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Effect of Adding Clonidine to Levobupivacaine in Supraclavicular Brachial Plexus Block- A Randomized, Controlled Study

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Abstract: Various drugs are used with local anesthetics for upper limb surgeries and postoperative analgesia. We experimented the effect of addition of clonidine with levobupivacaine in supraclavicular brachial plexus block with respect to onset & duration of sensory and motor blockade and duration of analgesia.A total of 60 patients of ASA grades I and II, aged 18-60 yrs of either sex scheduled for upper limb surgeries under supraclavicular brachial plexus block were divided into 2 equal groups in a randomized pattern. Patients in group L (n = 30), received 30 ml of 0.5% levobupivacaine with 1ml normal saline (control) and in group LC (n = 30), received 30 ml of 0.5% levobupivacaine with 1 ml (150µg) clonidine. The onset and duration of sensory and motor block & duration of analgesia were analyzed in both the groups. Statistical analysis done with SPSS 17 software and p value<0.05 taken as significant.The mean time of onset of sensory & motor blockade were 12.43±2.56 min and 17.96±3.05 min in group L and 9.03±1.60 min &15.00 ± 2.40 in group LC .The durations of sensory and motor block were 660.16 ± 44.28and 535.33 ± 50.66 min respectively in Group L, whereas they were 880.16 ± 55.48 and 771.83±54.19 min respectively in Group LC. The duration of analgesia was 728.86 ± 45.12 min in Group L compared to1013.5± 59.01 min in Group LC (p < 0.001). There was statistically significant difference present in onset and duration of sensory and motor blockade and duration of analgesia between 2 groups. Addition of clonidine in supraclavicular brachial plexus block with levobupivaicane decrease the onset of sensory and motor block and increase the duration of sensory and motor block with prolonged duration of analgesia.

Keywords: Clonidine, Supraclavicular brachial plexus block, Levobupivacaine.

INTRODUCTION

The supraclavicular brachial plexus block provides anaesthesia of the entire upper extremity in the most consistent and time-efficient manner.Halsted an American surgeon performed brachial plexus block with a solution of cocaine under direct exposure [1]. Now different local anaesthetics have used for brachial plexus block. Bupivacaine, a racemic mixture of the 2 stereo enantiomers dextrobupivacaine and levobupivcaine, frequently used as the local anesthetic resulted in cardiac and central nervous system toxic effects in some patients [2,3]. Levobupivacaine is the S (-) enantimer of racemic bupivacaine. It has less cardiotoxicity compared with bupivacaine [4, 5] and its pharmacology and duration of anaesthesia are similar to those of bupivacaine [5].

Clonidine, α_2 receptor agonist, an imidazoline derivative is highly lipid soluble, acting on both spinal and supraspinal level with in central nervous system and has been used for centrally acting antihypertensive agent.

Since the ‘80s, clonidine has been used as an adjuvent to local anaesthetic agents in various regional blocks to extend the duration of block. Some studies have shown that clonidine prolongs the effects of local anaesthetics [6-8]. Many studies have indicated an increased incidence of adverse effects like sedation,

hypotension and bradycardia [9-11]. Clonidine has been shown to be of benefit for use in central neuraxial blocks and other regional blocks by increasing the duration and intensity of pain relief [12, 13] as also by decreasing the systemic and local inflammatory stress response [14,15]. The current study was designed to test the hypothesis that clonidine when added as an adjuvant to levobupivacaine in supraclavicular brachial plexus block enhanced the duration of sensory and motor block, duration of analgesia and quality of block.

MATERIALS AND METHODS

This prospective, placebo controlled, randomized double blind study wascarried out after approval of ethical committee. Sixty patients of ASA grade I & II**,** age group 18 to 60 years of either sex admitted for upper limb surgeries were included for study. Patients with hepatic dysfunction, renal dysfunction, bleeding disorder, progressive neurological disorder, on treatment with α adrenergic antagonist, history of arrhythmias and labile hypertension, pregnant and lactating patients & patients with known history of allergy to local anaesthetic of amide type were excluded from study.

Preanaesthetic checkup of these patients was done with complete history, general examination and systemic examination. Routine investigations like complete blood count, blood urea, serum creatinin, blood sugar, chest X ray and ECG were done.

After obtaining written informed consent patients were subsequently randomized into 2 groups of 30 each by slip in a box technique.

1. Group L (n=30):30 ml of 0.5% Levobupivacaine with 1 ml normal saline. (Control)
3. Group LC (n=30):30 ml of 0.5% Levobupivacaine with 150 mcg Clonidine (1ml).

After securing an IV line with 18 G cannula, RL solution was started. Various monitoring devices like NIBP, Pulseoxymeter, 3 lead ECG were connected and basal readings were recorded.

Patients were placed in supine position with the head turned to contra lateral side and the arms were extended and pulled towards the knee.

The midclavicular point, external jugular vein and subclavian artery pulsation were identified .Under all aseptic precautions & after local infiltration of 2% Lidocaine 2 ml, a 22G 1.5 inch needle was introduced 2 cm above the mid-clavicular point directed just lateral to subclavian artery pulsation, caudad and medially until paresthesia was elicited. After negative aspiration of blood, the study drug was injected.

After the drug was injected, the following parameters were recorded:

Pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP) were noted at 0, 5, 10, 15, 20, and at 30 min interval up to 90 min and then every hour till 750 min.

Onset of sensory block

Onset of sensory block is defined as the time elapsed between injection of drug and complete loss of sensation as analyzed by pinprick.

Duration of sensory block

The time elapsed between injection of the drug and appearance of pain requiring rescue analgesia.

Onset of motor block

Defined as the time elapsed from injection of drug to complete motor block. Motor block was evaluated by thumb abduction (radialnerve), thumb adduction (ulnar nerve), thumb opposition (mediannerve), and flexion of the elbow in supination and pronationof the forearm (musculocutaneous nerve). Measurements were performedusing a modification of the Lovett rating scale [16].

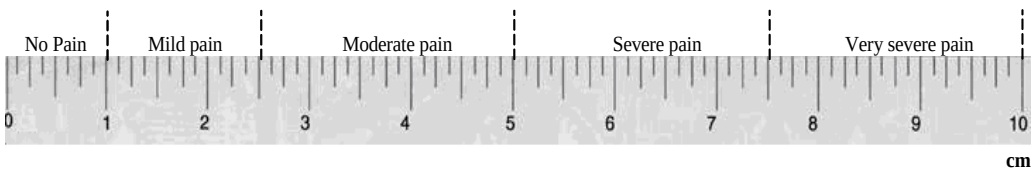
Grade 6 : Normal muscular force
Grade 5 : Slightly reduced muscular force
Grade 4 : Pronounced reduction of muscular force
Grade 3 : Slightly impaired mobility
Grade 2 : Pronounced mobility impairment
Grade 1 : Almost complete paralysis
Grade 0 : Complete paralysis

Assessment was done at every 1 min interval from the time of injection of test drug until the block was established. Only patient with complete motor block (grade 0) were included in study and equal number of new cases were added to complete the study.

Duration of motor block

Time elapsed between injections of the drug to complete return of motor power (grade 6). Postoperative Pain was assessed using a visual analogue score scale which consisted of a 10 cm horizontal scale with gradations marked as ‘0’means no pain at all and ‘10’means unbearable pain.

VAS score rating [17].



VAS score was recorded every 30 min in the postoperative period till the conclusion of study. Sedation was assessed on the basis of Cherniksedation score [18].

0 - Completely awake

- leeping but responding to verbal command
- Deep sleep but arousable
- Deep sleep not arousable

Careful watch was kept for complications such as nausea, vomiting, bradycardia, tachycardia, hypertension, hypotension, haematoma, headache, convulsions, and respiratory distress. After recording observations statistical analysis was carried out using independent student's t-test by SPSS V.17 software. p value <0.05 taken as significant.

RESULTS

Both groups were comparable for age, weight and male: female ratio and statistically insignificant (p>0.05). There was male predominancy in both groups.

Table-1: Demographic profile of 2 groups

S.no.	Parameters	Group L		Group LC	
		Mean	±SD	Mean	±SD
1.	Age (yrs)	37.96	14.79	40.63	12.94
2.	Weight (kgs)	66.30	8.85	63.40	9.01
3.	Sex (M:F)	21:9		22:8	

Table-2: Comparison of study parameters between two groups

Parameters	Group L		Group LC		
	Mean	±SD	Mean	±SD	P value
Onset time of sensory blockade (min)	12.43	2.56	9.03	1.60	0.00
Duration of Sensory blockade(min)	660.16	44.28	880.16	55.48	0.00
Onset time of motor blockade(min)	17.96	3.05	15.00	2.40	0.00
Duration of motor blockade (min)	535.33	50.66	771.83	54.19	0.00
Time of Rescue Analgesia (in min)	728.86	45.12	1013.5	59.01	0.00

This table showed the onset time of sensory blockade (mean ±SD) which was 12.43±2.56 min in group L and 9.03±1.60 min in group LC. Mean (±SD) of sensory blockade duration was 660.16±44.28 min in Group L and 880.16±55.48 min in Group LC. Onset time (Mean ±SD) of motor blockade was 17.96±3.05 min and 15.00±2.40 min in Group L and LC respectively. Duration of motor blockade (mean ±SD) was 535.33±50.66 min in Group L and 771.83±54.19 min in Group LC. Time of rescue analgesia was 728.86±45.12 min in Group L and 1013.5±59.01 min in Group LC. The difference was highly significant (p<0.001) between 2 groups in respect of onset of sensory and motor blockade. Duration of sensory and motor blockade was increased in group LC. Duration of analgesia was prolonged in group LC as compared to group L (p<0.001).

Table-3: Sedation Score between 2 Groups

Sedation Score	GROUP L		GROUP LC	
	n	%	n	%
0	30	100	17	56.66
1	0	0	13	43.33
2	0	0	0	0
3	0	0	0	0

Basal haemodynamic records were comparable in both groups. Pulse rate was lower significantly up to 450 min and blood pressure was lower between 90 min to 390 min in group LC after that the difference was insignificant.

In group L none of the patient had sedation while in group LC 43.33% patients had sedation of grade 1. No complication was found in group L while in group LC 2 patients had bradycardia. For treatment inj. atropine 0.6 mg was given IV to these patients.

DISCUSSION

Supraclavicular blocks are performed at the level of the brachial plexus trunks. Here, almost the entire sensory, motor and sympathetic innervations of the upper extremity are carried in just three nerve structures (trunks). Consequently, typical features of this block include rapid onset, predictable and dense anaesthesia along with its high success rate. Various long acting drugs have been used in these procedures. Levobupivacaine is a S isomer of bupivaicane which has lesser cardiac toxicity than bupivaicaine.

Clonidine with local anaesthetic agents have a synergistic action. Clonidine enhances both sensory and

motor blockade of neuraxial and peripheral nerves after injection of local anaesthetic solution [12,13].This is thought to be due to blockage of conduction of A delta and C fibres, increase in the potassium conductance in isolated neurons *in vitro* and intensification of conduction block achieved by local anaesthetics.

In this study we evaluated the effect of clonidine as an adjuvant with levobupivacainehydrochloride in supraclavicular brachial plexus block.

Findings of our study shown that there was rapid onset of sensory and motor blockade with adding of clonidine in levobupivacaine. Similar results were found by Singh and Aggarwal [19] Chakrabarty*et al*.[20]. Our findings are at variance with the study of Duma *et al*. [21] EI Saied A.H. *et al*. [22] which showed no statistically significant difference in onset time with added clonidine to local anesthetics.

In our observations duration of sensory and motor blockade were prolonged in group LC as compared to control group. Our findings are supported by EI Saied AH *et al*. [22]. They found in their study that addition of 150 mcg of clonidine to 0.75% Ropivacaine significantly prolongs the duration of sensory blockade (489±34 vs 628±35 min) ($p<0.01$). Authors explained in their study that clonidine in highly lipid soluble, easily crosses the blood brain barrier to interact with alpha 2 adrenergic receptors at both spinal and supraspinal sites with in the central nervous system producing its analgesic effects. These are in accordance with Singh and Aggarwal [19], Chakraborty S *et al*. [20] and Baj B *et al.* [23]. Duration of analgesia was longer in group LC as compared to control group. This may be because peripheral alpha 2 agonist produces analgesia by reducing the release of norepinephrine leading to alpha 2 receptors independent inhibitory effect on nerve fibre action potentials. Our study is also supported by Patel C *et al*. [24] and Chakraborty S *et al*. [20]. Our results showed that heart rate and blood pressure was significantly lower in group LC. These findings supported By Singh and Aggarwal [19]. In Group L none of the patient had sedation, while in group LD 43.33% patients had sedation of grade 1. Results are supported by Bernard *et al.* [25]. No complication was found in control group while in group LD 2 patients have bradycardia. Studies by Buttner *et al*.[26] and Bernard *et al*.[25] reported the incidence of bradycardia with the use of clonidine.

CONCLUSION

Addition of Clonidine to Levobupivacaine fastens the onset of motor & sensory blockade, increase the sensory and motor blockade duration and prolongs the time for rescue analgesia. Although it produces sedation it is an effective alternative to other drugs as an adjuvant in supraclavicular block.

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