Original Article

Effect of Verapamil Adjuvant with Local Anaesthetic Mixtures in Supraclavicular Brachial Plexus Block

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Abstract

Among the various approaches to block brachial plexus , supraclavicular approach offers a high success rate for elbow, forearm and hand surgery . Various adjuvant drugs have been used with local anesthetics in order to decrease the time of onset and prolong the duration and quality of regional blocks. So efforts were made to combine the adjuvant with local anesthetics to improve patient and surgeon satisfaction. In this randomized study we tried to see the effect of verapamil in brachial plexus block as an adjuvant with local anaesthetic .This randomized study wasconducted in Anaesthesiology department of ShaheedZiaurRahman Medical College Hospital after approved by the ethical review board of this hospital.The study subject were divided into two groups (Group A=only local anaesthetics&Group B=local anaesthetics with Verapamil) , 30 IN numbers in each group. Group-A patients was administered 15ml of 1% lignocaine with 15 ml of bupivacaine 0.25% while in Group-B patients was administered injection verapamil 3.5 ml (3.5 mg) in addition to the above mixture. In this study mean onset time of sensory block was 11.53 ± 1.4 minutes in group - A and 7.12 ± 1.68 minutes in group – B which is not statistically significant (p value = 0.057). The mean onset time of motor block in group A was 15.26 ± 1.96 min, and in group B was 11.58 ± 2.68 min and this difference isstatistically significant (p value=0.000152). Duration of motor block was 96.30 min and 115.08 min in group A and Group B respectively. Sensory block was 157.26 min and 188.0 min in group A and Group B respectively. Regarding the heart rate, no significant difference was detected between the groups at the time of preanesthesia and at the 5 min after anaesthesia. Compared with group B patients, group A patients shows slight but statistically significant increased heart rate at the 10 min (80, 92 beat/min respectively) after brachial plexus block. At 30 minute after, mean systolic BP was 97.9±4.7 mmHg in group A and 84.3±5.0 mmHg in group B. At 45 minute after, mean systolic blood pressure was 94.6±15.6 mmHg and 84.3±5.0 mmHg in group A and group B respectively. At 60 minutes after, mean systolic blood pressure was 59.6±6.0 mmHg in group A and 61.2±9.4 mmHg in group B. At 15, 30 and 45 minute difference was statistically significant (p<0.05) between two groups. In conclusion, the study revealed that verapamil can be used as an adjuvant to decrease the onset time of sensory and motor blocks of bupivacaine in supraclavicular block. Moreover, verapamil doses in regional blocks did not show any hemodynamic side effects.

Key words: Brachial plexus block, Supraclavicular block, Verapamil

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INTRODUCTION

Peripheral nerve blocks are gaining widespread popularity for perioperative pain management because of their specific advantages over general anesthesia and central neuraxial anesthesia. To select an appropriate local anesthetic drug for a specific clinical situation, one should be familiar with the clinical pharmacology of the local anesthetic drugs and adjuvants. Brachial plexus blockade is the cornerstone of the regional anesthesia practice of most anesthesiologists now-a-day[1].

Supraclavicular block is performed at the level of divisions of the brachial plexus. It has a rapid onset and deep level of block making it desirable for surgeries below the mid-humerus. The complications associated with this procedure are dependent on the level of block. However, the complications are few and infrequent in experienced hands, making it

a popular procedure[3]. In recent years it has gained popularity with addition of various adjuncts to local anaesthetic solution in an attempt to increase its efficacy and duration.

Local anaesthetics alone provide analgesia for not more than 4-8 hours. Increasing the duration of local anesthetic action is often desirable because it prolongs surgical anesthesia and analgesia. Different additives have been used to prolong regional blockade. Vasoconstrictors can be used to vasoconstrict vessels, thereby reducing vascular absorption of the local anesthetics[4-7]. Others drugs like calcium blocker, opioids, alpha2 adrenergic agonist, sodium bicarbonate, neostigmine, adrenaline, ketamine etc. are used as adjuvant to local anesthetics to lower doses of each agent and enhance analgesic efficacy while reducing the incidence of adverse reactions.

Verapamil is a calcium channel blocker. It can also block slow Na+- K+ channels in cardiac muscles and vessels. Besides that, verapamil can block fast channels similar to the process of local anesthetics8. Regarding the obvious role of calcium ion in pain formation, calcium channel blockers emerged as adjuvant for analgesia and anesthesia. The aim of the study was to assess the effects of verapamil on supraclvicular brachial nerve block regarding its consequences on the onset of sensory and motor block and duration of analgesia and also the effects on hemodynamic alterations.

MATERIALS AND METHODS

This randomized control study was conducted in Anaesthesiology department of Shaheed Ziaur Rahman Medical College Hospital after approved by the ethical review board of this hospital and also written informed consent obtained from all patients. Patients undergoing upper limb surgery with ASA physical status I, II and age between 18 to 60 years were included in this study except those with severe cardiorespiratory, renal, hepatic diseases, chronic neurological disease of upper limb, with coagulopathy, any contraindication to calcium channel blockers, history of drug abuse or history with local anesthetics toxicity. Study subject were divided into two groups (Group A=only local anaesthetics&Group B=local anaesthetics with Verapamil) randomly, 30 numbers in each group. After arrival to the operating theatre all patient's received Lactated Ringer's solution, infused at 10ml/kg/h over 30 min before anaesthesia . Base line parameters like BP, Pulse, oxygen saturation, ECG and axillary temperature were recorded before anesthesia. Group-A patients was administered 15ml of 1% lignocaine with 15 ml of bupivacaine 0.25% while in Group-B patients was administered injection verapamil 3.5 ml (3.5 mg) in addition to the above mixture. Total volume was made 40 ml by adding distilled water in both the groups. About 2 cm above the midclavicular point just lateral to subclavian artery pulsation, a 22 gauge 1.5 inch needle was introduced caudally and medially and when paraesthesia encountered 40 ml of local anaesthetics with or without verapamil injected. Pulse, BP, ECG was monitored in every 5 minutes up to 30 minutes of block. Onset of motor block was considered as time from injection to the inability of the patient to move his/her hands or fingers then block was assessed by Bromage scale upto 30 minutes in 5 minutes interval.Onset of sensory block was considered as dull sensation on any dermatomes tested by icepack, pin prick sensation. The duration of sensory blockade, defined as the time between onset of sensory block and return of dull pain and VAS<3, was assessed every 30 minutes postoperatively. The duration of motor block was assessed every 30 minutes till the ability of the patient to move his/her fingers. When the patient first requested for analgesics, the time of administration of the analgesics, number of doses and the VAS score noted. Any occurrence of side-effect also noted and managed accordingly. All data analysis was done by using SPSS version 6.

RESULTS

Table I: Demographic Data and ASA status.

	Group-A	Group-B	P Value
Age in years (mean ± S.D)	36.2±6.13	34.7±8.53	
Gender	21/9	18/12	0.621
Height (mean ± S.D)	162±4.13	160±6.69	
ASA status	19/11	18/12	0.790

A Total of 60 patients were studied to determine whether addition of varapamil to local anaesthetics increases the quality of bracheal plexus block. While studying the distribution of cases by age, gender and ASA physical status no significant differences were found between groups (Table I).

Table II: Time to onset of sensory and motor block (n=60)

	Group-A	Group-B	P Value
Time of Sensory onset in minutes	11.53 ± 1.40 min	7.12 ± 1.68 min	0.057
Time of motor onset in minutes	15.26 ± 1.96 min	11.58 ± 2.68 min	0.000152

In this study mean onset time of sensory block was 11.53 ± 1.4 minutes in group - A and 7.12 ± 1.68 minutes in group – B which is not statistically significant (p value = 0.057). The mean onset time of motor block in group A was 15.26 ± 1.96 min, and in group B was 11.58 ± 2.68 min and this difference is statistically significant (p value=0.000152).Table II).

Table III: Trends of mean arterial pressure (MAP) between groups with respect to time (n=60)

Time point after block	Mean arterial pressure -MAP (mmHg)		P-value
	Group U (n=30)	Group B (n=30)	
Preanaesthesia	69.60±11.6	68.93±9.1	0.883
5 min AS	73.45±8.2	67.90±9.5	0.0001
10 min AS	75.40±7.9	70.25±10.2	0.0001
15 min AS	76.92±8.1	69.18±9.5	0.0001
20 min AS	76.31±8.6	68.73±9.1	0.0001
30 min AS	75.57±10.2	69.18±7.5	0.0001
45 min AS	71.05±9.3	64.46±11.4	0.035
60 min AS	59.55±6.8	60.52±7.1	0.486

There was no significant difference between the groups as regards Preanaesthesia MAP (p=0.883), but after induction of anesthesia significant decrease in MAP was seen in all groups compared with basal MAP. At the 15th minute MAP was statistically significant (p=0.0001), After 45 minute, mean blood pressure was 71.05±6.8 mmHg in group A and 64.46±9.4 mmHg in group B, which statistically significant (p=0.035) between two groups but follow up after 60 minute mean BP stabilized to similar in both group, which was statistically not significant (p=0.486) between two groups. (Table-III).

Table IV: Occurrence of complication

Complications	Frequency of occurrence	
	Group A (n=30)	Group B (n=30)
Nausea, Vomiting	2	0
Dyspnoea	3	3
Hypotension	0	7
Bradycardia	1	4

No significant complication was observed in both group, but in group-A patient experienced vomiting, three patients noticed respiratory discomfort. In the B-group, seven patients had respiratory discomfort; hypotension and four of them experienced hypotension (Table IV)

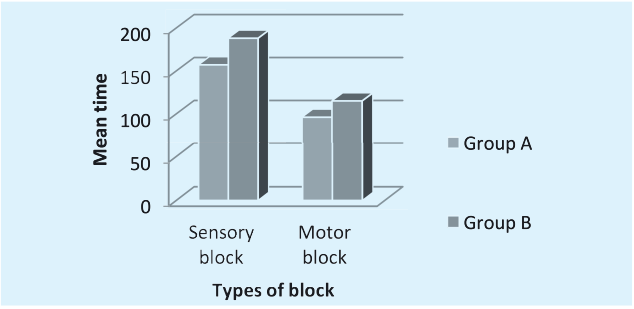

Fig 1: Mean duration (min) of motor and sensory block (n=60)

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Hypotension	0	7
Bradycardia	1	4

The duration of motor block was 96.30 min. and 115.08 min. in group A and Group B respectively. Sensory block was 157.26 min. and 188.0 min. in group A and Group B respectively (Figure:1).

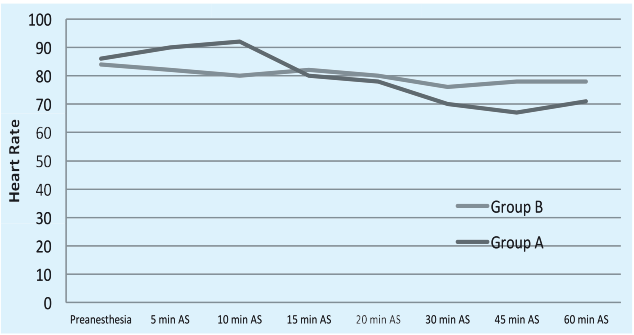

Fig 1: Mean duration (min) of motor and sensory block (n=60)

Regarding the heart rate, no significant difference was detected between the groups at the time of preanesthesia and 5 min after anaesthesia(Fig:2).

DISCUSSION

For upper limb orthopedic surgeries supraclavicular block is a very good form of regional anaesthesia for not only surgery but also to control the postoperative pain. Supraclavicular block attack the nerve fibers at the level of the trunks. Three trunks of the brachial plexus supplies the sensory, motor and sympathetic fibers to the upper limb, which contained in a very small, compact but easily accessible and relatively superficial area. So it's possible to have prompt and profound form of upper limb block with this approach.

In this way calcium channel blockers potentiate the analgesic effect of local anesthetics and acts primarily by means of vasodilatation and reduction of peripheral vascular resistance.[11]

In many studies calcium channel blockers along with local anesthetics been used. Nowycky et al. reported that there is three distinct types of calcium channels in sensory neurons namely, the L, T, and N types. Of these, the L and N types of channels have a strong role in regulating neurotransmitter

release from neurons.[12] The antinociceptive effects of N type channels are more than L type channel and N type channel blockers were not clinically suitable for use because of their severe neurotoxicity. Hara et al.[13] showed that the L-type channel blockers verapamil and diltiazem produced both somatic and visceral pain relief in a dose-dependent manner, suggesting the relevance of L-type channel blockers in pain management. Iwasaki et al.[12] showed that local sensory block produced by lidocaine injection at the tail base was potentiated by verapamil, diltiazem, and nicardipine in a dose-dependent manner in rats. Moreover, intrathecal verapamil alone did not produce motor or sensory block. However, in combination with lidocaine or tetracaine, the block produced was more potent and of longer duration than that produced by the local anesthetic alone in rats.[14] Brachial plexus administration of verapamil 2.5 mg increased the duration of surgical anesthesia by~90 min when added to lidocaine with epinephrine axillary block .[15]

In this study demographic profile and ASA status of patients which was statistically insignificant between two groups, was quite similar with other research investigations, and provided us the stable podium to evenly compare the results obtained.[16]

In this present study, Heart rate was comparable between groups. The mean BP had some significant variations at 15th and 45th minute but after 60th minute returned to base line, which are not comparable with other study, although it is well known that the systemic administration of calcium channel blockers cause myocardial depression leading to hypotension and bradycardia. This controversy may be due to the pharmacokinetic interaction of different drug solutions, such as changing pH and the temperature at injection site.[17]

In present study the onset of motor block and duration of sensory and motor block was statistically significant between groups. Mosaffa et al. also have the same effects but using 2 doses of verapamil with bupivacaine in supraclavicular brachial plexus block. They concluded that verapamil (both 2.5 mg and 5 mg) decreased the onset of sensory and motor block and increased the duration of analgesia[19] Messeha and Eldeen studied role of nimodipine, a calcium channel blocker when added to lignocaine in brachial plexus block and found prolongation of sensory blockade.[20]

This study was not without limitation. The limitations of the studies were as follows:

• Small sample size of the study population.

• It was a single center study. Only patients admitted in SZMCH hospital were taken for the study. So this will not reflect the overall picture of the country. A large scale study needs to be conducted to reach to a definitive conclusion

• Others limitation were short duration of study and limited investigation facility.

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