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Efficacy of Clonidine with Dexmedetomidine Added as Adjuvant to Bupivacaine (0.25%) for Brachial Plexus Block By Supraclavicular Approach: A Randomized Control Trial

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Abstract

Background and Aim: Brachial plexus blocks provide excellent anaesthesia and post operative analgesia for upper limb surgeries. Various adjuvants like opioids, midazolam and 2 agonists have been used to improve the quality of block. Present study was undertaken to compare the onset and duration of Supraclavicular block between clonidine and dexmedetomidine when added as adjuvant to local anaesthetic. *Methods:* The study was conducted at Department of Anesthesia, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. 50 patients undergoing forearm surgery under ultrasound guided supraclavicular block were randomized to receive 20ml of 0.25% bupivacaine with dexmedetomidine 1μg/kg (Group BD) or 20ml of 0.25% bupivacaine with clonidine 1μg/kg (Group BC). The onset and duration of sensory and motor block was assessed. The duration of post operative analgesia was also noted. *Results:* The mean time of onset of sensory and motor block was significantly faster in Group BD (8.8±0.91min, 11.3±0.952) than Group BC (11.14±1.13min, 13.6±1.11), respectively. The mean duration of sensory and motor block in group BD (9.3±0.667hrs, 8.5±0.692hrs) were found to be significantly longer than in group BC (7.06±0.664, 6.66±0.657). *Conclusion:* Dexmedetomidine produces faster sensory and motor block and prolongs the duration of analgesia as compared with clonidine when used as an adjuvant to Bupivacaine in supraclavicular block.

Keywords: Analgesia; Brachial Plexus; Forearm Surgery; Kutch.

Introduction

Brachial plexus blocks have been successfully used for upper limb surgeries. lignocaine and bupivacaine being the most commonly used local anaesthetics [1]. Various adjuvants like opioids midazolam, neostigmine have been used to improve the onset, quality and duration of block [2]. Of late, α2 agonists like clonidine and dexmedetomidine have been used as adjuvants with local anaesthetics. They had been used as antihypertensive agents initially but subsequently found to have sedative and analgesic properties. They are also known to have anti nociceptive action and enhance the effect of local anaesthetics when given intrathecally, epidurally and in peripheral nerve blocks. So, we decided to compare the onset time, duration and analgesic efficacy of clonidine with dexmedetomidine when added as adjuvant to bupivacaine (0.25%) for brachial plexus block by supraclavicular approach.

Materials and Methods

The study was conducted at Department of Anesthesia, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. Ethical approval was taken from institutional review board and ethical committee of the college and written informed consent was obtained from all participants. Fifty patients belonging to age group 20 -55 years of ASA PS I & II to undergo forearm surgeries under ultrasound guided

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supraclavicular brachial plexus block in a tertiary care hospital were included in the study. Patient refusal, coagulation abnormalities, known hypersensitivity to clonidine or dexmedetomidine and infection at local site were excluded from the study.

The patients were randomized by computer generated randomiza tion table into two groups. Group BD – received bupivacaine 0.25% (19 ml) + Dexmedetomidine 1 μg/kg to make 20 ml Group BC – received bupivacaine 0.25% (19 ml) + Clonidine1 μg/kg to make 20 ml Pre- anaesthetic evaluation was done on the day before the procedure included history, general physical examination and routine investigations. The study protocol was explained to the patients and a written informed consent obtained. Patient were kept NPO for 8 hours. On arrival in the operation theatre Intravenous access was obtained with 20G IV cannula, standard monitors connected and baseline HR, BP and SpO2 recorded Study drugs were prepared by an Assistant professor who was not involved in this study. Administering block and monitoring was done by the principal investigator who did not know about the preparation. the patient was positioned supine with the head turned slightly to the opposite side. After aseptic preparation of the supraclavicular fossa, under ultrasound guidance (Sonoray ultrasound machine) with high frequency (10MHz) linear probe the brachial plexus and the adjacent anatomical structures (subclavian artery, cervical pleura, and first rib) were identified. The bunch of grape appearance on Ultrasound was noted and then the study drug combination was given after negative aspiration using a 22 G, 6cm needle. A total of20 ml of solution containing study drug was injected to get a classical doughnut appearance on USG.

Sensory blockade was tested using pin prick method along the distribution of median nerve, radial nerve, ulnar nerve and musculocutaneous nerve. Sensory block was graded as Grade 0 = no sensation felt, Grade 1 = dull sensation felt, Grade 2 = sharp pain felt. Duration of sensory block was defined as the time from the onset of sensory block to regaining of sensation completely in all the dermatomes.

Motor block was assessed using a modified Bromage scale 3 (3 = extension of elbow against gravity, 2 = flexion of wrist against gravity, 1 = finger movement, and 0 = no movement). Onset of motor blockade was considered when there was Grade2 motor blockade. Duration of motor blockade was defined as the time interval between the administration of local anaesthetic and the return of complete motor function (grade 3). The duration of analgesia is noted from the time of onset of complete analgesia to the time at which the first rescue analgesic was required. After drug injection measurements of onset of sensory and motor blockade was carried out every 5 min for 30 minutes. Vital parameters like HR, BP and SpO2 was monitored. Patients in whom the block was unsuccessful or those who needed intravenous supplementation or general anaesthesia were excluded from the study. Any complications like sedation, nausea, vomiting, intravascular injection, pneumothorax and post-operative neuropathy was also noted. Postoperatively motor and sensory blockade and vitals of the patient was noted half hourly till the block completely wore off.

Statistical Analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. Descriptive statistics included computation of percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively. Quantitative data was analyzed using student's unpaired 't' test. Qualitative data was analyzed by Fisher's chi square test.

Results

The demographic variables such as age, weight, ASA status and duration of surgery were comparable in both the groups (P>0.05) (Table 1). The mean time of onset of sensory and motor block was significantly

Table 1: Demographic variables and duration of surgery

	Group BC	Group BD	P value
Age	36.4±12.22	35.12±9.04	0.33
Weight	64.9±9.15	64.2±7.27	0.54
ASAI/II	18/7	20/5	
Duration of Surgery	96.1 ± 8.2	98.1 ± 3.5	0.99

Statistical Significance at p≤0.05

faster in Group BD (8.8±0.91min, 11.36±0.952) than Group BC (11.14±1.13min, 13.6±1.11), ($p < 0.001$). The mean duration of sensory block in group BC was 7.06±0.664hrs and in group BD was 9.3±0.667hrs. ($p < 0.001$). The mean duration of motor block in group BC was 6.66±0.657hrs and in group BD was 8.5±0.692hrs ($p<0.001$) The mean duration of analgesia in group BC was 6.25±0.96 compared to 7.86±1.23 hours in group BD ($p < 0.0001$) There were no significant side effects or complications in any of the patients.

Discussion

The α2 agonists have peripheral analgesic and anaesthetic actions that are dependent and independent of α2 receptors. Both dexmedetomidine and clonidine have been successfully used in central neuraxial and peripheral nerve blocks with good results Kanazi et al, Brummett et al, Congedo E et al and Esmaoglu A et al [4-7]. We decided to compare the effects of 1 μg /kg of dexmedetomidine and clonidine as adjuvants to 0.25% bupivacaine in supraclavicular block. We used a dose of 1 μg /kg of both dexmedetomidine and clonidine like others S Swami et al, Preeti More et al, Jeby mathew et al. since the equipotent doses of these drugs as adjuvants in brachial plexus blocks have not been documented [8-10].

In our study, it was found that the onset of sensory block and motor block were significantly faster in patients who received dexmedetomidine than clonidine. This is in conjunction with others. S Swami et al, Preeti More et al, Bajwa SJ et al [8,9,11]. The α2 agonists causes faster sensory and motor onset by reducing norepinephrine release that causes inhibition of nerve fiber action potential. This effect is supposed to be not mediated through α2 receptors [12. Previous studies S Swami et al [8] Archana Tripathi et al [12], Preeti More et al [9] Munshi et al [13] have found the prolongation of sensory and motor block with dexmedetomidine when compared with clonidine. Our study also confirmed these findings. The prolongation of sensory and motor block is due to the reduction of the peak amplitude of compound action potential, the effect of which is maximum with dexmedetomidine. Kosugi et al [14]. Other studies have found that the dexmedetomidine group had longer duration of analgesia than clonidine group for brachial plexus block S Swami et al [8], Archana Tripathi et al [13], Preeti More et al [9] Munshi et al [13]. Similar results have been found in Epidural anaesthesia. Bajwa SJ et al [11]. Our study also concurs with the above findings. The reasons have already been elucidated above.

All the patients in both the groups were adequately sedated though the dexmedetomidine group had slightly higher sedation than clonidine group. This may be due to the systemic absorption of the drugs that causes sedation by their action on locus coeruleus. Other studies concur with the above findings S S wamiet al, Preeti More et al. Though there was a fall in Heart rate and Systolic blood pressure, none of the patients required treatment. These findings are in conjunction with other studies. S Swami et al, Preeti More et al.

Conclusion

To conclude, we would like to state that dexmedetomidine shortens the time of onset and prolongs the duration of sensory and motor block as compared with clonidine when used as an adjuvant to Bupivacaine in supraclavicular block.

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