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An Observational Study to Compare Effects of Dexmedetomidine with Levobupivacaine 0.5% and Levobupivacaine 0.5% alone for SCBP Block for Upper Limb Surgeries

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Abstract

Context: Dexmedetomidine, a potent α2 adrenoceptor agonist, is more selective towards the α2 adrenoceptor and have analgesic and sedative properties [3]. Levobupivacaine has been shown to be safe and effective for epidural/spinal anaesthesia and brachial plexus block [4]. *Aims:* To assess the safety, efficacy, onset & duration of sensory & motor block and rescue analgesia time of dexmedetomidine as an adjuvant to levobupivacaine 0.5% and levobupivacaine 0.5% alone in supraclavicular brachial plexus (SCBP) block. *Material and methods:* 60 patients aged 18-55 years of ASA I & II were divided randomly into two groups using chit method. Group LD (n=30) received 0.5% levobupivacaine 30 ml with inj. dexmedetomidine 1 µg kg-1 and Group L (n=30) 0.5% levobupivacaine 30 ml alone in SCBP block. Onset and duration of sensory & motor block, as well as duration of analgesia were assessed using pinprick, bromage score and visual analogue score respectively. *Statistical analysis:* The statistical analysis was assessed by unpaired t-test on Microsoft excel and IBM SPSS (Statistical Package for Social Sciences) version 21. P-value significant if <0.05. *Results:* The rescue analgesia time for Group LD was 1029.55 ± 95.87 and Group L was 657.93 ± 47.81 ($p<0.0001$). The onset of sensory & motor block was hastened, while duration was significantly prolonged in Group LD than Group L. *Conclusion:* Dexmedetomidine when added to levobupivacaine in SCBP block hastens the onset and prolongs duration of sensory & motor block and rescue analgesia time in the postoperative period with steady haemodynamics.

Keywords: Dexmedetomidine; 0.5% Levobupivacaine; Supraclavicular Brachial Plexus Block.

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Introduction

Pain is a personal and subjective experience that involves sensory, emotional, behavioural factors associated with actual/potential tissue injury as defined by International Association for the Study of Pain [1].

Upper limb surgeries are mostly performed under peripheral blocks such as the supra clavicular brachial plexus block (SCBPB) [2]. Dexmedetomidine, a potent α_2 adrenoceptor agonist and has analgesic and sedative properties. It prolongs the duration of block and analgesia with local anaesthetics [3]. Levobupivacaine, the S-enantiomer of racemic bupivacaine has less cardiac and neural toxic effects than bupivacaine [4]. So we studied effects of dexmedetomidine as an adjuvant to levobupivacaine in SCBPB.

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Materials and Methods

This study was carried out in the department of anesthesiology of Dhiraj hospital after getting approval from the institutional ethical and research committee. Patients were informed about the anaesthesia procedure & drugs that would be used, its effects & its side effects and were only included in the study after written and informed consent was taken.

Inclusion criteria

i. Patient willing to sign the informed consent form.

ii. ASA (American Society of Anaesthesiologists) grade I and II.

iii. Between the ages of 18-55 years, of either sex.

iv. Undergoing planned surgeries on upper limb.

Exclusion Criteria

i. Patient's refusal for procedure.

ii. Age < 18 & > 55 years, of either sex.

iii. Known hypersensitivity to local anaesthetics.

iv. Uncontrolled diabetes mellitus.

v. Pregnant woman.

vi. Pre-existing peripheral neuropathy.

vii. Patients with cardiac conduction defect.

viii. Patients with bleeding disorder.

ix ASA III and above.

x Patients already on adrenoreceptor agonist & antagonist therapy.

We studied 60 patients of ASA I & II of either sex fulfilling the inclusion criteria, planned for elective upper limb surgeries were divided by chit method into 30 patients in each, Group LD (n=30) received 0.5% levobupivacaine with dexmedetomidine (1µg kg^{-1}) and Group L (n=30) 0.5% levobupivacaine alone. This study was observational, randomized in nature.

For all patients, pre-anaesthetic check-up and routine investigations were carried out and were explained about visual analogue scale. Pre-operatively patients were kept nil per oral overnight before surgery. In the operating room an intravenous line was secured in the unaffected limb and inj. Ringer's lactate was started. Patients were premedicated with inj. glycopyrrolate 0.2 mg kg^{-1} i.v. and inj. ondansetron 4 mg kg^{-1} i.v. and oxygenated with venti mask before giving supraclavicular brachial plexus block.

Supraclavicular brachial plexus block technique:

Patients were placed in supine position. A pillow was placed below the shoulder to make the landmarks prominent. The head was turned 35^0- 45^0 away to the contra lateral side. The arm to be anesthetized was adducted. Using classic technique approach, the midpoint of the clavicle were identified and marked. The posterior border of the sternocleidomastoid was palpated easily when the patient raised the head slightly. Palpating the belly of the anterior scalene muscle moving towards interscalene groove with the fingers, a mark was made at approximately 1.5 to 2.0 cm posterior to the midpoint of the clavicle. By palpating the subclavian artery at this site, landmark was confirmed. After appropriate preparation and injection of a skin wheal with 23-G 1.5" needle was done at the point of entry above the midpoint of clavicle, supraclavicular block was given by using peripheral nerve stimulator when there were twitch in the forearm or hand at 1mA and drug was injected, following negative aspiration for blood, the solution containing local anaesthetic 0.5% levobupivacaine combined with dexmedetomidine (1µg kg^{-1}) or 0.5% levobupivacaine alone as mentioned above was injected. 3 minutes massage was performed to facilitate an even drug distribution.

Assessment of sensory block was done every 3 minutes after completion of drug injection in the dermatome areas corresponding to median nerve, radial nerve, ulnar nerve and musculocutaneous nerve till complete sensory blockade. Sensory block was assessed by pinprick test using 3-point scale [8]. Assessment of motor block was carried out by the same observer at every 3 minutes till complete motor blockade after drug injection. Motor blockade was assessed using bromage three point score [8]. Duration of analgesia was recorded every 30 minutes post-operatively. Patients were assessed 2 hourly for post operative analgesia till rescue analgesia. Rescue analgesia in form of inj. diclofenac sodium 75 mg i.v. was given when patient's visual analogue score (VAS) [7] were $\geq$ 4.

Patients were monitored for heart rate (HR), pulse oximetry (SpO_2), systolic blood pressure (SBP), diastolic blood pressure (DBP) at every 5 minutes up till 15 minutes and every 15 minutes up till 60 minutes, then 90 minutes maximum till 120 minutes.

Patients were monitored for any intraoperative/ post-operative complications like hypotension, bradycardia, confusion, dizziness, auditory and visual disturbances, convulsion, arrhythmias and respiratory depression.

Results

Total 60 patients were allocated for the study. Both groups were comparable in respect to age, sex, weight and duration of surgery which is depicted in table 1.

Mean HR per minute at different time interval where there is statistically significant difference after 10 min to 6 hrs in HR at point of observation. SBP (mm of Hg) at different time interval shows there was statistically significant difference after 10 min to 10 hrs in SBP at point of observation. DBP (mm of Hg) at different time interval shows there is statistically significant difference after 10 min to 4 hrs in DBP at point of observation (Chart 1).

Onset time for sensory and motor blockade was shorter in Group LD compared to Group L with P value < 0.05 which was statistically significant. Duration of sensory block was calculated from the time taken from onset of block to complete return of paraesthesia (sensory score 0). It was longer in Group LD as compared to Group L and was statistically highly significant (P value <0.0001). Duration of motor block was calculated from the time taken from complete motor blockade to restoration of movements of forearm (grade 0). It was longer in Group LD compared to Group L and it was statistically highly significant (P value < 0.0001) which is depicted in table 2.

Table 1: Demographic Data

Variables	Group LD (n=30)	Group L (n=30)	P value	Significance
Age (years) Mean ± SD	38.83 ± 14.31	39.67 ± 14.44	0.8218	NS
Weight (kg) Mean ± SD	61.00 ± 10.57	61.27 ± 8.41	0.9132	NS
Sex (M:F) Mean ± SD	22:08	23:07	1.0000	NS
Duration of Surgery Mean ± SD (minutes)	85.70 ± 35.37	84.60 ± 34.83	0.9038	NS

NS- Not significant

S- Significant

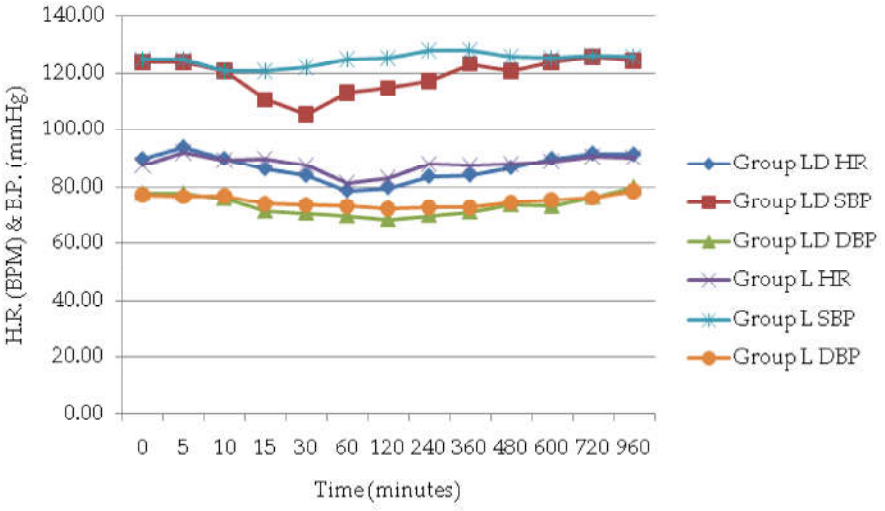

Chart 1: Changes in H.R. and Blood Pressure in both Groups

Table 2: Onset & Duration of Sensory and Motor Block

Time (minutes)	Group LD (n=30) Mean±SD	Group L (n=30) Mean±SD	P value	Significance
Onset of sensory block (Pin prick [8])	9.23 ± 2.31	11.93 ± 2.5	<0.0001	S
Onset of motor block (Bromage score [8])	14.67 ± 2.53	17.30 ± 3.89	<0.0030	S
Duration of sensory block (Pin prick [8])	950.67 ± 11.22	699.87 ± 18.87	<0.0001	S
Duration of motor block (Bromage score [8])	861.66 ± 17.91	576.90 ± 12.72	<0.0001	S

Table 3: Post-Operative VAS

Time	Group LD (n=30)	Group L (n=30)	p value	Significance
10 hrs	2 (6.6%)	9 (30%)	< 0.05	S
12 hrs	8 (26.6%)	14 (46.6%)	< 0.05	S
14 hrs	11(36.6%)	6 (20%)	< 0.05	S
16 hrs	9 (30%)	1 (3.3%)	< 0.05	S

Table 4: Duration of Post-Operative Analgesia

Time	Group LD (n=30)	Group L (n=30)	P value	Significance
Duration of Analgesia (mins)	1029.55 ± 95.87	657.93 ± 47.81	<0.0001	S

Table 5: Post-Operative Complications

Complications	Group LD	Group L
Confusion	NIL	NIL
Auditory and Visual Disturbances	NIL	NIL
Arrhythmias	NIL	NIL
Convulsions	NIL	NIL
Sedation	NIL	NIL
Respiratory Depression	NIL	NIL
Pneumothorax	NIL	NIL
Haemorrhage	NIL	NIL

Table 3 shows differences of post-operative VAS in both groups which is significant. Rescue analgesia was administered when VAS score was ≥ 4 in form of inj. diclofenac 75 mg i.v.

Duration of post-operative analgesia which was calculated from the "Time from onset of sensory blockade to time when patient VAS score ≥ 4. Post-operative analgesia was significantly longer in group LD as compared to group L and was statistically significant (p value < 0.0001) which is depicted in Table 4.

There were no post-operative complications in both the groups (Table 5).

Discussion

Regional anaesthesia provides improved satisfaction and cause less cognitive impairment and less immune-suppression compared to general anesthesia (particularly in elderly patients).

Brachial plexus block is a versatile and reliable regional anaesthetic technique and a suitable alternative to general anaesthesia for upper limb surgeries. It consists of injecting local anaesthetic drugs in the fascial spaces surrounding the nerve plexus there by blocking the autonomic, sensory and motor fibres supplying the upper extremity. It is a simple, safe and effective technique of anaesthesia having distinct advantages over general and intravenous regional anaesthesia.

We designed a randomized, prospective observational study to compare effects of levobupivacaine 0.5% along with dexmedetomidine as an adjuvant and levobupivacaine 0.5% alone on onset and duration of sensory and motor block and duration of postoperative analgesia in supraclavicular brachial plexus block.

A newer long acting local anesthetic drug levobupivacaine has a better safety profile compared to bupivacaine as it has less cardiac depression and central nervous system toxicity; potential clinical advantage during neural blockade when large volumes are used.

Dixit A et al. [5] studied patients in Group L (n = 20) were administered 29 mL of 0.5% levobupivacaine plus 1 ml 0.9% NS and group LD (n=20) were given 29 ml of 0.5% levobupivacaine with dexmedetomidine 1μg kg^{-1}. He found that the onset of sensory and motor block was significantly faster and rescue analgesic requirements were significantly less in group LD compared to Group L ($p < 0.05$). The recommended maximum dose for levobupivacaine of 0.25-0.5% concentrations is dose of 1-40 ml (maximum 150 mg) in peripheral nerve blocks.

The hypothesis of this study was that adding 1 μg kg^{-1} dexmedetomidine to 30 ml levobupivacaine

0.5% for supraclavicular brachial plexus block shortens the sensory block onset time, prolongs sensory and motor block duration and time to first analgesic use, and decreases the total analgesic requirement with no side effects.

In our study onset time for sensory block was 9.23 ± 2.31 mins, and 11.93 ± 2.5 mins for group LD group L respectively. Onset time for motor block was 14.67 ± 2.53 mins in and 17.30 ± 3.89 mins, in group LD and group L respectively. Thus our result showed faster onset time for sensory and motor blockade in group LD as compared to group Lwith p value < 0.05 which was statistically significant, which was comparable with study by Singh AP et al. [6].

The mean duration for sensory block was 950.67 ± 11.22 mins in group LD and 699.87 ± 18.87 mins in group L. The mean duration for motor block was 861.66 ± 17.91 mins in group LD and 576.90 ± 12.72 mins in group L. It was longer in group LD as compared to group L and it was highly statistically significant (p value <0.0001). Thus our result shows longer duration of sensory and motor block in group LD as compared to group L, which was comparable with the study of **N**allam SR et al. [7], Saumya Biswas et al. [8] & Kaur H et al. [9].

In our study time taken for starting of regression (p-value < 0.001) was more in group LD compared to group L and this finding was statistically significant. There were statistically significant differences in the duration of complete analgesia, duration of effective analgesia and time of first pain medication between the study groups. In our study, post-operatively out of 30 patients 29 (96.6%) patients reached pain score 4 at 14th hours while 1 (3.3%) patients reached at 16th hour in group L. In group LD out of 30 patients, 21 (70%) patients reached pain score 4 in 14th hours while 9 (30%) patients reached at 16th hour. Rescue analgesia was administered when VAS score was ≥ 4 in form of inj. diclofenac 75 mg i.v. Duration of post-operative analgesia which was calculated from the "Time from onset of sensory blockade to time when patient VAS score ≥ 4, which was 1029.55 ± 95.87 mins and 657.93 ± 47.81 mins for group LD and group L respectively which was statistically significant as p < 0.05, which was comparable with the study of Sarita S Swami et al. [10].

Singh AP et al. [6] had observed bradycardia in their patient group in which 100 µg of dexmedetomidine was used with levobupivacaine.

In our study, our observations show that the hemodynamic parameters like heart rate and blood pressure were more in the optimal range in levobupivacaine 0.5% with dexmedetomidine 1 µg kg^{-1} group than levobupivacaine 0.5% alone group. The respiratory parameters were almost similar in both the study groups. No Bradycardia and/or hypotension observed in the levobupivacaine 0.5% with dexmedetomidine 1 µg kg^{-1} group because of the lower dose of dexmedetomidine 1 µg kg^{-1} we used.

Conclusion

Based on observations and results, we concluded that dexmedetomidine when added to levobupivacaine 0.5% for supraclavicular brachial plexus block shortens the onset of sensory and motor blockade and prolongs their duration. The prolonged duration of analgesia significantly decreases the need for additional analgesics in dexmedetomidine group. The added advantage of conscious sedation, hemodynamic stability, and minimal side effects makes dexmedetomidine a potential adjuvant for nerve blocks when used in the dose of 1 µg kg^{-1}.

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Conflict of Interest: None

References

1. Merskey H, Bogduk N, editors: International Association for the Study of Pain (IASP). Task force on taxonomy part III. Pain terms. A current list with definitions and notes on usage. In: Classification of Chronic Pain. 2nd ed. Seattle, WA: IASP Press 1994. pp.209-14.
2. Bruce BG, et al. Brachial plexus blocks for upper extremity orthopedic surgery. J Am Acad Orthop Surg. 2012;20:38-47.
3. Memis D, et al. Adding dexmedetomidine to lignocaine for IVRA. Anesth Analg. 2004;98:835-40.
4. Foster R.H. et al. Levobupivacaine: a review of its pharmacology and use as a local anaesthetic; Drugs 2000;59:551-579.
5. Dixit A, Singhal S, Neema C, Sanwatsarkar S, Bhatia M. An evaluation of the addition of Dexmedetomidine to Levobupivacaine for supraclavicular brachial plexus block in upper limb orthopaedic surgeries. Asian Pac J Health Sci. 2015; 2:148-53.
6. Singh AP, Mahindra M, Gupta R, Bajwa SJ. Dexmedetomidine as an adjuvant to levobupivacaine in supraclavicular brachial plexus block: A novel anesthetic approach. Anesthesia, essays and researches. 2016 Sep;10(3):414.
7. Nallam SR, Chiruvella S, Karanam S.

Supraclavicular brachial plexus block: Comparison of varying doses of dexmedetomidine combined with levobupivacaine: A double-blind randomised trial. Indian J Anaesth. 2017;61:256-61.

8. Biswas S, Das RK, Mukherjee G, Ghose T. Dexmedetomidine an adjuvant to levobupivacaine in supraclavicular brachial plexus block: a randomized double blind prospective study. Ethiopian journal of health sciences. 2014; 24(3):203-8.
9. Kaur H, Singh G, Rani S, Gupta KK, Kumar M, Rajpal AS, Aggarwal S. Effect of dexmedetomidine as an adjuvant to levobupivacaine in supraclavicular brachial plexus block: A randomized double-blind prospective study. J Anaesthesiol Clin Pharmacol. 2015;31:333-8.
10. Sarita S Swami, Varshali M Keniya, Sushma D Ladi, and Ruchika Rao: Comparison of dexmedetomidine and clonidine (α2 agonist drugs) as an adjuvant to local anaesthesia in supraclavicular brachial plexus block: A randomised double-blind prospective study. Indian Journal of Anaesthesia: 2012 May-June;56(3):243–49.