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AN OBSERVATIONAL STUDY TO EVALUATE THE EFFECT OF ADDITION OF DEXMEDETOMIDINE TO LEVOBUPIVACAINE IN ULTRASOUND GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK IN PATIENTS UNDERGOING UPPER LIMB SURGERIES

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ABSTRACT

Background: Brachial plexus block has grown like a most successful technique for surgical procedures on the upper limb. **Aim:** To evaluate the role of addition of Dexmedetomidine to local anaesthetic drugs on onset and duration of sensory and motor block, analgesia and complications. **Materials and Methods:** After taking permission from the Ethical Committee, the study was conducted on 50 patients after taking due written informed consent. All patients posted for upper limb surgery received 1.5% Adrenalized Xylocaine (20ml) and 0.5% LevoBupivacaine (16ml) plus Dexmedetomidine 50 µg (1ml) in USG guided supraclavicular block. **Result and Conclusion:** The onset time of sensory and motor block were significantly shorter with Dexmedetomidine when added to Levobupivacaine. Duration of sensory as well as motor block was significantly longer with Dexmedetomidine. Postoperatively, the duration of analgesia was significantly more with Dexmedetomidine when added to Levobupivacaine.

INTRODUCTION

Regional anaesthesia has become very popular for orthopaedics upper limb surgeries as it gives many benefits over general anaesthesia and a fashion towards more selective and peripheral nerve blocks exists.[2] Brachial plexus block has grown like a most successful technique for surgical procedures on the upper limb. Various techniques have been explained for brachial plexus block, but supraclavicular approach demands less expertise and is the most consistently used approach for anaesthesia and analgesia for surgeries below the shoulder joint.

To extend the duration of analgesia, various methods have been used like using more amount of drug but it may also increase the possibility of systemic toxicity due to the LA drug. Various adjuvants can be used with varying degrees of success. Alpha-2 adrenergic agonists have become very famous due to their analgesic, sedative, antiemetic, anti-hypertensive properties and ability to reduce the anesthetic drugs requirement.[3,4]

AIMS AND OBJECTIVES

To evaluate the role of addition of Dexmedetomidine to local anaesthetic drugs on onset and duration of sensory and motor block, analgesia and complications.

MATERIALS AND METHODS

After taking permission from the Ethical Committee, the study was conducted on 50 patients after taking due written informed consent. Patients of either sex, ASA grade I/II, 18 - 60 years aged undergoing arm, forearm and hand surgeries were enrolled for the study. ASA III/IV patients, patients with severe systemic illness or coagulopathy were excluded from the study.

Study Design

This prospective observational study was done on 50 patients undergoing upper limb surgeries. A pre-anaesthesia evaluation was done which included routine investigations. Continuous monitoring of Heart Rate (HR), Non-invasive blood pressure (NIBP), Oxygen saturation (SpO2), Respiratory rate and Electrocardiogram (ECG) was done. Before undertaking the procedure, an intravenous drip was started which continued throughout the surgery. All patients received 1.5% Adrenalized Xylocaine (20ml) and 0.5% LevoBupivacaine (16ml) plus Dexmedetomidine 50 µg (1ml) making a total volume of 37ml in USG guided supraclavicular block. All vital parameters were observed throughout the procedure and oxygen was given at the rate of 5 L/min through oxygen mask. After recording the demographic data, heart rate , systolic blood pressure(SBP), diastolic blood pressure(DBP), mean arterial pressure(MAP) and oxygen saturation (SpO2) of the patient was recorded at the beginning of the surgery at every 5 till 30 minutes of block administration and thereafter 15 minutes of interval till the completion of the surgery.

We elicited the onset time of sensory block. It is the time from perineural injection to onset of analgesia in each of the major peripheral nerve distributions (ulnar, radial, medial and musculocutaneous). Sensory block was assessed by pinprick using the blunt end of a 27-gauge needle at 0, 2, 5, 10, 15, 20, and 30 min. After performing brachial plexus block and confirming the onset of analgesia, surgery was started. Time of onset of analgesia and time of injection of local anaesthetics was noted. Duration of analgesia was measured by asking the patient in the postoperative ward. Analgesia was given when patients complain of pain. The age of patient, onset of analgesia and duration of analgesia was noted. Time from peri-neural injection to the inability of the patient to move his/her fingers or hand is the Motor block. It was measured at 0, 10, 20, and 30 min by assessing the following motor functions: flexion at the elbow (musculocutaneous nerve), extension of the elbow and the wrist (radial nerve), opposition of the thumb and index finger (median nerve), and opposition of the thumb and small finger (ulnar nerve). The duration of motor block postoperatively was measured every hourly by asking the patients to move their fingers and to see whether they are able raise the hand or not. This time was recorded and taken as cessation of motor block effect. During the procedure, if the patient was not complaining of any discomfort or pain and if no sedation is necessary, anaesthesia was considered satisfactory. Follow up was done in the post- operative ward. According to 0-10 visual linear analogue score (VAS) for pain, the duration of analgesia was noted at every half an hour for first 10 hours and then hourly till 24 hours. When the patients started to feel the worst pain (VAS =8-10), it was considered that analgesic action of the drugs was over and rescue analgesic (Inj. Diclofenac sodium1-1.5mg/kg i.m) given.

In case of inadequate/patchy action of the block/weaning of block due to undue prolongation of surgery the block was supplemented with general anaesthesia and the patient was not be considered for our study.

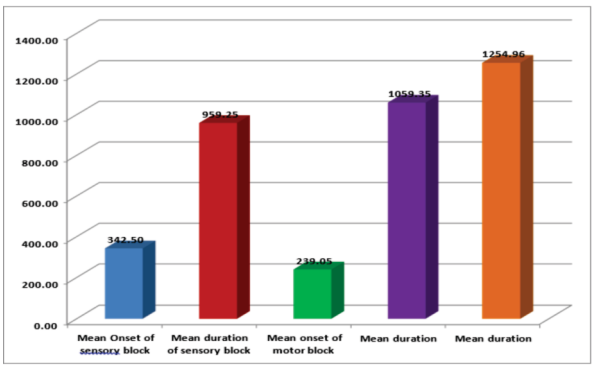
Possible side effects like nausea, vomiting, allergy to LA, pruritis, Horner's syndrome were looked for, noted and to be managed accordingly.

Statistical Analysis

All statistical analyses were performed using Excel 2007 TM (Microsoft, Redmond, WA). Patient demographic characteristics were analyzed using the t-test for independent groups. The results were presented in number, percentage, mean and standard deviation as appropriate. Hemodynamic parameters (PR, SBP, DBP and MAP) were analyzed using ANOVA –SINGLE FACTOR and Unpaired T –Test. Block characteristics were analyzed by one way analysis of variance (ANOVA – single factor) and Chi square test which ever were applicable. A p-value of <0.05 was considered statistically significant.

RESULTS

	Minimum	Maximum	Median	Mean	Standard deviation (n)	Standard error of the mean	Coefficient of Variation
Onset of sensory block	74.30	540.00	330.00	342.50	89.56	12.42	0.26
duration of sensory block	52.43	1080.00	990.00	959.25	186.61	25.88	0.19
onset of motor block	51.41	360.00	240.00	239.05	62.21	8.63	0.26
duration of motor block	190.17	2000.00	1070.00	1059.35	252.35	34.99	0.24
duration of analgesia	59.13	1460.00	1280.00	1254.96	243.62	33.78	0.19



DISCUSSION

Our study indicates that Dexmedetomidine is effective when added to Levobupivacaine in supraclavicular brachial plexus block as it reduces onset of block and causes greater prolongation of both sensory and motor block.

In consensus with the study by Dixit et al,[4] the mean duration for sensory block onset was 6.85±0.745 minutes and Singh et al[1,4] (the mean onset time was 3.24±0.95 minutes), Hosalli et al[42] reported a mean time for sensory onset to be 8.14±1.08 minutes. However, this was more than the study by Swami et al,[4,3] in which, the mean time required for the onset of sensory block was 1.77±1.28 minutes, Rao et al[1], the mean time required for onset of sensory block was found to be 1.70±1.28 minutes and Munshi et al[44], the mean time for onset of the sensory block was 1.93±0.44 minutes. While the mean onset time for sensory block in the study by Agarwal et al[1,5] was 16.2±1.8 minutes. The mean duration of sensory block was 959.25±186.61 seconds which was quite similar to the results reported by Singh et al, [4,1] (the mean duration for sensory block was 16.31±2.606 minutes). While, this was lesser than the study by Al-Mustafa MM et al,[4,5], the mean duration for sensory block was 261.5±34.8 minutes, Swami et al[4,3], in which, the mean duration for sensory block was 413.97±87.31 minutes, Hosalli et al[4,2] (the mean sensory block time was 423.17±80.01 minutes), Biswas et al[1,4], the mean duration of sensory block was 898±32.33 minutes, Ghali et al[46] (sensory block duration was reported to be 499.10±51.76 minutes for the patients undergoing Vitreoretinal Surgery with Sub-Tenon's block anesthesia), Munshi et al[2,4], the mean sensory block time was 406.7±61.45 minutes, Rao et al, the mean mean sensory block time was found to be 400.15±85.13 minutes and in the study by Agarwal et al the mean sensory block time was 755.6 ± 126.8 minutes.

In our study, the mean onset time for motor block was found to be 239.05±62.21 seconds. This was in accordance with the study by Munshi et al, in which, the mean motor block onset time was 4.82±1.43 minutes, Swami et al, in which, the mean motor block onset time was 4.65±2.46 minutes, Rao et al the mean motor block onset time was 4.60±2.41 minutes and Singh et al (the average motor block onset time was 2.83±1.20 minutes) for supraclavicular brachial plexus block. While the mean onset time for motor block in the study by Agarwal et al was 16.2±1.8 minutes and Hosalli et al[2,3] (the mean motor onset time was 14.93±1.84 minutes).

The mean duration of motor block was 1059.35±252.35 seconds. This was similar to the study by Singh et al (the mean duration of motor block was 17.52±2.098 minutes)[41] However, in the study by Al-Mustafa MM et al, the mean duration for motor block was 199±42.8 minutes, Swami et al[2,3], Munshi et al, in which, the mean onset time for motor block was 497±56.48 minutes, the mean duration of motor block was reported to be 472.24±90.06 minutes, Hosalli et al (the mean duration of motor block was 488.21±88.20 minutes)[1,2], Biswas et al[1,3], the mean duration of motor block was 840±50.23 minutes, Ghali et al (mean motor block duration was 371.90±48.10 minutes in patients having Vitreoretinal Surgery [1,2], Dixit et al,[4] the mean duration of motor block was 13.85±0.366 hours, Rao et al[1], the mean duration of Motor block 470±86.60 minutes and in the study by Agarwal et al[2], the mean duration time for motor block was 702.0 ± 112.6 minutes.

In the study by Zhang et al., the duration of sensory and motor blockade was prolonged among patients who received Dexmedetomidine (50 μg) in comparison to control group for axillary brachial plexus blockade.[3]

The mean duration of analgesia was 1254.60±243.62 minutes which was much less than the study by Munshi et al, in which, the mean duration of analgesia was 499±59.50 minutes, Swami et al, in which, the mean duration of analgesia was 456.21±97.99 minutes, Hosalli et al[2,3] (the mean duration of analgesia was 460.21±78.33 minutes), Singh et al[4,8] (the mean duration of analgesia was 1273.79±83.139 minutes), Biswas et al the mean analgesia duration was 997±154.23 minutes, Rao et al[1], the mean duration of analgesia was found to be 732.40±95.10 minutes for Bupivacaine added to Dexmedetomidine group and in the study by Agarwal et al[19], the mean duration of analgesia (DOA) for group SD was 776.4±130.8 minutes.

Rao et al[1] conducted a double blind clinical trial, which reported that dexmedetomidine was found to be a better adjuvant for the supraclavicular brachial block in comparison to the clonidine for providing the anaesthesia intraoperatively and analgesia for elective upper limb surgeries under Brachial Plexus Block.

Kalso et al. states that when Dexmedetomidine added to Lidocaine for regional anaesthesia intravenously, Dexmedetomidine improves the anaesthesia quality and analgesia intraoperatively as well as postoperatively without any undue side effects[2,3] because of the compatibility of dexmedetomidine to $\alpha 2$ adrenoceptor agonists is ten times in comparison to clonidine.[1,2]

CONCLUSION

- The onset time of sensory and motor block were significantly shorter with dexmedetomidine when added to levobupivacaine when compared with previous studies; similarly duration of sensory as well as motor block was significantly longer with dexmedetomidine.
- Postoperatively, the duration of analgesia was significantly more with dexmedetomidine when added to levobupivacaine.
- No significant adverse effects were noted in the study.

Limitations

1. This study is not a comparative study so we cannot compare the effects of the study drug among the groups.
2. The sample size of the study is small and a large group could have revealed more accurate and better results.

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