

COMPARATIVE STUDY BETWEEN 0.25% LEVOBUPIVACAINE WITH DEXMEDETOMIDINE AND 0.25% LEVOBUPIVACAINE WITH DEXAMETHASONE FOR UPPER LIMB SURGERIES UNDER ULTRASOUND GUIDED INTERSCALENE BRACHIAL PLEXUS BLOCK.

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ABSTRACT

Background : Brachial plexus blocks is useful alternative to general anesthesia for upper limb surgeries. They provide better intra-operative hemodynamic stability and also better postoperative pain relief. levobupivacaine is long acting local anesthetic which is an S-enantiomer of the bupivacaine with less cardiovascular and central nervous system toxic effects. Adding adjuvant to local anesthetic for peripheral nerve blocks may enhance the duration anesthesia and the analgesia.

Materials and methods : 60 of ASA I and II patients were randomized into two groups Group DM received 0.25% levo-bupivacaine(30ml) + dexmedetomidine 50 mcg (0.5 ml) + normal saline(1.5ml) Group DX

received 0.25% levo-bupivacaine(30ml) + dexamethasone 8 mg(2 ml).Parameters noted are onset and duration of sensory and motor block, hemodynamic changes, time for rescue analgesia.

Results : Onset of sensory and motor block is early in group DM compared to group DX. Postoperative analgesia was markedly prolonged in DM group than in DX group (p=0.0118).

Conclusion : Dexmedetomidine is superior to dexamethasone in providing effective block characteristics in the interscalene block.

Key words :Interscalene block, levobupivacaine, dexmedetomidine, dexamethasone, upper limb surgeries.

INTRODUCTION :

Compared to general anaesthesia, brachial plexus block has more merits including low cost, fewer adverse reactions, less postoperative pain, and shorter hospital stay¹. It works both as an intraoperative and postoperative analgesia.Interscalene approach to the brachial plexus is best

suited for surgeries of clavicle and upper arm. Advantages of this technique include easy to learn and master as the landmarks are readily palpable even in a very obese patients and the level at which the interscalene technique is performed makes pneumothorax virtually impossible.

Ultrasonographic visualization of structures provides safer methods for regional blocks. Ultrasound enables the anaesthesiologist to secure an optimal positioning of the needle and to visualize the distribution of local anesthetics in real time. The quantity of local anesthetics needed for effective regional block can be reduced by directly observing its distribution.

Levobupivacaine is an S (-) enantiomer of racemic bupivacaine. It is cardio stable, produces less vasodilation, less hypotensive episodes, less central nervous system toxicity, less negative inotropic effect, less prolongation of QTc interval, and a higher toxicity threshold². Adding adjuvant to local anesthetic for peripheral nerve blocks may enhance the duration of anesthesia and analgesia.

Steroids have powerful anti-inflammatory as well as analgesic property. Perineurally injected steroids is reported to influence post-operative analgesia. Dexamethasone microspheres have been found to prolong the block duration in animal and human studies and adding methyl prednisolone to local anaesthetic increase the duration of brachial plexus block³.

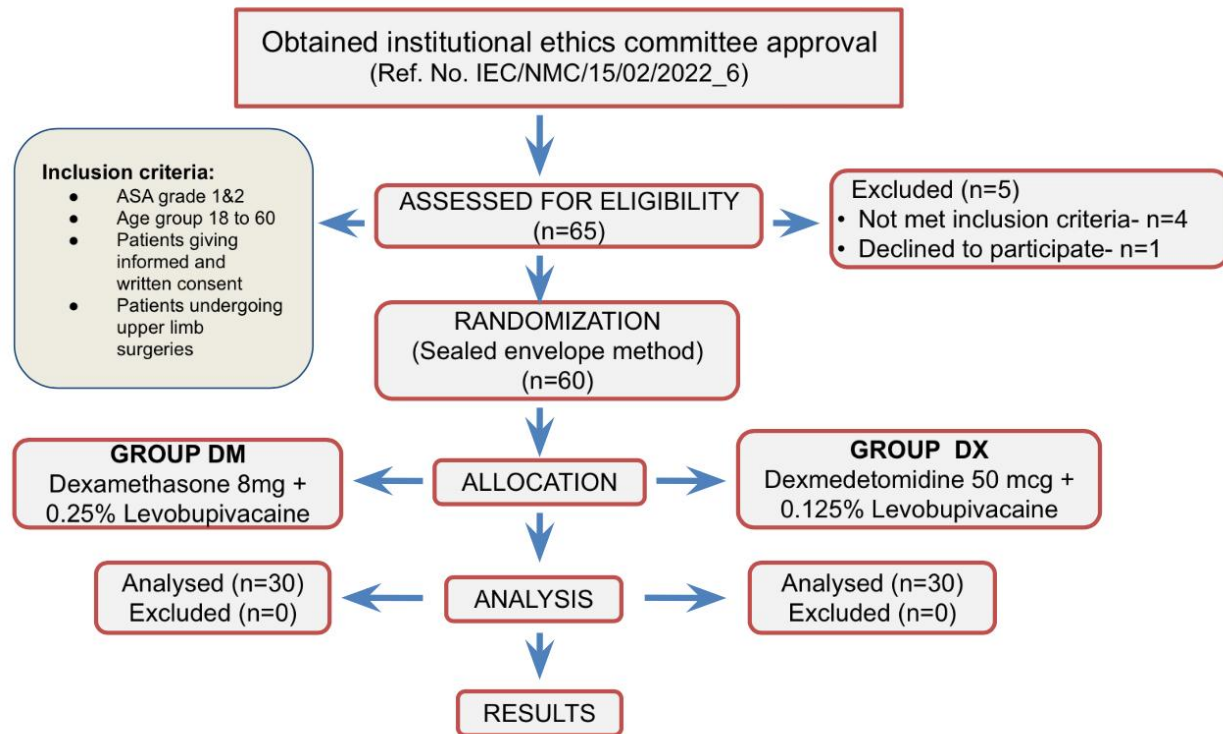
Dexmedetomidine is α_2 -receptor agonist was found to fasten the onset time, prolong the duration of action of local anesthetics, and increase the quality of analgesia in a regional block⁴. Numerous reports have confirmed that dexamethasone and dexmedetomidine prolong the action time following the introduction of local anaesthesia to peripheral nerve block⁵.

With these backgrounds, this study was carried out to compare the efficacy of dexmedetomidine versus dexamethasone as an adjuvant to levobupivacaine in interscalene brachial plexus block. Our primary goal was the onset time, duration of motor and sensory blocks and the quality of intraoperative analgesia.

MATERIALS AND METHODS :

After obtaining institutional ethics committee approval (**Ref. No. IEC/NMC/15/02/2022_6**), this study was conducted on 60 patients scheduled for upperlimb surgeries at narayana medical

college. Informed and written consent obtained from all patients.



Inclusion criteria :

1. ASA grade 1 and 2,
2. Patients giving informed and written consent,
3. Age group 18 to 60 years,
4. Patients undergoing upper limb surgeries.

Exclusion Criteria:

1. Patient refusal
2. Allergy to local anesthetics
3. Patients belonging to ASA grade III & IV
4. Coexisting severe Cardiovascular, Respiratory or neurological disorders
5. known history of hemorrhagic diathesis
6. Inflammatory/infective skin lesions at the site of giving block
7. Pre-existing neuropathies

60 patients belonging to ASA 1 and ASA 2 were randomly assigned into 2 groups using sealed envelope method. Group DX receives 30ml of 0.25% Levobupivacaine with 50mcg Dexmedetomidine(0.5 ml) + normal saline(1.5ml) and Group DM will receive 30ml of 0.25% levobupivacaine with 8mg Dexamethasone(2ml). A detailed preanaesthetic checkup was done a day before the procedure and patient was kept on NPO 6 hrs for solids and 2 hrs for clear fluids .On the day of procedure all emergency drugs and resuscitative equipment should be kept ready

.After shifting the patient to procedure room ECG,NIBP,SPO2 monitors were connected and recorded. Intravenous line was secured.

Patient was made to lie supine with head turned opposite to side of intended block and arm adducted. To make the field more prominent, a small pillow or folded sheet was put beneath the shoulder.

Under strict aseptic precautions and after infiltrating 2ml of 1% Lignocaine locally, the procedure was performed using SONOSITE M TURBO ultrasound with a 13-6 MHz probe by in-plane approach with 20G needle.

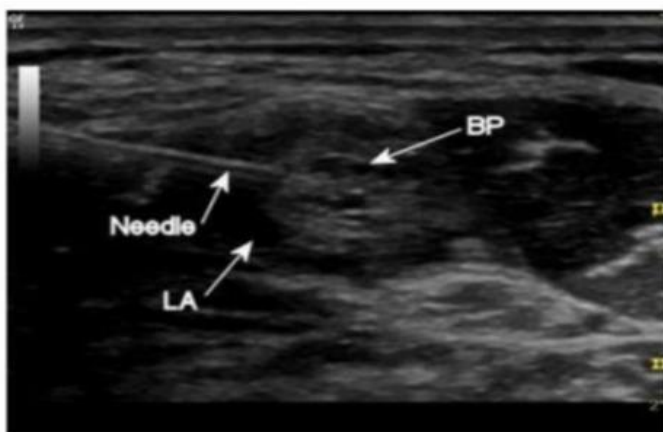


Image showing interscalene block

Linear transducer was positioned in transverse plane to recognize the carotid artery. Once the artery has been identified, the transducer is moved slightly laterally across the neck. The goal was to identify the Anterior and Middle scaleni muscles and the Brachial plexus located between them. Once brachial plexus was identified the above-mentioned drugs were given to the patients in respective group. Throughout the procedure, the patients were monitored for any side effects of drugs. Onset of sensory & motor blockade and duration of sensory & motor blockade and duration of analgesia were assessed for every 3 minutes till loss of sensation and movements and thereafter every half an hour till the regain of sensation and movements. Heart rate, mean arterial blood pressure and SPO₂ were also recorded during this period. Sensory block was assessed by spirit swab method. Assessment of motor block was done using the Bromage three point score. Quality of analgesia was assessed by visual analog score(VAS).

STATISTICAL ANALYSIS :

All the collected data were entered into a Microsoft excel sheet. It was then transferred to SPSS(statistical package for social service) version 25 software for statistical analysis.

-Quantitative data were analyzed by student's t -test.

-Qualitative data were analyzed by chi-square test.

-P-value (<0.05) - statistically significant.

SAMPLE SIZE ESTIMATION :

Sample size was calculated keeping two sided alpha error at 5% and power at 80% by using below formula.

$$\text{sample size } (n) = \frac{2 \times (Z\alpha + Z\beta)^2 (\sigma)^2}{(X_1 - X_2)^2}$$

n = Sample size

Zα = Level of significance

Zβ = Required power

σ = Anticipated standard deviation

X₁-X₂ = Meaningful difference between two means

Minimum of 20 patients in each group was required. For better validation 30 patients are selected in each group.

RESULTS :

TABLE 1 : COMPARISON OF CHARACTERISTICS OF SENSORY AND MOTOR BLOCK IN TWO GROUPS

	Group dexmed (DM)	Group dexamethasone(DX)	P value
Onset time of sensory block(mins)	8.34±1.4	12.34±3.45	0.0124 (S)

Onset time of motor block (mins)	10.12±1.6	15.34±4.51	0.052
Duration of sensory block(mins)	899.5±61.9	734±23.4	0.0001 (S)
Duration of motor block (mins)	845.12±56.2	692.65±23.08	0.0001 (S)
Duration of analgesia(mins)	908.5±14.2	786.35±69.74	0.0001 (S)

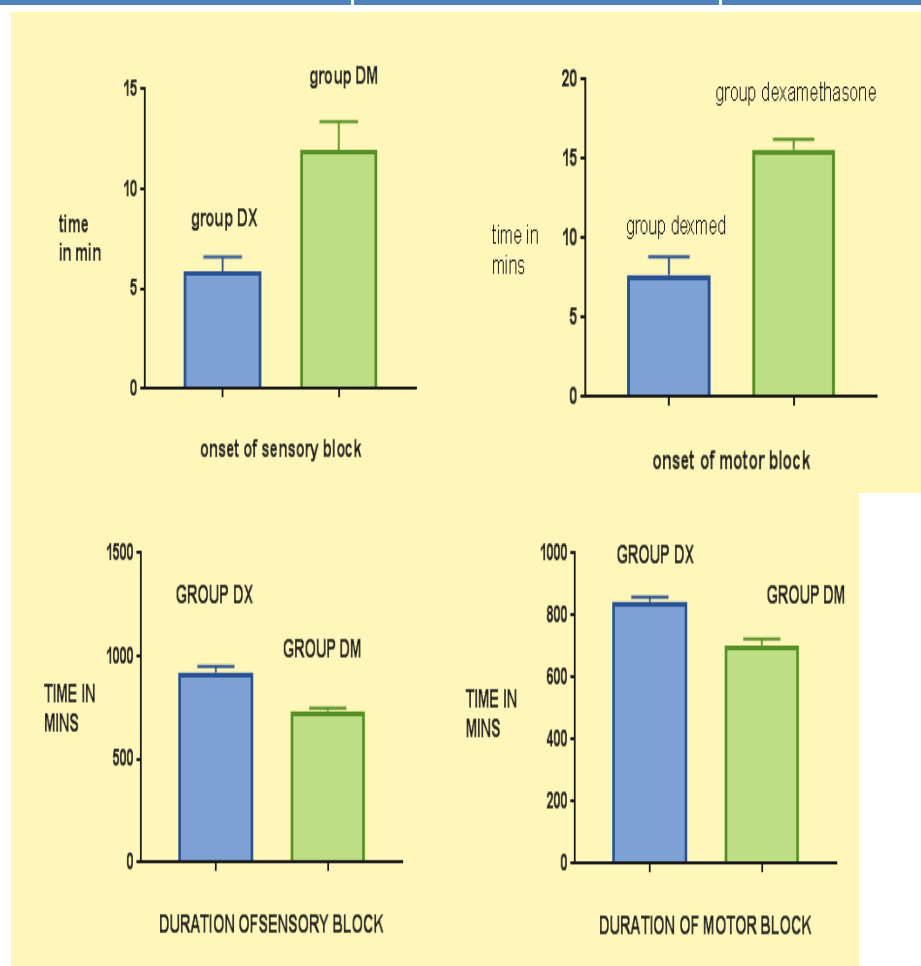


TABLE 2 : COMPARISON OF QUALITY OF ANALGESIA IN BOTH GROUPS

Quality of analgesia	Group dexmed (DM)	Group dexamethasone(DX)	P value
Excellent	48	46	>0.05
Good	2	2	
Fair	0	1	
poor	0	0	
Time of 1 st analgesia request (hrs)	16.69±0	14.50±0.03	0.0001(S)
Number of patients required postoperative analgesic consumption during 1 st 24hrs [(n%)]	16(32%)	21(42%)	0.0118 (S)

Insignificant between the two groups ($p>0.05$). From the 6th hour onwards, patients of group DM showed a significant lower VAS than the DX group. Mean arterial pressure, mean arterial pulse rate and SpO₂ recorded at 0,5,10,15,30,60,90,120 and 150 minutes showed no statistically significant changes ($p>0.05$).

TABLE 3 : COMPARISON OF PULSE RATE IN BOTH GROUPS

Duration	Group dexmed(DM)	Group dexamethasone(DX)	P value
Baseline	82	84	0.743
15 mins	80	82	0.568

30 mins	76	79	0.629
60 mins	68	74	0.232
120 mins	64	77	0.051
180 mins	66	74	0.065

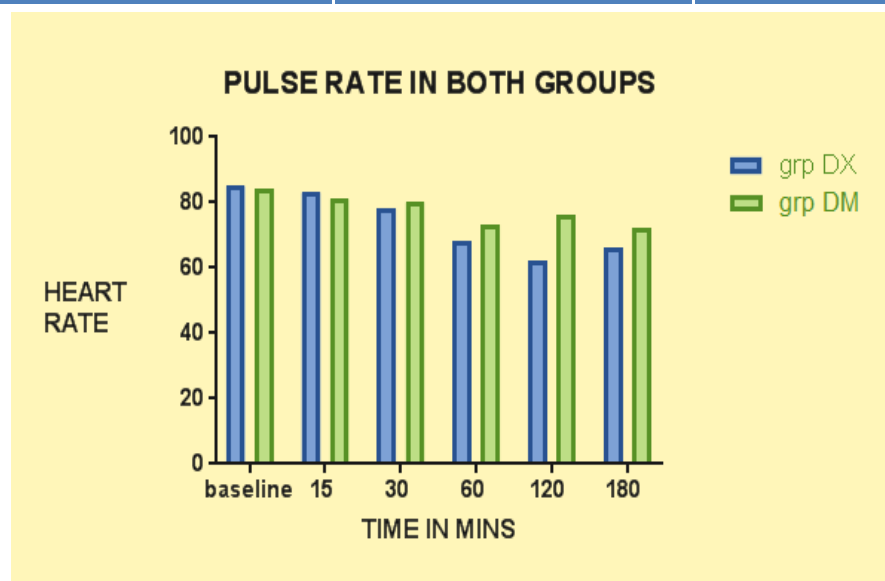


Table 3 shows the comparison of pulse rates in both the groups and were found comparable without any statistical significance. However pulse rates at 60, 120 and 180 minutes were slightly lower in DM group but it was never below 60 per minute.

TABLE 4 : COMPARISON OF MEAN ARTERIAL PRESSURES IN BOTH GROUPS

Mean arterial pressure	Group dexmed (DX)	Group dexamethasone	P value
Baseline	87	85	0.766
15 mins	84	82	0.654

30 mins	81	78	0.112
60 mins	76	75	0.234
120 mins	74	72	0.087
180 mins	72	70	0.065

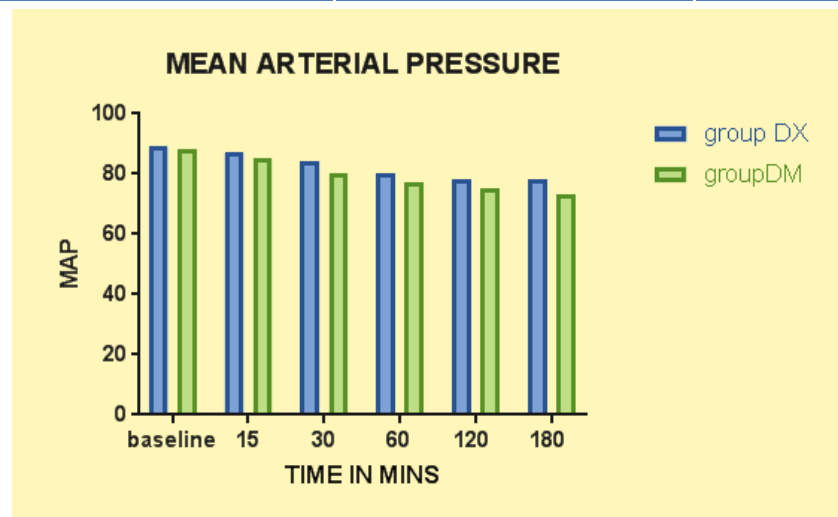


Table 3 shows the comparison of mean arterial pressure which was comparable in both the groups without any statistical significance.

DISCUSSION :

Brachial plexus block is commonly used for upper limb orthopedic surgeries. Interscalene approach of Brachial Plexus block is most often used for humerus and clavicle surgeries. With advent of ultrasound, USG nerve blocks have become the standard in regional anesthesia.

Many adjuvants such as clonidine⁶ fentanyl⁷ and magnesium⁸ have been added to local anesthetics to hasten the onset time and prolong the duration of block. Recently, dexmedetomidine and dexamethasone has been added to local anesthetics for regional block shows good results.

Dexamethasone is synthetic corticosteroid with anti-inflammatory, analgesic, immunosuppressive, and antiemetic properties. Mechanism of action as an adjuvant to the local anesthetics is unclear. It may produce some vasoconstriction, so that it acts like epinephrine by reducing local anesthetic absorption. Alternatively, it has suggested that it directly affects nerve

conduction along with the anti-inflammatory effects. In addition, efficacy of dexamethasone administered perineurally or systemically in combination with the local anesthetic to peripheral nerve block was recently evaluated in several trials, systematic reviews, and meta-analyses with varying results⁹.

Dexmedetomidine is newer congener of clonidine, which is an α_2 agonist. Dexmedetomidine is pharmacologically active d-isomer of the medetomidine and is a highly specific, and selective α_2 adrenoceptor agonist with $\alpha_2:\alpha_1$ binding selectivity ratio of 1620:1, thus decreasing the unwanted side effects of α_1 receptors. Presynaptic activation of α_2 adrenoceptor in a central nervous system inhibits the release of norepinephrine, terminating the propagation of pain signals and their postsynaptic activation inhibits sympathetic activity, thereby decreasing HR and BP¹⁰. Very few studies are present with levobupivacaine and dexamethasone & dexmedetomidine in supraclavicular brachial plexus block and no studies present till date for interscalene block.

Lakshmi S. Iyer et al¹¹ (2021) compared the effects of 0.25% levobupivacaine with dexmedetomidine (0.5 mcg/kg) versus 0.25% levobupivacaine in ultrasound guided supraclavicular brachial plexus block and concluded that addition of dexmedetomidine to levobupivacaine shortens the onset time of sensory blockade (6.51 ± 0.77 min) and motor blockade (10.71 ± 0.34 min) and prolongs duration of sensory (9.14 ± 0.19 h) and motor block (8.55 ± 0.31 h) and duration of analgesia (9.53 ± 0.29 h), ($P < 0.005$) whereas in our study we used 0.25% levobupivacaine and 50 mcg dexmedetomidine versus 8 mg dexamethasone and results were almost similar to above study.

Vinoj Krishnadiyil et al¹² (2020) compared the effects of 0.5% ropivacaine plus dexamethasone 8 mg (2 mL) and 0.5% Ropivacaine plus 75 mcg dexmedetomidine in ultrasound guided brachial plexus block and concluded that addition of dexmedetomidine to ropivacaine shortens the onset time of sensory blockade (10.3 ± 1.2 min) and motor blockade (14.7 ± 1.0 min) and prolongs duration of motor blockade (776.3 ± 48.0 min) and duration of analgesia (1394.3 ± 189.6 min) whereas in our study we used 0.25% levobupivacaine and 50 mcg dexmedetomidine versus 8 mg dexamethasone and results were almost similar to above study

From our study we have observed that the dexmedetomidine provides faster onset of sensory & motor blockade, prolonged duration of sensory & motor block and good quality of analgesia.

CONCLUSION : Dexmedetomidine is superior to dexamethasone in providing effective block characteristics in interscalene block.

Key words : Interscalene block, levobupivacaine, dexmedetomidine, dexamethasone, upperlimb surgeries.

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