



## “SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK WITH BUPIVACAINE AND LEVOBUPIVACAINE: A COMPARATIVE STUDY”

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Conflicts of Interest: Nil

### Abstract:

**Objective:** To compare Bupivacaine and Levobupivacaine in supraclavicular brachial plexus block in terms of onset, degree, duration of sensory and motor blockade and analgesia and also to compare the prevalence of failure of blockade and its adverse effects.

**Methods:** This was a prospective randomized double blind study which was done on 100 patients who were scheduled for arm and forearm surgeries. Patients were randomly divided into two groups of 50 patients. Group B: patients were given 30 ml of Bupivacaine Hcl (0.5%) and Group L: patients were given 30 ml of Levobupivacaine Hcl (0.5%). Heart rate, NIBP, respiratory rate and oxygen saturation (SpO<sub>2</sub>) were monitored. All the patients were premedicated with injection Ranitidine 50 mg IV and injection Ondansetron 4 mg IV. Injection Midazolam 1mg IV administered to all the patients after completion of block. All the patients were observed for onset of sensory and motor blockade, duration of sensory and motor blockade, degree of sensory and motor blockade, duration of effective analgesia, hemodynamic changes, side effects and complications.

**Result and interpretation:** Time of onset of sensory and motor blockade was comparable between both groups. The time of onset of sensory blockade was not statistically significant ( $p=0.0521$ ). The time of onset of motor blockade was not statistically significant ( $p=0.534$ ). Maximum patients achieved grade 2 block in both the groups. Duration of sensory and motor block was comparable in both the groups. Mean duration of sensory block was not statistically significant ( $p=0.0987$ ). Similarly duration of motor block was not statistically significant ( $p=0.0801$ ). Mean duration of analgesia was not statistically significant ( $p = 0.0895$ ). Both the groups were comparable in terms of duration of analgesia. Hemodynamic parameters and any side effects were observed in all the patients.

**Conclusion:** There were no significant changes reported in both the groups during entire study period.

**Keywords:** Anaesthesia, Bupivacaine, Levobupivacaine, supraclavicular brachial plexus block, Midazolam, Ondansetron.

### INTRODUCTION

Anaesthesia has evolved into a specialty subject over decades with lot of improvements in the methods employed and drugs used to provide anaesthesia with least complications. Modern local analgesia began with the introduction of cocaine into medical practice in 1884 by **Karl**

**Koller**. Regional Anaesthesia is a term first used by **Harvey Cushing** in 1901 to describe pain relief by nerve block. Regional nerve blocks are based on the concept that pain is conveyed by nerve fibers, which are amenable to interruption anywhere along their pathway. **William Steward Halsted** first performed the brachial plexus block by exposing the nerve roots in 1885.<sup>1,2</sup>

Since the introduction of long acting local anesthetics with better safety profiles as well as the availability of better equipment, the use of peripheral nerve blocks has increased. Historically, this was accomplished through the elicitation of one or more paresthesia. "No paresthesia no anaesthesia" - **Moore, 1953**. This became the dictum of many anesthesiologists.<sup>3</sup>

Brachial plexus block offers many advantages over general anaesthesia for upper limb surgeries. It is a safe anesthetic technique for the patients who arrive with full stomach and for day care surgeries. Post anaesthetic nausea, vomiting and other side effects of general anaesthesia such as atelectasis, hypotension; paralytic ileum, dehydration and deep vein thrombosis are reduced.

The technique of brachial plexus block has undergone many changes since its introduction. There are four usual sites of approach for brachial plexus block. They are Interscalene, Supraclavicular, Infraclavicular and Axillary routes.

Supraclavicular approach in brachial plexus block produces the most complete limb block. This technique provides most homogeneous block with minimal possibility of missing peripheral or proximal nerve branches. This technique was first introduced by **Kulenkampff** and modified by **Winnie et al**<sup>30</sup> in 1964.

Various local anaesthetics have been used to produce brachial plexus block. Bupivacaine is a local anaesthetic of amide group which provides prolonged period of anaesthesia and analgesia when used in peripheral nerve blocks. One of the drawbacks of Bupivacaine is its cardio toxicity especially when injected accidentally into the subclavian artery. The cardio toxicity may be life threatening as the dysrhythmias which are resistant to all routinely used antiarrhythmics. Hence there is a need for a drug which can have all the advantages of Bupivacaine without its cardiotoxicity.<sup>1,2</sup>

Although Levobupivacaine is considered effective and comparable to Bupivacaine but there is lack of consensus about quality and

duration of motor and sensory blockade provided by Levobupivacaine. Not many studies have been done using Levobupivacaine for brachial plexus block in India. Hence we decided to conduct this study in our institute. The purpose of this clinical study was to compare Bupivacaine and Levobupivacaine in terms of duration, effectiveness, and quality of sensory anaesthesia and motor blockade and presence of adverse effects in supraclavicular brachial plexus block.

Aim of this study was to compare Bupivacaine and Levobupivacaine in supraclavicular brachial plexus block in terms of onset, degree, duration of sensory and motor blockade and analgesia and also to compare the prevalence of failure of blockade and its adverse effects.

## MATERIALS AND METHODS

This study was conducted in the Department of Anesthesiology and Critical Care, Pt. J.N.M. Medical College and Dr. Bhim Rao Ambedkar Memorial Hospital Raipur (C.G.) after approval from ethical and scientific committee.

It was a prospective randomized double blind study with sample size of 100 patients. 50 patients each were randomly allotted in two groups. Randomization was done with the help of sealed envelopes. A sealed envelope was randomly selected by the patient, all the blocks were performed by single anesthesiologist and all the data were taken by the assistant who was blind for the drug used for brachial plexus block.

Group B: 30 ml of 0.5% of Bupivacaine Hcl

Group L: 30 ml of 0.5% of Levobupivacaine Hcl

**Inclusion criteria:** ASA physical status grade I and grade II, Age between 18 to 55 yrs, Body weight: between 50-75 kg, Patients with bone and soft tissue lesions of arms and forearms

**Exclusion criteria:** patients with Coagulation disorders, Severe cardiopathies, Liver and kidney diseases, Neurologic disorders, Associated peripheral nerve lesions, Skin lesion at the site of blockade, Associated lesions in other areas of body requiring general anaesthesia, Pregnancy, allergy to local anaesthetic drugs.

**Pre-operative assessment:** including history, clinical examination and relevant investigations (Hb, TLC, DLC, Urine examination, BT, CT, Platelet count, Blood sugar, Blood Urea, Serum creatinine and electrolytes, X-ray chest, ECG) were done. Patients were thoroughly explained about the procedure and written informed consent was taken from all patients.

## RESULTS

Patients were divided into two groups of 50 patients each. Group B patients received 30 ml injection Bupivacaine (0.5%) and Group L patients received 30 ml injection Levobupivacaine (0.5%). The sample size was determined using PASS (power and sample size) software with power of study nearly equal to 1, considering  $\alpha$ -error not  $>0.05$ . (Table-1,2,3)

Both the groups were statistically comparable ( $p > 0.05$ ). There was male predominance in both the groups which was statistically comparable. ( $p > 0.05$ ) Mean weight of the patients in Group B and Group L were  $58.89 \pm 6.79$  Kgs and  $59.79 \pm 6.51$  Kgs respectively. The mean weight in both groups were statistically comparable ( $p > 0.05$ ). The mean duration of surgery in two groups was  $65.95 \pm 10.66$  minutes in group B and  $69.97 \pm 10.86$  minutes in group L. This was statistically not significant ( $p > 0.05$ ). (Table-4)

Maximum numbers of the patients in our study were scheduled for surgeries of # BBFA/ Radius/ Ulna i.e. 18 (36%) and 16 (32%) patients in Group B and L respectively. Minimum patients were of B/E amputation in both the groups. Both the groups were comparable ( $p > 0.05$ ). All the patients who were unwilling to take part in study, patients suffering from severe cardiac, renal and hepatic diseases, patients having infection at the site of puncture, skin ulcer, coagulopathy, contra lateral phrenic nerve paralysis, contra lateral recurrent laryngeal nerve paralysis, preexisting neurological deficit, pneumothorax, pregnant patients were excluded from study. (Table-5)

We observed that mean onset of sensory blockade was  $14.08 \pm 1.262$  min in group B and  $13.66 \pm 1.825$  min in group L. The differences

between both the groups were not statistically significant ( $p > 0.05$ ). (Table-6)

We had evaluated the degree of sensory block as no difference from unblocked extremity (Grade 0), less pain from unblocked extremity (Grade 1) and no sensation of pain (Grade 2). In our study most of our patients had achieved grade 2 sensory block in both the groups. 88% patients of Bupivacaine group and 84% patients of Levobupivacaine group had achieved grade 2 sensory block. Both the groups were statistically comparable ( $p > 0.05$ ). (Table-7)

In our study motor block was evaluated by modified Bromage scale. Most of the patients of both the groups had achieved highest degree of motor blockade. Both the groups were statistically comparable ( $p > 0.05$ ). (Table-8)

Duration of motor blockade was the time taken from the onset of motor blockade to complete recovery of motor function. The mean duration of motor blockade in our study was  $1019.545 \pm 158.20$  min and  $960.43 \pm 146.56$  min for Bupivacaine and Levobupivacaine group respectively. The difference was not statistically significant ( $p > 0.05$ ). (Table-9)

The mean duration of analgesia was  $800.43 \pm 145.66$  minutes in Bupivacaine group and  $852.27 \pm 140.51$  min in Levobupivacaine group. The difference between both was not statistically significant ( $p > 0.05$ ). (Table-10)

Heart rate was observed in all the patients at 1 min, 2min, 5 min thereafter every 5 min up to 40 min and then at every 10 min till the end of surgery by using multiparamonitor(MP30).The mean heart rate at 5, 10, 15 min was 75.18, 74.77, 74.34 BPM in Bupivacaine group and 75.181, 75.54, 74.090 BPM in Levobupivacaine group respectively. These changes were not statistically significant. Changes in the heart rate were statistically comparable in both the groups throughout the surgery ( $p > 0.05$ ). (Table-11)

Along with heart rate systolic blood pressure was observed. The mean systolic blood pressure at 5, 10, 15 min was 113.71, 116.13, 116.34mm Hg in group B and 115.45, 115.81, 116.95 mmHg in

group L respectively. These changes were not statistically significant ( $p>0.05$ ). (Table-12)

Diastolic blood pressure was observed along with heart rate and systolic blood pressure. The mean diastolic blood pressure at 5, 10, 15 min was 74.127, 73.595, 74.127 mm Hg in Bupivacaine group and 73.568, 74.363, 74.227 mm Hg in Levobupivacaine group respectively.

No significant changes had been seen throughout the surgery in both the groups. It remained statistically comparable in both the groups during whole surgical period. These changes were not statistically significant ( $p>0.05$ ) (Table-13)

Mean blood pressure was monitored at regular intervals. The mean blood pressure at 5, 10, 15 min was 86.304, 86.065, 86.326 mm Hg in Bupivacaine group and 85.72, 86.54, 85.90 mm Hg in Levobupivacaine group respectively. These changes were not statistically significant ( $p>0.05$ ).

No significant changes were observed in both the groups in whole surgical period. It was statistically comparable in both the groups. (Table-14)

SpO<sub>2</sub> was monitored in the whole surgical period. The mean SpO<sub>2</sub> at 5, 10, 15 min was 99.95, 99.93, 99.91 in Bupivacaine group and

99.97, 99.25, 99.81 in Levobupivacaine group respectively. No significant changes have been seen in whole study period in both the groups. Both the groups remained statistically comparable. These changes were not statistically significant ( $p>0.05$ ). (Table-15)

Respiratory rate was also monitored and observed for entire operative procedure. The mean respiratory rate was 14.75, 15.21, 15.32 at 5, 10, 15 min was in Bupivacaine group and 14.66, 15.25, 15.61 min in Levobupivacaine group respectively. Mean respiratory rate was comparable in both the groups and no statistically significant change was noted, throughout the study period ( $p>0.05$ ). (Table-16)

We have recorded 10 cases as block failure out of which 4 were in Bupivacaine and 6 were in Levobupivacaine group. These were caused by complete failure of technique or inadequate anaesthesia. General anaesthesia was required in these cases. Both the groups were statistically comparable ( $p>0.05$ ). All the patients were monitored for adverse effects like vessel puncture, pneumothorax, hypotension, bradycardia, hoarseness of voice, dyspnoea. Three cases of vascular puncture were recorded in each group. One case of bradycardia was reported in one patient of Bupivacaine group. (Table-17)

**TABLE 1: AGE WISE DISTRIBUTION**

| SERIAL NO. | AGE (IN YEARS)   | GROUP B (n=50) | GROUP L(n=50) |
|------------|------------------|----------------|---------------|
| 1          | 18-23            | 7 (14%)        | 6 (12%)       |
| 2          | 24-29            | 8 (16%)        | 8 (12%)       |
| 3          | 30-35            | 11 (22%)       | 11 (12%)      |
| 4          | 36-41            | 7 (14 %)       | 10 (20 %)     |
| 5          | 42-47            | 7 (14%)        | 6 (12 %)      |
| 6          | 48-55            | 10 (20%)       | 9 (18%)       |
|            | <b>TOTAL</b>     | 50             | 50            |
|            | <b>MEAN ± SD</b> | 36.63±10.77    | 36.40±9.31    |

**TABLE 2: GENDER WISE DISTRIBUTION**

| SERIAL NO. | GENDER | GROUP B  | GROUP L | TOTAL | p VALUE |
|------------|--------|----------|---------|-------|---------|
| 1          | MALE   | 34 (68%) | 36(72%) | 50    | >0.05   |
| 2          | FEMALE | 16 (32%) | 14(28%) | 50    | >0.05   |

**TABLE 3: WEIGHT WISE DISTRIBUTION**

| SERIAL NO. | WEIGHT(Kgs)     | GROUP B        | GROUP L        |
|------------|-----------------|----------------|----------------|
|            | 50-55           | 20 (40%)       | 18 (36%)       |
| 1          | 56-60           | 10 (20%)       | 12 (24%)       |
| 2          | 61-65           | 7 (14%)        | 10 (20%)       |
| 3          | 66-70           | 8(16%)         | 7 (14%)        |
| 4          | 71-75           | 5 (10%)        | 3 (6%)         |
| 5          | <b>TOTAL</b>    | 50             | 50             |
|            | <b>MEAN± SD</b> | 58.89±6.796kgs | 59.79±6.511kgs |

**TABLE 4: DURATION OF SURGERY**

| SERIAL NO. | GROUPS | SURGERY DURATION(MINUTES) | p VALUE |
|------------|--------|---------------------------|---------|
| 1          | B      | 65.95 ± 10.667            | 0.0800  |
| 2          | L      | 69.97 ±10.868             |         |

**TABLE 5: TYPE OF SURGERIES**

| SERIAL NO. | Type of Surgeries           | Group B  | Group L  | P Value |
|------------|-----------------------------|----------|----------|---------|
| 1          | Bbfa#/ Radius/ Ulna         | 20 (40%) | 18 (36%) | >0.05   |
| 2          | Burn Contracture Release    | 6 (12%)  | 7 (14%)  | >0.05   |
| 3          | B/E Amputation              | 3 (6%)   | 2 (4%)   | >0.05   |
| 4          | K-Wire Fixation             | 8 (16%)  | 9 (18%)  | >0.05   |
| 5          | Other Orthopedics Procedure | 11 (22%) | 8 (16%)  | >0.05   |

**TABLE 6: ONSET OF SENSORY AND MOTOR BLOCKADE**

| SERIAL NO. | Groups | Onset Of Sensory Blockade (Min) | P-value | Onset Of Motor Blockade (Min) | P Value |
|------------|--------|---------------------------------|---------|-------------------------------|---------|
|            |        | Mean±SD                         |         | Mean±SD                       |         |
| 1          | B      | 14.08 ± 1.262                   | 0.0521  | 14.93 ± 2.016                 | 0.0534  |
| 2          | L      | 13.66 ± 1.825                   |         | 14.06 ± 2.182                 |         |

**TABLE 7: DEGREE OF SENSORY BLOCKADE**

| SERIAL NO. | Grade | Group B | Group L | P- Value |
|------------|-------|---------|---------|----------|
| 1          | 2     | 44(88%) | 42(84%) | >0.05    |
| 2          | 1     | 2 (4%)  | 2(4%)   | >0.05    |
| 3          | 0     | 4(8%)   | 6( 12%) | >0.05    |

**TABLE 8: DEGREE OF MOTOR BLOCKADE**

| SERIAL NO. | GRADE | GROUP B | GROUP L  | p VALUE |
|------------|-------|---------|----------|---------|
| 1          | 4     | 4 (8%)  | 6 (12%)  | >0.05   |
| 2          | 3     | 0       | 0        | >0.05   |
| 3          | 2     | 0       | 0        | >0.05   |
| 4          | 1     | 3 (6%)  | 2(4%)    | >0.05   |
| 5          | 0     | 43(86%) | 42 (84%) | >0.05   |

**TABLE 9: DURATION OF SENSORY AND MOTOR BLOCKADE (MIN)**

| SERIAL NO. | Group | Sensory Blockade<br>± SD (Min) | P Value | Motor Blockade<br>± SD (Min) | P Value |
|------------|-------|--------------------------------|---------|------------------------------|---------|
| 1          | B     | 898.89 ±160.23                 | 0.0987  | 1019.545 ±158.76             | 0.0801  |
| 2          | L     | 953.26 ±144.25                 |         | 960.43 ±146.56               |         |

**TABLE 10: DURATION OF ANALGESIA**

| SERIAL NO. | Groups | Mean±SD       | p-Value |
|------------|--------|---------------|---------|
| 1          | B      | 800.43±145.66 | 0.0895  |
| 2          | L      | 852.27±140.51 |         |

**TABLE 11: MEAN HEART RATE AT VARIOUS TIME INTERVALS (BPM)**

| SERIAL NO. | Time (Min) | Group B      | Group L      | P –Value |
|------------|------------|--------------|--------------|----------|
|            |            | Mean±SD      | Mean±SD      |          |
| 1          | Baseline   | 74.93±7.0804 | 74.931±7.804 | 0.9154   |
| 2          | 1 Min      | 75.13±6.924  | 75.295±6.917 | 0.6321   |
| 3          | 2 Min      | 75.22±6.303  | 75.340±6.324 | 0.8175   |
| 4          | 5 Min      | 75.18±6.070  | 75.181±6.700 | 0.5941   |
| 5          | 10 Min     | 74.77±6.626  | 75.54±6.680  | 0.6561   |
| 6          | 15 Min     | 74.34±6.68   | 74.090±5.782 | 0.8214   |
| 7          | 20 Min     | 74.18±5.66   | 74.840±6.365 | 0.7125   |
| 8          | 25 Min     | 75.15±6.163  | 75.818±6.460 | 0.6512   |
| 9          | 30 Min     | 76.20±6.836  | 76.386±6.634 | 0.5951   |
| 10         | 35 Min     | 78.84±7.237  | 78.954±7.084 | 0.7432   |
| 11         | 40 Min     | 75.56±6.585  | 75.52±6.28   | 0.6849   |
| 12         | 50 Min     | 76.29±6.579  | 75.090±7.152 | 0.5321   |
| 13         | 60 Min     | 74.65±7.881  | 74.159±8.098 | 0.4174   |
| 14         | End        | 76.308±6.519 | 76.482±7.222 | 0.7659   |

**TABLE 12: MEAN SYSTOLIC BLOOD PRESSURE AT VARIOUS TIME INTERVALS (mm Hg)**

| SERIAL NO. | Time (Min)     | Group- B        | Group- L       | P Value |
|------------|----------------|-----------------|----------------|---------|
|            |                | MEAN±SD         | MEAN±SD        |         |
| 1          | Baseline       | 118.34 ±10.442  | 117.99 ±10.356 | 0.8736  |
| 2          | 1              | 117.32 ±10.424  | 116.95 ±10.526 | 0.8663  |
| 3          | 2              | 118.69 ±11.229  | 118.31 ±10.996 | 0.8716  |
| 4          | 5              | 113.71 ±16.128  | 115.45 ±16.381 | 0.6129  |
| 5          | 10             | 116.130 ±11.467 | 115.81 ±11.476 | 0.8937  |
| 6          | 15             | 116.347 ±9.450  | 116.95 ±9.717  | 0.8447  |
| 7          | 20             | 117.717 ±9.420  | 117.79 ±9.305  | 0.9706  |
| 8          | 25             | 119.04 ±9.695   | 119.27 ±9.617  | 0.9137  |
| 9          | 30             | 118.14 ± 11.794 | 118.63 ±11.512 | 0.8345  |
| 10         | 35             | 118.56 ±10.213  | 119.27 ±9.996  | 0.8546  |
| 11         | 40             | 116.52 ±10.366  | 118.36 ±10.363 | 0.9220  |
| 12         | 50             | 116.82 ±9.327   | 118.636 ±9.295 | 0.7563  |
| 13         | 60             | 117.130 ±9.320  | 119.227 ±9.191 | 0.8126  |
| 14         | End of surgery | 119.28 ±9.397   | 116.568 ±8.424 | 0.8566  |

**TABLE 13: MEAN DIASTOLIC BLOOD PRESSURE AT VARIOUS TIME INTERVALS (mm Hg)**

| S No. | Time (Min)     | Group-B       | Group- L      | P Value |
|-------|----------------|---------------|---------------|---------|
|       |                | MEAN±SD       | MEAN±SD       |         |
| 1     | Baseline       | 74 ±7.23      | 73.772 ±7.656 | 0.8848  |
| 2     | 1              | 73.829 ±6.709 | 73.181 ±7.284 | 0.6338  |
| 3     | 2              | 73.489 ±6.220 | 74 ±6.120     | 0.6995  |
| 4     | 5              | 74.127 ±6.832 | 73.568 ±6.888 | 0.7145  |
| 5     | 10             | 73.595 ±6.002 | 74.363 ±6.197 | 0.6241  |
| 6     | 15             | 74.127 ±6.625 | 74.227 ±6.560 | 0.7142  |
| 7     | 20             | 74.212 ±5.344 | 72.681 ±5.854 | 0.8256  |
| 8     | 25             | 73.319 ±5.946 | 72.363 ±6.053 | 0.6523  |
| 9     | 30             | 72.81 ±4.957  | 73.227 ±4.725 | 0.7426  |
| 10    | 35             | 73.591 ±5.802 | 71 ±5.693     | 0.8246  |
| 11    | 40             | 72.955 ±6.324 | 72.136 ±6.409 | 0.7425  |
| 12    | 50             | 72.266 ±6.790 | 72.886 ±6.793 | 0.5641  |
| 13    | 60             | 73.311 ±6.536 | 72.136 ±6.432 | 0.8412  |
| 14    | End of surgery | 72.644 ±5.540 | 74.090 ±6.324 | 0.2511  |

**TABLE 14: MEAN BLOOD PRESSURE AT VARIOUS TIME INTERVALS (mm Hg)**

| SERIAL NO. | Time (Min)     | B      |       | L      |        | P Value |
|------------|----------------|--------|-------|--------|--------|---------|
|            |                | Mean   | SD    | Mean   | SD     |         |
| 1          | Baseline       | 86.282 | 7.929 | 86.522 | 7.544  | 0.8834  |
| 2          | 1              | 85.891 | 7.23  | 86.204 | 6.825  | 0.8334  |
| 3          | 2              | 85.913 | 6.643 | 86.875 | 6.448  | 0.4785  |
| 4          | 5              | 86.304 | 7.589 | 85.727 | 7.391  | 0.8546  |
| 5          | 10             | 86.065 | 6.598 | 86.545 | 6.923  | 0.7145  |
| 6          | 15             | 86.326 | 7.078 | 85.909 | 7.302  | 0.8956  |
| 7          | 20             | 86.782 | 5.886 | 84.913 | 6.171  | 0.8742  |
| 8          | 25             | 85.695 | 6.324 | 83.818 | 6.122  | 0.8546  |
| 9          | 30             | 85.434 | 5.984 | 85.068 | 13.683 | 0.8688  |
| 10         | 35             | 86.391 | 6.035 | 86.045 | 6.3888 | 0.7922  |
| 11         | 40             | 86.065 | 7.847 | 85.409 | 6.955  | 0.6459  |
| 12         | 50             | 84.434 | 7.083 | 85.068 | 7.276  | 0.7126  |
| 13         | 60             | 84.913 | 7.142 | 87     | 6.566  | 0.1530  |
| 14         | End of surgery | 85.521 | 5.807 | 86.522 | 6.697  | 0.4501  |

**TABLE 15: MEAN SpO<sub>2</sub> AT VARIOUS TIME INTERVALS**

| SERIAL NO. | Time (Min)     | Group B       | Group L       | P Value |
|------------|----------------|---------------|---------------|---------|
|            |                | Mean±SD       | Mean±SD       |         |
| 1          | Baseline       | 98.87±1.208   | 99.977±1.508  | 0.2994  |
| 2          | 1              | 99.13±1.013   | 99.909±0.4214 | 0.3152  |
| 3          | 2              | 98.86±1.210   | 99.977±0.1508 | 0.4126  |
| 4          | 5              | 99.956±0.294  | 99.25±1.564   | 0.3365  |
| 5          | 10             | 99.934±0.2496 | 98.817±0.3620 | 0.3652  |
| 6          | 15             | 99.913±0.3544 | 99.909±0.3620 | 0.8462  |
| 7          | 20             | 99.978±0.1474 | 99.886±0.4428 | 0.4851  |
| 8          | 25             | 99.956±0.2062 | 99.956±0.3542 | 0.3145  |
| 9          | 30             | 99.956±0.2949 | 99.954±0.301  | 0.5621  |
| 10         | 35             | 99.45±0.4156  | 99.977±0.150  | 0.6521  |
| 11         | 40             | 99.89±0.4335  | 99.955±0.300  | 0.5647  |
| 12         | 50             | 99.913±0.4124 | 99.977±0.150  | 0.4126  |
| 13         | 60             | 99.456±0.4563 | 98.845±0.4888 | 0.6125  |
| 14         | End of surgery | 99.935±0.3125 | 99.965±0.4685 | 0.7206  |

TABLE 16: MEAN RESPIRATORY RATE AT VARIOUS TIME INTERVALS (RRPM)

| SERIAL NO. | Time (Min)     | Group- B     | Group- L     | P- Value |
|------------|----------------|--------------|--------------|----------|
|            |                | Mean±SD      | Mean±SD      |          |
| 1          | Baseline       | 13.86 ± 1.40 | 14.40 ± 1.32 | 0.1432   |
| 2          | 1              | 13.73 ± 1.76 | 14.13 ± 1.83 | 0.6657   |
| 3          | 2              | 14.43 ± 1.19 | 14.80 ± 0.99 | 0.1124   |
| 4          | 5              | 14.75 ± 1.54 | 14.66 ± 1.54 | 0.2588   |
| 5          | 10             | 15.21 ± 1.42 | 15.25 ± 1.36 | 0.7439   |
| 6          | 15             | 15.32 ± 1.60 | 15.61 ± 1.61 | 0.7961   |
| 7          | 20             | 14.20 ± 1.44 | 13.96 ± 1.58 | 0.4176   |
| 8          | 25             | 14.73 ± 1.23 | 14.73 ± 1.23 | 0.9417   |
| 9          | 30             | 14.66 ± 1.59 | 14.26 ± 1.33 | 0.2653   |
| 10         | 35             | 14.63 ± 1.29 | 14.63 ± 1.18 | 0.6824   |
| 11         | 40             | 14.56 ± 1.52 | 14.86 ± 0.97 | 0.5345   |
| 12         | 50             | 14.06 ± 1.91 | 15.03 ± 1.03 | 0.4427   |
| 13         | 60             | 15.0 ± 0.94  | 14.46 ± 1.33 | 0.3565   |
| 14         | End of surgery | 14.93 ± 0.86 | 14.63 ± 1.40 | 0.4560   |

## DISCUSSION

**Cox C. R. et al<sup>11</sup>** observed that mean onset of sensory block with 0.5% Bupivacaine and 0.5% Levobupivacaine was  $8 \pm 8$  minutes and  $6 \pm 5$  minutes respectively. They did not find any significant difference between the two drugs. **Cacciupuoti A. et al<sup>6</sup>** had observed that onset of sensory blockade was  $10.30 \text{ min} \pm 2.40 \text{ min}$  in Levobupivacaine group and  $18.50 \pm 4.12 \text{ min}$  in Bupivacaine group. They had administered drug at a lower dose ( $1 \text{ mg/Kg}$ ) and they administered the drug in two parts through Axillary route. **Duma A. et al<sup>13</sup>** had observed that onset of sensory blockade was 10 minutes in Bupivacaine (0.5%) and Levobupivacaine (0.5%) in Axillary brachial plexus block and there was no significant difference in both the groups. **Pedro J.<sup>23</sup>** had found that onset of sensory block in C5-C8 dermatomes was 5 minutes in Levobupivacaine (0.5%) group and between 8-10 minutes in Bupivacaine (0.5%) group. They observed a significantly faster onset of sensory blockade in Levobupivacaine group in all dermatomes ( $p < 0.05$ ). **Eroglu F. et al<sup>15</sup>** had observed that onset of sensory blockade

was  $13.40 \pm 2.76$  minutes in Bupivacaine Group and  $9.66 \pm 2.52$  minutes in Levobupivacaine group in Axillary brachial plexus block. They found it statistically significant ( $p < 0.05$ ) with faster onset in Levobupivacaine group. **Ilham C. et al<sup>16</sup>** had observed that mean onset of sensory blockade was  $19.66 \pm 10.70$  and  $25.66 \pm 10.72$  minutes in Bupivacaine (0.5%) and Levobupivacaine (0.5%) respectively. They found earlier onset with Bupivacaine (0.5%) and it was statistically significant ( $p < 0.05$ ).

Different studies had got mixed results in terms of onset of sensory block in respect to both the drugs. **Cox C. R. et al<sup>11</sup>**, **Duma A. et al<sup>13</sup>** and **Liisanatti O. et al<sup>19</sup>** had observed no difference in onset of sensory block between both the drugs which is comparable to our study. **Pedro J. R. P. et al<sup>23</sup>**, **Eroglu F. et al<sup>15</sup>**, **Cacciupuoti A. et al<sup>6</sup>** had found that Levobupivacaine had an earlier onset of sensory block. **Pedro J. R.<sup>23</sup>** had calculated the median value and percentile. **Ilham C. et al<sup>16</sup>** had found that Bupivacaine had an earlier onset of sensory block, may be due to they had given the drug in two parts through supraclavicular route. They considered the

difference (of less than 6 min) in onset of sensory block as insignificant in clinical practice.

**Sheikh S. I., K. Veena**<sup>25</sup> observed earlier onset of Bupivacaine than what we found in our study, may be due to they had performed the block by eliciting paresthesia and tested the sensory loss by spirit soaked cotton swab. Considering this onset of Bupivacaine in our study is comparable to **Sheikh S. I., K. Veena**<sup>25</sup>. Mean onset time of motor blockade was  $14.93 \pm 2.016$  minutes and  $14.06 \pm 2.182$  minutes for Bupivacaine and Levobupivacaine group respectively. We had found no significant difference between both the groups ( $p > 0.05$ ).

**Cox C. Retal**<sup>11</sup> observed that onset of motor block with Bupivacaine 0.5% and Levobupivacaine 0.5% was 5 minutes and 6 minutes respectively. They took the onset time as the time between the block performed and the time of first loss of motor power. **Cacciupuoti A. et al**<sup>6</sup> had observed onset of motor blockade was  $14.40$  minutes  $\pm 2.36$  minutes in 0.5% Levobupivacaine group and  $21.27 \pm 5.20$  minutes in 0.5% Bupivacaine group, with earlier onset in Levobupivacaine group. **Cline E. et al**<sup>9</sup> observed that time of onset of motor blockade was  $19.67 \pm 8.34$  minutes with 0.5% Levobupivacaine along with epinephrine 1:200000. **Chakraborty S.**<sup>8</sup> et al had observed that onset of motor blockade was  $18.1 \pm 1.35$  minutes for 0.5% Bupivacaine group. **Pedro J. R. P. et al**<sup>23</sup> had found that latency of motor blockade for all movements of upper limb varied from 6.0 minute to 15 minutes in Bupivacaine group and 6.5 minutes to 15 minutes in Levobupivacaine group. They did not find any significant difference in onset of motor blockade between two groups.

**Erogulu F. et al**<sup>15</sup> had observed that onset of motor blockade was shorter in Levobupivacaine than in Bupivacaine group. They observed that onset of motor blockade with Bupivacaine was  $9.20 \pm 1.73$  minutes and  $6.40 \pm 2.55$  minutes in Levobupivacaine. They found it statistically significant ( $p < 0.05$ ). **Sheikh I. S.**<sup>25</sup> had observed that mean onset of motor block with Bupivacaine (0.5%) was  $9.96 \pm 5.69$  min. **Ilham C. et al**<sup>16</sup> had observed that mean onset of motor blockade was

$5.07 \pm 4.07$  &  $9.2 \pm 7.9$  minutes in Bupivacaine (0.5%) and Levobupivacaine (0.5%) respectively. They found earlier onset with Bupivacaine (0.5%) and it was statistically significant ( $p < 0.05$ ).

The results of previous studies were different from each other. The results of our study were comparable with **Pedro J.R.P. et al**<sup>23</sup>, **Cox C. R. et al**<sup>11</sup>, **Kim W. et al**<sup>18</sup>, **Chakraborty S. et al**<sup>8</sup>, **Duma A. et al**<sup>13</sup> and **Liisanatti O. et al**<sup>19</sup> in terms of no significant difference in onset between two groups. **Bedder M.D. et al**<sup>4</sup> had found that 77 % patients of Bupivacaine 0.5% had achieved complete sensory block. **Cox C. R. et al**<sup>11</sup> had observed that their 80% of patients of Levobupivacaine group and 74% of patients of Bupivacaine group had observed complete sensory block and they have regarded complete sensory block as satisfactory. So our study was comparable with that of **Cox C. R. et al**<sup>11</sup>, **Ilham C. et al**<sup>16</sup>, **Bedder M.D. et al**<sup>4</sup> and **Yurtulu B. S. et al**<sup>31</sup>.

**Cox C. R. et al**<sup>11</sup> had observed that most of the patients of 0.5% Bupivacaine and 0.5% Levobupivacaine had achieved highest degree of motor blockade (Grade-2). **Pedro J. et al**<sup>23</sup> had observed that 76% of patients of Bupivacaine and Levobupivacaine group achieved highest degree of motor blockade. **Riveron A et al**<sup>24</sup> had observed that almost all the patient who received 0.5% Bupivacaine had achieved highest degree of motor blockade.

So our study was comparable to **Cox C. R. et al**<sup>11</sup>, **Pedro P. et al**<sup>23</sup>, **Riveron A. et al**<sup>24</sup> in terms of degree of motor blockade.

**Cacciupuoti A. et al**<sup>6</sup> had observed that mean duration of sensory block was 10 hr 30  $\pm 57$  minutes for Levobupivacaine (0.5%) and 8 hr 45 min  $\pm 37$  min for Bupivacaine (0.5%). This was statistically significantly different ( $p < 0.05$ ). **Duma A. et al**<sup>13</sup> had observed that mean duration of sensory block was 1063 minutes and 1083 minutes respectively for Bupivacaine (0.5%) and Levobupivacaine (0.5%) group. **Jarbo K. et al**<sup>17</sup> had observed that mean duration of sensory block was  $5.95 \pm 1.4$  hours with Bupivacaine 0.5%. **Ilham C. et al**<sup>16</sup> had observed that duration of sensory blockade was  $14.25 \pm 5.81$  hours and

12.81 ± 3.32 hours in Bupivacaine (0.5%) and Levobupivacaine (0.5%) respectively. This difference was not statistically significant ( $p > 0.05$ ). Our results were comparable with that of **Cox C. R. et al (1998)<sup>11</sup>** and **Ilham C. et al<sup>16</sup>** and **Duma A. et al<sup>13</sup>** in terms of no significant difference were found between two for duration of sensory blockade. Although **Duma A. et al<sup>13</sup>** had got a longer duration of block probably because they had injected a greater volume of drug through Axillary route.

Considering these facts our study was also comparable to **Erogulu F. et al,<sup>15</sup> Cacciupuoti A. et al<sup>6</sup>** and **Jarbo K. et al<sup>17</sup>** in terms of duration of sensory block. **Cox C.R. et al<sup>11</sup>** had found that median duration of motor blockade was 933 ± 205 min with 0.5% Bupivacaine and 1050 ± 325 min with 0.5% Levobupivacaine. There was no statistically significant difference between two groups ( $p > 0.05$ ).

**Cacciupuoti A.<sup>6</sup>** had observed that mean duration of motor blockade with Bupivacaine 0.5% was 10 hr 12 min ± 1hr and 8 hr 28 min ± 1hr 17 min with Levobupivacaine 0.5%. **Cline E. et al<sup>9</sup>** had observed that patients who received 0.5 % Levobupivacaine had a mean duration of motor blockade of 1047 min. **Jarbo K. et al<sup>17</sup>** had observed that mean duration of motor blockade was 5.1 ± 1.14 hrs with 0.5% Bupivacaine group. **Yurtulu S. B. et al<sup>31</sup>** had found that mean duration of motor blockade was 608.21 ± 152.93 min with 0.5% Levobupivacaine.

**Sheikh I. S., K. Veena<sup>25</sup>** had observed that mean duration of motor block with Bupivacaine (0.5%) was 450.48 ± 57.95 min. **Ilham C. et al<sup>16</sup>** had observed that duration of motor blockade was 14.55 ± 5.55.hours, 13.8 ± 2.95 hours in Bupivacaine (0.5%) and Levobupivacaine respectively. This difference was not statistically significant ( $p > 0.05$ )

Our results were comparable with that of **Cox C.R. et al<sup>11</sup>**, **Ilham C. et al<sup>16</sup>** and **Cline E. et al.<sup>9</sup>** **Cacciupuoti A. et al,<sup>6</sup> Jarbo K. et al,<sup>17</sup> Yurtulu S. B. et al<sup>31</sup>** and **Sheikh I. S., K. Veena<sup>25</sup>** found shorter duration of motor block. **Cacciupuoti A. et al<sup>6</sup>** had used lesser amount of drug and the drug was administered through Axillary route.

**Yurtulu S. et al<sup>31</sup>** had also performed the block through Axillary route by triple injection technique so their result were different from our study.

**Riveron A. et al<sup>24</sup>** had observed that mean duration of analgesia was 13.1 hr with Bupivacaine (0.5%). **Erogulu F. et al<sup>15</sup>** had observed that mean duration of analgesia was 1068.33 ± 48.20 min with Levobupivacaine and 1121.75 ± 115.35 min with Bupivacaine. It was not statistically significant ( $p > 0.05$ ).

The results of our study was comparable with that of **Ilham C. et al<sup>16</sup>** and **Riveron A. et al<sup>24</sup>**. Duration of analgesia was longer in study of **Erogulu F. et al<sup>15</sup>** perhaps due to addition of morphine in the drug solution. **Cacciupuoti A.<sup>6</sup>**, **Yurtulu S. B.<sup>31</sup>** and **Sheikh I. S., K. Veena<sup>25</sup>** found lesser duration of analgesia. **Cacciupuoti A.<sup>6</sup>** used less amount of drug. **Yurtulu S. B.<sup>31</sup>** performed block through Axillary route using triple injection technique while in our study we performed the block through supraclavicular route with a single injection technique so we got different results from them. Our results also differ from **Sheikh I. S., K. Veena<sup>25</sup>** may be due to different technique of performing supraclavicular brachial plexus block. **Cox C.R. et al<sup>11</sup>** had also observed no significant changes in heart rate of their patients.

**Ilham C. et al<sup>16</sup>** had observed no significant changes in heart rate of their patients. Thus our study is comparable to that of **Pedro J. R. P. et al<sup>23</sup>**, **Cox C.R. et al<sup>11</sup>** and **Ilham C. et al<sup>16</sup>**.

No significant change seen in systolic blood pressure in both the groups. **Cox C.R. et al<sup>11</sup>** had observed no significant changes in systolic blood pressure in their study. **Cline E. et al<sup>9</sup>** and **Erogulu F. et al<sup>15</sup>** had also observed no significant difference in terms of systolic blood pressure. Our study was comparable with **Cox C.R. et al,<sup>11</sup> Erogulu F. et al,<sup>15</sup> Cline E. et al.<sup>9</sup>**

**Cox C.R. et al,<sup>11</sup> Pedro P. et al<sup>23</sup>** and **Erogulu F. et al<sup>15</sup>** had also observed no significant difference in terms of diastolic blood pressure. Our study was comparable with **Cox C.R. et al,<sup>11</sup>**

**Pedro P. et al<sup>23</sup> and Erogulu F. et al<sup>15</sup>** in terms of mean diastolic blood pressure.

**Cox C.R. et al<sup>11</sup>, Cline E. et al<sup>9</sup> and Pedro P. et al<sup>23</sup>** had observed no significant changes in mean blood pressure their study. Thus our study is comparable to that of **Cox C.R. et al<sup>11</sup>, Pedro J. R. P. et al<sup>23</sup> and Cline E. et al<sup>9</sup>**

**Cox C.R. et al<sup>11</sup> and Erogulu F. et al<sup>15</sup>** had also observed no significant difference in terms of SpO<sub>2</sub>. There was no major changes observed in SpO<sub>2</sub> in our study in both the groups which was comparable to that of **Cox C.R. et al<sup>11</sup> and Erogulu F. et al<sup>15</sup>**

**Cox C.R. et al<sup>11</sup>** observed 4 cases of block failures, 2 cases each in Bupivacaine and Levobupivacaine group. **Ilham C. et al<sup>15</sup>** had recorded 6 cases of block failure, 3 cases each in Bupivacaine and in Levobupivacaine group. They observed no significant difference in terms of incidence of failures in both the groups. In our study we also found no significant difference in both the groups in terms of failure of block which is comparable to **Cox C.R. et al<sup>11</sup>, Ilham C. et al<sup>16</sup>**

**Erogulu F. et al<sup>15</sup>** had not recorded any significant side effects or hemodynamic changes in their study. In our study we have recorded only one incidence of side effect in Bupivacaine group. Our study is comparable with **Cox C.R. et al<sup>11</sup>, Ilham C. et al<sup>16</sup>, Pedro P. et al<sup>23</sup>**. Vascular puncture was occurred due to faulty technique.

### Conclusion

In the present study both the drugs Bupivacaine and Levobupivacaine were studied in terms of onset of sensory and motor blockade, degree of sensory and motor blockade, duration of sensory and motor blockade, analgesia duration, and for side effects in patient undergoing arm and forearm surgeries and it was found that both the drugs were similar in almost all the parameters. As Levobupivacaine has a low toxic profile, it can be considered as a good alternative to Bupivacaine in supraclavicular brachial plexus block.

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