Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: www.saspublishers.com

OPEN ACCESS

Anaesthesiology

Anaesthetic and Analgesic Effects of Levobupivacaine versus Levobupivacaine with Dexmeditomidine for Supraclavicular Block in a Tertiary Level Hospital

Dr. Anitha R[1], Dr. Mahilamani PP[2*], Dr. V.G.Jayaprakash[3]

[1]Senior Resident, [2]Assosiate Professor, [3]Professor. Department of Anaesthesiology and Critical care medicine, Sree Mookambika Institute of Medical Sciences, Kulasekharam Tamil Nadu, India

DOI: 10.36347/sjams.2019.v07i09.051 | **Received:** 20.09.2019 | **Accepted:** 27.09.2019 | **Published:** 30.09.2019

***Corresponding author:** Dr. Mahilamani P.P

Abstract **Original Research Article**

Long acting local anaesthetics are used in brachial plexus block to increase the duration of analgesia. Adjuvants are added to local anaesthetics to improve the quality and duration of analgesia. Aim of our study is to evaluate the anaesthetic and analgesic effects of Levobupivacaine versus Levobupivacaine with Dexmeditomidine in supraclavicular block of brachial plexus and to find out if adding adjuvants makes it more effective in the block and also its safety profile in combination with Levobupivacaine. In this randomized double blinded controlled study, 72 patients who were posted for upper limb surgeries were recruited. These patients were divided into 2 groups. Group L (Levobupivacaine) received 30ml of 0.5% Levobupivacaine with normal saline and Group LD (Dexmeditomidine) received 30ml of 0.5% Levobupivacaine with 1mcg/kg dexmeditomidine via supraclavicular block under peripheral nerve stimulator. Sensory and motor block assessment was done every 3 min for 30 min till the patient recover from complete sensory and motor blockade. VAS score was assessed in post-operative ward at intervals of 30min, 60min, 2hrs, 12hrs, 18 hours. The onset of sensory and motor blockade was faster in Group LD when compared to Group L. The duration of sensory blockade, motor blockade and analgesia was longer in Group LD when compared to Group L ($p<0.001$). We conclude that addition of 1mcg/kg dexmeditomidine as an adjuvant to 0.5% Levobupivacaine for supraclavicular brachial plexus block increases the duration of analgesia and improves quality of analgesia by facilitating fast onset of sensory and motor blockade without any neurological deficits.

Keywords: Dexmeditomidine, Levobupivacaine, supraclavicular block.

INTRODUCTION

An increasing demand for regional anesthesia proves the fact that regional anaesthesia can provide superior pain management and may improve patient outcome post operatively.

Brachial plexus block is widely employed regional nerve block of the upper limbs. Various approaches to brachial plexus block have been described but supraclavicular approach is the easiest and most convenient method for anaesthesia and perioperative pain management in surgery blow the shoulder joint.

In today's era, more stress is laid on safer anaesthetic drugs and therefore the search for adjuvant anaesthetic drugs. There are very few studies, which have further tried to assess its safety and effectiveness when mixed with adjuvants.

The addition of adjuvant has following advantages

- Augmentation of the anaesthetic action of drug
- Reducing the actual dose of anaesthetic agent required, thus improving the safety margin.

Levobupivacaine is a new local anaestheticdrug which has established itself as a safer anaesthetic[1], as no single local anaesthetic is considered as most effective, various studies have been done to find the ideal adjuvant for this drug.

Dexmeditomidine, an alpha-2 receptor agonist, is increasingly being used for regional anesthesia and intravenous regional anaesthesia (IVRA) (Bier's block) improved the quality of anaesthesia, tourniquet tolerance and decreased the need of early post-operative analgesic requirement[2], when used as an adjuvant in

epidural with Ropivacaine, it prolonged sensory & motor block with good hemodynamic stability[3].

Dexmeditomidine compared with clonidine in epidural anaesthesia, the result showed Dexmeditomidine has more stable cardio-respiratory parameter, superior sedative and anxiolytic properties than clonidine during procedures under regional anaesthesia [4]. When Dexmeditomidine used in combination with Levobupivacaine in block the results were significant by shortening the onset of motor and sensory block, need for rescue analgesia delayed [5]. Its use in peripheral nerve blocks shows the increase in duration of analgesia without any clinical relevant side effects [6]. Dexmeditomidine in combination with bupivacaine prolongs the duration of analgesia in supraclavicular brachial plexus block with better hemodynamic stability and greater postoperative analgesia [7].

In this study we assessed the efficacy of adding dexmeditomidine as an adjuvant to Levobupivacaine in peripheral nerve block-supraclavicular brachial plexus block in terms of

- Onset and duration of sensory and motor blockade
- Postoperative analgesia
- Complications/ side effects if any

AIMS AND OBJECTIVES

- To evaluate the anaesthetic and analgesic effects of Levobupivacaine and Levobupivacaine with Dexmeditomidine in supraclavicular block of brachial plexus.
- To find out adding adjuvant makes it more effective in the block and its safety profile in combination with Levobupivacaine.

MATERIAL AND METHODS

This comparative study was done at Department of Anaesthesia, Sree Mookambika Institute of Medical Sciences, Kulasekharam, during the period of Feb 2017 to Jan 2018. Total sample size was 72. Two groups, Group L and Group DL

INCLUSION CRITERIA

- Patient giving valid consent.
- Patients under ASA (American society of Anesthesiologists) physical status 1 and 2.
- Patients undergoing elective surgery under supraclavicular block.
- Patients of either sex aged between 18-60yrs and weight of 50-70kg.

EXCLUSION CRITERIA

- Patients who refuse to give consent.
- Patients with bleeding disorder.
- Local infection at the site of block.
- Documented neuromuscular block.
- Respiratory compromise.
- Known allergy to local anaesthetics or dexmeditomidine.
- ASA Grade III and IV.

Procedure

After approval of this study protocol by our institutional ethical committee, randomized purposive sampling technique was used to select patients, sealed envelope containing Group I and II, 36 in each group, total 72 were made and picked randomly. Patients who met the inclusion criteria were enrolled for the study with written informed consent.

Patients were visited on the day prior to surgery and reassured, explained in detail about the anaesthetic procedure and informed written consent obtained. The patients were kept nil oral 6hrs prior to surgery. As a part of double blinding procedure, the patient and the investigator were not aware of the drug given as the supraclavicular block was to be administered by the consultant anesthesiologist. Patients were premedicated with oral Tab. Ranitidine 150mg and Tab. Alprazolam 0.25mg the night before the surgery, Tab. Ranitidine 150mg and Tab. Metoclopramide 10mg 2hrs prior to procedure. On arrival to premedication room, standard monitors like ECG, non-invasive Blood Pressure and SpO2 probes were attached and baseline values recorded, and continued during the procedure. 18G intravenous cannula was secured, iv fluid started and premedication Inj.Midazolam 1mg iv before shifting to the operation theater. Patient was positioned in supine with head turned to the side opposite to that to be blocked. A small towel placed under the occiput. The arm on the side to be blocked is held at the side, and the patient is asked to hold the shoulder down. The area is painted with 10% povidone iodine solution and draped with sterile sheets. Under all aseptic precautions, the site is identified and marked, which is expected to be 1cm behind the midpoint of the clavicle, infiltrated with 1ml of 2% Lignocaine intradermaly and subcutaneously after confirming the site. Brachial plexus is approached using a peripheral nerve stimulator connected to 22G 55mm long needle through the lignocaine infiltrated skin. During injection, negative aspiration will be performed for every 3-4ml, to avoid intravascular injection. If there was any blockade failure in a nerve distribution region, in spite of adequate block, the patients were excluded from the study. All patients were administered oxygen 2L/min via nasal prongs throughout the procedure. The onset and duration of sensory and motor blockade were studied. The sensory blockade assessed using pin prick every 3min for half an hour till the regain of sensation. The motor blockade assessed by verbal command

asking the patient to move the hand every 3 min for half an hour till regain of movements.

Preparation of drug

1ml of Dexmeditomidine (DEXTOMID 1ml containing 100mcg of dexmeditomidine was taken for the study). Group LD will be given Dexmeditomidine 1mcg/kg along with 0.5% Levobupivacaine 30ml for block, whereas Group L will be given 0.5% Levobupivacaine 30ml along with normal saline as placebo instead of dexmeditomidine.

Outcome variables

In our study the sensory blockade was assessed by pin prick method. Onset of sensory blockade was noted when the patient was able to appreciate dull sensation to pinprick along the distribution of any 2 of the nerves (median, radial, ulnar, musculocutaneous). Complete sensory block was considered when there is complete loss of sensation to pinprick. Sensory block was graded as:

- Grade 0:Sharp pain felt(+)
- Grade 1: Analgesia, dull sensation felt(+)
- Grade 2: Anaesthesia, no sensation felt (-)

Motor block assessment was done according to modified Bromage scale for upper extremities on a three point scale:

- Grade 0: when patient is able to do normal motor function with full flexion and extension of elbow wrist and fingers.
- Grade 1: when there is decreased motor strength with ability to move fingers only.
- Grade 2: complete motor block with inability to move fingers.

Sensory and motor blocks was recorded every 3min until 30min after injection, and then every 30min until the sensation and motor reflex have resolved. Complete sensory block was considered by anaesthetic block (Grade 2) on all nerve territories involvement. The duration of sensory block was considered as time interval between the end of administration of local anaesthetics and complete resolution of anaesthesia on all nerves. Complete motor block was considered when there is absence of voluntary movement on fingers (Grade 2). Duration of motor block was noted as the time interval between end of local anaesthetic administration and complete recovery of motor function of arm and forearm.

Hemodynamic parameters

The heart rate (HR), mean arterial pressure (MAP), peripheral oxygen saturation (SpO2), respiratory rate (RR) were recorded before and after premedication, before and after supraclavicular block and for every 5 minutes thereafter.

Fall in MAP below 20% of baseline or a systolic pressure less than 90mmHg was considered as hypotension for the purpose of study and was treated with incremental doses of Inj. Ephedrine.

Heart rate below 50m beats/min was considered bradycardia and was treated with 0.6mg of inj Atropine (iv), respiratory rate below 12 breaths/min was considered respiratory depression.

Time to request for rescue analgesia

Postoperative pain assessed by using the Visual Analog Scale (VAS 0→ no pain, and VAS 10→ worst possible pain) at 30min, 60min, 2, 6, 12 and 18hrs. Patients with VAS score of 3 or more were given Inj.Tramadol 50mg slow (i.v.). The time of patient's first request for postoperative analgesia after the surgery was recorded as duration of postoperative analgesia.

DATA ANALYSIS

Data obtained was coded and entered into Microsoft Excel. The categorical data expressed as mean±standard deviation (SD). Statistical Package for Social Sciences (SPSS 18.0) is used for the statistical analysis of the present study. Unpaired sample't' test is applied to find the statistical significant between the two groups. p value less than 0.05 ($p<0.05$) is considered statistically significant at 95% confidence interval. The data are expressed in number, percentage, mean and standard deviation.

STATISTICAL ANALYSIS

- Level of confidence interval is 95%; p value less than 0.05 are taken as significant.
- Software(s) to be used for statistical analysis: SPSS (Statistical Package for Social Sciences) trial version 18.0.

RESULTS

Statistical analysis of data are presented as mean and standard deviation. The qualitative data as frequency and percentage.

Hemodynamic parameters like HR, SBP, DBP was analyzed using ANOVA. Sensory and motor block characteristics were analyzed with t-test. Chi-square test was used to analyze the peak sensory level attained adverse effects between the two groups.

$p<0.01$ statistically highly significant ($p<0.01$)
$p<0.05$ statistically significant ($p<0.05$)
$p>0.05$ statistically not significant ($p>0.05$)

The statistical software SPSS version 18.0 was used for the analysis of data. Microsoft word and Excel were used to generate graphs and tables.

The demographic profile of both groups was comparable in terms of age, sex ratio, BMI and ASA PS grading (Table I).

Table-I: Demographic profile

Sl.	Parameters	Group L	Group LD	P value
1	Age	38.67±12.86	41±12.86	O.444
2	Sex (M/F)	21/15	22/14	
3	Weight (kg)	64.00±4.04	60.81±5.62	0.014
4	Height (cm)	159.25±3.73	162.19±6.35	0.019
5	ASA PS Grade I/II	30/6	27/9	

Parameters are Mean ± SD (standard deviation) *ASA-American Society of Anaesthesiologist.

Sensory and motor blockade

Onset of sensory blockade was faster in LD Group than L Group. (Figure1)

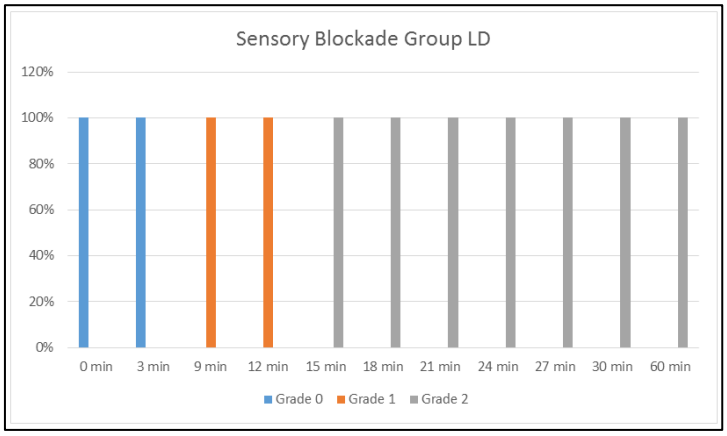

Fig-1

Time of onset of motor blockade, in seconds, was also faster in LD group with an early onset of 9 minutes and was statistically comparable with both the groups (Figure 2).

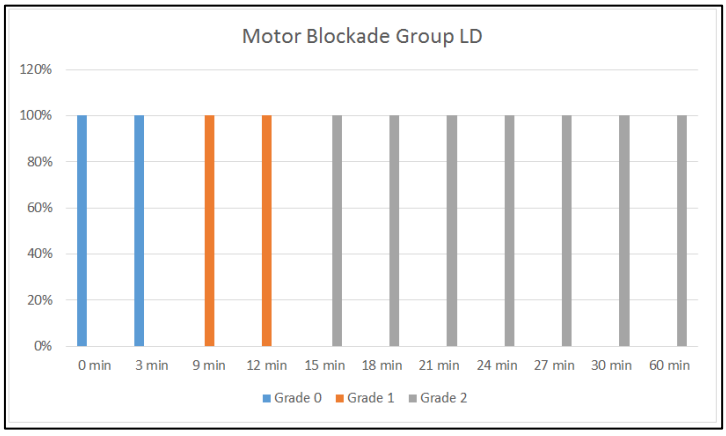

Fig-2

Duration of motor block, sensory block, rescue analgesia, were more in LD Group than Group L and was statistically highly significant. P value< 0.001 in Group LD than L (Table II).

Table-II: Duration of motor block, sensory block, rescue analgesia

Duration	Group L	Group LD	P value
Motor Block	496.11±10.65	815.61±19.10	<0.001
Sensory Block	619.33±12.78	862.42±36.24	<0.001
First Analgesia	792.33±16.30	955.36±28.32	<0.001

Parameters are Mean ± SD (standard deviation)

Hemodynamic Parameters

Heart rate: The baseline heart rate was comparable in both groups. In Group LD patients, at 25, 30 and 60 mins, there was a gradual fall in heart rate, but with no further significant biphasic changes throughout surgery when compared to L Group (Figure 3).

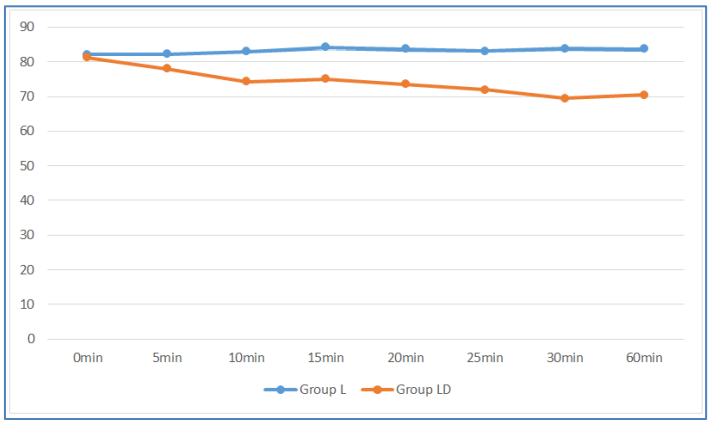

Fig-3: Heart Rate

Systolic Blood Pressure: Overall mean SBP was on lower side in Group LD in comparison with Group L, at different time intervals, but was statistically significant (Figure 4).

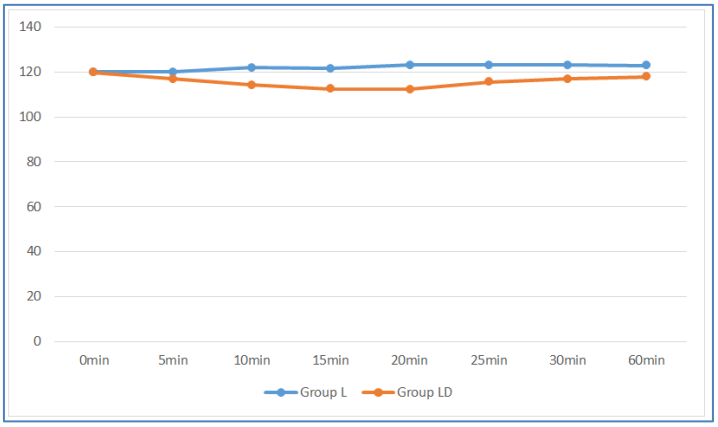

Fig-4: SBP

Diastolic Blood Pressure: Mean DBP was higher in L Group which was statistically significant. By 25min of the procedure, the BP in both the procedures was comparable (Figure 5).

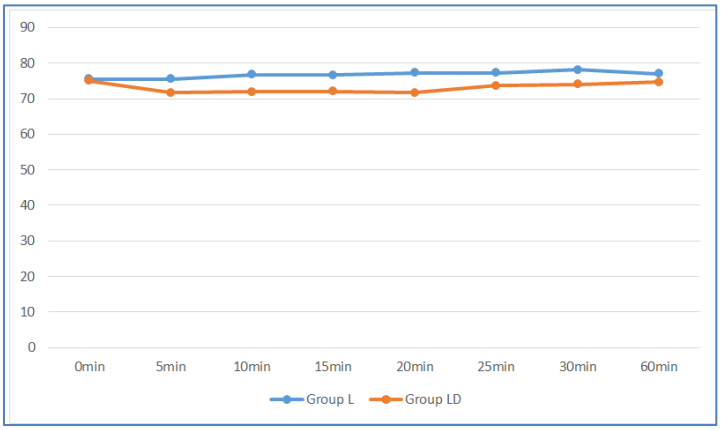

Fig-5: DBP

SpO2: SpO2 was comparable in both groups throughout and P value was insignificant (Figure 6).

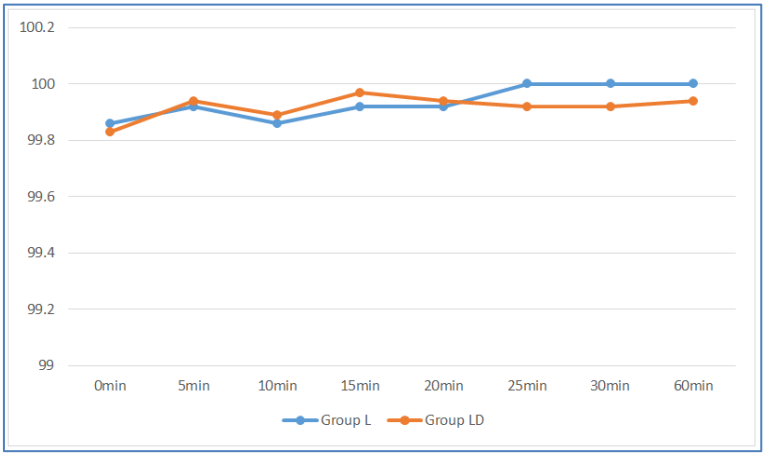

Fig-6:SpO2

Hypotension: Two patients in the LD Group developed hypotension. In Group L, no hypotension noted, and was statistically insignificant. No patients in both the groups developed bradycardia.

VAS Scores over the entire 18hours were comparable between the two groups. The P value between the two groups in the postoperative period was statistically significant, with P value <0.01.

DISCUSSION

This randomized double blinded study demonstrated the efficacy and safety of addition of an adjuvant to an anaesthetic drug.

In our study successful block was defined as the anaesthesia for a pain free surgery, without need for supplemental anaesthesia. We found that there is increase in the duration of sensory and motor blockade as well as need for requirement time for rescue analgesia was increased when Levobupivacaine + Dexmeditomidine was used. The α2 adrenergic agonist receptor mechanism by which it produces analgesia and sedative action is not completely understood but most likely to be multifactorial. Peripherally, analgesic effects produced by decreasing the release of norepinephrine and causing α2 receptor-independent inhibitory effects, on nerve fiber action potentials. Centrally, α2 agonists produce analgesic and sedation action by inhibiting substance P release in the nociceptive pathway, at the level of the dorsal root neuron and by activating α2 adrenoceptors in the locus ceruleus [8, 9].

Onset of sensory and motor block

The test showed that the time of onset of sensory block is faster in L+D group when compared to L group. The onset was early 9min in L+D group. This shows that Dexmeditomidine causes early onset of sensory block.

Comparison of the time of onset of motor block in sec between the two groups shows that time of onset of motor block in sec is faster in L+D group with an early inset of 9 min and was statistically significant.

Comparison of the Complete Block between the two groups shows that Complete Block is faster in L+D group. This shows that Dexmeditomidine does affect the onset of motor block when given with parent drug. Agarwal Sandhya *et al.* [10] in their study showed that Dexmeditomidine is a useful adjuvant to Bupivacaine in brachial plexus block. Swami *et al*. [11] in their study compared Clonidine and Dexmeditomidine as an adjuvant to local anaesthetic agent in supraclavicular block with comparing the onset and duration of sensory and motor and duration of analgesia. They showed significant increase in duration of analgesia on addition of Dexmeditomidine to bupivacaine 0.25% in brachial plexus block.

Intraoperative hemodynamics

Here the two groups which received supraclavicular block containing Levobupivacaine and Levobupivacaine+Dexmeditomidine compared with respect to intraoperative hemodynamics.

Intraoperative hemodynamics included systolic blood pressure, diastolic blood pressure, heart rate, peripheral capillary oxygen saturation.

The mean systolic blood pressure in Levobupivacaine group at 0 mins had a mean of 119.94 mm of mercury, 20 mins mean of 123 mm of mercury, 60 mins mean of 122.89mm of mercury.

Comparing to Levobupivacaine+Dexmeditomidine at 0 mins having mean of 119.75 mmHg, 20mins mean of 112.19 mmHg and 60mins mean 117.86 mmHg.

The mean diastolic blood pressure in Levobupivacaine group at 0 mins had a mean of 99.86

mmHg, 20 mins mean of 99.92 mmHg, 60 mins mean 100 mmHg. Comparing to Levobupivacaine+Dexmeditomidine at 0 mins having mean of 99.83 mmHg, 20mins mean of 99.94 mmHg and 60mins mean 99.94 mmHg.

Heart rate was measured over the entire 60mins intraoperatively at specific time intervals. The heart rate was found to be comparable in both the groups at all time intervals and data interpreted at mean for Levobupivacaine at 0 mins is 82.06 beats per min, 20 mins is 83.69 beats per minute and at 60 mins is 83.72 beats per min.

For Levobupivacaine+Dexmeditomidine mean heart rate at 0 mins is 81.25 beats per minute, 20 mins is 73.50 beats per minute and at 60 mins is 70.50 beats per minute. Therefore in our study, Systolic blood pressure, Diastolic blood pressure and heart rate were compared between the two groups and found to be statistically significant as p value is <0.05.

Our observation of statistical significant changes were similar to Jones and Khan[12] who found that alpha 2 adrenergic agonists had activity of sedation, analgesia, antihypertensives, anti-emetic actions in addition to reducing the anaesthetic drug requirement. In our study, peripheral capillary oxygen saturation was found to be statistically insignificant at all times (p>0.05).

VAS SCORING

Post-operative pain scores were measured using a visual analog scale in a 0-10cm. The visual analog score was compared between two groups Levobupivacaine and Levobupivacaine+Dexmeditomidine.

VAS scores were measured at 30minutes, 60 minutes, 2 hours, 6 hours, 12 hours and 18 hours. The VAS scores over the entire 18hours were comparable between the two groups. The p value between the two groups in the post-operative period was statistically significant with p value <0.01.

Rescue analgesia requirement

First analgesia was provided in visual analog score ≥4 or on patient demand. Here the two groups which received supraclavicular block with Levobupivacaine+ Dexmeditomidne were compared with respect to time for first rescue analgesia in minutes.

In patients with Levobupivacaine group mean time for first rescue analgesia is 792.33 minutes and Levobupivacaine+ Dexmeditiomidne mean time for first rescue analgesia is 955.36 minutes.

This was statistically significant with p<0.05, similarly in a study done by Saumya Biswas *et al.* [13] to assess the effect of adding Dexmeditomidine to Levobupivacaine in supraclavicular brachial plexus block. The study revealed that addition of Dexmeditomidine as an adjuvant to Levobupivacaine prolongs the duration of sensory and motor blockade as well as need for the requirement of rescue analgesia delayed.

SIDE EFFECTS

Bradycardia, Hypotension and respiratory depression

There were no incidence of Bradycardia, Hypotension and respiratory depression reported in both the groups.

CONCLUSION

The present study showed that when Dexmeditomidine added as adjuvant to Levobupivacaine in supraclavicular block has faster onset of sensory and motor blockade, prolonged duration of sensory and motor blockade, and the time of request for rescue analgesia. When compared with Levobupivacaine without adjuvants, it also provided arousable sedation without respiratory depression and maintained a stable hemodynamic profile throughout the perioperative period.

REFERENCES

1. Bajwa SJ, Kaur J. Clinical profile of Levobupivacaine in regional anaesthesia: A systematic review. J Anaesth Clin Pharmacol. 2013;29(4):530
2. Esmaoglu A, Mizrak A, Akin A, Turk Y, Boyaci A. Addition of dexmedetomidine to lidocaine for intravenous regional anaesthesia. Eur J Anaesthesiol. 2005; 22(6)447-51
3. Bajwa SJ, Arora V, Kaur J, Singh A Parmar SS. Comparative evaluation of dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries. Saudi J Anaesth. 2011;5(4):365-70
4. Bajwa SJ, Bajwa SK, Kaur J, Singh G, Arora V, Gupta S, Kulashrestha A, Singh A, Parmar SS, Singh A,Goraya SP, Dexmedetomidine and clodine in epidural anaesthesia: Acomparative evaluation. Indian J Anaesth. 2011;55(2):116-21.
5. Mantz J. Importance of patient orientation and reusability as components os intensive care unit sedation. In International Congress and Symposium Series. 1998;221:23-9.
6. Esmaoglu A, Yegenoglu F, Akin A, Turk CY, Dexmedetomidine added to Levobupivacaine prolongs axillary brachial plexus block. Anaesth Analg. 2010;111(6)1548-51.

7. Gandhi R, Shah A, Patel I, Use of dexmeditomedine along with bupivacaine for brachial plexus block. Natl J Med Res. 2012;2(1):67-9.
8. Eisnach JC, De Kock M,Klimscha W. Alapha-2-adrenergic agonists for regional anaesthesia. A clinical review of clonidine (1984-1995) Anaesthesiology. 1996:85(3):665-74.
9. Guo TZ, Jiang JY, Butterman AE, Maze M. Dexmedeetomidine injection into the locus cerleus produces antinociception. Anaesthesiology 1996;84(4)873-81
10. Agarwal S, Aggarwal R, Gupta P. Dexmedetomidine prolongs the effect of bupivacaine in supraclavicular brachial plexus block. JAnaesth Clin Pharmacol. 2014;30(1);36.
11. Swami SS, Keniya VM,Sushma D, Ladi Rao R. Comparison of dexmedetomidine and clodine (a2 agonist drugs) as an adjuvant to local anaesthesia in supraclavicular brachial plexus block: A randomized double-blind prospective study. Indian J Anaesth. 2012;56(3):243-9.
12. Khan ZP, Ferguson CN, Jones RM. Alpha-2 and imidazoine receptor agonists. Their pharmacology and therapeutic role. Anaesthesia. 1999;54(2):146-65.
13. Biswas S, Das RK, Mukherjee G, Ghose T. Dexmedetomidine an Adjuvant to Levobupivacaine in Supraclavicular Brachial Plexus Block: A Rnadomizes Double Blind Prospective Study. Ethiop J Health Sci. 2014;24(3):203-8.