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A CLINICAL COMPARISON BETWEEN 0.5% BUPIVACAINE AND 0.5% BUPIVACAINE DEXAMETHASONE 8mg COMBINATION IN BRACHIAL PLEXUS BLOCK BY SUPRACLAVICULAR APPROACH

Anaesthesiology

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ABSTRACT

Aim: To study the onset and duration of sensory and motor blockade

Introduction: Brachial plexus block provides a useful alternative to general anaesthesia for upper limb surgeries. Bupivacaine is one of the most frequently used local anaesthetic which has a longer duration of action of 3 to 8 hours but has drawbacks of delayed onset and patchy analgesia. Dexamethasone is a very potent glucocorticoid with very good anti-inflammatory and analgesic activity.

Materials and methods: A prospective, randomised single-blinded study was undertaken in patients posted for upper limb surgeries under the supraclavicular block. 60 patients with ASA class I and II were randomly grouped into two groups. Group I received 30ml bupivacaine 0.5% and Group II received a combination of 28ml bupivacaine 0.5% and 2ml dexamethasone 8mg. 30ml solution is used for a single shot blockade of supraclavicular brachial plexus.

Results: Group II patients had a faster onset of action and prolonged duration of action.

Discussion: The addition of dexamethasone 8mg to bupivacaine 0.5% speeds the onset of sensory and motor blockade also prolongs the duration thus provides better analgesia and reduces the requirements of rescue analgesics.

Conclusion: A combination of bupivacaine 0.5% and dexamethasone 8mg has **a** significantly faster onset and prolonged duration of action.

KEYWORDS

Brachial plexus, bupivacaine, dexamethasone

INTRODUCTION

Regional nerve block offers an alternative choice of anaesthesia using minimal anaesthetic drugs and a high safety profile. Brachial plexus block is a popular and widely employed regional nerve block technique for upper limb surgeries. The supraclavicular approach of the brachial plexus block is the easiest and most consistent method for surgeries below the shoulder joint.[1]

The supraclavicular approach of brachial plexus block is an excellent alternative to general anaesthesia for upper limb surgery. This achieves complete muscle relaxation, intraoperative hemodynamic stability, and postoperative analgesia.[2]

Bupivacaine is used frequently for supraclavicular nerve block as it has a long duration of action of 6-9 hours. Adjuvants for brachial plexus block may improve the quality and duration of analgesia. To minimize these drawbacks many drugs like Neostigmine, Opioids, Hyaluronidase, Midazolam, Clonidine, Dexamethasone etc., have been added to local anaesthetics to improve the quality and duration of action and postoperative analgesia.[3]

Dexamethasone is a very potent and highly selective glucocorticoid. Basically, it is used as an anti-inflammatory and immunosuppressant. Its potency is about 40 times that of hydrocortisone. Clinical Uses of Dexamethasone are for the treatment of many inflammatory and autoimmune conditions but Glucocorticoids are also used to treat patients suffering from neuropathic pain and complex regional pain syndromes (CRPS). So, steroids have anti-inflammatory as well as analgesic effects. Many studies have successfully proved the usefulness of Dexamethasone as an effective analgesic.[4]

AIMS AND OBJECTIVES

To evaluate the

1. Onset of sensory and motor blockade
2. Duration of sensory and motor blockade
3. Hemodynamic variables (HR, BP, O2 saturation)
4. Number of rescue analgesics in postoperative 24 hours.
5. Compare the above effects with that of 0.5% bupivacaine in brachial plexus block for upper limb surgeries.

METHODS

Study type

The prospective observational was carried at the department of anaesthesia, santhiram general hospital

Sampling technique

The sampling technique used for the study was a simple randomised single-blind technique.

Study population

The study population included in the current study were 60

INCLUSION CRITERIA

Inclusion criteria included those patients giving informed and written consent, patients with ASA class I and II, Patients aged between 18 to 65 years, Patients with SBP: 100-139 mm of Hg, Patients with DBP: 60-89 mm of Hg.

EXCLUSION CRITERIA

Exclusion criteria excluded a patient who has not given informed and written consent, Patients belonging to ASA III and IV, Known case of hypersensitive reaction to Dexamethasone and local anaesthetic, Patients with abnormal BT, CT or on anticoagulation therapy, severe anaemia, hypovolemia, shock, septicemia and h/o seizures, Local infection at the site of proposed puncture for the supraclavicular block.

Sample size

A study was done in 60 patients in the department of anaesthesiology at santhiram medical college and general hospital, for a duration of 6 months (January 2021- June 2021)

STATISTICALANALYSIS

Data was collected and entered into Microsoft Excel and analysed using SPSS software version 18. Quantitative data was analysed by using the student 't' test. Qualitative data was analysed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

METHODOLOGY

A randomized single-blinded study was taken up among 60 patients aged between 18 to 65 years undergoing upper limb surgeries in the department of anaesthesiology at santhiram medical college and

general hospital for a duration of 6 months (January 2021 – June 2021). Ethical clearance was obtained before the Institutional Ethical review committee. An informed, bilingual and written consent was obtained from all the patients.

The patients who satisfied the inclusion and exclusion criteria were divided into two groups of 30 patients each. All the patients underwent pre-anaesthetic check-up.

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

The patients were subjected to a detailed pre-anaesthetic Checkup. The patients were also subjected to detailed laboratory workup including a complete haemogram and urine routine. patients were subjected to HIV and HBsAg, Chest X-ray and ECG examination.

Patients were kept nil oral overnight and kept in the supine position in the operation table with arms by the side and head turned to another side. With all aseptic precautions, subclavian artery pulsations were felt at a point 1.5 to 2.0 cm posterior and cephalad to the midpoint of the clavicle. A skin wheel is raised with local anaesthetic cephalo posterior to the pulsations. A 22 gauge, 1.55 inches short bevelled needle is introduced through the point located parallel to the head and neck in a caudal and slight medial and posterior direction until either paraesthesia is elicited or the first rib is encountered. If the 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 the same position and the medication under study was injected slowly by ruling out the intravascular injection intermittently.

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

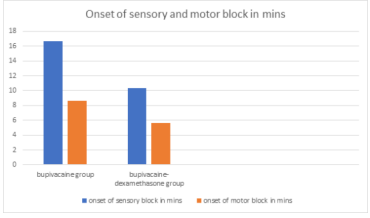
RESULTS

About 60 patients of ASA I and II posted for upper limb surgeries were enrolled in this study as study subjects. They were randomly divided into two equal groups where the first group received 30 ml of 0.5% Bupivacaine and the second group received 28 ml of a mixture of Bupivacaine with Dexamethasone (8 mg) by supraclavicular approach.

Table.1 Onset Of Sensory And Block Between The Study Groups

GROUP	BUPIVACAINE GROUP	BUPIVACAINE-DEXAMETHASONE GROUP	t-VALUE*	P-value
The onset of sensory block in mins Mean ± SD	16.7 ± 2.1	10.3 ± 1.4	13.921	< 0.001 Sig
onset of motor block in mins Mean ± SD	8.6 ± 1.2	5.6 ± 0.7	11.997	< 0.001 Sig

* Student's unpaired t-test Sig = Significant

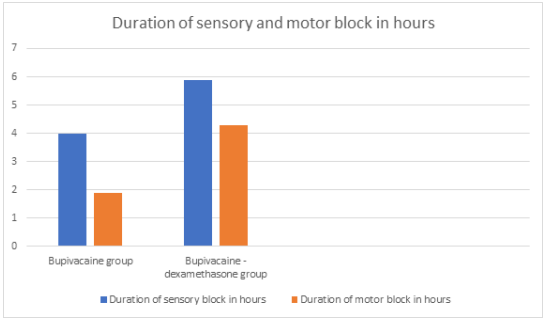


Graph 1: Onset Of Sensory And Motor Block In Mins

Table 2: Duration Of Sensory And Motor Block In Hours

GROUPS	BUPIVACAINE GROUP	BUPIVACAINE AND DEXAMETHASONE GROUP	t-VALUE	P-value
Duration of sensory block in mins Mean ± SD	4.0 ± 6.3	5.9 ± 0.7	- 1.7	> 0.05, NS
Duration of motor block in mins Mean ± SD	1.9 ± 0.5	4.3 ± 0.9	- 14.868	< 0.001, sig

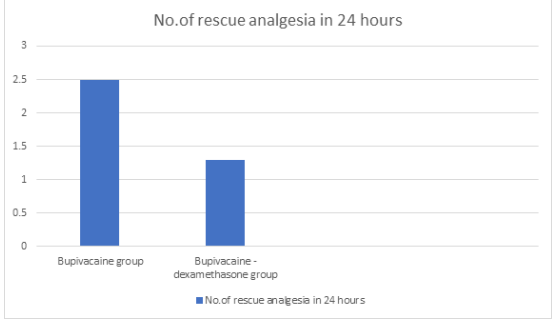
* Student's unpaired t-test NS = Not Significant Sig = significant



Graph 2: Duration Of Sensory And Motor Block In Hours

Table 3: No. of RA in 24 hours between the study groups

Groups	Bupivacaine Group	Bupivacaine - Dexamethasone group	t value*	p value, Sig
No. of RA in 24 hours Mean ± SD	2.5 ± 0.5	1.3 ± 0.4	9.693	< 0.001, Sig
* Student's unpaired t-test			Sig = Significant	



Graph 3: No. Of Rescue Analgesia In 24 Hours

DISCUSSION

Brachial plexus block has emerged as a popular technique among anaesthetists for upper limb surgeries. This type of anaesthesia avoids the unwanted effects of general anaesthesia like complications related to upper airway instrumentation. The research has also shown that this approach is attractive approach and effective in terms of cost, performance, the margin of safety and also provides good postoperative analgesia[5]. Many approaches of brachial plexus block are also described and the available literature has consistently shown that supraclavicular block is superior and easiest method for anaesthesia and postoperative pain management[6].

Several drugs have been tried as anaesthetics in brachial plexus block and Bupivacaine was consistently used for its longer duration of action. However, bupivacaine is condemned for its delayed onset, patchy or incomplete analgesia. Many drugs are in turn used to treat the side effects of Bupivacaine also make the drug more effective for surgery and postoperative analgesia[7].

Dexamethasone, being glucocorticoid, has emerged as a potent

corticosteroid when used along with Bupivacaine. Many studies have successfully proved the usefulness of Dexamethasone as an effective analgesic[7,8,9,10].

A randomized single-blinded study was taken up among 60 patients posted for upper limb surgeries who were aged between 18 to 65 years in santhiram medical college and general hospital.

The mean time of onset of sensory block was later in the Bupivacaine group compared to Bupivacaine – Dexamethasone group. The mean time of onset of motor block was also lesser in the Dexamethasone group than the local anaesthetic 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.[11]However, the mean onset of sensory anaesthesia was slightly lesser in this study on the contrary to findings of Shreshtha et al.

In another study, Yadav et al compared three different drugs by supraclavicular brachial plexus block. However, the onset of anaesthesia in the Dexamethasone group was faster than the other two groups of durgs[12]. In a study by Islam et al, the onset of sensory block was also lesser in the Dexamethasone group than in the plain local anaesthetic group.[13]

The mean duration of sensory block in the Bupivacaine group was 4 (± 6.3) hours and 5.9 (± 0.7) hours in Bupivacaine – Dexamethasone group. The mean duration of motor block in the Bupivacaine group was 1.9 (± 0.5) hours and in Bupivacaine – Dexamethasone group was 4.3 (± 0.9) hours. There was a statistically significant difference in duration of action between Bupivacaine and Bupivacaine – Dexamethasone groups.

A similar study in Nepal[14] found that the duration of action of the local anaesthetic was 3.16 hours in the local anaesthetic group and 12.75 hours in the steroid group.

The mean numbers of rescue analgesic doses were lesser in the 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 the Dexamethasone group than the other two groups.

The mean heart rate in the Bupivacaine group was around slightly higher in the Dexamethasone group than in the local anaesthetic group. There was no statistically significant difference between the pulse rates of the Dexamethasone group than a local anaesthetic group.

The mean systolic and diastolic pressure was also almost similar in both the groups within normal limits except after 2 hours. The mean oxygen saturation also not varied much in both groups.

CONCLUSION

The supraclavicular approach of brachial plexus block has been a popular technique in the delivery of anaesthesia in patients undergoing upper limb surgeries. The elegancy in the technique helps in the safe delivery of anaesthesia and also assures prolonged analgesia by preventing the side effects of general anaesthesia. Steroids are commonly used now a day to along with the local anaesthetic due to their anti-inflammatory and analgesic effects. Dexamethasone being a potent corticosteroid is becoming popular for the regional blocks. This study has made an effort to compare the Bupivacaine alone with Bupivacaine – Dexamethasone. The study is methodologically elegant since it is a randomized controlled study. However, one cannot rule out bias since it is a single-blind study. Hence the results cannot be generalized. But this study has shown the beneficial effect of the addition of steroid to a local anaesthetic in terms of onset and duration of anaesthesia. Further research with the calculation of sample size is needed to study the beneficial or adverse effects of the addition of steroids along with local anaesthetic for producing the blockade.

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