International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

# A Comparative Study on the Efficacy between 0.75% Ropivacaine with Dexmedetomidine and Dexamethasone as Adjuvants for Ultrasound-Guided Supraclavicular Brachial Plexus Block in Upper Limb Surgeries

**Dr. Vamsi Krishna Mamidala [1], Dr Anjani Davaluri[2], Dr. Vijaya Lakshmi Gattu[3]**

[1]Final Year Anaesthesiology PG, GSL Medical College & General Hospital, Rajahmundry, Andhra Pradesh, India

[2]MD Anaesthesiology

[3]MD Anaesthesiology, Professor and HOD, Department of Anaesthesiology, GSL Medical College, Rajahmundry, Andhra Pradesh, India

**Abstract:** ***A randomized controlled study was done among 90 patients who underwent upper limb surgeries under department of anesthesiology during the study period of October 2019 to August 2021 in GSL medical college and hospital, satisfying inclusion and exclusion criteria. All the patients were randomly allocated into following groups after obtaining their consent. Group A-Patients received (20ml 0.75% ropivacaine diluted to 30ml + 0.5ml [50mcg] Dexmedetomidine plus 1.5ml of N/S) perineurally in the Brachial Plexus using supraclavicular approach. Group B-Patients received (20ml of 0.75% ropivacaine diluted to 30ml+ 8mg (2ml) Dexamethasone) perineurally with same approach. Group C - Patients received 20ml of 0.75% ropivacaine diluted to 30 ml+2ml of N/S. It was interpreted that Dexmedetomidine provided superior to dexamethasone, but both adjuvants are superior.***

**Keywords:** Ropivacaine Dexmedetomidine Dexamethasone Ultrasound Guided Supra Clavicular Brachial Plexus Block

## 1. Introduction

The advent of peripheral nerve block has taken patient care in anesthesia to a whole new level. Because of the emergence of nerve stimulator and peripheral nerve block techniques, even patients with ASA grade 3 and 4 can be taken up for surgery safely. Moreover, with the use of adjuvants in brachial plexus block (B. P. B. ), one can extend patient care in the form of extended postoperative analgesia, and also ensure compliance of patient with physiotherapy and early mobilization of patient with stable hemodynamic variables.

Adjuvants or additives are often used with local anesthetics for its synergistic effect by prolonging the duration of sensory and motor block and limiting the cumulative dose requirements of local anesthetics [1]. Ropivacaine is preferred as it is lesser lipophilic than bupivacaine and has less cardiovascular and central nervous system toxicity[2].

Local adjuvants act by several mechanisms. They may cause local vasoconstriction, or they may have direct effects on peripheral nerves[3].

Dexmedetomidine is a highly selective α-2 adrenergic agonist with an affinity of 8 times greater than clonidine.6

Dexamethasone prolongs the duration of analgesia significantly, and the magnitude of effect differs with different local anesthetics. [4]

Steroids have potent anti-inflammatory as well as analgesic property. Perineurally injected steroids are reported to influence postoperative analgesia.5

**Aim**

To evaluate the effect of addition of perineural Dexmedetomidine and Dexamethasone on characteristics of ultrasound-guided supraclavicular brachial plexus block performed using 0.75% ropivacaine.

## 2. Review of Literature

1) Vinoj KV et al. conducted a study to compare the efficacy of ropivacaine with Dexamethasone and Dexmedetomidine in interscalene brachial plexus block in two groups each consisting of 20 sample size and concluded that Dexmedetomidine provides more duration of sensory block with reduced onset time.
2) Niranjan Kumar Verma et al. conducted a study to compare Dexmedetomidine, and Dexamethasone added to ropivacaine concerning the onset, duration of sensory and motor block, and duration of analgesia in 100 patients and concluded that both of them prolong duration of block and postoperative analgesia, but Dexmedetomidine has earlier onset and more extended period
3) S Choy et al. conducted a study on the effect of Dexamethasone as adjuvant for local anesthetic and concluded that perineural administration of Dexamethasone with local anesthetic prolongs the brachial block effect with no adverse effects.

4) KC Cummings et al. conducted a study to evaluate the analgesic effect of Dexamethasone on the duration of interscalene nerve block with ropivacaine or bupivacaine and concluded that Dexamethasone prolongs analgesia from interscalene block using ropivacaine and bupivacaine with the impact being stronger with ropivacaine.

## 3. Material and Methodology

**Study Setting:** The proposed study will be conducted in the department of Anaesthesiology G. S. L. Medical college.

**Study Design:** Prospective study.

**Study Period:** From October 2020 to August 2022.

**Study Population:** After getting clearance from ethical committee, convenience sample of 90 Patients posted for elective surgery in orthopedic department of GSL MEDICAL COLLEGE & HOSPITAL who are satisfying inclusion and exclusion criteria will be taken into study.

**Inclusion Criteria**

1) Age: 18 - 60 years
2) American society of anesthesiologists (A. S. A. ) physical status-I-II
3) Elbow, forearm and hand surgeries

**Exclusion Criteria**

1) Patient refusal.
2) Bleeding disorders.
3) Previous injury to brachial plexus.
4) History of known allergy to trial drugs.
5) Local infection.
6) Pregnancy.
7) History of Psychological disorders.
8) Chronic use of pain medications.
9) History of intolerance to opiates.

**Statistical Analysis**

All statistical analysis will be performed by S. P. S. S. software version 20.0 and Microsoft office 2013. Descriptive data will be presented in form mean +/-standard deviation and percentages. Student-t-test will be performed to compare the means of different continuous variables. ANOVA will be done to compare the means of various continuous variables. For all statistical analysis, $p<0.05$will be considered as statistically significant

**Sampling Technique**

Arterial blood for measurement of pH and $PaCO_2$. First sample was taken pre operatively [T1], second sample was taken at 15min after opening the peritoneum [or] pneumoperitoneum [T2], Third sample after 40min [T3] and the fourth sample was collected at 60 min [T4], fifth sample collected 30min after surgery. The ABG sample was analysed.

## Methodology

Patients will be randomly allocated to one of the three groups.

- Group A-Patients receiving (20ml 0.75% ropivacaine diluted to 30ml + 0.5ml [50mcg] Dexmedetomidine plus 1.5ml of N/S) perineurally in the Brachial Plexus using supraclavicular approach
- Group B-Patients receiving (20ml of 0.75% ropivacaine diluted to 30ml+ 8mg (2ml) Dexamethasone) perineurally with same approach.
- Group C - Patients receiving 20ml of 0.75% ropivacaine diluted to 30 ml+2ml of N/S.

## 4. Procedure

On arrival in the premedication room, baseline heart rate, blood pressure, and oxygen saturation will be recorded. Intravenous access will be secured in the unaffected limb, and Ringer's lactate / Normal saline infusion will be started.

Supraclavicular brachial plexus block will be performed under aseptic precautions with the patient lying supine and head turned 45degrees to contralateral side. The brachial plexus and its relationship to surrounding structures will be imaged using ultrasound probe. The probe will be placed in coronal oblique plane in supraclavicular fossa to visualize the subclavian artery and brachial plexus in the transverse section view. Brachial plexus will be approached with a 22G needle using in-plane method. Once the needle reaches the brachial plexus cluster, pre-decided study medication, as mentioned above, will be injected incrementally following negative aspiration. Spread of study medication at the time of injection will be observed in real-time. Needle will be repositioned to ensure that the drug reaches all the imaged parts of the plexus. The onset and duration of sensory and motor blockade will be studied. Neural blockade will be assessed using a cold swab sensation every 5 minutes till the start of loss of Sensation then monitored till the regain of Sensation in the median, ulnar, radial, and musculocutaneous nerve territories. The motor blockade will be assessed every 5 minutes till the attainment of surgical anaesthesia as defined below. Contralateral upper limb will be used as control.

Block success is defined as attainment of surgical anaesthesia-a motor score of 2 or higher according to modified Bromage scale for upper limb, with absent appreciation of pinprick sensation. Block failure is defined as the absence of surgical anaesthesia at 30 min in one or more of the four nerve territories. In the postoperative period, the Observer will note the VAS score initially after the block and also the time for the first request for analgesia and the corresponding VAS score will be noted. Patients will be provided rescue analgesia as inj. paracetamol 1000 mg i. v. bolus as a first rescue analgesia.

Pain intensity (on movement and rest) will be assessed by visual analog scale.

Motor Block Assessment

| Score | Criteria |
|---|---|
| 0 | No Block-Total Arm plus Forearm Flexion |
| 1 | Partial Block-Total Forearm and Partial Arm Flexion |
| 2 | Almost Complete Block - inability to Flex the Arm and decreased ability to flex the Forearm |
| 3 | Total Block-Inability to flex both the Arm and Forearm |

Sensory Block Assessment

| Score | Criteria |
|---|---|
| 0 | Appreciates Sharp Pain |
| 1 | Appreciates touch Sensation Only |
| 2 | Does not Appreciate even touch Sensation |

Sedation will be assessed using the sedation score described by Ramsay et al.

1) Patient is anxious and agitated or restless, or both
2) Patient is co-operative, oriented, and tranquil
3) Patient responds to commands only
4) Patient exhibits brisk response to light glabellar tap or loud auditory stimulus
5) Patient shows a sluggish response to light glabellar tap or loud auditory stimulus
6) Patient exhibits no response

**Duration of blockade:**

Sensory block: Time interval between loss of cold swab sensation to reappearance of Sensation in all four nerve territories.

Motor block: Time interval between attainment of Grade 2 or 3 motor block to complete recovery of motor power in all four nerve territories.

**Management of unsuccessful block:**

Block will be supplemented with opioids/ general anaesthesia, and the patient will be excluded from the study. If in case surgery is unduly prolonged, and the effect of the block wears off, rescue analgesia will be given in the form of intravenous Fentanyl 1-2 mcg/kg and paracetamol 1gm.

## 5. Results

**Comparison of mean onset of motor block among the study groups (n=90).**

| Parameter | Group A | | Group B | | Group C | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Onset of Motor Block | 10.33 | 3.61 | 13.4 | 4.64 | 16.93 | 5.04 |
| P Value | <0.0001 | | | | | |

**Comparison of mean duration of sensory block in patients among the study groups (n=90)**

| Parameter | Group A | | Group B | | Group C | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Duration of Sensory Block (minutes) | 111.77 | 37.78 | 102.77 | 32.87 | 82.83 | 26.87 |
| P Value | 0.003 | | | | | |

**Comparison of mean VAS score of patients among study groups (n=90).**

| VAS | Group A | | Group B | | Group C | | P Value |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | |
| Baseline | 6.17 | 0.91 | 6.07 | 0.94 | 6.03 | 0.96 | 0.849 |
| 5 min | 4.03 | 0.61 | 4.3 | 0.84 | 4.47 | 0.82 | 0.092 |
| 10 min | 2.97 | 0.81 | 2.9 | 0.80 | 2.87 | 0.73 | 0.881 |
| 15 min | 1.97 | 0.81 | 1.83 | 0.46 | 1.77 | 0.57 | 0.459 |
| 20 min | 0.40 | 0.56 | 0.37 | 0.56 | 0.30 | 0.54 | 0.775 |
| 25 min | 0.07 | 0.25 | 0.00 | 0.00 | 0.10 | 0.31 | 0.233 |
| 30 min | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - |
| 2 hours | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - |
| 4 hours | 0.43 | 0.51 | 0.17 | 0.38 | 0.13 | 0.35 | 0.011 |
| 6 hours | 1.10 | 0.48 | 0.93 | 0.45 | 0.90 | 0.48 | 0.217 |
| 8 hours | 1.83 | 0.69 | 1.97 | 0.32 | 1.90 | 0.31 | 0.559 |
| 10 hours | 3.63 | 0.72 | 2.63 | 0.93 | 2.47 | 0.86 | <0.0001 |
| 12 hours | 2.17 | 0.75 | 2.93 | 0.94 | 3.03 | 0.93 | 0.000 |
| 14 hours | 2.37 | 0.56 | 2.13 | 0.51 | 2.17 | 0.46 | 0.165 |
| 16 hours | 1.93 | 0.58 | 2.03 | 0.41 | 2.03 | 0.49 | 0.672 |
| 18 hours | 2.20 | 0.66 | 2.30 | 0.59 | 2.34 | 0.49 | 0.545 |
| 20 hours | 1.97 | 0.56 | 2.30 | 0.65 | 2.43 | 0.51 | 0.007 |
| 22 hours | 2.23 | 0.73 | 2.03 | 0.49 | 2.13 | 0.35 | 0.368 |
| 24 hours | 2.23 | 0.51 | 2.20 | 0.71 | 2.30 | 0.59 | 0.812 |

A randomized controlled study was done among 90 patients who underwent upper limb surgeries under department of anesthesiology during the study period of October 2019 to August 2021 in GSL medical college and hospital, satisfying inclusion and exclusion criteria. All the patients were randomly allocated into following groups after obtaining their consent.

Group A-Patients received (20ml 0.75% ropivacaine diluted to 30ml + 0.5ml [50mcg] Dexmedetomidine plus 1.5ml of N/S) perineurally in the Brachial Plexus using supraclavicular approach.

Group B-Patients received (20ml of 0.75% ropivacaine diluted to 30ml+ 8mg (2ml) Dexamethasone) perineurally with same approach.

Group C - Patients received 20ml of 0.75% ropivacaine diluted to 30 ml+2ml of N/S.

It was interpreted that Dexmedetomidine provided superior to dexamethasone, but both adjuvants are superior.

## 6. Conclusion

Regional anesthesia is an excellent adjuvant or alternative to general anesthesia for elective upper limb surgeries. Although the regional anesthesia has an opioid sparing effect, it provides superior intra operative and post-operative analgesia. Occasionally postoperative analgesic duration of local anesthetics is not enough for acute nociceptive pain. To prolong the duration of post-operative analgesia, many adjuvants have been tried. In our study we compare the efficacy of Dexmedetomidine and Dexamethasone with Ropivacaine 0.5% for the supraclavicular block. To conclude, the addition of 50µg of Dexmedetomidine for 0.5% Ropivacaine for supraclavicular brachial plexus block, hastens the onset of sensory and motor block when compared to perineural Dexamethasone, duration of sensory and motor block as well as duration of analgesia were

increased. To conclude, both the adjuvants are superior in providing post-operative analgesia with minimal side-effects but dexmedetomidine is more better choice.

## References

[1] Merskey H. International Association for the Study of Pain (IASP): Subcommittee on taxonomy, classification of chronic pain, description of pain terms. Pain. 1986; 3.
[2] Chaturvedi S, Chaturvedi A. Postoperative pain and its management. Indian Journal of Critical Care Medicine. 2007 Oct 1; 11 (4): 204-11.
[3] Cousins MJ, Bridenbaugh PO, editors. Neural blockade in clinical anesthesia and management of pain. Lippincott Williams & Wilkins; 1998.
[4] Liu SS, Strodtbeck WM, Richman JM, Wu CL. A comparison of regional versus general anesthesia for ambulatory anesthesia: a meta-analysis of randomized controlled trials. Anesth Analg. 2005 Dec; 101 (6): 1634-42.
[5] Andrew T. Grey, ultrasound guidance for regional anesthesia, Miller 's Anesthesia, Ronald. D. Miller 7th edition Miller's anesthesia; New York: Churchill livingstone 1982010; 1675-1686.
[6] Vainionpaa VA, Haavisto ET, Huha TM, Korpi KJ, Nuutinen LS, Hollmen AI, Jozwiak HM, Magnusson AA. A clinical and pharmacokinetic comparison of ropivacaine and bupivacaine in axillary plexus block. Anesthesia & Analgesia. 1995 Sep 1; 81 (3): 534-8.
[7] Honorio TB. Epidural Steroids: In P. Prithvi Raj. Pain medicine, a comprehensive review. Mosby publications. 1999: 259-63. .
[8] Brummett CM, Norat MA, Palmisano JM, Lydic R. Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor 74blockade in sciatic nerve block without inducing neurotoxicity in rat. The Journal of the American Society of Anesthesiologists. 2008 Sep 1; 109 (3): 502-11.
[9] Brummett CM, Amodeo FS, Janda AM, Padda AK, Lydic R. Perineural dexmedetomidine provides an increased duration of analgesia to a thermal stimulus when compared with a systemic control in a rat sciatic nerve block. Regional Anesthesia & Pain Medicine. 2010 Aug 1; 35 (5): 427-31.
**[10]** Dar FA, Jan N. Effect of addition of dexamethasone to ropivacaine in supraclavicular brachial plexus block. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)2013 Sep-Oct; 10 (4): 1-5

**LIST OF ABBREVIATIONS:**

| | |
|---|---|
| **ASA** | American Society of Anesthesiologists. |
| **BMI** | Body Mass Index |
| **Cm** | Centimetre. |
| **DBP** | Diastolic Blood Pressure |
| **DNA** | Deoxy ribonucleic acid |
| **G** | Guaze |
| **Hz** | Hertz |
| **HPA** | Hypothalamo Pituitary Axis |
| **Kg** | Kilogram |
| **LA** | Local Anaesthesia |