



Original Research Article

A clinical study of effects of 30 ml of 1.5% lidocaine with adrenaline and 30 ml of 0.333% levobupivacaine for axillary block using nerve stimulation technique

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ABSTRACT

Introduction and Objective: Axillary block is most commonly used regional anaesthetic technique for surgeries of forearm, wrist and hand surgeries. Various local anaesthetic been used for axillary block, among them levobupivacaine has gained more interest as it prolong the duration of analgesia with reduced cardiovascular and central nervous system toxicity. This study is done to compare the effects of 1.5% lignocaine with 1:300000 adrenaline with the 0.333% levobupivacaine in axillary brachial plexus block and the quality of postoperative analgesia.

Materials and Methods: After obtaining ethical committee clearance and written informed consent, 60 patients of ASA class I and II, aged between 18-60 years, posted for elective upper limb surgeries, were randomly assigned to 2 groups of 30 in each group A and group B. Group A to receive 30ml of 1.5% lidocaine with adrenaline 1 in 300000 and group B to receive 30ml of 0.333% levobupivacaine. Through perivascular approach axillary brachial plexus block given using peripheral nerve stimulator. Onset and duration of sensory and motor block, quality of block, duration of analgesia and adverse effects if any were evaluated.

Result: Levobupivacaine had slower onset of actions but statistically significant increased duration of sensory and motor blockade, prolonged duration of analgesia were obtained in levobupivacaine group, with no haemodynamic variations and adverse effects in both groups.

Conclusion: Levobupivacaine produced prolonged duration of analgesia with reduced toxic potential thus providing greater margin of clinical safety.

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1. Introduction

Early days general anaesthesia was the most commonly used technique to provide anaesthesia in upperlimb surgeries. But with better understanding of local anaesthetics and with introduction of newer and safe local anaesthetics, regional anaesthesia become most popular for upperlimb surgeries.¹ The advantage of regional anaesthesia is, it is site specific longlasting and provides effective analgesia and relaxation.²

Peripheral nerve blocks can be used as the sole anaesthetic technique or in combination with general anaesthesia to provide analgesia and good muscle relax-

ation, and it is superior to parenteral analgesia in terms of providing analgesia and side effects.^{2,3} Additional advantage associated with peripheral nerve blocks are patient satisfaction, less cognitive impairment in elderly, early mobilization, low cost.^{4,5}

Among peripheral nerve blocks brachial plexus block is commonly used.^{1,6} There are various approach for brachial plexus block,^{1,4} among them axillary approach remains the safest.⁷ The axillary plexus is an excellent choice of anaesthesia technique for hand, wrist, forearm and elbow surgeries.⁸

Among local anaesthetics Lignocaine with adrenaline and bupivacaine 0.25-.0.5% has been employed for Axillary brachial plexus block.⁹⁻¹² The bupivacaine provides longer duration of block with good analgesia which extends to

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postoperative periods,^{10,13} but it is associated with severe cardiovascular and central nervous system toxicity.^{10–13} Therefore levobupivacaine has been recently introduced into clinical practice which has better pharmacological profile.^{11,13} Levobupivacaine used in various concentration (0.33%, 0.375%, 0.5%) for brachial plexus blocks.^{14,15} It is the pure levo enantiomer of the racemic formulations of bupivacaine with less systemic toxicity.^{10–17} The present study is undertaken to compare lidocaine with adrenaline 1.5% and levobupivacaine 0.333% for axillary brachial plexus block and the quality of postoperative analgesia.

2. Objectives

To study the effects of levobupivacaine 0.333% and 1.5% lidocaine with adrenaline 1 in 300,000 on

1. Onset of sensory blockade.
2. Onset and quality of motor blockade.
3. Duration of sensory blockade.
4. Duration of motor block ade
5. Overall quality of block
6. Duration of analgesia.
7. Adverse effects.

3. Materials and Methods

The study was undertaken after obtaining institutional ethical committee clearances as well as informed consent from all participant. 60 participant belonging to ASA class I or II between 18 and 60 years of age scheduled for elective upper limb surgeries were enrolled in the study.

3.1. Inclusion criteria

1. Adult patient between 18 to 60 years
2. ASA class I and II
3. Body weight 50 -70 kg
4. Scheduled for elective upper limb surgeries (forearm and hand)

3.2. Exclusion criteria

1. Patient not willing for regional anaesthesia
2. Patient with known hypersensitivity or contraindications to study drugs
3. Infection at the site of block
4. Morbidly obese patients
5. Patient with known coagulopathy or patient on anticoagulants
6. Pregnant and lactating patients
7. Patients with severe systemic disorder (respiratory, cardiac, hepatic, renal diseases)
8. Patients with neurological, psychiatric or neurovascular disorders
9. Patients with injury to any of the nerves of the upper limb

Routine pre anaesthetic examination was conducted on the evening before the surgery assessing the general condition of the participant, including airway assessment and systemic examinations. Routine investigations included CBC, RBS, RFT, coagulation profile, ECG, chest x ray.

The participant was randomly divided into 2 subgroups of 30 participant each using simple sealed envelope method.

1. Group A(lidocaine adrenaline): received 20ml of 2% lidocaine with 1 in 200000 adrenaline was taken and 10ml of normal saline was added to it to make it up to 30ml volume of 1.5% lidocaine with adrenaline 1 in 300000
2. Group B : 20 ml of 0.5% levobupivacaine was taken and 10ml of normal saline was added to it make it up to 30ml of 0.333% Levobupivacaine.

The double blind design of the study was assured by the fact that a senior anaesthesiologist who was not further involved with the study was assigned to prepare the solution before the administration of drugs.

The anaesthesiologist responsible for providing anaesthesia and observing the parameters during the surgery and the patient were kept unaware of the content of the syringes.

After arrival in the preanaesthesia room 20 G and 18 G intravenous cannula were inserted for the infusion of the study drug and for the administration of fluids and other drug.

Standard intraoperative monitoring including Spo₂, ECG, NIBP was performed.

All patients were premedicated with intravenous midazolam 1mg and fentanyl 1mcg/kg. Under aseptic precautions, perivascular approach of axillary brachial plexus block using nerve stimulator was performed using 22G 50mm insulated blunt tipped needle (Vygon) and Plexygon nerve stimulator.

Immediately after the block placement, patients were evaluated every 1minute for the assessment of onset of sensory and motor blockade, quality of motor blockade, overall quality of the block, duration of sensory and motor blockade and haemodynamic variables. Sensory blockade was assessed by pin prick test and motor blockade assessed by modified bromage scale. The motor and sensory motor blockade assessed every 1 minutes till it is achieved until 30 minutes. After 30 minutes if adequate analgesia and motor blockade achieved surgeons were allow apply tourniquet and start surgery; if not general anaesthesia given to patients.

During surgery tourniquet time, HR, SBP, DBP, MAP, SpO₂, ECG were monitored every 2nd, 5th and 10th minute and then every 10minute till the completion of the surgery along with that CVS and CNS toxicity, hypersensitivity reactions for drugs and other adverse effects.

The quality of analgesia was assessed during surgery and in the postoperative period according to a VAS score. When

patient began to experience pain in the operative site more than 5 on the VAS (0 being no pain and 10 being unbearable pain), it was considered that the analgesic action of the drug has terminated and rescue analgesics inj. Diclofenac sodium 75mg was given and study was concluded. The patients followed up for 24hour for any side effects.

3.3. Definitions

1. Onset of sensory blockade: Time from the completion of injection of study drug to first loss of pinprick sensation in any of the area of distribution of the four nerves.
2. Onset of motor blockade: The time from the completion of injection of study drug to first loss of motor power of any of the four nerves.
3. Duration of sensory blockade : The time from the onset of sensory blockade to complete recovery of sensation in all the areas of nerve distribution.
4. Duration of motor blockade: The time from the onset of motor blockade to complete recovery of motor power.
5. Duration of analgesia: The time between the end of local anaesthetics administration and the first rescue analgesia request.(VAS >5)
6. Quality of motor blockade : Motor block was graded according to the following scale

0 – no block (full muscle activity)

1- Partial block (decreased muscle activity)

2 – complete block (no muscle activity)

7. Quality of over all block : an overall assessment of quality of block was made as a three point scale as follows

0 – complete failure

1 – unsatisfactory block

2 – Satisfactory block

Adverse effects: patients monitored for any sign of CNS and CVS toxicity

Hypotension: mean arterial pressure less than 30% of the baseline.

4. Results

There were no statistically significant difference in the demographic profile of the patients in either group in terms of age, sex ratio and weight($p > 0.05$)

The types of surgery was similar in both groups with p values=0.692. Mean duration of surgery in group A (46+/-10.69) and group B (44.5+/-10.93) was comparable in both groups. Tourniquet time was 54.67+/-10.58 min in group A and that of group B 53.50+/-10.91 min which was comparable. There were no statistically significant difference in mean heart rate variation within the group before and after surge r y and mean arterial pressure variation within the group before and after the surgeries.

The onset of sensory block in group A (lidocaine with adrenaline) was 1.61+/-0.737min and in group B (Levobupivacaine) was 5.29 +/-1.21 min. The difference between two group being statistically highly significant with p value=0.000. The maximum sensory blockade achieved in group A at 9.14+/- 1.6min and in group B at 11.07+/-2.107min. The difference between two group was significant with p value=0.000. These conclude that lidocaine with adrenaline provides early sensory block onset and achieves maximum sensory blockade earlier than levobupivacaine.

The onset of motor block in group A was 3.035 +/-1.035 min and in group B 7.964+/-1.373 min. the difference between two group statistically significant with p values=0.000. Complete motor block was achieved in 10.535+/-1.47min in group A and 16.142+/-2.33 min in group B, which is statistically significant with p values=0.000.it concludes that levobupivacaine has delayed onset of motor blockade as compare to lignocaine with adrenaline.

The quality of motor blockade in both group is comparable with no statistical significant difference between the two groups.

The mean duration of analgesia in group A (lignocaine with adrenaline) was 137.93+/-9.44min and in group B 548.39+/-52.70min, which is statistically significant with p values=0.000.

The duration of sensory block and motor block in group A were 159.107+/-8.71 min and 14 9.03+/-8.59 min respectively. Whereas in group B the mean duration of sensory block and motor block were 583.57+/-49.51 min and 567.64+/-51.92 min respectively. Which is statistically significant with p values 0.000.

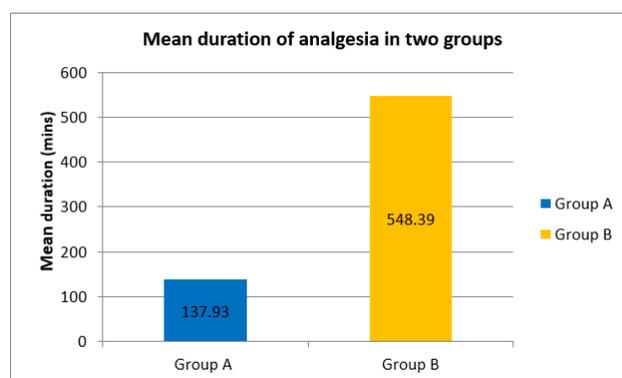


Fig. 1:

5. Discussion

Levobupivacaine is local anaesthetics which is introduced in clinical practice in India recently;^{11,13} which is a pure levoenantiomer of the racemic formulation of bupivacaine.

Table 1:

Variables	Group A	Group B	P value
Age (years)	34.80+/-11.43	34.77+/-10.431	0.991
Sex(M/F)	18(60.0%) 12(40.0%)	20 (66.67%) 10(33.3%)	0.592
Weight (Kg)	58.87+/-5.25	58.67+/-5.604	0.791

Table 2:

	Group A	Group B	P value
Sensory block onset (min)	1.61+/-0.737	5.29+/-1.21	0.000
Time of maximum sensory blockade (min)	9.14+/-1.6	11.07 +/-2.107	0.000

Table 3:

	Group A	Group B	P values
Onset of motor blockade	3.035+/-1.035	7.964 +/- 1.373	0.000
Complete motor block	10.53+/- 1.47	16.142+/-2.33	0.000

Table 4:

	Group A	Group B	P values
Duration of sensory blockade (min)	159.107+/-8.71	583.57+/-49.51	0.000
Duration of motor blockade (min)	149.03+/-8.59	569.64+/-51.92	0.000

As compared to racemic bupivacaine, levobupivacaine is associated with less cardiovascular and nervous system toxicity.^{10,16,17} It has got all advantage of bupivacaine like long duration of sensory and motor blockade, high potency, long duration of analgesia. Only disadvantage is it has a delayed onset of action. Since the advantage outweighs the only disadvantage, we have selected the levobupivacaine to compare with lignocaine with adrenaline for axillary blocks for upperlimb surgeries in our study.

Various clinical studies have shown that volume required for axillary brachial plexus blocks is 30-40ml. Due to the ethnic variation the volume of axillary sheath in Asian populations found to be less hence in our study 30ml of both the study drugs used.

In our hospital routinely 1.5% lignocaine with adrenaline 1:300000 concentration routinely used hence we have selected same concentration for our study.

The study conducted by Babst CR et al showed equipotent doses of lidocaine and bupivacaine 4:1. The equipotent dose of levobupivacaine and bupivacaine 1:0.98:1; therefore 0.333% levobupivacaine selected for our study.

The onset of sensory blockade in group A (lidocaine with adrenaline) was 1.61+/-0.737 min and in group B (levobupivacaine) was 5.29+/-1.213 min. the differences in the onset of sensory block between the groups statistically highly significant with P values =0.000. The differences in the onset of sensory block attributed to drugs pKa values, lidocaine has pKa value of 7.8 and levobupivacaine has 8.1. The onset of sensory block of levobupivacaine given

in our study was 5.29+/-1.213 which is similar to studies conducted by Cox et al¹⁸ and Duma et al.¹⁹

The complete sensory block was achieved in 9.14+/-1.6 min in lidocaine with adrenaline group and 11.07+/-2.07 min in levobupivacaine group which is highly significant. The complete sensory block achieved in group A is comparable with studies conducted by Ali et al²⁰ (11+/-4 min) and Kaabachi et al²¹ (9+/-3 min); in group B it is comparable with studies conducted by Crews et al¹⁰ (12.5min) Gonzalez et al¹⁴ (12.03+/-5.8 min).

In our study the duration of sensory block in group A was 159.1+/-8.7 min and in group B it was 583+/-49.51 min which is statistically highly significant with p values=0.000. The findings in Group A correlates with studies conducted by Biradar et al²² (159+/- 20min), Goemley et al²³ (189+/-58 min), Kaabachi et al²⁴ (126+/-48 min) whereas in group B it correlates with studies conducted by Gonzalez et al¹⁴ (11.3+/-4.1hours), Piangatelli et al²⁵ (11.4+/-2.2 hr).

The onset of motor block was 3.035+/-1.035 min in Group A and in group B it was 7.964+/-1.373 min. The difference between both groups were statistically significant with P values=0.000. The findings of group B is comparable with studies conducted by Eroglu et al²⁶ (6.40+/-2.55 min), Yurtlu et al²⁴ (9.29+/-6.97 min), Gonzalez¹⁴ (12.4+/-7.8).

The complete motor block achieved within 10.535+/-1.47 min in Group A and 16.142+/-2.33min in Group B, which is highly statistically significant in our study group B finding was 16.142+/-2.33, similar findings observed in Cline et al¹³ (19.67+/-8.34min), Kaygusuz et al²⁷ (15.75+/-4.06min).

In both the groups 93.33% complete paralysis observed whereas 6.66% patients in both groups had either partial motor and sensory blockade due to sparing of nerves. In our study mean duration of motor block was 149.03±8.59 min in group A and 569.64±51.92 min in group B, which is highly significant statistically with P value=0.000.

The mean duration of analgesia was 137.93±9.4 min in group A and 548.39±52.70 min in group B. The difference between the group was statistically highly significant. The mean duration of analgesia in lignocaine with adrenaline group is similar to findings observed in Yadav et al²⁸ (176.5±53min), Nishikawa et al²⁹ (215±78 min). The total duration of analgesia in levobupivacaine group was 548.39±52.70 min which correlates with studies conducted by Gormley et al²³ (14.18±3.83hours), Yurtlu et al²⁴ (606.79±171.64 min).

The overall quality of block in both groups were comparable and there is no statistical significant difference between the groups. The adverse effects like hematoma, inadvertent intravascular injection, nerve injury, infection, post block nausea, vomiting convulsions neuralgia were nil in either groups. Hemodynamic parameters in the both groups were normal throughout the studies.

6. Conclusion

The lidocaine 1.5% with adrenaline 1:300000 30ml for axillary brachial plexus block using nerve stimulation technique provides a faster onset of sensory and motor blockade than 0.33% levobupivacaine 30ml. Where as levobupivacaine provides longer duration of sensory blockade, motor blockade and prolonged duration of analgesia compare to lidocaine with adrenaline. Overall quality of axillary brachial plexus block satisfactory in the both groups. Our study has concluded that levobupivacaine is an ideal agent for axillary plexus block.

7. Source of funding

None.

8. Conflict of interest

None.

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