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Original Research

Evaluation of Efficacy of clonidine in supraclavicular brachial block for surgeries on upper limb

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ABSTRACT:

Background: The supraclavicular block of the brachial plexus is a useful alternative to general anesthesia for upper limb surgeries as they provide reliable and ideal operating conditions by maintaining stable hemodynamics, superior analgesia, and muscle relaxation. **Aim of the study:** To evaluate efficacy of Clonidine as an adjuvant to ropivacaine in supraclavicular brachial plexus block for surgeries on upper limb. **Materials and Methods:** A prospective, randomised, double-blinded study was carried out on 80 patients of either sex, aged 18–60 years undergoing various surgeries on the upper extremities under supraclavicular brachial plexus block and divided in two groups . Group A received 30ml 0.375% ropivacaine and 1ml saline while group B received 0.375% ropivacaine 30 ml with clonidine 150 µg (1 ml) for the block. Demographic data of patients, mean onset of sensory and motor block, mean duration of sensory and motor block and mean time for rescue analgesic was seen. Chi-square test and Student's t-test were used for statistical analysis. A p-value of ≤0.05 was defined to be statistical significant. **Results:** Demographic data of all participants was comparable. The mean onset of sensory and motor block in Group A was significantly longer than Group B. The mean duration of sensory and motor block was significantly longer in Group B. The mean time for first rescue analgesic requirement was also more in Group B patient. **Conclusion**: Clonidine as an adjuvant to local anesthetic in supraclavicular brachial plexus block provided rapid onset of block and better duration of analgesia without significant side effects in our study. Thus, Clonidine is a good adjuvant to local anesthetic agent for brachial plexus block via supraclavicular approach for various upper limb surgeries.

Keywords: Supraclavicular brachial plexus block, Ropivacaine ,Clonidine, Postoperative Analgesia

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INTRODUCTION

The supraclavicular block of the brachial plexus is the most commonly used regional anesthesia technique for upper limb surgeries as they provide reliable and ideal operating conditions by maintaining stable hemodynamics, superior analgesia, and muscle relaxation.[1] The sympathetic block it provides reduces the postoperative pain, vasospasm, and edema. Ropivacaine is an amino amide local anaesthetic prepared as "S" enantiomer. It is less cardio toxic, less arrhythmogenic, less toxic to central nervous system (CNS) than bupivacaine, and it also has intrinsic vasoconstrictor property.[2] α-2 adrenoreceptor agonists agents like clonidine have been the focus of interest for their sedative, analgesic, and perioperative sympatholytic and cardiovascular stabilizing effects with reduced anesthetic requirements. [3]

Clonidine, an imidazoline, α-2 adrenoreceptor agonist, has been extensively studied as an adjuvant to local anesthetic in peripheral nerve blocks. [4] The concurrent injection of alpha-2 adrenergic agonist drugs improve the nerve block characteristic of local anesthetics through either local vasoconstriction [5] and facilitation of C fiber blockade [6] or spinal action caused by retrograde axonal transport or simple diffusion along the nerve.[7] Clonidine is a selective alpha-2 adrenergic agonist with some alpha-1 agonist property. Brachial plexus blocks have a success rate for surgical anesthesia ranging between 70 and 100% . In fact, there is a need for distal arm supplementation in up to 22% of patients having brachial plexus blocks .[8]

The maximum allowable dose of ropivacaine is 3 mg/kg .If we use lower and effective concentration of any Local anesthetic agent in peripheral nerve block then we will be left with allowable volume for rescue block if at all needed. So we chose to give 0.375% of ropivacaine.

Hence, the present study was conducted to evaluate efficacy of Clonidine in combination with lower dosage of Ropivacaine in supraclavicular brachial plexus block for surgeries on upper limb.

Aims and Objectives: To determine the onset and duration time for sensory block, motor block, analgesia, side effects and complication with addition of clonidine as an adjuvant to 0.375% ropivacaine in supraclavicular block .

MATERIALS AND METHODS:

After Institutional Ethical Committee approval and written informed consent, a prospective, randomised, double-blinded study was carried out on 80 American Society of Anesthesiologists physical status I and II patients of either sex, aged 18–60 years undergoing various surgeries on the upper extremities under supraclavicular brachial plexus block. The exclusion criteria included patient refusal, patients having preexisting peripheral neuropathy, history of coagulation disorders, history of brachial plexus injury, allergy to the study drugs, taking other medications with α-adrenergic blocking effect, hepatic or renal insufficiency, systemic infection or infection at the site of injection, contralateral lung injury. Randomization was done with the use of sealed envelope which contain computer generated random numbers. Odd numbers indicate Group A (40 patients) and even numbers indicate Group B(40 patients). Double blinding was done for the conducted study. Person who is giving block and person observing the effect of the block were different and were blinded to the drug given to the patients. Patients in group A received 30ml 0.375% ropivacaine and 1ml saline while those in group B received 0.375% ropivacaine 30 ml with clonidine 150 µg(1 ml)

On arrival in the operation theatre, ECG, Pulse oximetry, Non invasive blood pressure monitoring were applied, baseline parameters noted and thereafter monitored intraperatively. Intravenous line was secured with 18 G intravenous cannula and ringer lactate was started in all patients. Injection midazolam 0.02 mg/kg given. Brachial plexus block was performed using a supraclavicular approach by classic technique. The patient was placed in the supine position, with the head turned away from the side to be blocked and the ipsilateral arm adducted. The interscalene groove and midpoint of the clavicle were identified and a mark 1.5 to 2.0cm above and posterior to the midpoint of clavicle was made. Palpation of the subclavian artery at this site confirmed the landmark. After aseptic preparation of the area, a skin wheal was raised at the marked point with 1ml of lidocaine 2% subcutaneously, facing the patient's head in opposite direction, a 22 G, 5cm peripheral nerve stimulator needle (Stimuplex, Braun, Germany) was inserted in a caudal slightly lateral and posterior direction. A nerve stimulator was used to locate the brachial plexus. The location end point was a distal motor response with an output up to 0.5mA. On localization of the brachial plexus and negative aspiration of blood, the study medication was injected. The assessment for onset of sensory and motor block was done every minute from the time of injection of test drug until the block was established. Onset time for analgesia was defined as the time taken from the end of the injection to the first dull response to pinprick in the distribution of any of the three sensory nerves in the hand. Onset time for sensory blockade was defined as the time taken from the end of the injection and the complete loss of pin prick sensation in all three, median ulnar and radial sensory nerves in the hand. Onset time for motor blockade was defined as the time from the end of the injection to time when patient was unable to abduct arm at shoulder.

Total duration of motor blockade was defined as time interval between onset of motor block and complete recovery of motor power. Total duration of sensory blockade was defined as time interval between onset of sensory block and complete recovery of sensation. Total duration of analgesia was defined as time interval between onset of analgesia and requirement of first rescue analgesic.

Only patients with complete motor block were included in the study. After the establishment of block, surgery was started and time of beginning of surgery was noted. Any complication like tachycardia, bradycardia, hypotension, nausea, vomiting, breathlessness, cough, discomfort and sedation were noted. During the procedure, anesthesia was considered

satisfactory if patient did not complain of any pain or discomfort. Any patient requiring supplemental anesthesia was excluded from the study. All 80 patients were monitored for anesthesia and analgesia upto 15 hours in the post-operative period. Intensity of postoperative pain was evaluated using Visual Analogue Scale (VAS), Grade 0 (No pain) to 100 (Worst pain). Analgesia was considered satisfactory if the score was 30 or less. If the score was more than 30, analgesia was judged unsatisfactory and rescue analgesic inj. Diclofenac sodium (aqueous) 1 mg/kg i.v. was administered. Time for first analgesic was noted. Postoperatively, heart rate, blood pressure, respiratory rate, oxygen saturation and VAS were recorded at 0 min, 30 min, 1 hr, 2 hr, 3 hr, 4 hr, 6 hr, 9 hr, 12 hr and 15hr. Patients were observed carefully for any complications of supraclavicular block like pneumothorax, local anesthetic toxicity and complications of clonidine like sedation, bradycardia, nausea, vomiting etc. The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square test and Student's t-test were used for statistical analysis. A p-value of ≤ 0.05 was defined to be statistical significant.

RESULTS

In the present study, a total of 80 patients participated. Demographic data of all participants was comparable in both groups (Table 1). The mean onset of sensory and motor block in Group A was significantly longer than Group B.(Table 2)(Fig 1) .The mean duration of sensory and motor block was significantly longer in Group B.(Table 3)(Fig 3) The mean time for first rescue analgesic requirement was also more in Group B patients. The results were statistically significant. The side effects of drugs were not significant .

Table 1: Demographic data of participants

Variables	Group A (n=40)	Group B (n=40)	p-value
Sex (M:F)	25:15	24:16	0.23
Mean age (years)	35.65 ± 12.25	34.12±12.39	0.15
Mean weight (KG)	59.35± 5.86	62.65 ±5.22	0.75
HR(/min)	78.77±7.76	78.10±7.91	
SBP(mmHg)	122.67±9.30	122.65±9.20	
DBP(mmHg)	78.47±6.10	78.63±6.20	
MAP (mmHg)	92.20±6.60	92.00±7.10	

M=Male; F= Female; HR=Heart rate; SBP=Systolic blood pressure; DBP=Diastolic blood pressure; DBP=Diastolic blood pressure

Table 2: Mean onset of Sensory and Motor block (min)

Onset of Anesthesia	Group A	Group B	p-value
Mean sensory block (min)	6.23	5.87	0.02
Mean motor block (min)	11.65	10.68	0.03

Fig 1: Mean onset of Sensory and Motor block

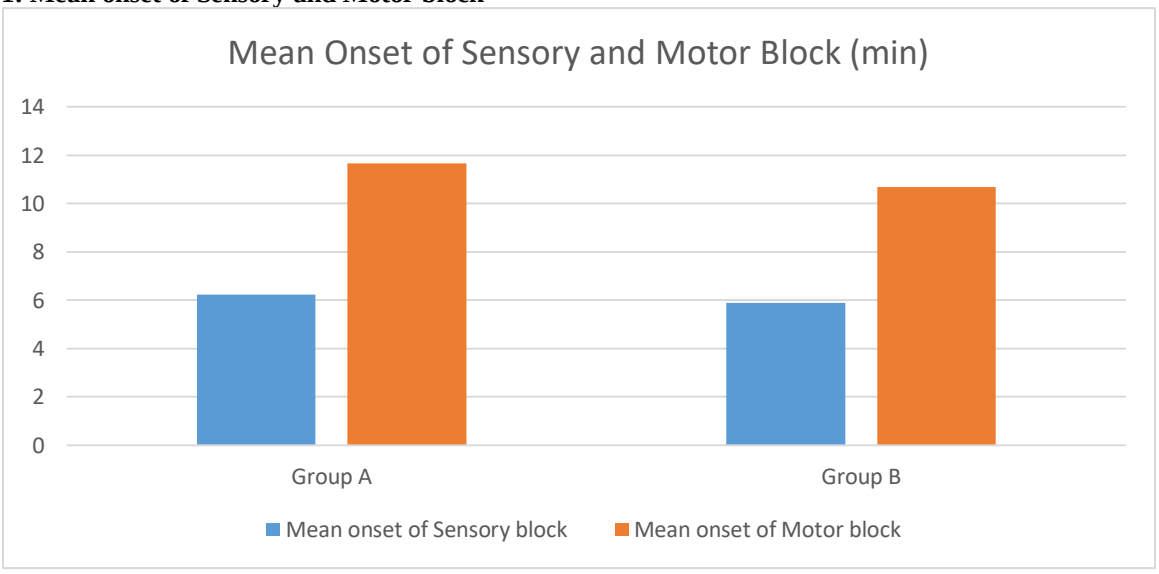
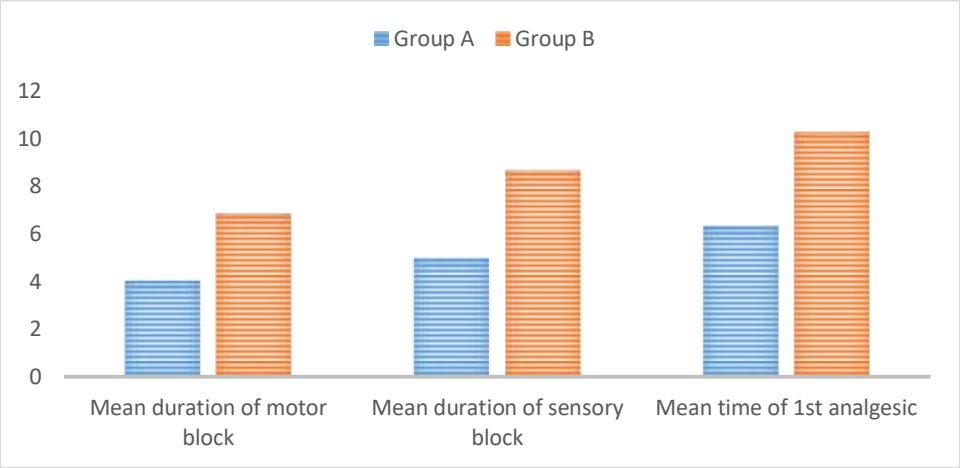


Table 3: Duration of Analgesia and Anesthesia

Time (hrs)	Group A	Group B	p-value
Mean duration of motor block	4.02	6.85	0.02
Mean duration of sensory block	4.98	8.65	0.001
Mean time of 1st analgesic	6.32	10.26	0.04

Figure 2: **:** Duration of Analgesia and Anesthesia



DISCUSSION

We in our study wanted to evaluate feasibility of using lower doses of ropivavaine with clonidine as an adjuvant to achieve clinically significant results.

Chakraborty S et al evaluated the effect of this combination in supraclavicular brachial plexus block for upper limb orthopedic procedures. A randomized double-blind placebo controlled trial was done with 70 patients of American Society of Anesthesiologists Grade I or II status undergoing upper limb orthopedic procedures. Group A (n = 35) patients received 25 ml of 0.5% bupivacaine and 0.2 ml (30 mcg) clonidine, whereas group B (n = 35) received 25 ml of 0.5% bupivacaine and 0.2 ml normal saline through a supraclavicular approach for brachial plexus block. 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 as soon as they complained of pain as rescue analgesic. Duration of analgesia was taken as the time from placement of block till injection of rescue analgesic. Analgesia duration was 415.4 ± 38.18 min (mean ± standard deviation) in Group A (clonidine) compared to 194.2 ± 28.74 min in Group B (control). No clinically significant difference was observed in heart rate, blood pressure, and oxygen saturation. Sedation score was higher in the clonidine group. It was concluded that addition of a small dose of clonidine to 0.5% bupivacaine significantly prolonged the duration of analgesia without producing any clinically important adverse reactions other than sedation.[9]

Gupta K et al compared the onset and duration of sensory and motor blockade of 0.75% ropivacaine alone or in combination with clonidine during ultrasound guided supraclavicular brachial plexus block for upper extremity surgeries under tourniquet. Sixty four adult American Society of Anesthesiologist grade 1 and 2 patients, scheduled for upper extremity surgeries were randomized to receive either 19.8 mL of 0.75% ropivacaine with 0.2 mL of normal saline (Group R) or 0.2 mL (30 µg) of clonidine (Group RC) in supraclavicular block. Onset and duration of sensory and motor blockade was compared. The hemodynamic variability, sedation, respiratory adequacy and any other adverse effects were also recorded. Ultrasound helped to visualize the nerves, needle and spread of local anesthetic at the brachial plexus block site. There was no statistically significant difference in the onset of sensory and motor blockade between the groups. Surgical anesthesia was achieved at the mean time of 20 min in all patients. Prolonged post-operative analgesia (mean duration 956 min) was observed in RC group as compared with R group (736 min). No complication of technique or adverse effect of ropivacaine and clonidine was reported. They concluded that Clonidine as an adjuvant to ropivacaine for ultrasound guided supraclavicular brachial plexus enhanced duration of post-operative analgesia. There was no incidence of vessel puncture or pneumothorax. [10] Ali QE et al evaluated the effects of clonidine on nerve blockade during brachial plexus block with ropivacaine using

peripheral nerve stimulator. Sixty patients were randomly divided into two groups, Group A and B. Group A received 30 ml of 0.5% of ropivacaine with 0.5 ml normal saline while Group B received same amount of ropivacaine with 0.5 ml (equivalent to 75 μg) of clonidine for supraclavicular brachial plexus block. There was a significant increase in duration of motor and sensory block and analgesia in Group B as compared to Group A patients. There was no significant difference in onset time in either group.[11]

Bafna U et al evaluated the effect of clonidine on ropivacaine-induced supra clavicular brachial plexus block. A total of 80 adult patients randomly recruited to two groups of 40 each: Group I: 28 ml 0.5% ropivacaine + 1 ml normal saline. Group II: 28 ml 0.5% ropivacaine + 2 mcg/kg clonidine diluted to 1 ml with normal saline. The onset of sensory and motor block was similar in both the groups. The mean duration of analgesia was prolonged in patients receiving clonidine. Although incidence of hypotension and bradycardia was higher in Group II when compared to Group I, it was not clinically significant. They concluded that Ropivacaine 0.5% is well-tolerated and provides effective surgical anesthesia as well as relief of postoperative pain. Clonidine as an adjuvant to ropivacaine significantly enhances the quality of supraclavicular brachial plexus block with prolonged duration of sensory and motor block and improved postoperative analgesia.[12]

In our study lower doses of ropivacaine along with 150 ug of clonidine as an adjuvant to it provided early onset and longer duration of analgesia and anaesthesia. The results were statistically significant. On comparing the results with previous studies, the results were found to be consistent.

CONCLUSION

Within the limitations of the present study, it can be concluded that addition of 150 ug clonidine to 0.375% ropivacaine in supraclavicular brachial plexus block provides rapid onset of block and better duration of analgesia without significant side effects. In addition lower dosage of ropivacaine provided allowable local anesthetic dose for any rescue block, if needed. Thus, Clonidine is a good adjuvant to local anesthetic agent for brachial plexus block via supraclavicular approach for various upper limb surgeries.

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