A comparative study of anesthetic properties of bupivacaine alone and in combination with dexamethasone for supraclavicular brachial plexus block in patients undergoing elective upper limb surgeries

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Abstract— *Bupivacaine is one of the local anesthetic used most frequently as it has a longer duration of anesthesia. Sometime other medicines are used to get better effect. So this study was conducted to compare the anesthetic effect of Bupivacaine alone and Bupivicaine along with Dexamethasone. For this purpose 30 upper limb surgery cases were given Bupivacaine alone and 30 upper limb surgery cases were given Bupivicaine along with Dexamethasone. The mean time of onset of sensory block in Bupivacaine group was 16.7 minutes and 10.3 minutes in Bupivacaine plus Dexamethasone group. The mean time of onset of motor block with Bupivacaine group was 8.6 (± 1.2) minutes and with Bupivacaine plus Dexamethasone group was 5.6 (± 0.7) minutes. The mean duration of sensory block in Bupivacaine group was 4 (± 6.3) hours and in Bupivacine plus Dexamethasone group was 5.9 (± 0.7) hours. The mean duration of motor block in Bupivacaine group was 1.9 (± 0.5) hours and in Bupivacaine plus Dexamethasone group was 4.3 (± 0.9) hours. It can be concluded from this study that time taken to onset of sensory block and motor block was significantly earlier in Bupivacaine plus Dexamethasone group than Bupivicaine only group. Although there was no significant difference in duration of sensory block in both the group but duration of motor block was significantly more in Bupivacaine plus Dexamethasone group than Bupivicaine only group. Number of rescue analgesic doses in 24 hours required were significantly more in Bupivacaine than Bupivacaine plus Dexamethasone groups.*

Keywords: Bupivicaine, Dexamethasone, Anesthetic effect.

I. INTRODUCTION

Brachial plexus block is a popular approach for upper limb surgeries as an alternative to general anesthesia. This type of anesthesia mainly helps in to achieve ideal operating conditions by producing muscular relaxation, maintaining stable intra- operative hemodynamic condition and sympathetic block which reduces postoperative pain, vasospasm and edema.[1]

A variety of approaches of brachial plexus block have been described in the literature. However supraclavicular block is a consistent and easiest method for anesthesia and post operative pain Management.[3,4,5]

Bupivacaine one is of the local anesthetic used most frequently as it has a longer duration of action varying from 3 to 8 hours. However, it has limiting factors like delayed onset, patchy or incomplete analgesia. To minimize these drawbacks many drugs like Neostigmine, Opioids, Haluronidase,

Midazolam, Clonidine, Dexamethasone etc., have been added to local anesthetics to improve the quality and duration of action and postoperative analgesia.[3]

So this study was conducted to compare the anesthetic property of Bupivacaine alone and in combination with Dexamethasone in upper limb surgeries.

II. METHODOLOGY

A randomized single blinded study was taken up among 60 patients aged between 18 to 65 years undergoing upper limb surgeries in SMS medical college and attached hospitals. Ethical clearance was obtained before Institutional Ethical review committee. An informed, bilingual and written consent was obtained from all the patients.

For this study, ASA class I and II patients with blood pressure in normal range aged between 18 to 65 years undergoing upper limb surgeries were included. Out of these patients, patients having hypersensitive reaction to Dexamethasone and localanesthetic and /or patients having abnormal BT, CT or on anticoagulation therapy, severe anemia, hypovolemia, shock, septicemia and h/oseizures and even patient having local infection at the site of proposed puncture for supraclavicularblock were excluded from study.

The patients who satisfied the inclusion and exclusion criteria were allocated in any of the following group through chit box with replacement method till there were 30 patients in each of two group.

1. Control group – Group I : 30 subjects receive 30ml Bupivacaine0.5%
2. Study group – Group II: 30 subjects received 28ml of mixture of Bupivacaine 0.5% and + 2ml Dexamethasone (8mg).

The patients were subjected for detailed pre anesthetic Check up. The patients were also subjected for detailed laboratory work up including complete heamogram and urine routine. Patients were also subjected for HIV and HBsAg, Chest X ray and ECG examination.

The anesthesia machine, emergency oxygen source (E type cylinders), pipeline O_2 supply, working laryngoscopes, appropriate size endotracheal tubes and connectors were kept ready for emergency resuscitation. Apart from this working suction apparatus with suction catheter, Oropharyngeal airways, intravenous airways and drugs including Thiopentone, Diazepam, Succinylcholine, Hydrocortisone, Atropine, Adrenaline, Aminophylline, Mephentermine, Calcium gluconate and sodium bicarbonate were also kept ready. Pulse oximeters and non invasive blood pressure monitor by sphygmomanometer was tied on opposite upper limb.

Patients were kept nil oral overnight and kept in supine position in the operation table with arms by the side and head turned to other side. With all aseptic precautions sublcavian artery pulsations were felt at a point 1.5 to 2.0 cm posterior and cephalad to midpoint of clavicle. A skin wheel is raised with local anesthetic cephalo posterior to the pulsations. A 22 gauge, 1.55 inches short beveled needle is introduced through the point located parallell to head and neck in a caudal and slight medial and posterior direction until either paraestehsia is elicited or first rib is encountered. If rib is felt by the needle, it should be moved over the first rib until paraesthesia is elicited in the arm or hand.

After paraesthesia is elicited and encountering the negative aspiration of blood, the needle should be kept in same position and the medication under study was injected slowly by ruling out the

intravascular injection intermittently.

The onset of anesthesia was evaluated by the pin prick with a 23 gauze needle. The time of onset was defined as the time between injection and complete loss of pin prick sensation in C_2 and T_2 dermatomes. The temperature was tested by using the spirit soaked cotton on the skin dermatomes from C_2 to T_2. The time of onset of complete sensory blockade was recorded.

The motor block was assessed by using Bromage three point score [0= normal motor function with full flexion and extension of elbow, wrist and fingers, 1=decreased motor strength with ability to move fingers and/or wrist only, 2= complete motor blockade with inability to move fingers]. The time of motor blockade was noted.

The time of onset of sensory block was defined as the time elapsed between the injection of drug and complete loss of cold perception of the hand, while onset of the motor blockade was defined as the time elapsed from injection of drug to complete the motor block.

Duration of sensory block which is the time elapsed between the injection of drug and appearance of pain requiring analgesia and duration of motor block was also recorded.

Diclofenac sodium intra muscular injection was used as rescue analgesic whenever patients complained of pain. The numbers of rescue analgesics in 24 hours of post – operative period were also recorded.

The data thus obtained was complied and analysed using Statistical Package for Social services. (SPSS trial version 18). Quantitative data was analysed by using student unpaired 't' test. Qualitative data was analysed using Chi – Square test. A p value of less than 0.05 was considered as statistically significant.

III. RESULTS

A total of 60 patients of ASA I and II posted for upper limb surgeries were enrolled in this study as study subjects. They were randomly divide into two equal groups where first group received 30 ml of 0.5% Bupivacaine and second group received 28 ml of mixture of Bupivacaine with Dexamethasone (8 mg) by supra clavicular approach. Both groups were comparable age and sex wise. (Table 1)

Table 1
Characteristics of Control Group and Study Group

S. No.	Variable	Control Group	Study Group	P Value LS
1	**Age (Mean±SD) in years**	36.9±10.4	34.7±7.1	**0.328 NS**
2	**Sex (M:F)**	16:14	18:12	**0.794 NS**

The mean time of onset of sensory block in Bupivacaine group was 16.7 minutes and 10.3 minutes in Bupivacaine plus Dexamethasone group. This difference in onset of sensory block was statistically significant between the two groups. (Table 2)

The mean time of onset of motor block in this study in Bupivacaine group was8.6 (± 1.2) minutes and the mean onset of motor block in Bupivacaine plus Dexamethasone group was 5.6 (± 0.7) minutes. There is significant difference between the onset of motor block in minutes and Bupivacaine and Bupivaciane plus Dexamethasone groups. (Table 2)

The mean duration of sensory block in Bupivacaine group was 4 (± 6.3) hours and in Bupivacine plus Dexamethasone group was 5.9 (± 0.7) hours. This difference was not statistically significant between the Bupivacaine and Bupivacaine plus Dexamethasone group. (Table 2)

The mean duration of motor block in Bupivacaine group was 1.9 (± 0.5) hours and the mean duration of motor block in Bupivacaine plus Dexamethasone group was 4.3 (± 0.9) hours. There was statistically significant difference in duration of motor block between Bupivacaine and Bupivacaine plus Dexamethasone groups. (Table 2)

When the number of rescue analgesic doses in 24 hours were obsedreved, the patients of Bupivaciane group had received 2.5 (± 0.5) doses and the patients of Bupivacaine plus Dexamethasone group received 1.3 mean doses of rescue analgesic. The difference in receiving the mean doses of rescue analgesic was statistically significant between the Bupivacaine and Bupivacaine plus Dexamethasone groups. (Table 2)

Table 2
Comparison of anesthetic property of Control Group and Study Group

S. No.	Variable	Control Group	Study Group	P Value LS
1	**Time of onset of sensory block**	16.7 ± 2.1	10.3 ± 1.4	<0.001 S
2	**Time of onset of motor block**	8.6 ± 1.2	5.6 ± 0.7	<0.001 S
3	**Duration of onset of sensory block**	4.0 ± 6.3	5.9 ± 0.7	>0.05 NS
4	**Duration of onset of Motor block**	1.9 ± 0.5	4.3 ± 0.9	<0.001 S
5	**Number of rescue analgesic doses in 24 hours**	2.5 ± 0.5	1.3 ± 0.4	<0.001 S

IV. DISCUSSION

A randomized single blinded study was taken up among 60 patients posted for upper limb surgeries who were aged between 18 to 65 years.

The mean time of onset of sensory block was later in Bupivacaine group compared to Bupivacaine – Dexamethasone group. The mean time of onset of motor block was also lesser in Dexamethasone group than local anesthetic group in this study. This difference was also statistically significant between the two groups. In a study by Shreshtha et al, the mean onset of action was 18.15 ± 4.25 minutes while it was 14.5 ± 2.1.[6] However, the mean onset of sensory anesthesia was slightly lesser in this study in contrary to findings of Shreshtha et al.[6] In another study, Yadav et al[3] compared three different drugs by supraclavicular brachial plexus block. However, the onset of anesthesia in Dexamethasone group was faster than other two groups of durgs.[3] In a study by Islam et al[7], the onset of sensory block also lesser in Dexamethasone group than the plain local anesthetic group.

The mean duration of sensory block in Bupivacaine group was 4 (± 6.3) hours and 5.9 (± 0.7) hours in Bupivacine – Dexamethasone group. The mean duration of motor block in Bupivacaine group was 1.9 (± 0.5) hours and in Bupivacaine – Dexamethasone group was 4.3 (± 0.9) hours. There was statistically significant difference in duration of action between Bupivacaine and Bupivacaine – Dexamethasone groups. A similar study in Nepal[3] found that the duration of action of the local anesthetic as 3.16 hours in local anesthetic group and 12.75 hours in steroid group.[3] In a study by Shreshtha et al,[8] the mean duration of post operative analgesia was around 16 hours in a group who received Bupivacaine with Dexamethasone and its was around 8 hour in Bupivacaine – Tramadol group. This shows that the addition of steroid to certainly prolongs the duration of anesthesia and also

produces earlier onset of action. This might be due anti-inflammatory effect of Dexamethasone. It has also been proved in many studies that the addition of Dexamethasone to local anesthetic prolongs the duration of action. However, another study also noted that the mean duration of analgesia was more in Dexamethasone group than plain anesthetic group.[7]

The mean numbers of rescue analgesic doses were lesser in Dexamethasone group than Bupivacaine alone group significantly. In a study by Yadav et al, the mean number of rescue analgesic doses was also lesser in Dexamethasone group than other two groups.[3]

V. CONCLUSION

It can be concluded from this study that time taken to onset of sensory block and motor block was significantly earlier in Bupivacaine plus Dexamethasone group than Bupivicaine only group. Although there was no significant difference in duration of motor block in both the group but duration of motor block was significantly more in Bupivacaine plus Dexamethasone group than Bupivicaine only group. Number of rescue analgesic doses in 24 hours were required significantly more in Bupivacaine than Bupivacaine plus Dexamethasone groups.

CONFLICT OF INTEREST

None declared till now.

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