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Levobupivacaine with Dexmedetomidine Versus Levobupivacaine with Clonidine in Ultrasound-Guided Supraclavicular Brachial Plexus Block

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Abstract:
Background*: Regional nerve blocks of the upper limb are gaining popularity in modern anaesthetic clinical practice as an alternative to general anaesthesia. Supraclavicular brachial plexus block is a frequent regional anaesthetic technique used in upper extremity surgeriesbelow the shoulder joint, at level of trunks that transport sensory, motor & sympathetic innervations of upper limb with dense anaesthesia and better success rate.*
Objective:*To compare the duration of analgesia using 0.5% levobupivacaine with "dexmedetomidine" versus 0.5%levobupivacaine with clonidine in supraclavicular brachial plexus block with ultrasound guidance for upper limb surgeries.*
Materials and Methods: *This study was done at a tertiary care teaching institute in the Department of anaesthesia at GEMS, Srikakulam, Andhra Pradesh, India, from January 2020 to January 2022. 60 patients were included as per the eligibility criteria. They were randomized into three groups LC, and LD, each group containing 30 patients. Age, gender, duration of surgery, onset of sensory and motor blocks, duration of sensory and motor blocks, duration of analgesia, side effects were assessed.*
Results:*There is no significant difference in the mean age and mean duration of surgery among two groups of patients. Most of the patients were males. Onset of sensory and motor blocks was quick in group LD patients. Duration of sensory and motor blocks was more in group LD patients.Most common side effect is nausea/vomiting.*
Conclusion:*When compared to clonidine added to 0.5 % levobupivacaine, dexmedetomidine appeared to be better at providing early onset of sensory & motor blockade and increasing duration of sensory & motor blockade, as well as extending the analgesic duration with stable hemodynamics in patients undergoing elective upper extremity surgeries via ultrasound-guided supraclavicular brachial plexus block.*
Key Words: *Clondine, Dexmedetomidine, Efficacy, Safety,Supraclavicular brachial plexus block, Upper limb surgeries*

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I. Introduction

Regional nerve blocks of the upper limb are gaining popularity in modern anaesthetic clinical practice as an alternative to general anaesthesia[1]. Supraclavicular brachial plexus block is a frequent regional anaesthetic technique used in upper extremity surgeries[2] below the shoulder joint, at level of trunks that transport sensory, motor & sympathetic innervations of upper limb with dense anaesthesia and better success rate. It provides better operative conditions as it blocks the above innervations without any systemic effects.[3] Brachial plexus block causes sympathetic blockade, which results in an improvement in blood flow, reduction in vasospasm & edema[4]. The other modes of performing block are Interscalene, Infraclavicular &Axillary approach apart from supraclavicular approach.[5] Brachial plexuses block not only provide intraoperative anaesthesia but also good post-operative analgesia without many systemic side effects[1]. Consequently, the more excellent failure rates and chances of damage to adjacent nerves and vasculature by blind technique, USG (ultrasound guided) blocks are preferred. Hence all anaesthesiologists should get familiar about all the above methods, benefits and limitations. Bupivacaine (amide local anaesthetic) commonly used drug for regional nerve block and is associated with cardio toxicity when higher concentrations of drug or accidentally during intravascular injection[6]. Levobupivacaine is the S (-) enantiomer of racemic bupivacaine. It is more cardioprotective than bupivacaine & provides a significantly more period of sensory numbness and therefore better chosen for upper extremity surgeries[7].Quality, duration of nerve block was finer with usage of higher concentrations of levobupivacaine (0.5% to 0.75%). Adding adjuvants[8,9,10,11] to local anaesthetics will speed up the onset of block, extend the

duration of blockade, and increase the nerve block's quality. Because of their sedative, analgesic, antihypertensive, antiemetic properties and their ability to lessen the need for anaesthetic drugs, α 2 adrenergic receptor agonists were widely used as adjuvants[1]. Clonidine, alpha 2 receptor agonist, imidazole derivative is highly lipid soluble acts on spinal, supra spinal level with in central nervous system and is being used as centrally acting antihypertensive agent, also have sympatholytic, sedative and analgesic properties[12,13,14]. Dexmedetomidine more selective 2 adrenoceptor agonist which has sedative & analgesic effects is 7-8 times more potent than clonidine[1,15] (alpha 1,15 2:1) concerning onset time, extends the period of local anaesthetics effects & improves quality of sensory blockade in a regional block[16,17,18]. Success of the block depends on correct localization of nerve, placement of needle, local anaesthetic injection, i.e., right drug, right dosage, placed in right place, by the right technique. Traditional conventional approach and paresthesia elicitation lead to multiple attempts, which results in procedure-related complications such as pain, blood vessel injury and pneumothorax. The use of ultrasonic guidance to do a "supraclavicular brachial plexus" block has grown in popularity, leading to the detection of anatomical variation of brachial plexus, accurate needle placement and avoiding needle-related complications like an injury to blood vessels, pneumothorax and local anaesthetic toxicity[19,20,21.]

Objective: To compare the duration of analgesia using 0.5% levobupivacaine with "dexmedetomidine" versus 0.5%levobupivacaine with clonidine in supraclavicular brachial plexus block with ultrasound guidance for upper limb surgeries.

II. Material And Methods

This randomized study was carried out at a tertiary care centre in India from January 2020 to January 2022
Study Design: Interventional randomizedstudy
Study Location: This study was done at a tertiary care teaching institute in the Department of anaesthesia at Great Eastern Medical School &Hospital (GEMS), Srikakulam, Andhra Pradesh, India.
Study Duration: January 2020 to January 2022
Sample size: 60 Patients
Sampling procedure: Simple random sampling
Sample size calculation: We got a minimum sample size of 54 as per the study done by Kaur S et al. with power of study of 90% and at confidence intervals of 95%.
Subjects & selection method: The study population includes patients who were scheduled for various upper limb surgeries at our tertiary care center under ultrasound guided supraclavicular brachial plexus block.
Group LC (n=30) Patients received 0.5% levobupivacaine (25 ml) +1mcg/kg clonidine +remaining normal saline to a solution of 30 ml
Group LD (n=30): Patients received 0.5% levobupivacaine(25ml)+1mcg/kg dexmedetomidine +remaining normal saline to solution of 30 ml.

Eligibility criteria:

Inclusion criteria:
1. Patients aged above 18 years of either sex, scheduled for elective upper extremity surgeries under supraclavicular brachial plexus block.
2. Patients who provided informed consent to participate in the study.

Exclusion criteria:
1. Patients with labile blood pressure
2. Patients with bleeding abnormalities
3. Patients with allergies to clonidine or dexmedetomidine or levobupivacaine
4. Patients with uncontrolled diabetes
5. Patients with obesity (BMI above 30kg/m^2.)
6. Patients with severe cardiac or hepatic or renal disorders which interfere data collection.
7. Patients with incomplete data.
8. Patients with infection at the site of puncture.

Methodology or technique:

In the preoperative room, the anaesthetic procedure has been explained to the patients. After getting informed and written consent, the patient was shifted to the operation theatre. Intravenous access was done with 18 Guaze IV cannula on non-operating limb & isotonic fluid; Ringer lactate at 10ml/kg was started. Standard monitors (ECG, NIBP, SPO2 probe) were attached. Baselines vitals were recorded.

Under strict aseptic precautions, supraclavicular area is painted and draped Using high frequency linear ultrasound probe, plexus around Subclavian artery are visualised. Needle was placed near the plexus through in plane approach, following negative aspiration of blood, drug was introduced around the brachial plexus.

Assessment of analgesia was done every 3 min, by pinprick method, using 22 G needle every 3 min until patient complains of pain while assessing.

A complete sensory block is known as the total loss of sensation to pinprick.

Parameters assessed:

- Age
- Gender
- Duration of surgery.
- Onset of sensory block
- Onset of motor block
- Duration of sensory block
- Duration of motor block
- Duration of analgesia
- Side effects

Statistical analysis

Data was analyzed using Epi info software version 7.2.5. Results were expressed as percentages and mean with standard deviation. Students t test was used to compare numerical parameters between two groups.Chi square test was used to compare categorical paramaters between two groups. P value below 0.05 is considered significant.

III. Results

The current study included 60 patients scheduled for upper limb surgeries.

Age and weight:

There is no significant difference in the mean age and mean weight of patients in three groups(p=0.12).

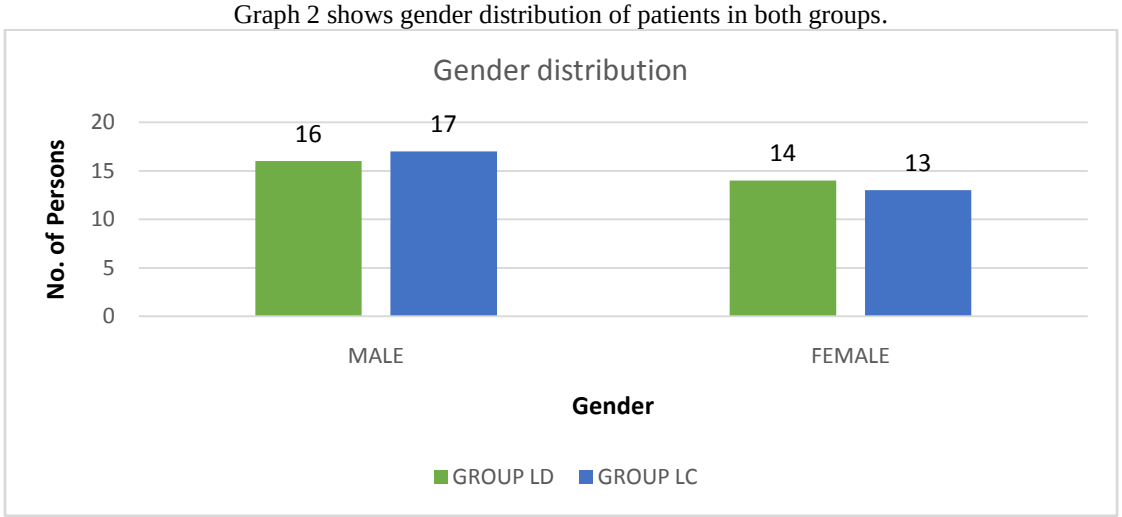
Table 1: Mean age of patients between two groups

Age	Group LD	Group LC	P value
Mean age (years)	39.30±13.68	34.07±12.13	0.122
Mean weight (kg)	60.03±5.35	57.70±4.98	0.08

Gender:

33 patients were males and 27 patients were females in the current study.

Graph 2 shows gender distribution of patients in both groups.



Duration of surgery:

There is no significant difference in the duration of surgery between 3 groups, as per students t test(p=0.07).

Table 2 shows duration of surgery in three groups:

GROUP	Group LD	Group LC
Mean+-SD	94.33±16.75	106.97±18.44
P value	0.074	

Onset of sensory andmotor blocks:
There is significant difference in the onset of sensory and motor blocks among two groups. Onset is quick in group LD patients.

Table 3 shows onset of sensory and motor blocks

Groups	**Mean onset of sensory block(min)**	**P value**
LD	7.90±0.88	0.001
LC	8.97±1.00	
Groups	**Mean onset of motor block(min)**	**P value**
LD	10.87±1.01	0.001
LC	12.40±1.07	

Duration of sensory and motor blocks:

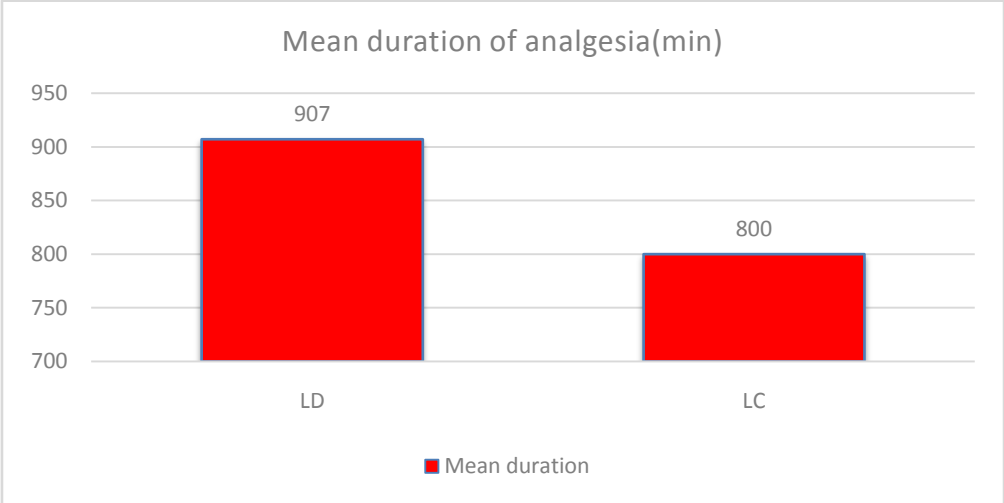
There is significant difference in the onset of sensory and motor blocks among two groups. Mean duration is morein group LD patients.

Table 4 shows duration of sensory and motor blocks

Groups	**Mean duration of sensory block(min)**	**P value**
LD	707.33±19.46	0.001
LC	612.33±23.29	
Groups	**Mean duration of motor block(min)**	**P value**
LD	791.33±23.00	0.001
LC	708.33±25.74	

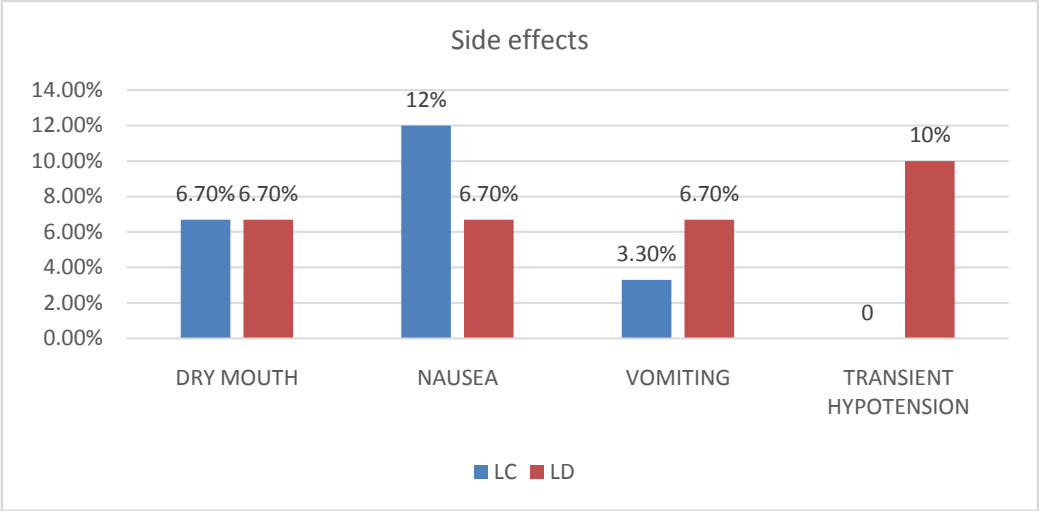
Duration of analgesia:
There is significant difference in the duration of analgesiaamong patients oftwo groups. Mean duration is more in group LD patients.(p=0.001)

Graph 2 shows mean duration of analgesia



Side effects:
Nausea/vomiting was seen in 28.7% of patients overall. Hypotension was seen in 10% of patients.

Graph 3 shows side effects among 3 groups of patients



IV. Discussion

The current study included 60 patients scheduled for elective upper limb surgeries.There is no significant difference in the mean age and mean duration of surgery among two groups of patients. Most of the patients were males. Onset of sensory and motor blocks was quick in group LD patients. Duration of sensory and motor blocks was more in group LD patients. Most common side effect is nausea/vomiting.

Singelyn et al in 1996 performed a study and concluded that the least dose of 0.5 mcg/kg of clonidine has to be added on to local anaesthetics to prolong its analgesic effects.[22]

Later, **Murphy et al** reviewed 24 studies and concluded that doses of clonidine up to 150 mcg did not deliver considerable adverse effects.[23]

Eldgem et al[24]supported the rationale for using this concentration of levobupivacaine (0.5 percent). They employed a dose range of 30-300 g in several studies and found that doses up to 150 g are associated with less side effects. So, in "supraclavicular brachial plexus block," we opted to add 150 ug of clonidine as an additive to levobupivacaine.

Bernard et al[25], **and Lohom et al**[26]compared local anaesthetics alone, and found that using clonidine (1-2 g/kg) as an adjunct to local anaesthetic resulted in early arrival of sensory and motor inhibition.

However, clonidine did not hasten the start of block, according to **Gaumann et al**[27] **El Saied et al**[28]**,** regardless of the dosage administered.These variable observations could have a number of explanations. It could be related to drug responders and nonresponders, interpatient variance in architecture of the plexus sheath or nerve, chosen block technique, or uncertain mechanism of action of clonidine in peripheral nerve blocks, according to Duma A. et al[14].

In a study conducted by **Sarita S. Swami et** al[29] authors employed dexmedetomidine 1µg/kg and clonidine 1µg/kg with bupivacaine 0.25 % (35 cc) and discovered that the duration of motor block was more in dexmedetomidine compared to clonidine group, similar to current study.

Limitations of this study:

1. Small sample size

V. Conclusion

When compared to clonidine added to 0.5 % levobupivacaine, dexmedetomidine appeared to be better at providing early onset of sensory & motor blockade and increasing duration of sensory & motor blockade, as well as extending the analgesic duration with stable hemodynamics in patients undergoing elective upper extremity surgeries via ultrasound-guided supraclavicular brachial plexus block. The study is self-sponsored. There were no conflicts of interest.

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