Original Research Paper

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# COMPARISON OF 0.5% LEVOBUPIVACAINE AND 0.5% BUPIVACAINE FOR SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK: RANDOMISED CONTROL TRIAL.

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**ABSTRACT** **Background and objective:** Brachial plexus blockade at the supraclavicular level delivers an excellent regional anaesthetic technique with unmatched effectiveness for upper limb surgeries Success rate of catheter applications is low in supraclavicular block. Thus, bupivacaine and levobupivacaine become important with their long effect time in single injection practices. In this study, we aimed to compare the effectiveness, side effects and complications of bupivacaine and levobupivacaine in supraclavicular block. **Method:** Sixty patients aged between 20 and 65, with body weight between 50 and 100 kg, inthe ASA I-II-III group who were scheduled for hand, forearm and arm surgery using supraclavicular block were randomized into two groups of 30. The patients received 30 ml 0.5% bupivacaine(Group A) or 30 ml 0.5% levobupivacaine (Group B). Motor and sensory blocks were evaluated.Motor and sensory block onset times, total block durations, postoperative pain, amount ofpostoperative analgesic used and patient satisfaction were recorded. **Result:** Demographic data, distribution of surgical area and hemodynamic data were similar between the two groups. motor and sensory block durations of Group B is longer than group A($p>0.05$). However, motor and sensory block onset times in GroupA were shorter than Group B ($p > 0.05$)this was clinically not significant. The mean time for first postoperativeanalgesic demand were 802.3 ±26 MINS in Group B and 605.3±29MINS in Group A ($p > 0.05$). **Conclusion:** 30 ml 0.5% bupivacaine and levobupivacaine provide similar block characteristics for supraclavicular block. Bupivacaine leads to faster motor and sensory block onset compared to levobupivacaine however duration of post operative analgesia is longer in levobupivacaine group.

**KEYWORDS :** levobupivacaine,bupivacaine,supraclavicular block.

## INTRODUCTION

Peripheral nerve blocks provide ideal operating conditions when used in optimal conditions. They reduce the stress response and least interfere with the body's vital physiological functions compared to conventional techniques. Adequately administered regional anesthesia not only provides excellent intraoperative pain relief but also gives the best postoperative analgesia. Most of the local anaesthetic agents developed in the 1st half of the 20th century (1900–1940) were ester compounds. They lost their importance due to their short duration of action, systemic toxicity, and associated allergic reactions. These paved the way for the synthesis of newer agents, namely, amide-type of local anesthetic agents.

Currently, Bupivacaine is one of the most commonly used local anesthetics for central and peripheral nerve blocks. However, it can cause serious cardiovascular side effects, and the new local anesthetic levobupivacaine is reported to be safer in this respect. The experience with Levobupivacaine is limited in peripheral blocks when compared to Bupivacaine.

Supraclavicular block enables complete anesthesia to the arm, elbow, and hand. Postoperative analgesia requires a catheter insertion perineurally; however, the success rate of catheter applications in the supraclavicular block is lower than other brachial plexus nerve block sites. Another way of providing postoperative analgesia is to use local anesthetics with a long duration of action. Long-term postoperative analgesia with a single application is possible with the use of Bupivacaine, Levobupivacaine, or Ropivacaine. Thus We Aimed To Compare Bupivacaine With Its S(+) Enantiomer, Levobupivacaine In Terms Of Their Effectiveness, Side Effects And Complications In Supraclavicular Block.

## MATERIALS AND METHOD:

After obtaining institutional ethical committee approval and written informed valid consent, a study of 60 patients of either sex, ASA-I/II, in 18-65 years was conducted in Civil hospital, Ahmedabad.

**Study Design:**

- A randomized, prospective, and controlled study was undertaken. Sixty patients were divided into two equal groups.

**Technique**

For performing brachial plexus blockade through the supraclavicular approach, we used the Classical technique (Kulenkampff's).

- After placing the patient in a dorsal recumbent position with head turned away from the site of injection with strict aseptic and antiseptic precautions, midclavicular point, external jugular vein and subclavian artery pulsation were identified. About 2 cm above the midclavicular point just lateral to subclavian artery pulsation, a 22 gauge 1.5 inch hypodermic needle attached with 2 ml saline-filled syringe was introduced and directed caudal and medially until paraesthesia or motor response was elicited, or the first rib was encountered.
- After the brachial plexus was located, the drug was injected, and before every incremental dose, negative aspiration for blood was performed to avoid any intravascular placement.

➢ According to the drug administered the patients were randomly allocated to 2 groups-
**Group A :** Bupivacaine 0.5% 30ml
**Group B:** levobupivacaine 0.5% 30ml

During the conduct of the block and after that, the patient was observed vigilantly for any complications of the block and for the toxicity of the drugs injected.

➢ **Prevention of deleterious effects:**

Following precautions were taken during conduct of the block-

1. Repeated aspiration was performed before injection to prevent intravascular spread.
2. The injection was planned to be stopped immediately if there were any early signs of toxicity.

**Parameters To Be Observed :**

All the following parameters were observed at 5 minutes intervals for 15 minutes, then 15-minute break for 30 minutes, then 30-minute interval for 60 minutes, then one hourly interval for 2 hours, then two hourly intervals for 12 hrs and then at 16 hours.

**A) Sensory Blockade :**

➢ Sensory block onset was assessed every 2 min by atraumatic pinprick test in the areas innervated by radial, ulnar, and median nerves and compared with the same stimulation on the contralateral hand.

Sensory blockade was graded as

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| Grade 0: No loss of sensation to pinprick |
| Grade 1: Analgesia ( patient feel touch but no pain on pinprick ) |
| Grade 2: Anesthesia (patient even not feel touch sensation on pinprick) |

➢ Onset time was defined as time taken from drug injection to complete ablation of sensation (sensory score 2).

➢ Duration of sensory block was defined as time from onset of block to complete return of parasthesia (sensory score 0).

**B) Motor Blockade :**

➢ By asking the patient to elevate the arm while keeping elbow straight (superior trunk) and at hand by grip strength (middle and inferior trunk), which were graded as follows:-

➢ Motor block evaluated by THREE point scale:

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| Grade 0: No weakness |
| Grade 1: Paresis (decreased movements with an inability to perform activities) 0against resistance ) |
| Grade 2: Paralysis |

➢ Onset time was defined as the time taken from drug injection to complete motor block (motor grade score 2)

➢ Duration of motor blockade was defined as the time taken from complete motor blockade to restoration of movements of the forearm (grade 0)

**C) Hemodynamic Parameter** Intra-operative Pulse, Blood pressure, Respiratory rate, Spo2 were recorded at a regular interval in proforma.

**D) Intra-op Complications :**

➢ Patients were observed for any systemic side effects like bradycardia, hypotension, Nausea, Vomiting, Pruritus, etc.

**E) Post-operative Analgesia :**

➢ The intensity of postoperative pain was evaluated using a VAS Score (visual analog scale) with grade 0 (no pain) to 10 (worst pain). Pain scores were noted post-operatively at 30 mins , 60 min, and then 2 hourly intervals until 18 hrs and 24 hours. Time was noted when the patient regained a VAS score of 4. Analgesia was considered satisfactory if the score was three or less. If VAS score was more than 4, analgesia was judged unsatisfactory and RESCUE ANALGESIA was administered in the form of inj. Diclofenac sodium 2 mg/kg i.v.

➢ The evaluation was stopped and time for need of first analgesia was noted. Both groups were compared for duration of analgesia.

**Duration of postoperative analgesia =** time from onset of sensory blockade to time when patient VAS score > 4 (four).

**F) Postoperative Complications :**

➢ Patients were observed for any complications like

- Local : Haematoma / Infection/ Neuropathy
- Systemic: Neurotoxicity/ cardiotoxicity/ pneumothorax
- Miscellaneous.

➢ Tourniquet inflation and deflation time and duration of surgery were noted.

All data entry was entered in MS excel and analysis was also done in MS excel. Continuous variable was expressed as median with standard deviation. For qualitative data chi-square test was applied and for quantitative data unpaired t test was applied to determine the statistical difference between two groups.

## OBSERVATION AND RESULT:

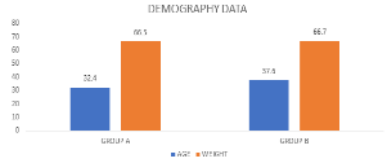


**Figure 1:**

It shows patients' distribution according to mean age and mean weight with standard deviation and sex incidence of patients in both groups with no significant difference.

**Table -1: Duration Of Surgery (in Mins)**

| Group A (MEAN ± SD.) | Group B (MEAN ± SD) |
|---|---|
| 76.7 ± 13.1 | 80.1 ± 15.2 |
| P value | 0.34682 |
| | Not significant |

▪ This table shows the mean duration of surgery in both groups. There is no significant difference in of duration surgery between two groups.

**Table -2: Onset Time For Sensory And Motor Block**

| | Group A (n=30) | Group B (n=30) | P value |
|---|---|---|---|
| **Sensory Block Onset Time (mins)** | 16.3 ± 1.56 | 18.87 ± 1.383 | <0.00001 |
| **Motor Block Onset Time (mins)** | 17.6 ± 1.522 | 21.63 ± 2.371 | <0.00001 |

▪ The table shows difference of the mean duration of onset of sensory and motor block was statistically significant as p value <0.05.

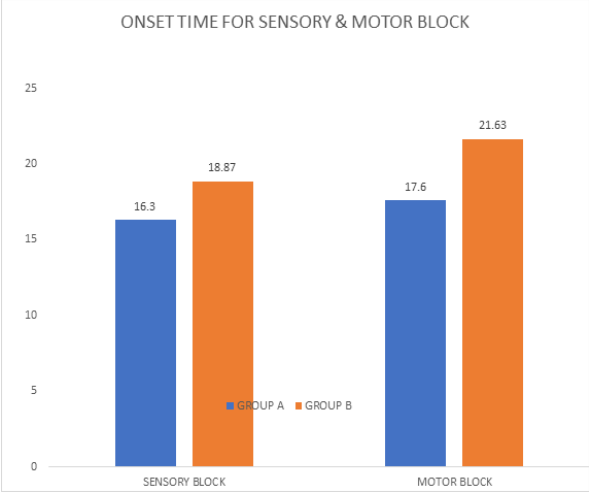


**Figure 2:**

**Table -3: Duration Of Sensory And Motor Block**

| | Group A (n=30) | Group B (n=30) | P value |
|---|---|---|---|
| **Duration of Sensory block (mins)** | 524 ± 19 | 695 ±34 | <0.00001 |
| **Duration of Motor block (mins)** | 427±32 | 547 ± 21 | <0.00001 |

▪ The table shows difference of the mean duration of sensory and motor block was statistically significant (p<0.05).

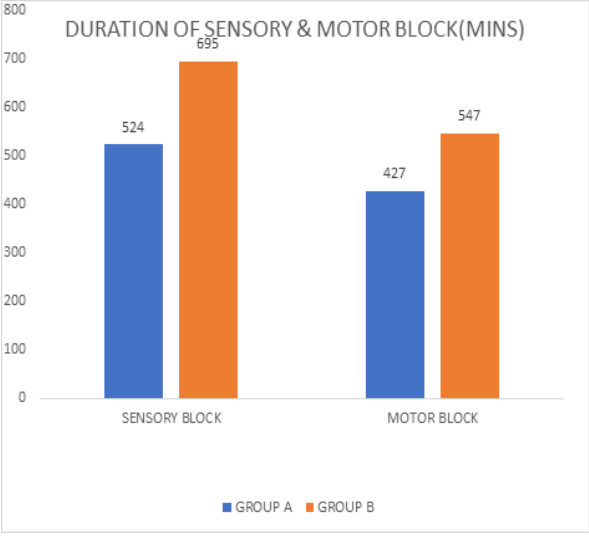


**Figure:3**

**Table 9: Duration Of Postoperative Analgesia**

| | Group A (n=30) | Group B (n=30) | P value |
|---|---|---|---|
| **Duration of Analgesia (mins)** | 605.3 ± 29.97 | 802.3 ± 26.2 | <0.00001 |

Duration of post operative analgesia and time for rescue analgesia was longer in group B as compared to group A and difference was statistically significant (P-value <0.05).

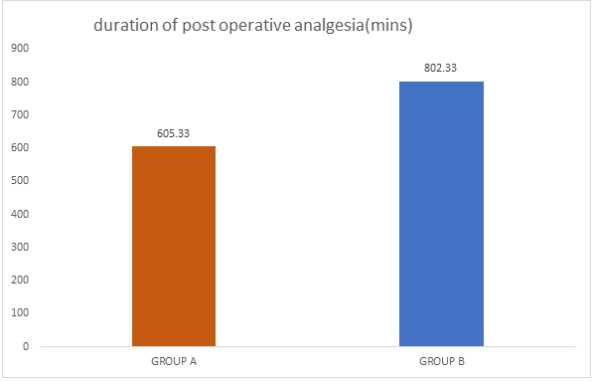


**Figure 7:**

## DISCUSSION

Although General anesthesia continues to be employed for most of the surgical procedures, Regional anaesthesia has been increasing in popularity in recent years.

Levobupivacaine has less tendency to cause cardiac toxicity due to

1) Dextroenantiomer R(+)Bupivacaine has a 2.4 times higher affinity for cardiac sodium channels and dissociates it slowly than levorotatory enantiomer.
2) Plasma protein binding of Levobupivacaine is >97% whereas Bupivacaine is 95%, which means availability of the drug is less in Levobupivacaine
3) Levobupivacaine has inherent vasoconstrictor activity, which gives a prolonged duration of action and less systemic toxicity.

Present randomized control study was done to evaluate the effect of levobupivacaine-newer local anesthetic and compared it to Bupivacaine along in brachial plexus block through supraclavicular route posted for upper limb surgeries. The results were assessed in terms onset of sensory and motor block, duration of sensory and motor block and duration of analgesia in 60 patients of ASA physical status I/II.

### Demographic Data

All patients in our study were demographically similar in both groups. There were no statistically significant intergroup variations regarding age, body weight, and gender distribution.

### Surgical Procedure And Duration Of Surgery

The majority of patients had surgical procedures like K-wire, platting, nailing implant removal, external fixator, and debridement in upper limb and comparable in between the groups.

Duration of surgery was also similar in both groups and statistically not significant (p>0.05).

### Onset Of Sensory Block

Onset of Sensory block was rapid with Bupivacaine as compared to Levobupivacaine. The mean onset time was 16.3±1.56 min in group A while it was 18.87 ± 1.383 min with group B and the difference was statistically significant (p<0.05) but clinically was not significant.

### Onset Of Motor Block

The Onset of Motor block was also rapid with the bupivacaine group as compared to the levobupivacaine group. The mean onset time was 17.6±1.522 min in group A while it was 21.63 ± 2.371 min with group B, and the difference was statistically significant (p<0.05) but clinically was not significant.

### Duration Of Sensory And Motor Block

The duration of the Sensory block was significantly longer with the levobupivacaine group as compared to the Bupivacaine group. The mean duration of sensory block was 695±34 MINS in group B, while it was 524±19 mins with group A and the difference was statistically significant (p<0.05).

The motor block duration was significantly longer with the levobupivacaine group compared to the Bupivacaine group. The mean duration of motor block was 547±21MINS in group B while it was 427± 32MINS in group A the difference was statistically significant (p<0.05).

### Duration Of Postoperative Analgesia

Postoperative analgesia duration was significantly longer with the levobupivacaine group compared to the Bupivacaine group. The mean duration of postoperative analgesia was 605.3±29MINS in group A while it was 802.3 ±26MINS with group B, and the difference was statistically significant (p<0.05).

### Intra Operative Hemodynamic Parameters

The intraoperative Pulse rate, Blood pressure, $SPO_2$, Respiratory Rate remained stable without any significant fluctuation in both groups.

### Complications

No significant intraoperative and postoperative complications like pneumothorax, intra-arterial or intravascular placement of drug, nausea, vomiting, pruritus, neurotoxicity, or cardiotoxicity were found in either group.

## CONCLUSION

To conclude the study, we observed that levobupivacaine – a new local anaesthetic agent as it has less cardiac depression and central nervous system toxicity, having a better profile in terms of prolonged duration of sensory block and postoperative analgesia; has a better safety profile offers an alternative to Bupivacaine for brachial plexus block in upper limb surgeries.

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