Original Research Article

A Comparative Clinical Study of Levobupivacaine with Dexmedetomidine v/s Bupivacaine with Dexmedetomidine in Supraclavicular Brachial Plexus Block: A Randomized Control Trial

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Received: 27-10-2020 / Revised: 18-11-2020 / Accepted: 18-12-2020

Abstract

Objectives: Levobupivacaine is a new local anaesthetic having similar pharmacological profile of Bupivacaine, but with less cardiotoxicity. This study was conducted to assess and compare onset and duration of sensory and motor blockade, with any associated adverse effects, between Levobupivacaine with Dexmedetomidine v/s Bupivacaine with Dexmedetomidine in supraclavicular brachial plexus block. **Materials and methods**: This was a prospective randomized study, conducted on 100 ASA grade I or II patients, of either sex, aged 18-60 years, scheduled for upper limb surgeries under supraclavicular brachial plexus block, fulfilling inclusion and exclusion criteria. The patients were randomized in two groups of 50 each- in Group LD, Levobupivacaine with Dexmedetomidine while in Group BD, Bupivacaine with Dexmedetomidine was injected as study drug for brachial plexus block. Heart rate (HR), mean arterial pressure (MAP), onset time for complete sensory and motor blockade, along with duration of sensory and motor blockade were studied. **Results:** It was observed that 1. Hemodynamic parameters remain comparable in both groups throughout the surgery.2. Average time of onset of sensory and motor blockade differ significantly in both the groups (earlier in group of Bupivacaine with Dexmedetomidine) but difference in duration of sensory and motor blockade was not statistically significant in both the groups.**Conclusion:** Onset of sensory and motor blockade was significantly earlier in Bupivacaine with Dexmedetomidine, compared to Levobupivacaine with Dexmedetomidine; but duration of sensory and motor blockade of two groups was approximately similar. In this study we found that Levobupivacaine was an appropriate drug for brachial plexus block. Its less toxic potential than Bupivacaine was also a positive factor, thus Levobupivacaine increases the safety margin in regional anaesthesia.

Keywords: Clinical,study,brachial plexus.

Introduction

In general, regional anaesthesia avoids the unwanted effects of anaesthetic drugs used during general anaesthesia and is beneficial for patients with various cardio respiratory and other co-morbidities[1].

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In supraclavicular approach, brachial plexus is blocked where it is most compactly arranged at nerve trunks; as a result a block with rapid onset can be achieved. Currently, Bupivacaine is one of the commonly used local anaesthetics for central and peripheral nerve blocks. Supraclavicular block enables a complete anaesthesia to the arm, elbow and hand. Postoperative analgesia requires a catheter insertion perineurally; however, success rate of catheter applications in supraclavicular block is lower than other brachial plexus nerve block sites. Another way of providing postoperative analgesia is to use local anaesthetics with

long duration of action. Long term postoperative analgesia with a single application is possible with the use of Bupivacaine, Levobupivacaine or Ropivacaine [2].

Levobupivacaine, S (−) enantiomer of Bupivacaine is a new local anaesthetic having similar pharmacological profile of Bupivacaine with less cardiotoxicity compared to Bupivacaine[3]. Various adjuvants including opioids, midazolam, $MgSO_4$, dexamethasone and neostigmine, etc. have been added to local anaesthetics in an attempt to increase duration of block and for post-operative analgesia. Dexmede-tomidine, an α2-receptor agonist, with α2/α1 selectivity 8 times that of Clonidine, has also been reported to improve the quality of intrathecal and epidural anaesthesia, when used along with LA as adjuvant. Its use in peripheral nerve blocks has recently been described. It has been reported in various studies that Levobupivacaine has rapid onset time; Dexmede-tomidine and Clonidine are added to prolong the duration of local anaesthetics and are reported to be safe and effective in peripheral nerve blockade[4-6]. The present study was conducted with aim of assessing onset and duration of sensory and motor blockade with any associated adverse effects, by comparing the use of Levobupivacaine and Dexmedetomidine versus Bupivacaine and Dexmedetomidine in brachial plexus block.

Materials and Method

This was a double blind randomized control trial, conducted in our hospital; after the approval of local institutional ethical committee. An informed written consent was taken pre operatively from each patient, after explaining the procedure.100 patients of ASA physical status I and II of either sex, 18-60 years age group, undergoing upper limb surgery under supraclavicular brachial plexus block were enrolled in this study. Patient with history of opioid or sedative medications a week before surgery, history of alcohol or drug abuse, history of allergy to any of the test drugs, contraindication of brachial plexus block (e.g. coagulation defects, infection at puncture site and preexisting neurological deficits in the extremities), known cardiovascular, respiratory, neurological, psychological, hepatic or renal disease, history of seizures, pneumothorax and pregnancy were excluded. Patients were randomly allocated into two groups of an equal number of patients (**n** = 50 participants per group) with a computer generated randomization. The two groups were:

1. Group LD- patients were injected with Levobupivacaine and Dexmedetomidine.
2. Group BD- Bupivacaine with Dexmedetomidine was injected for brachial plexus block.

Method

Pre-anaesthetic checkup was done and patient was informed about the procedure. On the day of surgery, after taking written informed consent, IV line was secured (with 18 Gauze cannula) in healthy forearm and IV fluid (Ringer's lactate) was started. The patient was connected to all the standard monitors to record basal vital parameters like pulse rate, O2 saturation, NIBP and ECG. Premedication with Inj. Midazolam 0.05 mg/kg body weight before the procedure was given. Base line heart rate, blood pressure and oxygen saturation were recorded.Neural localization was achieved using a nerve locator (B. Braun Stimuplex® HNS 12 Nerve stimulator) connected to a 22G, 50 mm long stimulating needle (Stimuplex ultra 360 B Braun Medical, Mumbai). The location end point was a distal motor response with an output lower than 0.5 mA in the median nerve region.

Following negative aspiration, Levobupivacaine (0.5%) 30 ml with Dexmedetomidine (0.1 µg/kg) 2ml (diluted in NS to make it 2ml), total 32ml for Group LD and Bupivacaine (0.5%) 30 ml with Dexmedetomidine (0.1 µg/kg) made 2 ml, total 32 ml, for Group BD was injected for brachial plexus block.Five minutes after the end of injections, the surgical area started to be checked with the pin prick test at 5min intervals. Sensory block was assessed with 3 point scale (0=No sensory loss, 1= Loss of sensation to pin prick, 2= Loss of sensation to touch). Motor block was evaluated with Modified Bromage Scale (MBS; 0= Normal muscle function, 1=Elbow flexion, 2= Wrist flexion, 3= Full motor block) and recorded. Motor block onset time was taken as the time between injection of local anaesthetic and appearance of MBS 1, while sensory block onset time was taken as time between injection of local anaesthetic and loss of pain sensation with pin- prick stimuli. Surgery was allowed when pin-prick test was positive in surgical area. Oxygen was given by face mask. Vital parameters (pulse, respiration and blood pressure) were recorded every 5 min for first 30 min and thereafter, every 15 min till 120 min, followed by 4, 8, 12, 16, 20 and 24 hrs from the time of administration of the study drugs.Heart rate (HR), mean arterial pressure (MAP), onset time for complete sensory blockade, duration of sensory block, onset time for complete motor blockade and duration of motor block were studied. Episodes of perioperative hypotension (systolic blood pressure <20% of baseline), bradycardia (HR <50 beats/min), and desaturation (SpO_2 <90%) were also recorded.

Statistical Analysis

Data were entered in Microsoft Office Excel database and analyzed by standard statistical software. Numerical variables were compared between group-wise unpaired Student's *t*-test. If normally distributed, categorical variables were compared between groups by Chi-square test or Fischer's exact test as appropriate.

Results and Analysis

A total of 100 patients were enrolled in our study. The mean age of patients was 32.56 ± 10.06 years in LD group and 30.34 ± 12.98 years in BD group. Mean weight of the patients was 70.34 ± 12.30 kg in LD group and 71.36 ± 9.38 kg in BD group. Mean height of the patients was 170.34 ± 10.08 cm in LD group and 168.45 ± 11.08 cm in BD group. Numbers of male and female patients were comparable in both the groups. As per table 1, there was no statistically significant difference in demographic parameters (age, sex, height and weight).

Table 1: Distribution of demographic data

	Group LD (n=50)	Group BD (n=50)	P value
Age	32.56±10.06	30.34±12.98	0.341
Sex (male/Female)	24/26	26/24	0.146
Height (cm)	170.34±10.08	168.45±11.08	0.374
Weight (kg)	70.34±12.30	71.36±9.38	0.642

Hemodynamic parameters remain comparable in both groups throughout the surgery.

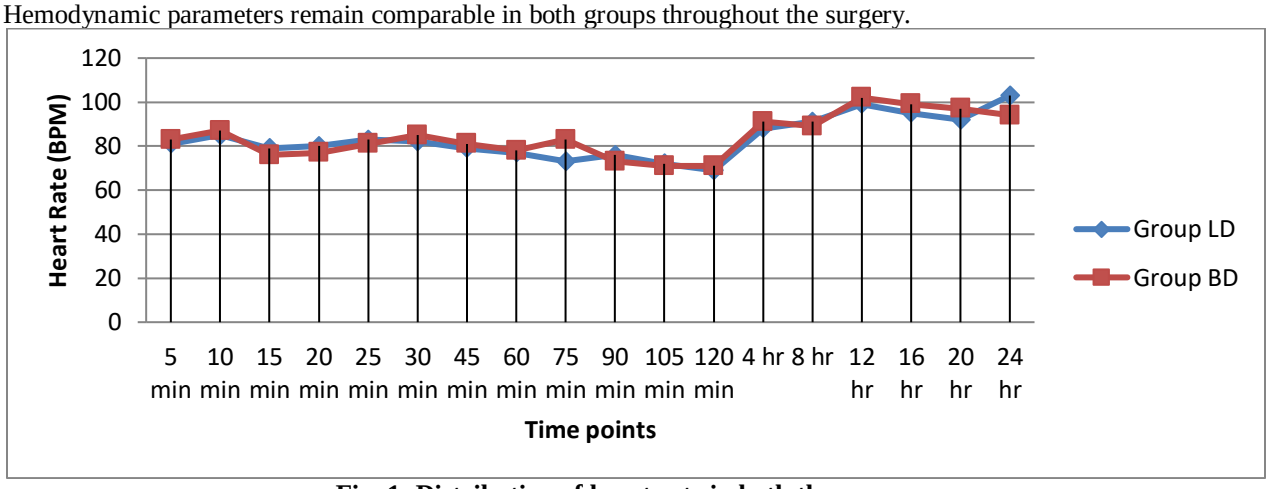

Fig 1: Distribution of heart rate in both the groups

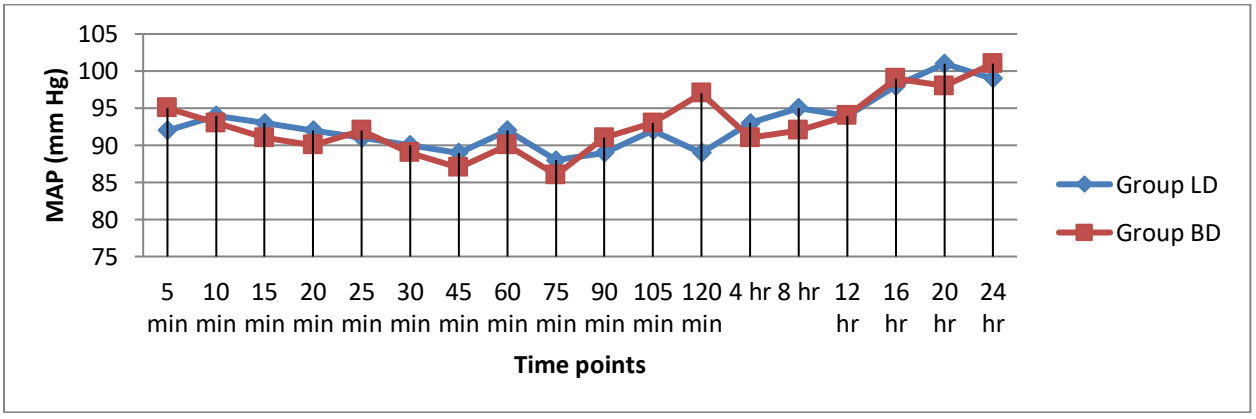

Fig 2: Distribution of mean arterial pressure (MAP) in both the groups

Table 2: Distribution of sensory and motor blockade onset time, sensory and motor blockade duration in both groups

	Group LD (n=50)	Group BD (n=50)	P value
Onset of sensory block (min)	9.2±2.7	6.94±2.99	0.0001
Onset of motor block (min)	16.3±4.2	10.15±2.92	0.0001
Duration of sensory block (hours)	12.92±2.78	12.47±2.97	0.436
Duration of motor block (hours)	12.47±3.97	13.19±3.18	0.319

Table 2 shows that the average time of onset of sensory and motor blockade was earlier in BD group than in LD group and there was statistically significant difference between the two groups. However, duration of sensory and motor blockade was approximately similar with both the drugs and difference was not statistically significant. Other adverse effects such as nausea, vomiting, dryness of mouth, and complications such as pneumothorax, hematoma, local anaesthetic toxicity and post block neuropathy in the intra- and post-operative periods were not seen in any of the subjects.

Discussion

An advantage of supraclavicular block is that the upper extremity position does not affect application negatively during the procedure[7]. Even though block with ultrasound are known to yield more successful outcomes, the importance of experience is also mentioned in previous studies[8,9]. We, therefore, preferred nerve stimulator (NS) in our study as we had more experience with it. Despite the high doses of Bupivacaine and Levobupivacaine used in peripheral blocks, serious cardiovascular, pulmonary or neurological complications are rare[10-15]. Cox CR et al[16] compared Bupivacaine and Levobupivacaine in brachial plexus block. They found no difference between the dose-dependent effects of 0.25% and 0.5% Levobupivacaine; however, 0.25% Levobupivacaine had slower onset, shorter maintenance and a lower overall success rate than the other two groups (0.5% Levobupivacaine, 0.5% Bupivacaine) in their study. In our study, the sensory block onset times were significantly earlier in Group BD than Group LD (6.94±2.9 min v/s 9.2±2.7, *p*-0.0001) and the motor onset time was also significantly shorter in Group BD than in Group LD (10.15±2.92 v/s16.3±4.2, *p-0.0001*). Although the difference between onset of sensory and motor blockade was statistically significant but 6min difference is not of significance in clinical application. Similar results were observed in a study conducted by Nallam SR et al[17]. In a study conducted by Swami SS et al,[18] among all the adjuvants, α2-receptor agonist has shown a promising effect in quickening the onset of blockade and prolonging the block.In the present study, hemodynamic parameters heart rate, blood pressures were assessed. Both group showed a stable hemodynamics and there was no incidence of hypotension or bradycardia. Agarwal S et al [19] also had observed that there was no incidence of bradycardia or hypotension when they used Dexmedetomidine (at a dose of 100µg) as an adjunct to 0.375% Bupivacaine in supraclavicular brachial plexus block. However, in another study conducted by Zhang Y et al[20] Dexmedetomidine used as an adjuvant to Ropivacaine in axillary brachial plexus block in doses of 50 µg and 100 µg had shown hypotension and bradycardia in group receiving 100 µg dose of Dexmedetomidine. This could have been because of relatively larger doses of Dexmedetomidine.

Conclusion

Thus, we concluded that onset of sensory and motor blockade was significantly earlier in Bupivacaine with Dexmedetomidine, compared to Levobupivacaine with Dexmedetomidine; but difference in duration of sensory and motor blockade of two groups was not statistically significant. In this study we found that Levobupivacaine was an appropriate drug for brachial plexus block. Its less toxic potential than Bupivacaine was also a positive factor, thus Levobupivacaine increases the safety margin in regional anaesthesia.

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Conflict of Interest: Nil
Source of support:Nil