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A comparative study of effects of 0.5% isobaric levobupivacaine with 0.5% bupivacaine in interscalene brachial plexus block for upper limb surgeries

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Abstract

Isobaric levobupivacaine is a long acting amide type of local anaesthetic that is S-enantiomer of racemic bupivacaine with clinical profile resembling that of bupivacaine. It has been stated that its faster protein binding rate reflects a decreased degree of toxicity and studies done have supported that it has lesser cardiovascular and central nervous system toxicity than bupivacaine. Sixty patients aged between 18yrs and 60yrs of physical status ASA grade 1 and ASA grade 2 undergoing elective upper limb surgeries were included in the study after ethical clearance from the college ethical committee. The mean duration of motor block in Bupivacaine group was 485.33 ± 59.75 min and 467.67 ± 56.85 min in Levobupivacaine group. There was no significant statistical difference seen between the two groups with regards to duration of motor block ($p=0.170$).

Keywords: isobaric levobupivacaine, bupivacaine, interscalene brachial plexus block

Introduction

Upper limb surgery can be performed under regional or general anaesthesia. The regional anaesthesia provides a reversible blockade of nerve conduction by local anaesthesia in the part where it is applied thus leaving other vital centres unaffected.

Regional anaesthesia in the form of brachial plexus blocks are commonly used for upper limb surgeries. Brachial plexus blocks avoids complications associated with general anaesthesia and has been credited with having several advantages over general anaesthesia for upper limb surgeries^[1].

Among these approaches the interscalene approach to the brachial plexus is best suited to surgery of the shoulder and upper arm surgery. The advantages of this technique include easy to learn and master as the landmarks are readily palpable even in a very obese person and the level at which the interscalene technique is performed makes pneumothorax virtually impossible

Various local anesthetics have been used to produce brachial plexus block. Bupivacaine 0.5% is one of the most popular drugs used because of its higher potency and prolonged duration of action^[2]. One of the drawbacks of Bupivacaine is its cardiotoxicity especially when injected accidentally into the vessels. The cardiotoxicity may be life threatening as the dysrhythmias that are produced are resistant to all routinely used antiarrhythmics. Hence there is a need for a drug which can have all the advantages of Bupivacaine with least cardiotoxicity.

Isobaric levobupivacaine is a long acting amide type of local anaesthetic that is S-enantiomer of racemic bupivacaine with clinical profile resembling that of bupivacaine. It has been stated that its faster protein binding rate reflects a decreased degree of toxicity and studies done have supported that it has lesser cardiovascular and central nervous system toxicity than bupivacaine^[3, 4]. Hence the present study undertaken to compare effects of 0.5% of isobaric levobupivacaine with 0.5% bupivacaine in interscalene brachial plexus block in onset and duration of motor and sensory blockade and safety profile of isobaric levobupivacaine.

Methodology

Sixty patients aged between 18yrs and 60yrs of physical status ASA grade 1 and ASA grade 2 undergoing elective upper limb surgeries were included in the study after ethical clearance from the college ethical committee.

Each patient was visited pre-operatively and the procedure explained and written informed consent was obtained. Complete blood count, blood grouping, blood sugar, bleeding time, clotting time, blood urea, serum creatinine, serum electrolytes (sodium, potassium, chloride), chest x-ray, ECG were done as institutional protocol. All patients were pre-medicated with tablet alprazolam 0.5 mg overnight of surgery.

Each patient was randomly allocated to one of the two groups of 30 patients each.

Group B- Bupivacaine group receives 30ml bupivacaine 0.5% (5mg/ml)

Group L- Levobupivacaine group receives 30ml Isobaric levobupivacaine 0.5% (5mg/ml)

All necessary equipments and drugs needed for administration of general anaesthesia and resuscitation were kept ready in order to manage failure of block and any complications.

Procedure: Intravenous access to be obtained in the upper limb opposite to that undergoing surgery with an intravenous cannula-18G and iv fluid connected. Standard monitors, ECG, pulse oximeter, non invasive blood pressure, respiratory monitoring to be connected and basal parameter noted. Patient will be premedicated with inj.Midazolam 0.02 mg/kg body weight. Patient is placed in supine position with head extended and rotated to contralateral side. Arm to be anaesthetized is pronated and directed to ipsilateral knee.

Landmarks: - lateral border of clavicular head of sternocleidomastoid, midpoint of clavicle, external jugular vein

Supraclavicular area is aseptically prepared and draped. The posterior border of the sternocleidomastoid muscle is readily palpated by having the patient briefly lift the head. The interscalene groove may be palpated by rolling the fingers posterolaterally from this border over the belly of the anterior scalene muscle into the groove. A line extended laterally from the cricoid cartilage and intersecting the interscalene groove indicates the level of the transverse process of C6. A 21G needle is selected as brachial plexus lies approximately 2cm below the skin. Needle is inserted perpendicular to the skin at 60° and advanced in a medial, caudal and slightly posterior direction. By palpating interscalene groove the needle is slowly advanced until a single paraesthesia is elicited in the ipsilateral upper extremity. In the event of bony transverse process being encountered, the needle is partially withdrawn and redirected anteriorly. Once paraesthesia is obtained, the needle is stabilised and aspiration is attempted to exclude intravascular needle placement and 30 ml of local anaesthetic is injected.

Immediately after block placement, patients were evaluated every 2 minute for first 10 minutes then every 5 minutes till completion of surgery, 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. If the block was considered to be inadequate for surgery, the patient was

given general anaesthesia with endotracheal intubation and excluded from our study. Patients were monitored for any signs of cardiovascular or central nervous system 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.

HR, ECG, SPO2, NIBP, monitored continuously in all the patients and recorded at interval of 2 minutes for first 10minutes, then every 5minutes thereafter till the end of surgery.

Sensory block will be assessed by loss of pin prick sensation using the blunt needle over C5-T1 dermatomes. Motor block was assessed by asking the patient to abduct the shoulder while keeping the elbow straight.

Results

Table 1: Onset of Sensory blockade (in minutes)

	Group B	Group L	p value
Onset of Sensory blockade (in minutes)	9.10±2.31	9.37±2.37	0.661

The mean onset time of sensory block in Bupivacaine group was 9.10±2.31 min and 9.37±2.37 min in Levobupivacaine group. The statistical analysis showed no significant difference between the two groups (p=0.661).

Table 2: Onset of motor blockade (in minutes)

	Group B	Group L	p value
Onset of motor blockade (in minutes)	13.63±2.57	13.93±2.52	0.649

The mean onset time of motor block in Bupivacaine group was 13.63±2.57 min, and 13.93±2.52 min in Levobupivacaine group. No significant statistical difference was seen between the two groups (p=0.649).

Table 3: Duration of sensory blockade (in minutes)

	Group B (n=30)	Group L (n=30)	P value
Duration of sensory blockade (in minutes)	508.00±61.44	490.33±58.81	0.315

The mean duration of sensory block in Bupivacaine group was 508.00±61.44 min and 490.33±58.81 min in Levobupivacaine group. There was no significant statistical difference seen between the two groups with regards to duration of sensory block (p=0.315).

Table 4: Duration of motor blockade (in minutes)

	Group B (n=30)	Group L (n=30)	P value
Duration of motor blockade (in minutes)	485.33±59.75	467.67±56.85	0.170

The mean duration of motor block in Bupivacaine group was 485.33±59.75 min and 467.67±56.85 min in Levobupivacaine group. There was no significant statistical difference seen between the two groups with regards to duration of motor block (p=0.170).

Table 5: Duration of analgesia (in minutes)

	Group B	Group L	p value
Duration of analgesia (in minutes)	517.67±61.46	506.00±57.63	0.451

The mean duration of analgesia in Bupivacaine group was 517.67±61.46 min and 506.00±57.63 min in Levobupivacaine group. There was no significant statistical difference seen between the two groups with regards to duration of analgesia (p=0.451).

Discussion

In our study onset time of sensory blockade in Bupivacaine group was comparable with Levobupivacaine group.

SemihBaskan *et al.* [5], in their study observed that mean onset time of sensory block was comparable in levobupivacaine and bupivacaine group.

Unlike us Stephen M Klein *et al.* [6], observed faster onset of sensory blockade with bupivacaine group (i.e.<6 min)

In our study we observed similar onset time of motor blockade in Bupivacaine and Levobupivacaine group.

SemihBaskan *et al.* [5], also like our study observed that mean onset time of motor block in levobupivacaine group was comparable with bupivacaine group.

Contrary to our study Andrea Casati *et al.* [7], in their study observed delay in onset of motor blockade i.e.20min in patient receiving levobupivacaine for interscalene block.

In our study the duration of sensory block was comparable in both bupivacaine and levobupivacaine group.

Similar to our study SemihBaskan *et al.* [5], also in their study observed that duration of sensory block (min) was comparable in levobupivacaine and bupivacaine group [8].

In our study the duration of motor block in levobupivacaine group was comparable with bupivacaine group.

In our study the duration of analgesia was similar in both Bupivacaine and Levobupivacaine group.

In a study conducted by Stephen M Klein *et al.* [6], Bupivacaine group had longer duration of analgesia. This observation probably because they used bupivacaine solutions containing fresh epinephrine in a 1:400,000 concentration.

Hence, we conclude, that Bupivacaine 0.5% and Levobupivacaine 0.5% show similar efficacy with respect to onset time and duration of sensory and motor blockade and analgesia for Interscalene Brachial Plexus Block at equal volume of 30ml each.

Conclusion

- Onset of sensory block was similar in Levobupivacaine and Bupivacaine group.
- Duration of sensory blockade was comparable in Levobupivacaine and Bupivacaine group.
- Onset of motor block was comparable in Levobupivacaine and Bupivacaine group.
- Duration of motor blockade was similar in Levobupivacaine and Bupivacaine group.
- Duration of analgesia was similar in Levobupivacaine and Bupivacaine group.

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