



A COMPARATIVE STUDY OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK WITH LOCAL ANAESTHETICS ALONE AND LOCAL ANAESTHETICS COMBINED WITH ADJUVANT CLONIDINE IN UPPER LIMB SURGERIES

Anaesthesiology

Naramala Bhavani Junior Resident, Department Of Anaesthesiology, Kurnool Medical College, Kurnool, Andhra Pradesh.

K Anitha* Assistant Professor, Kurnool Medical College, Kurnool, Andhra Pradesh. *Corresponding Author

ABSTRACT

Aims and Objectives: The Aim of study is to evaluate the onset and duration of sensory and motor characteristics, total duration of analgesia and intraoperative and postoperative complications by adding clonidine to local anaesthetics in supraclavicular brachial plexus block.

Materials and Methods: A total of 50 patients were randomly allocated into two groups of 25 each: Group A received 25ml of 0.5% Bupivacaine + 10ml of 2% Lignocaine + 1ml of Normal saline. Group B received 25ml of 0.5% Bupivacaine + 10ml of 2% Lignocaine + 1mcg/kg clonidine diluted to 1ml with normal saline.

Results: The mean onset time of sensory block in Group A was 9.40±3.6 min and in Group B was 7.50±3.4min. Mean onset time of motor block in Group A was 15.70±4.6min and in Group B was 10.30±3.75min. Mean total duration of analgesia in Group A was 360.20±45.23min and in Group B was 602.34±65.54min. The onset and duration of sensory and motor block and total duration of analgesia were statistically significant in between the groups. Haemodynamic parameters were statistically insignificant in between the groups. No significant adverse effects are seen in both the groups.

KEYWORDS

Supraclavicular brachial plexus block, Local Anaesthetics, Clonidine

INTRODUCTION

Supraclavicular brachial plexus block is done more commonly for upper limb surgeries and to this various adjuvants are added to improve quality of intraoperative blockade and prolongation of duration of analgesia. Clonidine, an α_2 adrenergic agonist has been used as an adjuvant to local anaesthetics in nerve blocks, in spinal and epidural anaesthesia to improve the quality and duration of sensory and motor block¹. This property is due to facilitation of C fiber blockade, by local vasoconstriction or by spinal action caused by diffusion along the nerve or retrograde axonal transport². Clonidine possibly enhances or amplifies the sodium channel blockade action of local anaesthetics by opening up the potassium channels resulting in membrane hyperpolarization, a state in which the cell is unresponsive to excitatory input³.

AIMS AND OBJECTIVES OF THE STUDY:

The present study aimed to evaluate the efficacy of 1mcg/kg of clonidine used along with local anaesthetics in supraclavicular brachial plexus block on the quality, duration of sensory and motor blockade, total duration of analgesia and intraoperative and postoperative complications for upper limb surgeries.

METHODOLOGY:

This prospective, randomised study was commenced after obtaining approval from the Institutional Ethics Committee. Written informed consent was taken from the patients. 50 patients with American Society of Anaesthesiologists (ASA) physical status classes I and II, aged between 20 and 60 years of both genders undergoing surgical procedures of forearm or hand under supraclavicular brachial plexus block were selected at Government General Hospital, Kurnool, Andhra Pradesh. Patients with significant history of neurological, diabetes mellitus, renal disorders, neuromuscular diseases, psychiatric, alcohol and drug abuse, other contraindications for a supraclavicular block such as local infection at the site, bleeding disorders, anticoagulant therapy, and patient refusal were excluded from the study.

METHOD OF COLLECTION OF DATA:

The Study population are randomly divided into 2 groups with 25 in each group. Group A received 25ml of 0.5% Bupivacaine + 10ml of 2% Lignocaine + 1ml of Normal saline. Group B received 25ml of 0.5% Bupivacaine + 10ml of 2% Lignocaine + 1mcg/kg clonidine diluted to 1ml with normal saline.

Patient's demographic data like age, height, weight, history and findings of the examination of the airway, cardiovascular and other systems were recorded. Routine investigations like Haemoglobin, urine sugar, blood urea, creatinine, Chest X- ray, ECG were done in all patients. Patients are explained about the anaesthesia procedure and

drugs. All the patients were kept nil by mouth 6-8 hours pre-induction. On the day of surgery, standard monitors as per ASA guidelines were connected, and an intravenous (IV) cannula was secured in the non-operative limb once the patient arrived in the premedication room. The patient was positioned supine with head turned away from the limb to be operated. Nerve blocks were performed, with the aid of a nerve stimulator, by using a 22G short-beveled, insulated (Teflon®-coated) 25 mm long stimulating needle. Stimulation frequency was set at 2 Hz, while the intensity of stimulating current was initially set to deliver 1 mA and gradually decreased to <0.5 mA. Sensory block was assessed by pinprick discrimination (with 22G hypodermic needle) and motor block was evaluated by asking the patient to move the forearm against resistance and to flex the forearm.

Duration of sensory and motor block was observed from completion of anaesthetic injection until 15 hours postoperatively. Haemodynamic parameters like pulse rate(PR), Systolic blood pressure(SBP), Diastolic blood pressure(DBP), Mean arterial pressure(MAP), oxygen saturation were noted before anaesthesia (baseline), 5min interval for first 30min, 15 min interval next 2 hours or till surgery and postoperatively for 8 hours. Sedation score was assessed by Ramsay Sedation Score intraoperatively and postoperatively for 8 hours.

Both the groups were compared for any difference in demographics such as weight, age, sex distribution, and time of onset of sensory and motor blockade, duration of sensory and motor blockade, Total duration of analgesia (time for first rescue analgesia), and sedation scores in the intraoperative and postoperative period.

STATISTICAL ANALYSIS:

Data will be entered into MS-Excel and statistical analysis will be done by using IBM SPSS Version 25.0. For category variables, the data values are expressed as number and percentages and to test association between the groups, chi-square test will be used. For continuous variables, the data values are represented as mean \pm standard deviation and to test the mean difference between the two groups, student's t-test will be used. All the P values are having less than 0.05 are considered as statistically significant.

RESULTS:

The demographic data like age, weight, gender are statistically insignificant in both the groups. These are summarised in table. 1

Table 1: Age, weight and gender of two groups

Parameters	Group A Mean \pm SD	Group B Mean \pm SD	P value
Age in years	37.28 \pm 8.63	40.27 \pm 6.83	0.211(NS)
Weight in kgs	56.82 \pm 7.23	55.68 \pm 6.86	0.57(NS)

Gender (M/F)	19/6	18/7	0.747(NS)
--------------	------	------	-----------

NS- Not significant

The mean time of onset of sensory and motor blockade were earlier in group B than in group A and it was significant in between the groups. Mean duration of sensory and motor blockade was prolonged in group B than in group A and also duration of analgesia was prolonged in group B than in group A. These are statistically very highly significant in between the groups. These values are summarised in Table 2.

Table 2: Mean time of onset and duration of sensory and motor block, and total duration of analgesia.

Parameters	Group A Mean \pm SD	Group B Mean \pm SD	P value
Time of onset of sensory block(min)	9.63 \pm 3.72	7.54 \pm 3.38	0.043 (S)
Time of onset of motor block(min)	15.67 \pm 4.84	10.57 \pm 3.43	< 0.0001 (VHS)
Duration of sensory block(min)	336.83 \pm 58.48	582.69 \pm 64.57	< 0.0001 (VHS)
Duration of motor block(min)	303.84 \pm 48.64	516.79 \pm 79.84	< 0.0001 (VHS)
Total duration of analgesia(min)	362.41 \pm 46.33	602.73 \pm 65.19	< 0.0001 (VHS)

P<0.0001 is considered as statistically very highly significant.

VHS- Very highly significant; S-Significant;

In the present study, all patients in group A were awake and alert and had a sedation score of 1. While, in Group B, 20% of patients at the 25-min time, and 28% of patients at the 35-min had a sedation score of 2 and it was mild and desirable. Sedation score of 3 and above was not observed in both the groups. At 25 min and 35 min time, sedation score was statistically significant (P<0.05), remaining time period sedation score was insignificant. Haemodynamic parameters like pulse rate(PR), Systolic blood pressure(SBP), Diastolic blood pressure(DBP), Mean arterial blood pressure(MAP), Oxygen saturation are maintained well and it was statistically insignificant in between the two groups. No significant adverse effects are seen in both the groups.

DISCUSSION:

The supraclavicular block of the brachial plexus is a useful alternative to general anaesthesia for upper limb surgeries as they provide reliable and ideal operating conditions by maintaining stable haemodynamics, better analgesia, and muscle relaxation. The mean onset time for sensory block in group A was 9.4 \pm 3.6min and in group B was 7.50 \pm 3.4min. It was earlier in group B than in group A and it was statistically significant. It is similar to study done by Chakraborty et al⁴ and it is also similar to meta-analysis done by Pöpping et al⁵. The mean onset time for motor block in group A was 15.70 \pm 4.6min and in group B was 10.3 \pm 3.75min, it was earlier in group B than in group A. It was statistically very highly significant. This is due to the local effect of clonidine in the ionic channels of the nerve and a synergistic action with that of local anesthetic agents. This finding is in correlation with study done by Chakraborty et al⁴. Mean duration of sensory block in group A was 336.30 \pm 57.50min and in group B was 582.42 \pm 65.44min, it was statistically very highly significant. It was prolonged in group B than in group A. This is similar to study done by Iohom et al⁶, Cucchiario et al⁷, and Prashant Sirohiya et al⁸. Mean duration of motor block in group A was 303.52 \pm 48.76min and in group B was 516.65 \pm 79.43min, it was statistically very highly significant. It was prolonged in group B than in group A. This finding is in correlation with study done by Pöpping et al⁵, Erlacher et al⁹ and Shreya Das Adhikari et al¹⁰. Mean total duration of analgesia in group A was 360.2 \pm 45.23min and in group B was 602.34 \pm 65.54min, it was statistically very highly significant. It was prolonged in group B than in group A. This is due to the action of clonidine inhibiting the action potential of A and C fibers in peripheral nerves. This is similar to study done by Murphy et al¹¹ and Pöpping et al⁵. Sedation score in group B was more than in group A at 25 min and 35 min time period, and it was statistically significant. This mild sedation was desirable during that period and none of the patients experience airway compromise and did not require any intervention. This is similar to study done by Chakraborty et al⁴. Haemodynamic parameters like pulse rate, systolic

blood pressure, diastolic blood pressure, mean arterial pressure, oxygen saturation were maintained well and statistically not significant in between the two groups. This finding is in correlation with study done by Culebras et al¹² and Chakraborty et al⁴. The patients were monitored postoperatively for any clonidine related side effects like respiratory depression, bradycardia, hypotension, excessive sedation. No complications were noted. There were no neurological and urological side effects.

CONCLUSIONS:

In this study, we would like to conclude that 1mcg/kg of clonidine added to 0.5% bupivacaine and 2% lignocaine had faster onset of sensory and motor block and prolonged duration of sensory and motor block and total duration of analgesia was also prolonged than 0.5% bupivacaine and 2% lignocaine combination. So, clonidine can be a better adjuvant to local anaesthetics in supraclavicular brachial plexus block for upper limb surgeries.

Financial support and sponsorship:

Nil.

Conflicts of interest:

There are no conflicts of interest.

REFERENCES:

- 1) Duma A, Urbanek B, Sitzwohl C, Kreiger A, Zimpfer M, Kapral S, et al. Clonidine as an adjuvant to local anaesthetic axillary brachial plexus block: A randomized, controlled study. *Br J Anaesth* 2005;94:112-6.
- 2) Marhofer D, Kettner SC, Marhofer P, Pils S, Weber M, Zeitlinger M, et al. Dexmedetomidine as an adjuvant to ropivacaine prolongs peripheral nerve block: A volunteer study. *Br J Anaesth* 2013;110:438-42.
- 3) Butterworth JF, 5th, Strichartz GR. The alpha 2-adrenergic agonists clonidine and guanfacine produce tonic and phasic block of conduction in rat sciatic nerve fibers. *Anesth Analg*. 1993;76:295-301.
- 4) Chakraborty S, Chakraborti J, Mandal MC, Hazra A, Das S. Effect of clonidine as adjuvant in bupivacaine-induced supraclavicular brachial plexus block: A randomized controlled trial. *Ind J Pharmacol*. 2010;42(2):74-77.
- 5) Pöpping DM, Elia N, Marret E, Wenk M, Tramèr MR. Clonidine as an adjuvant to local anaesthetics for peripheral nerve and plexus blocks: A meta-analysis of randomized trials. *Anesthesiology* 2009;111:406-15.
- 6) Iohom G, Machmachi A, Diarra DP, Khatouf M, Boileau S, Dap F, et al. The effects of clonidine added to mepivacaine for paronychia surgery under axillary brachial plexus block. *Anesth Analg* 2005;100:1179-83.
- 7) Cucchiario G, Ganesh A. The effects of clonidine on postoperative analgesia after peripheral nerve blockade in children. *Anesth Analg*. 2007;104(3):532-7.
- 8) Sirohiya P, Mantan K, Rehman H, Kumari M, Devra V, Singh R. Effect of bupivacaine and bupivacaine-clonidine combination in supraclavicular brachial plexus block—A comparative study. *IAIM*. 2016;3(5):29-37.
- 9) Erlacher W, Schuschnig C, Koinig H, Marhofer P, Melischek M, Mayer N, Kapral S. Clonidine as adjuvant for mepivacaine, ropivacaine and bupivacaine in axillary, perivascular brachial plexus block. *Canadian Journal of Anesthesia*. 2001 Jun 1;48(6):522.
- 10) ADhikAri SD, Panwar MK, Mahajan S. A Comparative Study of Supraclavicular Brachial Plexus Block with Clonidine as Adjuvant in Two Different Doses in Upper Limb Surgery. *Journal of Clinical & Diagnostic Research*. 2018 Nov 1;12(11).
- 11) Murphy DB, McCartney CJ, Chan VW. Novel analgesic adjuncts for brachial plexus block: a systematic review. *Anesth Analg*. 2000;90(5):1122-8.
- 12) Culebras X, Van Gessel E, Hoffmeyer P, Gamulin Z. Clonidine combined with a long acting local anaesthetic does not prolong postoperative analgesia after brachial plexus block but does induce haemodynamic changes. *Anesth Analg*. 2001;92(1):199-204.