A Comparative Clinical Study of Levobupivacaine and Levobupivacaine with Dexmedetomidine for Supraclavicular Brachial Plexus Block

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ABSTRACT

BACKGROUND

Sensory and motor functions of peripheral nerve can be blocked by injecting local anaesthetic around the group of nerves, which will stop the conduction of nerve impulse. Peripheral nerve block is a well-accepted technique in anaesthesia care. Brachial plexus block is also one of the reliable techniques in providing regional anaesthesia for upper limb surgery.

METHODS

This was a prospective, double blinded, randomised comparative study which included 40 patients of American Society of Anaesthesiologists (ASA) grade I and II of either sex of 20 - 65 years old age groups for upper limb surgery. Cases were divided randomly into two groups: Group A: received levobupivacaine hydrochloride 0.5 % 25 cc with dexmedetomidine injection. Group B: received levobupivacaine hydrochloride 0.5 % 25 cc injection. Each individual was allocated to respective group by computer generated randomisation chart. Both group A and B were assessed for the onset of sensory & motor block, duration of postoperative analgesia and duration of action.

RESULTS

In the present study, it was observed that the onset of sensory blockade ($P < 0.001$) & motor blockade ($P < 0.001$) was earlier in groups A with prolonged duration of sensory & motor blockade ($P < 0.001$) as compared to group B. Group A took longer time for first rescue analgesia post operatively compared to group B, and the difference was found significant ($P < 0.001$). Both group A and group B were comparable for systolic blood pressure, diastolic blood pressure, and heart rate.

CONCLUSIONS

The onset of sensory and motor blockade was early in 0.5 % levobupivacaine with dexmedetomidine with prolonged duration of action and required lesser dose of rescue analgesic in 0.5 % levobupivacaine with dexmedetomidine as compared to 0.5 % levobupivacaine in supraclavicular brachial plexus block.

KEYWORDS

Dexmedetomidine, Levobupivacaine, Brachial Plexus Block

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BACKGROUND

Sensory and motor functions of peripheral nerve can be blocked by injecting local anaesthetic around the group of nerves, which will stop the conduction of nerve impulse. Peripheral nerve block is a well-accepted technique in anaesthesia care. Brachial plexus block is also one of the reliable techniques in providing regional anaesthesia for upper limb surgery. "Brachial plexus block technique became popular against general anaesthesia as it is cost effective, provides better postoperative recovery, central nervous system (CNS) function remains intact, side effects of laryngoscopy, muscle relaxants and haemodynamic changes are avoided.

Four common approaches used for brachial plexus block, are the supraclavicular, infraclavicular, interscalene and axillary approaches. Among different approaches of brachial plexus block supraclavicular brachial plexus block has many advantages over other approaches of brachial plexus block.[1,2] It is the easiest and consistent method of anaesthesia for surgery below the shoulder joint and for perioperative pain management. It has the reputation of providing the most effective approach for upper limb anaesthesia.[3]

Ultrasound offers excellent guidance in selective nerve blocks for invasive pain therapy. It has the advantages of direct visualisation of nerve and related structures like blood vessels and tendons. Guidance of the needle under real-time visualisation avoids complications like intravascular and intraneural injection, monitor the spread of local anaesthetic, and repositioning of the needle to allow better delivery of local anaesthetic to areas that may not be completely blocked with a single dose.[4-7]

Variety of local anaesthetic drugs are used, out of them bupivacaine is most commonly used drug for brachial plexus block, but at high dose, may lead to cardiotoxicity and neurotoxicity. Now it has proven that S (-) enantiomer of bupivacaine is the newest local anaesthetic agent in anaesthesia practice, which has less cardiotoxic and neurotoxic effects than bupivacaine and it is not widely studied.

Objectives

1. To determine the effect of dexmedetomidine added to levobupivacaine on onset, duration of motor & sensory block and post-operative analgesia.
2. To describe the haemodynamic parameters and side effects due to addition of dexmedetomidine.

METHODS

This was a prospective randomised, double blinded comparative study. The participant, the observer and the person doing the analysis were blinded. Institutional ethical committee clearance was obtained and informed consents from patients were taken.

Sample Size

40 patients, divided randomly into two groups of 20 each, using a random computer-generated number.

1. Group A (N = 20): Levobupivacaine hydrochloride 0.5 % 25 cc with dexmedetomidine.
2. Group B (N = 20): Levobupivacaine hydrochloride 0.5 % 25 cc.

Allocation concealment was done using sealed envelope technique. This study was carried out in our institute (Katihar Medical College) for a period of one year, from August 2019 to July 2020.

Inclusion Criteria

1. Patients belonging to American Society of Anaesthesiologists physical status I and II of both sexes.
2. Patients undergoing elective upper limb surgery under supraclavicular brachial plexus block.
3. Anticipated duration of surgery less than 2 hour.
4. Age group between 18 and 60 years, haemodynamically stable.

Exclusion Criteria

1. Patient refusal.
2. Patients with known neurological and psychiatric disorders.
3. Patients with gross shoulder and clavicular deformity.
4. Patients on sedatives, hypnotics, antidepressants and drugs with effects on the nervous system.
5. Patient converted to general anaesthesia after failed block.

Tablet alprazolam 0.5 mg was given at 7 pm, a day before surgery and at 6 am in the morning on the day of surgery with a sip of water. Preoperative vitals heart rate (HR), non-invasive blood pressure (NIBP), electrocardiogram (ECG) and oxygen saturation (SpO2) were recorded. Intravenous (I.V) fluid with ringer lactate @ 10 ml / kg through 18G IV cannula was started. According to group of the patient's drug solutions were prepared by independent anaesthesiologist.

Landmark technique was used to palpate the subclavian artery. The posterior border of sternocleidomastoid muscle was palpated, then palpating finger rolling over anterior belly of scalene muscle into the interscalene groove, a mark was made approximately 1.5 - 2.0 cm to the midpoint of the clavicle. The patient lied in supine position, head turned toward opposite side of proposed block. The arm to be anaesthetised was abducted and the hand extended along the side as far as possible. After strict aseptic precautions, subclavian artery pulsation was felt from the midpoint of clavicle 1.5 - 2.0 cm cephalad and posteriorly. A local anaesthetic wheel was made cephalo-posterior to the pulsation of subclavian artery.

Using clavicle, subclavian artery pulsation as a landmark, A 22 G 100 mm short bevelled needle was introduced at the

prespecified landmark, where nerve stimulator was set at a current of 2 mA & a frequency of 2HZ. When movement of the finger & wrist elicited as approached to the nerve, then the current of nerve stimulator gradually was reduced to 0.5 mA. The exact location of nerve was taken by the end point, where hand twitching could be elicited at a current of 0.5 mA. The local anaesthetic was given, aspirated before each bolus to avoid intravascular injection. Patient was monitored closely after completing the local anaesthetic injection.

The level of sensory block was assessed using loss of sensation to pin prick using a needle of 20G at the C5 – T1 dermatomes. Motor block was assessed by using modified Bromage scale and by asking patients to move the thumb. Onset of motor block was defined as attainment of Bromage scale duration of analgesia, and it was recorded from onset of block to the time when the first recue analgesia was given.

Blockade Grading	Motor Block	Sensory Block
0 (no block)	Able to touch pulp of little finger to pulp of thumb.	No sensory loss over C5 to T1 dermatomes when assessed with blunt end of needle.
1 (partial block)	Able to touch pulp of index finger with pulp of thumb.	Patients feel touch but no pain on pin prick.
2 (complete block)	Able to approximate thumb to lateral aspect of index finger.	Patients do not feel touch or pin prick.

Table 1. Blockade Grading

Postoperative pain was assessed by using visual analogue scale (VAS), Where on visual analogue scale '0' represented no pain & '10' meant worst pain. Post operatively, when VAS was equal to or more than 4, tablet aceclofenac and paracetamol combination was given as rescue analgesic.

Statistical Analysis

Comparison of onset and duration of sensory & motor block was tested by an unpaired t-test. Pain score was obtained by VAS, rescue analgesic requirement between two groups. A P-value of < 0.05 was considered as statistically significant.

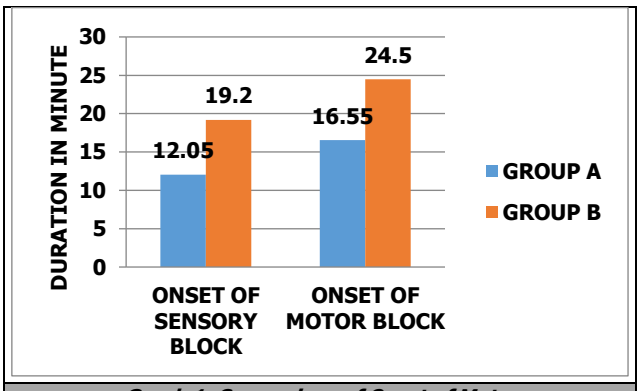
RESULTS

Parameter	Group-A	Group-B
Age (in years)		
20 – 35 Years	8	10
36 – 50 Years	7	7
51 – 65 Years	5	3
Male: Female	13:7	12:8
ASA – Grade (i:ii)	15:5	13:7

Table 2. Comparison of Demographic Data, ASA Grading

	Group–A Onset Time in Min. (Mean± SD)	Group-B Onset Time in Min. (Mean ± SD)	P-Value
Sensory block	12.050 ± 2.416	19.200 ± 3.442	< 0.001
Motor block	16.550 ± 1.820	24.500 ± 2.704	< 0.001

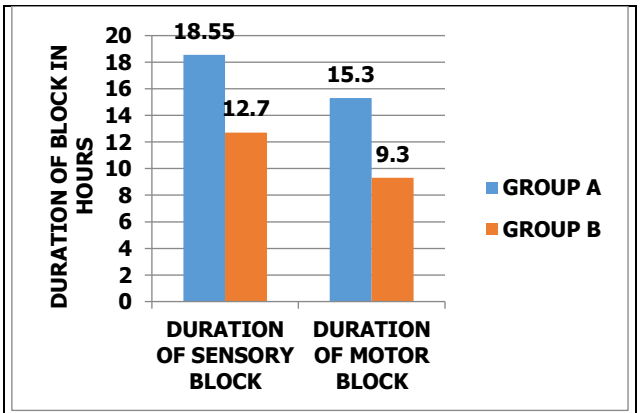
Table 3. Comparison of Onset of Motor and Sensory Block in Groups A & B with 't' Test



Graph 1. Comparison of Onset of Motor and Sensory Block in Groups A & B

	Group-A Duration in Hrs. (Mean ± SD)	Group-B Duration in Hrs. (Mean ± SD)	P-Value
Sensory block	18.550 ± 3.993	12.700 ± 2.494	< 0.001
Motor block	15.300 ± 2.408	9.300 ± 2.319	< 0.001

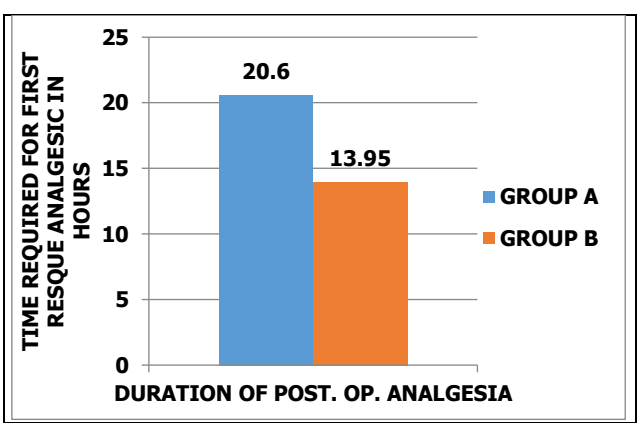
Table 4. Comparison of Duration of Motor and Sensory Block in Groups A & B with 't' Test



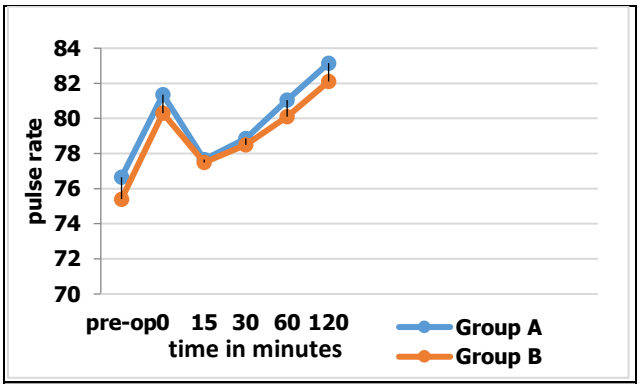
Graph 2. Duration of Motor and Sensory Block in Both the Groups

	Group-A (Mean ± SD)	Group-B (Mean ±SD)	P-Value
Time of first rescue analgesic required (in hours)	20.600 ± 4.592	13.950 ± 3.068	< 0.001

Table 5. Comparison of Time for Requirement of First Rescue Analgesic with 't' Test



Graph 3. Comparison of Time for Requirement of First Rescue Analgesic



Graph 4. Pulse Rate Variation in the Study

Pulse rate variation in Group A and Group B is not significant.

DISCUSSION

'Peripheral nerve block is a cost effective anaesthetic technique which provides excellent analgesia & anaesthesia without using airway instrument and bypass haemodynamic consequences of general & neuraxial anesthesia.[8]

In the present study, ultrasound sonography (USG) guided technique was used for block. In our study, none of the patients developed any feature of cardiovascular or central nervous system toxicity and did not receive general anaesthesia or sedation before administration of block and did not complain about incomplete action or failure of technique.

Study done by Baskan et al.[9] compared the onset time and quality of posterior approach interscalene brachial plexus block produced by 0.25 % levobupivacaine & 0.25 % bupivacaine and proved the efficacy of 0.25 % levobupivacaine in posterior approach interscalene brachial plexus block. They concluded that 0.25 % bupivacaine and 0.25 % levobupivacaine have similar effect on motor and sensory blocks, onset time and qualities when inter-scalene block with posterior approach was used, which provided comfortable analgesia and anaesthesia for shoulder surgery. Study done by Cox et al.[10] compared levobupivacaine with bupivacaine in brachial plexus block found that 0.25 % levobupivacaine had slower onset & less duration of action & success rate compared to 0.5 % levobupivacaine. This difference was not found to be statistically significant.

In studies done by Arvider pal et al.[11] Agarwal et al.[12] Vivek S Palsule et al.[13,] and Ali et al. validated the role of dexmedetomidine as adjuvant to local anaesthetic in brachial plexus block. Studies have shown that addition of dexmedetomidine lowers the concentration of local anaesthetic for supraclavicular brachial plexus block.[13] In the perioperative period, use of dexmedetomidine reduced the requirement of local anaesthetic and analgesic.

CONCLUSIONS

Onset of sensory and motor blockade was faster in 0.5 % levobupivacaine with dexmedetomidine with prolonged duration of action and requires lesser dose of rescue analgesic in 0.5 % levobupivacaine with dexmedetomidine as compared to 0.5 % levobupivacaine in supraclavicular brachial plexus block.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
Financial or other competing interests: None.
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