

A Comparative Study of Effects of Adding Dexmedetomidine to 0.5% Isobaric Levobupivacaine with 0.5% Isobaric Levobupivacaine Alone in Patient Undergoing Hand and Forearm Surgeries Under Axillary Brachial Plexus Block

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ABSTRACT

Introduction: Upper limb surgeries are mostly performed under peripheral blocks such as brachial plexus block. Peripheral nerve blocks not only provide intra-operative anaesthesia but also extend analgesia in the post operative period without any side effects. Although studies have described the effect of dexmedetomidine on Neuraxial and peripheral nerve blocks, to date, there are limited numbers of studies available on the effect of adding dexmedetomidine to levobupivacaine for axillary brachial plexus block.

Objectives: In this study we investigated the effects of addition of dexmedetomidine to isobaric levobupivacaine for axillary brachial plexus block. In view of the idea that decreasing the dose of dexmedetomidine may help to reduce side effects such as bradycardia and hypotension, we evaluated the effects of addition of dexmedetomidine at a lower dose (1µg/kg).

Methods: In this study, 100 patients with ASA status I and II scheduled to undergo forearm and hand surgeries were randomly divided in two equal groups, Group L (control) with 39 ml of 0.5% isobaric levobupivacaine + 1 ml of isotonic saline and Group LD (study) -0.5% isobaric levobupivacaine + 1ml of dexmedetomidine (1µg/kg) solution.

Results: The results showed that the onset of sensory and motor blockade were significantly more rapid in Group LD (7.88 ±.87 minutes vs 10.16 ±1.13 minutes and 13.16 ±.89 mins vs

15.04 ±.856 mins) than in the Group L. The duration of sensory and motor blockade was also significantly longer in group LD (918.8 ±1.12mins vs 656.1±8.58 mins and 799.9 ±12.59 mins vs 538.7±7.68 mins) respectively than in group L. There were no side effects or complications observed in any group.

Conclusion: Addition of dexmedetomidine to isobaric levobupivacaine results in faster onset and prolonged duration of axillary plexus block.

Keywords: Dexmedetomidine, Levobupivacaine, Axillary Plexus Block.

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Article History:

Received: 20-02-2022, Revised: 11-03-2022, Accepted: 28-03-2022

Access this article online	
Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2022.8.2.008	

INTRODUCTION

Prolonging the duration of sensory and motor blockade for regional anaesthesia is often desired for completing prolonged surgeries and post-operative analgesia. Various adjuvants like fentanyl, clonidine etc. have been used for this purpose.

Levobupivacaine is a long duration local anaesthetic, with pharmacology similar to bupivacaine and better safety margin.¹

Recently, α-2 adrenergic receptor agonists have been the focus of interest for their sedative, analgesic and peri-operative sympatholytic and cardiovascular stabilising effects in addition to their general anaesthetic sparing effects and ability to prolong local anaesthetic induced analgesia when used in regional

blocks.² Clonidine, a partial α2 adrenoreceptor agonist has been used successfully as additive in peripheral nerve blocks to prolong the duration of block. Dexmedetomidine is 8 times more selective α2 receptor agonist than clonidine.³

Many studies evaluated the effects of dexmedetomidine on Neuraxial and peripheral nerve blocks.⁴⁻⁶ But its use in axillary block is still not known.

In this study, we evaluated the effect of addition of dexmedetomidine to isobaric levobupivacaine for axillary brachial plexus block with primary endpoint as onset and duration of sensory and motor blocks.

METHODS

We enrolled 100 ASA, physical status I-II, after ethical committee approval and informed consent, scheduled to undergo hand and forearm surgery under axillary plexus block. Patients, with history of respiratory, cardiac renal or hepatic failure, pregnant women any coagulation disorder were excluded from the study.

After standard anaesthesia monitoring baseline HR, BP, RR and SpO₂ were recorded. IV line was secured and maintained with ringer lactate.

Patients were randomly divided in two groups using sealed envelope technique. Group L (control, n=50) 39 ml of 0.5% isobaric levobupivacaine + 1 ml of isotonic saline and Group LD (n=50) - 0.5% isobaric levobupivacaine + 1ml of dexmedetomidine (1µg/kg) solution. The drug solutions were prepared by an assistant not involved in the study. Axillary blockade was performed with the patient lying in the supine position with the arm in 90° abduction and 110° flexion at elbow. After preparation of the area, axillary artery pulse was identified. Median nerve lies superior ulnar nerve lies inferior and radial nerve postero-inferior to axillary artery. Musculocutaneous nerve was blocked separately at the elbow. If any block failure or inadequate block happened, the patients were excluded from the study. Motor blockade was

checked by adduction of thumb (ulnar nerve), abduction of thumb (radial nerve), elbow flexion (musculocutaneous nerve) and opposition of thumb (median nerve) using modified Lovett rating scale from 6 (normal) to 0 (complete paralysis).

Sensory block was assessed by pinprick test using a 3-point scale from 0 (normal sensation) to 2 (loss of touch). Onset time and duration of motor and sensory block were recorded. Postoperative pain was assessed by 10 cm VAS scale (0-10). Time to first analgesic use (VAS >4, Diclofenac 75 mg in 50 ml NS infusion) and total analgesic required in first postoperative 12 hrs were recorded. HR, SBP, DBP were recorded at 5 min intervals. Any adverse event was recorded. Sample size was determined on basis of pilot study with post operative pain score reduction of 30% was observed. Minimum sample size was calculated to be 40 each group, assuming type 1 error of 0.05 and margin of error of 10%. Final sample size selected was 50 in each group. Statistical analysis was performed with SPSS 15.0 and SigmaStat 3.5 Statistical package programs. Continuous variables analyzed with student -t test while categorical variables analyzed with chi-square test and Fisher Exact Test. *P* <0.05 value was considered to be statistically significant.

Table 1: Demographic distribution

Patient characteristics	Group L	Group LD
Age	32.48±11.1	37.36±12.41
Sex(F/M)	13/37	7/43
Weight	65.56±6.4	66.42±5.3
Duration of surgery	63.6±7.14	68±5.4

Table 2: Sensory and motor blockade

	Mean	SD	P value	Remarks
Onset of sensory block				
Group 1	10.16	±1.13	<.05	Significant
Group 2	7.88	±.87		
Onset of motor block				
Group 1	15.04	±.856	<.05	Significant
Group 2	13.16	±.89		
Duration of sensory block				
Group 1	656.1	±8.58	<.05	Significant
Group 2	918.8	±1.12		
Duration of motor block				
Group 1	538.7	±7.68	<.05	Significant
Group 2	799.9	±12.59		

RESULTS

The groups were comparable with respect to patient age, sex, weight and duration of surgery. (table 1)

The onset of sensory and motor blockade were significantly more rapid in Group LD (7.88 ±.87minutes vs 10.16 ±1.13minutes and 13.16±.89 mins vs 15.04 ±.856 mins) than in the Group L (table 2). The duration of sensory and motor blockade were also

significantly longer in group LD (918.8 ±1.12mins vs 656.1±8.58 mins and 799.9 ±12.59 mins vs 538.7±7.68 mins) respectively, than in group L (table 2). During post-operative period, VAS score was significantly higher in group L than in group LD. There were no side effects or complications observed in any group. Intra operative and post-operative vitals were stable.

DISCUSSION

Our study showed that the addition of dexmedetomidine to local anaesthetic significantly enhance the quality of axillary plexus block in forearm and hand surgeries in terms of onset of sensory and motor blockade as well as duration of block.

Dexmedetomidine is a potent α -2 adrenoreceptor agonist. The precise mechanism by which α 2 blockers exerts its analgesic effects remains unknown. Activation of postsynaptic α 2 receptors in substantia gelatinosa of the spinal cord is the presumed mechanism by which α 2 blockers produces analgesia. α 2 blockers enhance peripheral nerve blocks of local anaesthetics by selectively blocking A δ and C fibres. These may produce a peripheral analgesic effect by releasing enkephalin like substances. In previous studies dexmedetomidine has been added as adjuvant in peripheral nerve blocks successfully. Based on inferences and due need to further research on all these studies, we decided to use dexmedetomidine adjuvant to local anaesthetic levobupivacaine in axillary plexus block.

CONCLUSION

In conclusion, addition of dexmedetomidine to isobaric levobupivacaine results in faster onset and prolonged duration of axillary plexus block. Further studies are required for elucidating the precise mechanism of action of dexmedetomidine.

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Source of Support: Nil. **Conflict of Interest:** None Declared.

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Cite this article as: Sumit Soni, Tejinderpal Kaur Grewal, Simrit Kaur, Kartik. A Comparative Study of Effects of Adding Dexmedetomidine to 0.5% Isobaric Levobupivacaine with 0.5% Isobaric Levobupivacaine Alone in Patient Undergoing Hand and Forearm Surgeries Under Axillary Brachial Plexus Block. *Int J Med Res Prof*. 2022 Mar; 8(2): 31-33. DOI:10.21276/ijmrp.2022.8.2.008