(1) ANALGESIC & ANESTHETIC PROPERTY OF LEVOBUPIVACAINE COMPARED WITH BUPIVACAINE IN PATIENTS UNDERGOING A SUPRA-CLAVICULAR BRACHIAL PLEXUS BLOCK.

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Abstract:

Background: *Single injection of supraclavicular brachial plexus block is an effective anesthetic; however it is limited by the duration of action of local anesthetic.Bupivacaine is a long-acting local anesthetic which has been reported to be associated with slower onset time for nerve blockade.*

Method: *The present study was conducted in random 60 patients posted for upper limb surgery having ASA grade 1 and 2 physical status. The patients were randomly allotted into two groups each having 30 patients. Group R– inj. Levobupivacaine 0.5% 0.8 ml/kg Group B– inj. Bupivacaine 0.5% 0.8 ml/kg. And the effects were assessed.*

Observations: *There was significant difference in duration of sensory block (<0.05), and analgesia (<0.05) in both the groups. The average duration of sensory block was 630±95.22 minutes in L Bupivacaine group whereas it was 525±.8 minutes in Bupivacaine group which was significant statistically. The average duration of motor blockade was 520±20, minutes in L-Bupivacaine group whereas it was 612±89.41 minutes in Bupivacaine group which was not significant statistically (p<0.05). The average duration of analgesia was 781 minutes in L bupivacaine group as compared to 622 minutes in Bupivacaine group which was statistically significant.*

Conclusion: *Levobupivacaine is a long acting local anesthetic with a clinical profile similar to that of bupivacaine. In an individual patient, the clinical anesthetic effect from the drug is similar to that of bupivacaine. The better safety profile of levobupivacaine confers an advantage over its racemic parent, Bupivacaine.*

INTRODUCTION :

Supraclavicaular brachial plexus block (BPB)[1,2] is used to provide anesthesia and analgesia for upper limb surgery. Single injection of supraclavicular brachial plexus block is an effective anesthetic; however it is limited by the duration of action of local anesthetic. Bupivacaine[2] is a long-acting local anesthetic which has been reported to be associated with slower onset time for nerve blockade. Because of its long duration of action Bupivacaine is frequently the local anesthetic of choice for regional anesthesia. However lethal arrhythmias, including cardiac

arrest, can occur after accidental intravascular injection. Levobupivacaine, the *S*-enantiomer of bupivacaine is the latest local anesthetic agent introduced into clinical practice. Studies revealed that the *R*-dextrobupivacaine) and the *S*-levobupivacaine) enantiomers of bupivacaine possessed anesthetic activity, but the *S*-enantiomer had significantly less cardiac and neural toxic effects than bupivacaine, 14 while still possessing a similar duration of sensory blockade.2,15,16 Levobupivacaine has been shown to be safe and effective for epidural and spinal anesthesia15 and blockade of the brachial plexus.15,17,18 This study was conducted to compare sensory and motor block onset, duration and efficacy of block with Levobupivacaine 0.5% versus Bupivacaine 0.5% and assess severity of complications if they develop.

AIMS AND OBJECTIVES

To study and compare 0.5% Levobupivacaine and 0.5% Bupivacaine, 0.8ml/kg in brachial plexus block by supraclavicular approach for elective upper limb surgery and to compare for following criteria,

1) Onset of sensory blockade
2) Onset and quality of motor blockade
3) Duration of sensory and motor blockade
4) Duration of post-operative analgesia
5) Adverse effects like nausea, vomiting, hypotension, dysrhythmias, convulsion, pneumothorax, pruritus, jerky movements, horner'ssyndrome, hypersensitivity reaction to any drug

FORMATION OF BRACHIAL PLEXUS[5]

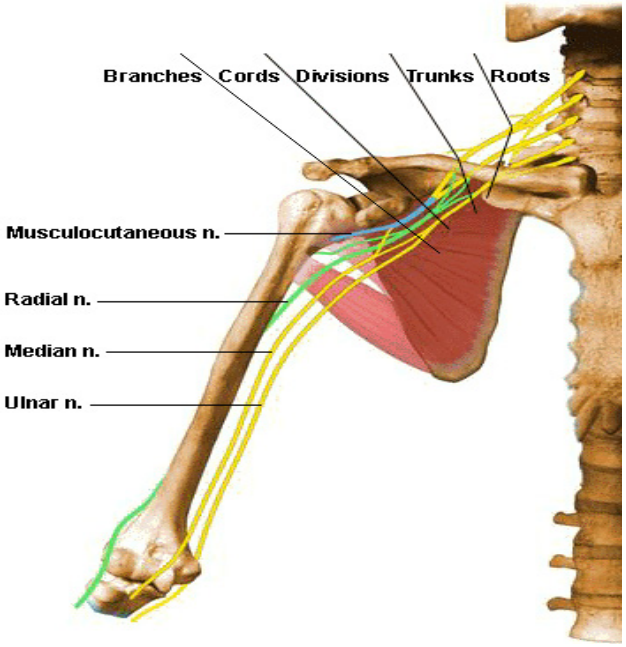

Fig. showing formation of brachial plexus from nerve roots.

Subclavian perivascular by technique of winni, is carried out at the level where the three trunks cross the first rib; a point where the plexus is reduced to its fewest component parts, so at this level a smaller volume of local anesthetic is required to fill the space and block all of the components contained therein than with any other technique, which is the reason for the popularity of this technique and for its high success rate.

PHARMACOLOGY: Local anaesthetics (LA) prevent transmission of nerve impulses (conduction blockade) by inhibiting passage of sodium ions through ion selective sodium channels in nerve membranes, which is reversible.

The minimum concentration of local anaesthetic necessary to produce conduction blockade of nerve impulses is termed the Cm. Nerve fibre diameter influences Cm with larger nerve fibres requiring higher concentration of local anaesthetic for production of conduction blockade. An increased tissue pH or high frequency of nerve stimulation decreases Cm. Systemic toxicity of local anaesthetic is due to an excess plasma concentration of the drug.

CNS toxicity

In causes restlessness, vertigo, tinnitus and difficulty in focusing occurs initially. Further increase in concentration results in slurred speech and skeletal muscle twitching. Skeletal muscle twitching is often first evident on the face and extremities and signals the imminence of tonic-clonic seizures.

Drowsiness occurs before the onset of seizures. Seizures are classically followed by CNS depression which may be accompanied by hypotension and apnoea.

The typical plasma concentration associated with seizures is 4.5 to 5.5ug/ml., of Bupivacaine For L-bupivacaine it requires 30 times more blood concentration, so less toxic. Uptake in C.N.S. is also entomere selective, results in less CNS uptake hence less toxic.

Selective cardiac toxicity

After accidental iv injection may result in precipitous hypotension, cardiac dysrhythmias and atrioventricular heart block. Cardio toxic plasma concentration of bupivacaine is 8 to 10 ug/ml. The threshold for cardiac toxicity produced by Bupivacaine may be decreased in patients being treated with drugs that inhibit myocardial impulse propagation (beta-adrenergic blockers, digitalis preparations, calcium channel blocker). L- Bupivacaine show less affinity & strength of blockage in active state for cardiac sodium channel, hence less cardio toxic.

Hepatotoxicity

Continuous or intermittent epidural administration of Bupivacaine has been associated with increased plasma concentration of liver transaminase enzymes that normalized when Bupivacaine infusion was discontinued.

MATERIALS AND METHODS

The present study was conducted in random 60 patients posted for upper limb surgery having ASA grade 1 and 2 physical status.

The patients were randomly allotted into two groups each having 30 patients.

Group R– inj. Levobupivacaine 0.5% 0.8 ml/kg

Group B– inj. Bupivacaine 0.5% 0.8 ml/kg

Inclusion criteria

Normal adult patients of either sex, aged between 18 to 75 years belonging to ASA class I and II admitted for elective upper limb surgeries.

Exclusion criteria- (1, 2)

1 Patients with known hypersensitivity or contraindications to study drugs

2 Infection at site of block

3 Patients on anticoagulant drugs or with altered coagulation profiles

4 Patients with severe systemic illness

5 Patients with psychiatric or neurological disorders

Pre anesthetic assessment:

- All patients were thoroughly examined on previous day of the surgery and again in pre-anaesthetic room before surgery.
- A history of any present or past illness and detailed general as well as systemic examination were done and investigations were checked.
- Baseline vitals were noted and informed written consent was taken from patient and his/her close relative.
- On the day of surgery, intravenous line was secured.

Anaesthesia machine, filled oxygen cylinders, 2 working laryngoscopes, appropriate sized ET tubes, suction apparatus with catheters, airways, and emergency tray/kit containing drugs and instruments.

Pre-medication:

All the patients were premedicated with injondansetron 4mg, iv. Vitals were noted before and after premedication.

Supraclavicular block was performed in all patients with technique described by Winnie, with the help of nerve stimulator. (4)

Immediately after block placement, patients were evaluated every 1 minute, for assessment of onset of sensory and motor blockade, quality of motor blockade, duration of sensory and motor blockade and hemodynamic changes. Assessments were carried out every 1 minute till

the achievement of motor and sensory blocks until 30 minutes. After 30 minutes if the block was considered to be adequate, surgeons were allowed to apply the tourniquet and start surgery. If the block was considered to be inadequate for surgery, the patient was given general anesthesia with endotracheal intubation.
During the surgery tourniquet time, hemodynamic variables like HR, SBP, DBP, MAP, SPO_2, ECG were monitored at 2, 5 and 10 minutes and then every 10 minutes till the completion of the surgery, later every 60 minutes till 24 hours. Patients were monitored for any signs of cardiovascular or central nervous toxicity (changes in HR/BP/rhythm/signs of CNS stimulation) throughout the study. Any hypersensitivity reaction for the drugs, evidence of pneumothorax, and other adverse events were also monitored. Patients were asked to document the time when they feel the pain and the time when full power returned to the shoulder. In the post-operative period, when the patient complained of pain at the operative site, inj.diclofenac sodium 75 mg was given and study was concluded.

Table 6: duration of sensory block, motor block and analgesia in two groups (minutes) (mean± SD)

	L-Bupivacaine	**Bupicaine**	**p-value**
Sensory block	630.96±95.22	525.8±100.90	<0.05
Motor block	520.20±85.24	612.66±89.41	<0.05
Analgesia	781.43±96.22	622.16±103.80	<0.05
Total	N=30	N=30	

There was significant difference in duration of sensory block (<0.05), and analgesia (<0.05) in both the groups.

The average duration of sensory block was 630±95.22 minutes in L Bupivacaine group whereas it was 525±.8 minutes in Bupivacaine group which was significant statistically.

The average duration of motor blockade was 520±20, minutes in L-Bupivacaine group whereas it was 612±89.41 minutes in Bupivacaine group which was not significant statistically (p<0.05).

The average duration of analgesia was 781 minutes in L bupivacaine group as compared to 622 minutes in Bupivacaine group which was statistically significant.

Demographic data comparing age, sex, weight, height shows no statistically significant differences between the groups

Discussion:
L-Bupivacaine has been studied in many clinical trials involving most forms of regional anesthesia. (3, 5, 6)

Here in our study we found that block produced by both the drugs, was good, complete sensory& motor block, recent investigations by Cline E et al, Cacciapuoti A, et al,& Piangatelli C, et al, have similar findings. (6, 9)

Levobupivacaine has average sensory block onset time 10.5 minutes as compared to 18.7 minutes with Bupivacaine, i.e earlier onset of sesory block. Finding similar to Cline E et al, Cacciapuoti A, et al,& Piangatelli C, et al.

L-bupivacaine , in our study have average sensory block duration of 630 min. compared to 525 min. of bupivacaine, findings similar to Cline E et al, Cacciapuoti A, et al,& Piangatelli C, et al, (6,7,8,9)

The average duration of total analgesia was 781 minutes in L bupivacaine group as compared to 622 minutes in Bupivacaine group which was statistically significant. Eric et al have 832±285 of analgesia, &cox has1032 mint. Neither which is more as they have added epinephrine (1:200000) to their respective drug. (6)

L-bupivacaine, in our study has average motor block duration of 510minutes as compared to 612 min. of Bupivacaine. Findings similar to Cline E et al, Cacciapuoti A, et al,& Piangatelli C, et .(6,7,8,9)

From our study we can say that L-bupivacaine & Bupivacaine have similar clinical profile, sensory block has early onset & longer duration of action, with l-bupivacaine., while motor block has faster onset & longer duration with bupivacaine. Findings may not have any clinical significance use of either drug. But L-bupivacaine is having safety index of 1.3, i.e it requires 30 times more blood level to trigger adverse cardiac &CNS reactions.

SUMMARY & CONCLUSION :

Levobupivacaine is a long acting local anesthetic with a clinical profile similar to that of bupivacaine. In an individual patient, the clinical anesthetic effect from the drug is similar to that of bupivacaine. The better safety profile of levobupivacaine confers an advantage over its racemic parent, Bupivacaine.

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