomidine" is a selective alpha 2 – "adrenergic receptor agonist" that has various clinical advantages such as sedation, analgesia, anxiolysis, and sympathetic repression with low respiratory depression and stable hemodynamics. It has a superior safety and side-effect profile compared to other adjuvants. It is especially valuable as a peripheral nerve block, and it improves the block quality and increases "analgesia" with not significant problems.

"Glucocorticoids are potent anti-inflammatory and analgesic agents. When administered perineurally with local anaesthetics, corticosteroids affect the start and duration of sensory and "motor blocks".

In this randomized double-blinded clinical study, we evaluated the effect of 50mcg dexmedetomidine with ropivacaine and 8 mg dexamethasone as an adjuvant to 30 mL of 0.5% ropivacaine in the supraclavicular brachial plexus block. The findings showed that the onset time and duration of sensory and motor blocks improved, and the" requirement for postoperative analgesia (injection diclofenac sodium) was reduced.

In the study Group A (dexmedetomidine group) received a supraclavicular brachial plexus block with 30 mL of 0.5% ropivacaine plus 1.5ml of normal saline+0.5mL of dexmedetomidine (50 mcg), while Group B received a supraclavicular brachial plexus block with 30 mL of 0.5% ropivacaine plus 2 mL of dexamethasone (8mg). The groups were comparable regarding demographic parameters and time of surgery.

CONCLUSION

In our study, we conclude that adding dexmedetomidine to 0.5% ropivacaine is better than dexamethasone to 0.5% ropivacaine in a supraclavicular brachial plexus block prolongs the duration of sensory and motor blockade and reduces the need for rescue analgesics in the postoperative period. Adding dexmedetomidine has a faster onset time of the blockade. Further studies are required to determine the optimal dose of the adjuvant drug for "prolonged block and to understand the exact mechanism" of this effect.

REFERENCES

1. Shrestha BR, Maharjan SK, Shrestha S, Gautam B, Thapa C, Thapa PB et al. Comparative study between tramadol and dexamethasone as an admixture to bupivacaine in supraclavicular brachial plexus block. J Nepal Med Assoc 2007; 46(168):158-64.
2. Golwala MP, Swadia VN, DhimarAA,Sridhar NV. Pain relief by dexamethasone as an adjuvant to local anaesthetics in supraclavicular brachial plexus block. J Anaesth Clin Pharmacol 2009; 25(3):285- 8.
3. Johansson A, Hao J, Sjölund B. Local corticosteroid application blocks transmission in normal nociceptive C-fibres. Acta Anaesthesiol Scand 1990; 34:335–8.
4. Devor MD, Gorvin-Lippmann R, Raber P. Corticosteroids suppress ectopic neural discharge originating in experimental neuromas. Pain 1985; 22:127–37.
5. Castillo J, Curley J, Hotz J, Uezono M, Tigner J, Chasin M, et al. Glucocorticoids prolong rat sciatic nerve blockade in vivo from bupivacaine microspheres. Anesthesiology 1996; 85:1157–66
6. Shrestha BR, Maharjan SK, Tabedar S.Supraclavicular brachial plexus block with and without dexamethasone - A comparative study. Kathmandu University Medical Journal 2003; 1:158- 60.
7. Stan T, Goodman EJ, Bravo-Fernandez C, Holbrook CR. Adding methylprednisolone to local anesthetic increases the duration of axillary block.RegAnesth Pain Med 2004; 29(4):3801.
8. Yadav RK, Sah BP, Kumar P, Singh SN. Effectiveness of addition of neostigmine or dexamethasone to local anaesthetic in providing perioperative analgesia for brachial plexus block: A prospective, randomized, double blinded, controlled study. Kathmandu University Medical Journal 2008; 6(23):302-9.