ORIGINAL RESEARCH

Comparative Study of Efficacy of Clonidine Added To Levobupivacaine And Levobupivacaine Alone In Supraclavicular Brachial Plexus Block For Upper Limb Surgery

Sarfraj Ahmad,[1] Ananda Prakash Verma,[2] Ram Pal Singh,[3] Lakhvinder Singh Kang,[4] Malti Agrawal,[5] Shaheen Begum[6]

ABSTRACT

Introduction: Supraclavicular brachial plexus block provides safe, effective and low cost anaesthesia. To enhance its effects into postoperative period and provide postoperative analgesia adjuvants are added like clonidine, dexamethasone and adrenaline etc. we conducted this study to compare the efficacy and safety of clonidine for supraclavicular brachial plexus blockade along with levobupivacaine.

Material and methods: A randomized single-blind controlled trial was done in 60 patients of ASA Grade I or II status undergoing upper limb surgery. Group A (n = 30) patients received 30 ml of 0.5% levobupivacaine and 1 ml normal saline through a supraclavicular approach for brachial plexus block, whereas group B (n=30) received 30 ml of 0.5 % levobupivacaine with 0.3 ml clonidine (50 µg) diluted with normal saline to make up the solution 1 ml. Vital parameters were recorded 10 min prior to block placement and every 3 min thereafter till the end of the procedure. Onset and duration of both sensory and motor blocks and sedation score were recorded. All patients were observed in postanesthesia care unit and received tramadol injection 100mg IV in 100 ml of saline as soon as they complained of pain as rescue analgesic. Duration of analgesia was taken as the time from placement of block till the injection of rescue analgesic.

Results: It was observed that in group B, onset of motor and sensory blockade was faster. No statistically significant difference was observed in heart rate, blood pressure, and oxygen saturation in both groups. Sedation score was higher in the group B, postoperative analgesia lasted for 946.17 ± 137.99 min as compared to group A where it was 655 ± 159.39 min. It was statistically very significant ($p<0.0001$).

Conclusion: Our study concluded that the levobupivacaine is a suitable drug for supraclavicular brachial plexus block. It provides a long duration of pain free period and with minimum disturbances in hemodynamic variables. The addition of 50 µg of clonidine as an adjuvant to levobupivacaine prolongs the duration of sensory and motor block and at the same time shortening the latency (onset) period.

Key words: Clonidine, Levobupivacaine, Supraclavicular brachial plexus block.

[1]Post Graduate Student, [2]Professor, [3]Associate Professor, [4]Professor and HOD, [5]Professor, [6]Senior Resident, Department of Anaesthesiology, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India.

Corresponding author: Dr. Sarfraj Ahmad, Resident 3rd year, Department of Anaesthesiology, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India.

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INTRODUCTION

A peripheral nerve block (PNB) is the injection of a local anesthetic around a nerve or group of nerves for blockade of nerve impulse conduction, causing temporary analgesia and loss of sensory and motor function. Peripheral neural blockade is now a well accepted component of comprehensive anesthetic care.

Peripheral nerve blocks are cost effective anesthetic techniques used to provide good anaesthesia and analgesia while avoiding airway instrumentation as compared to hemodynamic consequences of general and neuraxialanaesthesia [1]and for this reason all around the world, interest in regional anaesthesia is growing rapidly. Patient satisfaction and a growing demand for favorable post operative recovery profile have resulted in an increasing demand for regional anaesthesia.

Satisfactory surgical conditions are obtained with complete sensory and motor blockade. Concurrent sympathetic blockade reduces post-op pain, vasospasm and oedema. Currently bupivacaine is the most frequently used local anaesthetic because of long duration.[2,3]

The use of α-2 adrenoceptor agonist for enhancement of peripheral nerve blocks has added a new dimension to their clinical application.[4] The ability of clonidine to reduce the dosage requirements of traditional anaesthetic and analgesic agents is increasingly being used in perioperative period. Clonidine, when combined with a local anaesthetic, has been found to extend the duration of nerve block.[5] It has been postulated that this action could be due to local vasoconstriction or facilitation of C fibre blockade.[6]

The purpose of the present study is to evaluate the post operative analgesic effects and efficacy of clonidine (α-2 agonist) in combination with levo-bupivacaine on peripheral nerves during supraclavicular brachial plexus block.

MATERIAL AND METHODS

The study was conducted on 60 patients with American Society of Anaesthesiologists (ASA) I and II adult of either sex, undergoing upper limb surgery under supraclavicular brachial plexus block. They all underwent a thorough pre anaesthetic evaluation.

In present study, we included all the patients of upper limb surgery satisfying the inclusion and exclusion criteria during the period of one year w.e.f January,2013 to December,2013.

Exclusion criteria was:Patients age <18 yrs or more than 60 years. Patients receiving anticoagulants, β- blockers or opioids, on chronic analgesics, infection or any swelling on the side of block. Patients with history of hypertension, myocardial infarction, alcohol abuse, pregnancy, psychiatric disorder, diabetes mellitus, contralateral phrenic nerve palsy, neurological deficit, cardiac, respiratory, hepatic and/or renal failure, peripheral neuropathy or hypersensitivity to local anesthetic agents.

The aim was to evaluate the clinical effects of clonidine as an adjuvant to supraclavicular brachial plexus block with 0.5% L-bupivacaine. Permission from Institutional ethical committee was taken before starting the study and informed written consent was taken from all patients.

After carefully explaining the procedure to the patients, they were divided randomly into 2 groups by using table of random numbers.

Group A (n=30) recieved 30 ml of 0.5 % levobupivacaine with 1 ml normal saline.

Group B (n=30) received 30 ml of 0.5 % levobupivacaine with 0.3 ml clonidine (50 µg) diluted with normal saline to make up the solution 1 ml. Drugs were prepared by anesthetist who was not involved in the proceedings of the study.

PREPARATION AND POSITION

After shifting the patient to the operation theatre, an intravenous access was obtained and ringer lactate started and inj. Ondansetron 4 mg intravenous was given. Patient was made to lie supine on the OT table and routine monitoring leads were applied. Baseline values of pulse rate, blood pressure, SpO_2, ECG and respiratory rate were recorded. The head was turned away to the opposite side by 30˚ as to palpate the interscalene groove.

The functional safety of the peripheral nerve stimulator was verified. The skin electrode, placed on the ipsilateral arm approximately 6 inches away, was connected to the electrode

cable using the red alligator clip (anode). With full aseptic precautions the supraclavicular region of the patient was prepared with savlon, spirit and betadine. The area was then properly drapped. The ipsilateral arm was adducted. The interscalene groove was palpated at its lowest point and the point of maximum intensity of subclavian artery was located. The brachial plexus was located with the nerve locator pen. A nerve locator needle (Stimuplex® A, B Braun) was directed just above and posterior to the subclavian pulse and directed backwards and medially. Once the desired twitch was obtained and then reducing the current until the muscle contractions occur at a 0.5 mA current level.

This was taken as the confirmation of the proximity to the brachial plexus. The needle was then held immobile and 1ml of the local anesthetic solution after carefully aspiration was injected. At this point the twitching disappeared. The mechanism for the immediate disappearance of the twitching is not a result of the local anesthetic blocking the nerve, but the mechanical displacement of the nerve away from the needle tip[7].

The aspiration test was done for blood to avoid the intravascular injection of drug. The required volume of the drug was injected at this point.

Pulse and blood pressure were recorded preoperatively and immediately after giving the block. Thereafter pulse and blood pressure were recorded every 10 min during the operation and post operatively till the effect of local anesthetic drug weaned off completely.

Onset of sensory blockade and motor blockade and onset of analgesia was observed every 2 minutes and compared with the corresponding areas of the other arm.

Inj tramadol 100 mg diluted in 100 ml normal saline was used as rescue analgesia and number of doses given were noted.

The regression of block was similarly observed till complete recovery. Side effects and complication during injection, during operation and postoperatively were properly recorded and treated accordingly.

STATISTICAL ANALYSIS

Data were summarized as mean ± standard deviation or as percentages.Comparison of categorical variables between the two groups was done by Chi-square test or Fisher's exact test, as appropriate. Numerical variables were normally distributed and were compared by Student's unpaired 't'-test. All analyses were two-tailed and $P < 0.05$ was considered statistically significant.

RESULTS

This prospective single blind study was conducted on 60 patients of age 18 to 60 years posted for various upper limb surgeries and randomly allocated into two equal groups of 30 each. Table-1 shows demographic profile of the studied groups and difference was found to be statistically insignificant($p>0.05$).

As shown in Table 2, the onsets of both sensory and motor block were significantly shorter and durations were significantly greater in the group receiving clonidine.

The pre-operative mean pulse rate was 83.86 ± 7.99/min in group A and 85.13 ± 10.58/min in group B. The difference was statistically insignificant ($p>0.05$). Five minutes after the block, the mean pulse rate was 87.73 ± 6.23/min in group A and 88.8 ± 7.31/min in group B. The difference was statistically insignificant ($p>0.05$). Post thirty minutes of giving the block, the mean pulse rate was 85.56 ± 6.37/min in group A and 84.03 ± 5.15/min in group B. This difference in pulse rate between the two groups was statistically insignificant ($p>0.05$). At 2 hr after block, the mean pulse rate was 81.96 ± 7.15/min in group A and 79.46 ± 7.91/min in group B. This difference was statistically insignificant ($p>0.05$). At 180 minutes after block, the mean pulse rate was 78.86 ± 9.13/min in group A and 73.6 ± 6.78/min in group B. This difference was statistically significant ($p<0.05$) (figure-1).

The pre-operative mean arterial pressure was 95.8 ± 8.4/min in group A and 94.6 ± 7.9/min in group B. The difference was statistically insignificant ($p>0.05$).Five minutes after the block, the mean arterial pressure was 101.3 ± 7/min in group A and 97 ± 6.7/min in group B. The difference was statistically significant ($p<0.05$). Post thirty minutes of giving the block, the mean arterial pressure was 96.6 ± 7.2/min in groupA and 95.8 ± 7.2/min in group B. This difference in pulse

rate between the two groups is statistically insignificant (p>0.05). At 2 hr after block, the mean pulse rate was 92.1 ± 7.4/min in group A and 92.6 ± 5.7/min in group B. This difference was statistically insignificant (p>0.05) (figure-2). At thirty minutes, the mean pain scores were zero for both the groups. After two hours, mean score in group A was 3 and 0 in group B. At eight hours, the mean ± SD is 40±18.57 for group A and 5 ± 11.06 for group B. The difference between the two was statistically significant (p<0.05).At 12 hours, the mean ± SD was 53.33±6.8 for group A and 41.16 ±4.3 for group B, that was statistically significant. No patient complained of nausea and vomiting.

Parameters	Group A (n=30) Mean ± SD	Group B (n=30) Mean ± SD	p value*
Age (years)	34.96 ± 12.11 yr	36.23 ± 14.7 yr	p > 0.05
Male: Female	21: 9	22:8	p > 0.05
BMI (kg/m^2)	24.53±3.05	24.37±1.79	p > 0.05
Mean Duration of surgery (minutes)	98.16 min	93.50 min	p > 0.05

Table-1: Demographic profile of study population.
* unpaired t-test was used for analysis of results, p<0.05 consider significant.

Variables	Group A (n=30)	Group B (n=30)	p value*
Onset of motor block (minutes)	16.97 ± 3.17	12.87 ± 3.39	p <0.0001
Duration of motor block (minutes)	655 ± 159.39	946.17 ± 137.99	p <0.0001
Onset of sensory block (minutes)	10.57±2.36	7.68 ± 1.94	p <0.0001
Duration of sensory block (minutes)	700.67 ± 157.35	990 ± 143.84	p <0.0001

Table-2: Onset time and duration of motor and sensory block
* unpaired t-test was used for analysis of results, p<0.05 consider significant.

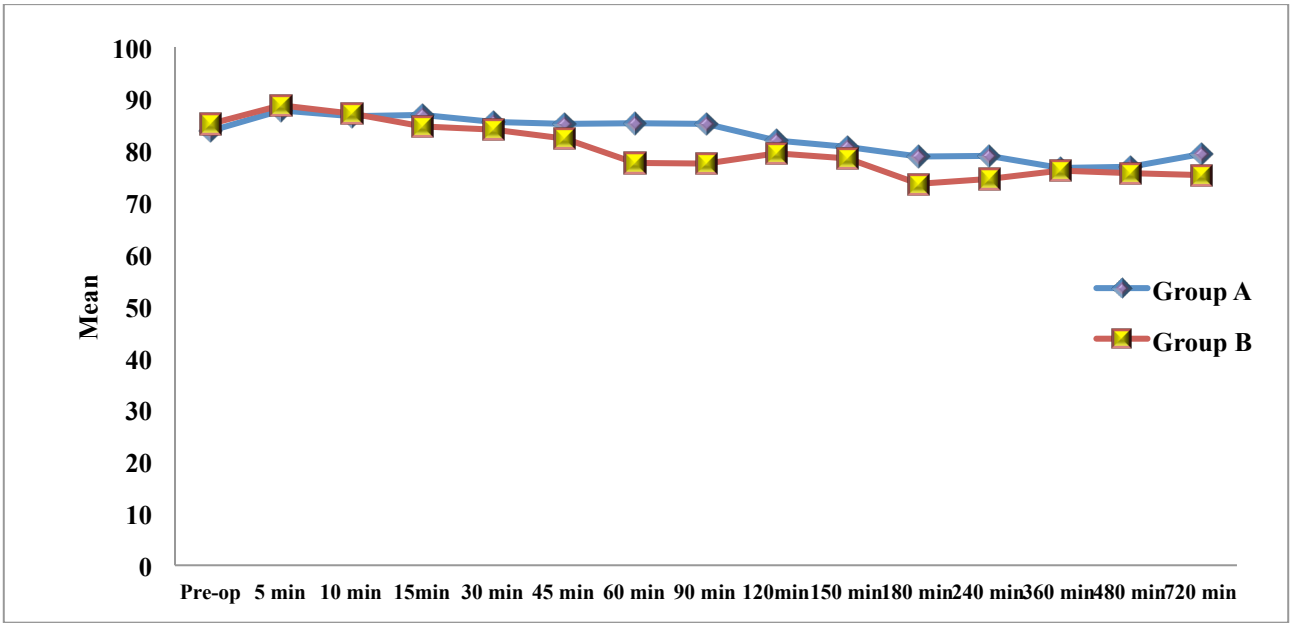

Figure-1: Comparison of mean pulse rate in group A and B

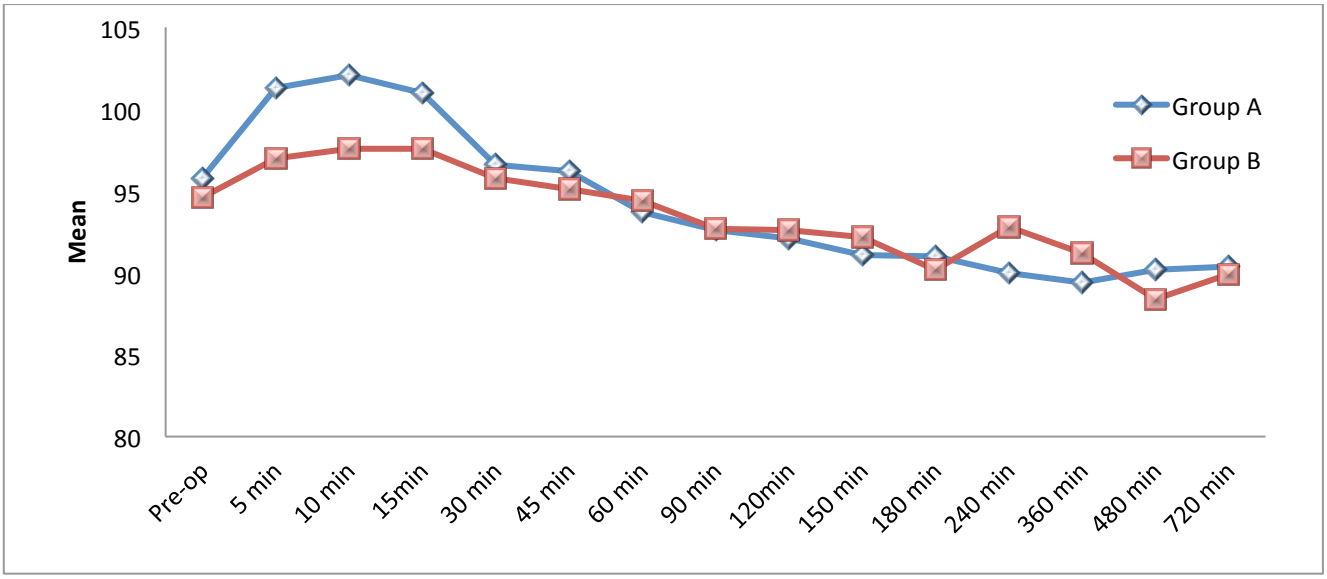

Figure-2: Comparison of mean of mean arterial pressure group A and B

DISCUSSION

This study was conducted in the Department of Anesthesia, Rohilkhand Medical College and Hospital, Bareilly. The duration of study was one year w.e.f. January, 2013 to December 2013.

The result of the present randomized controlled trial clearly suggests that relatively low-dose clonidine, as adjuvant to 0.5% levobupivacaine for supraclavicular brachial plexus block, prolongs the duration of analgesia as well as motor block.

In the present study, the time of sensory onset was shortened in Group B, using 50 µg of clonidine with levobupivacaine with a mean time of 7.68 ± 1.94 min. The onset of motor blockade in Group A was 16.97 ± 3.17 minutes and in Group B (12.87 ± 3.39) minute. The difference between the two groups was statistically significant ($p < 0.0001$). It can be concluded that the addition of clonidine 50 µg shortened the onset time and thus rapidly produced sensory and motor block.

The values in various studies conducted by different workers are in consonance with the present study (using 30 mL of 0.5% levobupivacaine). According to Moore et al[8],the time of onset and establishment of maximum operative anaesthesia vary markedly and depend on 3 factors: concentration, volume of local anaesthetic and type of block performed. The results of our study are substantiated by the results of the study conducted by AliyeEsmaoglu et al.[9] who added dexmedetomidine (α_2 agonist) to levobupivacaine for axillary brachial plexus block and showed that it shortens the onset time of both sensory and motor block and prolongs the duration of block and the duration of post-operative analgesia.

Our results for the onset and duration of sensory and motor block do not tally with the results of the study conducted by Sarita S Swami et al[10],who compared clonidine with dexmedetomidine as an adjuvant to 35 cc of 0.25% bupivacaine for supraclavicular block and reported that the onset of sensory and motor blockade (clonidine group) was [(2.33±1.2) and (3.87±1.78)] min respectively (too short). To my mind, I cannot attribute any other reason for this discrepancy except paltry pharmacologic difference between racemic and S (-)-enatiomer of bupivacaine.

Chakraborty et al[11], assessed the efficacy of clonidine as an adjuvant to Bupivacaine in brachial plexus block who reported that the mean onset duration of sensory and motor blockade was significantly faster in patients who received clonidine and this validates our results Various studies in which clonidine was used in peripheral nerve block found that Clonidine with Bupivacaine improves analgesic characteristics compared to Bupivacaine alone. [12,13]

A Duma et al[14],reported onset of sensory block [10(5-60) vs. 5(5-60)] min and motor block

[10(5-120) vs. 10(5-180) min], using levobupivacaine alone and with 150µg clonidine and duration of sensory block as [1083 (785-1680) vs. 1365(705-2465) min]. They further mentioned that they found no difference between levobupivacaine and bupivacaine in onset or duration of axillary brachial plexus block. Their study showed no significant difference in onset of motor or sensory block when plain local anesthetic was compared with anesthetic plus clonidine in axillary brachial plexus block. They also reported no difference in duration with or without the use of clonidine. At the same time a marked variability of duration of block in the groups containing clonidine was seen. They inferred that clonidine was not able prolong duration of block consistently. They summarized that clonidine as an adjuvant to long acting local anesthetic bupivacaine and levobupivacaine in axillary brachial plexus block exerts an uncertain and inconsistent effect, resulting in a lack of predictability and no significant prolongation of duration.Our study contradict with the study of A Duma et.al. as they have done comparison of levobupivacaine with clonidine in axillary plexus block and as axillary space is bigger as compared to supraclavicular space.

Side effects such as nausea and vomiting were not a major problem in Groups A and in Group B. Adverse reactions to levobupivacaine are characteristic to those seen with bupivacaine and other local anaesthetics of amide class.

CONCLUSION

From the results of the present study it can be concluded that the local anesthetic levobupivacaine is a suitable drug for supraclavicular brachial plexus block, provides a long duration of pain free period and with minimum disturbances on hemodynamic variables. The addition of 50 µg of clonidine as an adjuvant to levobupivacaine prolongs the duration of sensory and motor block and at the same time shortening the latency (onset) period. The drug alone or in combination with clonidine produces very minimal side effects of no clinical significance. Hence we recommend the incorporation of clonidine as an adjuvant to local anesthetics.Further more studies are needed for comparison of levobupivacaine alone and in combination with clonidine especially in supraclavicular block.

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