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A Comparative Study of Dexmedetomidine and Clonidine as an Adjuvant to Local Anesthetics among Patients Given Supraclavicluar Block at Tertiary Care Hospital, Gujarat

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Abstract

Background: When adjuvant is used along with local anaesthetic agents they augment the onset of action, prolong the duration of analgesia and improve quality of block. Nowadays different drugs have been used as an adjuvant with local anesthetics in brachial plexus block to achieve quick, dense and prolonged block. *Objective:* To evaluate the effects of adding α_2 receptor agonist Dexmedetomidine and Clonidine to local anaesthetics in brachial plexus block through Supraclavicluar route in upper limb surgeries. *Materials and Methods:* The present study was conducted on 100 patients of 18 to 60 years age group of either sex of ASA physical status I or II planned for upper limb surgery. According to the adjuvant along with anaesthetic agent given to the patients; they were randomly divided into two groups of 50 patients each. Group A received Dexmedetomidine while in Group B; Clonidine was used as an adjuvant to local anesthetics. Supraclavicluar brachial plexus block was performed according to the group selected. All patients were observed for onset and duration of sensory and motor block, duration of analgesia, VAS score. *Results:* In Group A Mean age of patients was 35.64 years while in group B, it was 37.48 years. The average duration of surgery was 139.6 minutes in Group A while 147.2 minutes in Group B. Dexmedetomidine (3.5 mins, 6.48 mins) and Clonidine (4.2 mins, 6.48 mins) has similar onset of sensory and motor block time respectively. Both have longer motor block duration than sensory block duration. Dexmedetomidine has significantly prolonged sensory and motor block duration than clonidine ($p<0.0001$). Dexmedetomidine also has longer duration of analgesia in compared to clonidine with $p<0.0001$. *Conclusion:* Dexmedetomidine has better profile in terms of duration of sensory and motor block and duration of analgesia, as an adjuvant to supraclavicular brachial plexus block in comparison of clonidine.

Keywords: Dexmedetomidine; Clonidine; Adjuvant; Supraclavicular Brachial Plexus.

Introduction

Regional anaesthesia has been increasingly popular in recent years. It provides a safe and low cost technique with advantage of early ambulation and prolonged postoperative pain relief. It avoids unwanted effects of anaesthetic drugs used during general anaesthesia, pressure response of laryngoscopy and tracheal intubation etc [1]. Peripheral neural blockade remains a well accepted component of comprehensive anaesthetic care. Brachial plexus blocks are amongst the most commonly performed peripheral neural blocks for upper extremity. Brachial plexus block is a versatile and reliable regional anaesthesia technique first performed by Halsted in 1884. It provides a useful alternative to general anaesthesia for upper limb surgery by being safe, decreasing the cost of anaesthetic agents, decrease operation theatre pollution and with an advantage of prolonged post-operative pain relief [2]. The block achieves ideal operating conditions by producing complete muscular relaxation maintaining stable intraoperative haemodynamic parameters and the associated sympathetic block. The sympathetic block decreases post-operative pain, vasospasm and

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The supraclavicular approach to brachial plexus blockade was introduced in clinical practice in Germany by Kulenkampff in 1911. The supraclavicular route of brachial plexus blockade provides anaesthesia of the entire upper extremity in the most consistent and time efficient manner of many brachial plexus block techniques. It is performed at the trunk level where plexus is presented most compactly. This anatomic compactness is responsible for rapid onset, appropriate position and complete & reliable anaesthesia [3]. Local anaesthetics are administered in regional nerve block for relieving postoperative pain by blocking the transmission of pain signals to the dorsal horn. It is always be the interest of anaesthetists to increase the quality of local anaesthetics by adding adjuvant to local anaesthetic. These adjuvants augment the onset of action, prolong the duration of analgesia and improve quality of block with minimal adverse effects. Nowadays different drugs have been used as an adjuvant with local anesthetics in brachial plexus block to achieve quick, dense and prolonged block. α_2 adrenergic receptor agonists have been the focus of interest for their sedative, analgesic, perioperative sympatholytic and cardiovascular stabilizing effects with reduced anaesthetic requirements [4-6]. The present study was conducted to evaluate the effects of adding α_2 receptor agonist Dexmedetomidine and Clonidine to local anaesthetic Bupivacaine and Lignoadrenaline in brachial plexus block through supraclavicular route in upper limb surgeries in terms of onset, duration of sensory and motor blockade and duration of analgesia.

Methods

This randomized prospective study was conducted among 100 patients in the age group of 18-60 years after obtaining written informed valid consent admitted in a tertiary care hospital in central Gujarat. Patients with ASA grade I, II and III and undergoing any arm and forearm surgery were enrolled in the study. Patients with Extremes of age, uncontrolled systemic diseases, allergy to local anesthetics, dysarrythmias on ECG, history of drug or alcohol abuse, pregnant women, ASA grade IV, patients with local infection, neuropathies involving brachial plexus was excluded from the study. Approval from institutional ethics committee was obtained.

Patients were randomly divided into two groups; each group included 50 patients.

Group A: 2% xylocaine adrenaline (1:200000) (15 ml) + 0.5% bupivacaine(15 ml) + Dexmedetomidine 1 mcg/kg

Group B: 2% xylocaine adrenaline (1:200000) (15 ml) + 0.5% Bupivacaine (15 ml) + Clonidine 1mcg/kg

Pre-anesthetic check-up was done for each patient as per standard protocol. On the day of surgery, Written informed valid consent was taken. In operation theatre, routine and standard monitoring like ECG, pulse oxymetry, NIBP applied and baseline values noted. Intravenous access established using 18G or 20G cannula. After giving premedication (glycopyrrolate 0.004mg/kg i.v. and ondansetron 0.1mg/kg), after thorough explanation of the procedure and emphasising the need for patient co-operation, supraclavicular brachial plexus block was given by the classical technique. Intensity of post-operative pain was evaluated using VAS Score (visual analogue scale) with grade 0 (no pain) to 10 (worst pain). Pain score were noted post-operatively at 60 minutes and then 2 hourly intervals till 16 hrs. Time noted when patient regain VAS score of 4. Analgesia was considered satisfactory if the score was 3 or less. If VAS score was more than 4, analgesia was judged unsatisfactory. Evaluation was stopped and time for need of first analgesia was noted. Both groups were compared for duration of analgesia. Duration of postoperative analgesia was considered as time from onset of sensory blockade to time when patient VAS score > 4 (four).

Data was entered in Microsoft Excel worksheet and analysed by applying "Unpaired student t-Test" using Med Calc Software version 11.0. p value of less than 0.05 was considered to be statistically significant.

Results

Table 1 shows socio-demographic details of all 100 patients. Age and weight is expressed in mean ± Standard Deviation. As shown in Table 2, 64% of patients in Group A had duration of surgery lasted more than 120 minutes as compared to Group B (72%). Table 3 shows that onset of sensory block was faster in Group A than in Group B but the difference was not statistically significant with the P value of 0.14. Onset of motor block was almost comparable in both groups with the P value of 0.58. Moreover, the duration of sensory block was longer in Group A than in group B and the difference was extremely

significant statistically with the P value of <0.0001. Duration of motor block was also longer in group A than in group B and the difference was extremely significant statistically with the P value of <0.0001. Table 3 also shows that duration of post- operative analgesia was longer in group A than in group B and the difference was extremely significant statistically with the P value of <0.0001.

Table 1: Socio-demographic details of study participants (n =100)

Socio-demographic variables	Group A (n=50)	Group B (n=50)
Age (yrs)	35.64±11.8	37.48±16.16
Weight (kg)	62.64±10.41	61.6±10.12
Sex ratio (M:F)	46:4	38:12

Table 2: Duration of Surgery among study participants (n =100)

Duration of surgery (Minutes)	Group A (n=50)	%	Group B (n=50)	%
0 to 60 minutes	2	4%	2	4%
61 to 120 minutes	16	32%	12	24%
More than 120 minutes	32	64%	36	72%
Mean ± SD	139.6± 35.87	-	147.2±32.34	-

Table 3: Outcome variables in terms of onset and duration of sensory and motor blocks and duration of postoperative analgesia among study participants (n =100)

Outcome variables	Group A	Group B	P value
Onset of sensory block in minutes	3.5± 1.64	4.2± 1.73	0.14(>0.05)
Onset of motor block in minutes	6.48±1.93	6.4816±2.18	0.58(>0.05)
Duration of sensory block in minutes	519.2±52.75	381.8±76.14	<0.0001
Duration of motor block in minutes	570.4± 64.19	423.6±90.64	<0.0001
Duration of analgesia in minutes	632.4± 76.44	471.6 ±93.92	<0.0001

Discussion

The supraclavicular approach provides the most complete and reliable anaesthesia as it provides anaesthesia of the entire upper extremity in the most consistent and time efficient manner of many brachial plexus techniques. It is performed at the trunk and division level where plexus is presented most compactly. This anatomic compactness is responsible for rapid onset, complete and reliable anaesthesia. Another advantage is that it can be performed with the patient's arm in any position to provide excellent anaesthesia for elbow, forearm and hand surgery.

Many studies have been performed for different doses of dexmedetomidine and clonidine in brachial plexus block. In our study, we decided to take dexmedetomidine and clonidine in a dose of 1 mcg/kg each. S S Swami et al and V Kanvee et al selected same doses of dexmedetomidine and clonidine each, 1 mcg/kg as an adjuvant to local anaesthetics in supraclavicular brachial plexus block [4-5].

Earlier, similar studies have been done regarding comparison of onset of sensory and motor block. In our study onset of sensory block was faster with dexmedetomidine group than with clonidine but the difference was not statistically significant as the P value of 0.14 (>0.05). Onset of motor block was almost comparable in both group with no statistically significant difference observed as the P value of 0.58 (>0.05). S S Swami et al and V Kanvee et al, evaluated same result that no statistically significant difference in onset of sensory and motor block between the clonidine and Dexmedetomidine as an Adjuvant in Supraclavicular Brachial Plexus Block [4-5]. In contrast, study by Somasekharam P et al, concluded that onset of sensory block and motor block was faster with dexmedetomidine than clonidine in supraclavicular brachial plexus block [6].

Many studies have been done to compare Dexmedetomidine and clonidine with respect to duration of sensory and motor block and duration of analgesia in brachial plexus block [6-10]. In our study, Dexmedetomidine has longer duration of sensory and motor blockade as compared with Clonidine group. The mean duration of sensory block was 519.2 minutes with SD 52.75 minutes with Group A and it was 381.8 minutes with SD of 76.14 minutes with Group B and the difference was statistically significant (p<0.05). The mean duration of motor block was 570.4 minutes with SD of 64.19 minutes with Group A and it was 423.6 minutes with SD of 90.64

minutes with Group B with the p value of <0.05 which show statistically significant difference .

The trend of our result was similar to study by S S Swami et al, they found that duration of sensory block and motor block with dexmedetomidine was 413.97±87.13 and 472.24±90.06 minutes which was significantly longer than clonidine (227.00±48.36 and 292.67±59.13 minutes) [4]. It was also supported by the study done by V Kanvee et al, observed that significant difference in relation to duration of sensory block 346.8(±74.54) minutes in clonidine group and 540 (±56.12) minutes in dexmedetomidine group, duration of motor block 386.4(±67.82) minutes and 586.8 (±55.51) minutes respectively. This finding was comparable to our finding in all aspects [5].

In our study, dexmedetomidine has significantly longer duration of analgesia (632.4± 76.44 minutes) as compared to clonidine (471.6 ±93.92minutes). This difference was statistically significant (p<0.05). SS Swami et al and V Kanvee et al also suggested similar result of longer analgesia duration with dexmedetomidine in compared to Clonidine in Supraclavicluar brachial plexus block. [4-5].

Conclusion

Dexmedetomidine and Clonidine has similar onset of sensory and motor block time. Dexmedetomidine and Clonidine both have longer motor block duration than sensory block duration. However, Dexmedetomidine has significantly prolonged sensory and motor block duration than clonidine. Dexmedetomidine also has longer duration of analgesia in compared to clonidine. Hence, Dexmedetomidine has better profile in terms of duration of sensory and motor block and duration of analgesia when added as an adjuvant to supraclavicular brachial plexus block in comparison of clonidine.

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