Original Article

ISSN (O): 2456-7388; ISSN (P): 2617-5479

A Comparative Study on Effects of Bupivacaine- Lignocaine and Bupivacaine- Lignocaine with Dexmedetomidine Combination in Ultrasound Guided Supraclavicular Brachial Plexus Block

P. Rajeswar[1], **MN Girish**[2]

[1]Associate Professor, Department of Anaesthesiology, Kamineni Academy of Medical Sciences and Research Centre, LB Nagar, Hyderabad, Telangana, India,
[2]Department of Anesthesiology, Sapthagiri institute of medical sciences and Research Center, Bangalore, Karnataka, India.

Abstract

Background: To compare the effects of Bupivacaine Lignocaine and Bupivacaine Lignocaine in the ultrasound-guided Supraclavicular brachial plexus block with a mixture of Dexmedetomidine. **Subjects and Methods:** It is an interventional study undertaken over a course of 9 months in 60 patients undergoing elective upper limb surgery in the anaesthesia clinic of the Tertiary Centre. Sixty patients were allocated randomly to 2 groups, group I and group II. Effects on the onset and length of sensory and motor blockade and on the extent of postoperative analgesia may be studied. **Results:** Demographic data are equivalent in all grades. There is no significant change in hemodynamic parameters in comparison to the 2 groups. The onset of the sensory blockade and motor blockade in Group B was much smaller. With additional time in Group-B, the length of the sensory blockade and the motor blockade is statistically significant. Compared to A, the duration of complete sensory recovery and full motor recovery time forecast was longer in category B. In group-B at 0 and 4, the duration of complete analgesia at VAS is considerably long. Among the research classes, the length of maximal analgesia and the time of first rescue pain relief are statistically important. In the study, no complications were found. **Conclusion:** As an adjuvant to bupivacaine in the USG supraclavicular plexus block, dexmedetomidine shortens the onset and prolongs the sensory and motor block length.

Keywords: Bupivacaine, Lignocaine, Dexmedetomidine, Ultrasound-guided Supraclavicular brachial plexus block

Corresponding Author: MN Girish, Department of Anesthesiology, Sapthagiri institute of medical sciences and Research Center, Bangalore, Karnataka, India.
E-mail: drgirishmn@gmail.com

Received: 24 December 2019 **Revised: 25 January 2020** **Accepted: 03 February 2020** **Published: 24 December 2020**

Introduction

Due to its versatility in terms of expense, potency, degree of protection, and good post-surgical analgesia, a supraclavicular brachial plexus is a typical form of anaesthesia for different upper limb procedures. It offers rapid onset, dense arm anesthesia with a single injection. It offers the most powerful block for the upper extremity and also guarantees post-op analgesia without side effects. At the distal trunk-proximal division stage, it is over. The brachial plexus is compact at this stage and a small amount of local anesthetic allows for the rapid onset of reliable brachial plexus blockade. Blockade of brachial plexus (C5-T1) will allow for surgical anesthesia for elbow, forearm, and hand surgeries. Several different methods have been developed, but the primary drawback to these 'blind' approaches remains the limited but substantial risk of pneumothorax, considering improvements to the initial Kulenkampff scheme.[1,2] This risk has been stated to be nil in specialist hands, with other series citing as high as 6.1 percent occurrence of pneumothorax. When using a regional blockade landmark technique, weak nerve localization can result from anatomical differences or damage to the area, resulting in failed anesthesia or causing morbidity. In the upper limb, surface ultrasound can easily identify neuronal components of the brachial plexus as well as surrounding structures.

The value of exact nerve localization, real-time visualization of brachial plexus, blood vessels, needle positioning, the local anaesthetic spread is obtained by ultrasound-guided brachial plexus block. It minimizes the number of needle attempts. Various adjuvants, which will prolong the duration of analgesia were tried in many trials with lesser side effects but yet the ideal adjuvant remains undiscovered. Dexmedetomidine is a highly selective and active alpha2 -adrenergic agonist (8 times more selective than clonidine). When used in

systemic channels, it has analgesic, antihypertensive, sedative, and anesthetics-paring impact. During procedures for peripheral nerve blockade and regional anaesthetic, the addition of Dexmedetomidine to local anesthetics has been shown to enhance block effectiveness.[3,4]

When applied to local anaesthetic in separate regional blocks, dexmedetomidine prolongs the block length and time of post-operational analgesia. The efficacy of intrathecal, caudal, and epidural anesthesia has been documented to increase. Its use has recently been established in peripheral nerve blocks. To research the efficacy of the use of dexmedetomidine as an adjuvant in the supraclavicular block, very few studies have been performed. Dexmedetomidine was used in conjunction with a local anaesthetic study for sensory and motor blockade activation and duration, postoperative analgesia, and hemodynamic results.

Subjects and Methods

It is an interventional study undertaken over a course of 9 months in 60 patients undergoing elective upper limb surgery in the anaesthesia department of the Tertiary Centre. Sixty patients were assigned at random to 2 groups, group I, and group II. Patients undertaking elective upper limb surgery at the hospital were included in our sample after ethical acceptance.

Inclusion criteria:

Elective surgery for upper limb surgery (i.e. hip, wrist, and hand surgery) in the 18-60 age range of ASA grade I and grade II patients.

Exclusion criteria:

Patients with a history of bleeding complications, local block site inflammation, neuromuscular disorders, respiratory difficulties and local anaesthetic drug reactions have been identified.

Both patients received 0.05 mg/kg of Midazolam injection and 0.5 μg/ kg of Fentanyl injection 15 minutes before the operation. The HR, SBP, DBP were monitored every 5 minutes and spo2 was also monitored continuously. In a non-operated arm, an IV cannula of size 18 gauge (G) was inserted and the lactated Ringer solution was started.

A supraclavicular brachial plexus block was applied to the patient in the supine position, the head-turning to the opposite side. Within the supraclavicular fossa, the ultrasound probe was found, and the brachial plexus was established. A 22 G, 55 mm needle was used to tackle it:

Group I: Patients received 15ml of 0.5% Bupivacaine + 15ml of 1% Lignocaine

Group II: Patients received 15ml of 0.5% Bupivacaine + 15ml of 1% Lignocaine+ Dexmedetomidine 0.75 μg/kg

The initiation of sensory and motor blockade and length were studied. Using a 3 point scale, the sensory block was tested with a pinprick test:

0 = natural feeling

1 = loss of feeling with a pinprick

2= lack of sense of touch

Based on the adjusted Bromage scale, the engine block was calculated:

Grade 0: Natural flexion and elbow, forearm, and finger extension maximum motor control

Grade 1: With only the fingers being able to lift, decreased motor force

Grade 2: Full motor block of fingers that are not able to move

Every 3 minutes until the sensation loss started and then every 15 minutes until the sensation recovered, the pinprick sensation loss was checked. Every 3 minutes before the loss of movement and then every 15 minutes before they regained movement, the motor blockade was evaluated. HR, SBP, DBP were monitored every 5 minutes and SpO_2 was also monitored continuously. Both patients have been tracked for complications. During the intra-operative process for up to 48 hours post-operatively, (if any). The observations and details of each patient were documented in the proforma attached.

Results

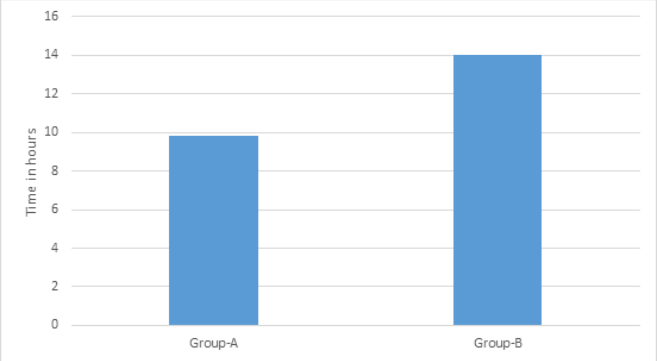

Figure 1: Time offirst pain Medication

Statistically important is the length of full analgesia and the timing of the first rescue pain treatment within the research groups.

No complications are observed in the study.

Table 1: Analysis of Socio-Demographic par ameters in study groups

	Group A	Group B
Age	39.29	32.93
Sex		
Male	38.33%	36.67%
Female	13.33%	11.67%
Anthropometry		
Weight	67.42	68
Height	1.69	1.64

There is no substantial difference between the mean age, with regard to the above results.

Table 2: Hemodynamic parameters comparison in the study

Group	Mean	Mean Difference	P-Value	95% CI (Lower)	95% CI (Upper)
Heart Rate					
Group A	82.13	-5.35	0.161	-12.84	2.13
Group B	87.48				
Systolic BP					
Group A	127.06	-13.15	0.0047	-21.9938	-4.291
Group B	140.21				
Diastolic BP					
Group A	82.03	-6.31	0.0157	-11.24	-1.39
Group B	88.34				
Respiratory Rate					
Group A	13.29	-0.95	0.047	-1.8712	-0.0309
Group B	14.24				
SPO_2					
Group A	99.94	0.11	0.199	-0.064	0.2798
Group B	99.83				

In contrast with the 2 groups, there is no substantial improvement in hemodynamic parameters.

Discussion

In our study, a mixture of Lignocaine and Bupivacaine was used for Group A patients and Dexmedetomidene with Lignocaine and Bupivacaine was used for Group B patients. In our research, ultrasound, which has become a helpful instrument, was used. The age group of 18-60 years recorded for upper limb surgery was included in our research At random, patients were assigned to Group A and Group B. Heart rate, respiratory rate, non-invasive systolic arterial blood pressure (SBP), peripheral oxygen saturation (SpO2), and diastolic blood pressure (DBP) were measured. In a Sarita et al. (2012),[5] The study comparing clonidine with dexmedetomidine in supraclavicular block showed a mean motor block onset period of 4.65 minutes in clonidine compared to 3.87 minutes in the dexmedetomidine group. In the clonidine group, the meantime of sensory block onset was 2.3 minutes, compared with 1.7 minutes in the dexmedetomidine group. In a study by Kenan et al.,[6] when Dexmedetomidine was applied to the axillary block with Levobupivacaine, no shortening of the motor block onset occurred while the sensory block onset was shortened.

The results of Dexmedetomidine Dexmedetomidine with Bupivacaine in a supraclavicular block were studied by Keshav Govind Rao et al.[7] (2014) and Rachana Gandhi et al. (2014). In our study, the duration of sensory blockade (mean difference -3.4, p-value < 0.00001) and motor blockade (mean difference -2.47 hours, p-value < 0.00001) were statistically significant and all of these effects were statistically significant. They observed that its onset has been greatly reduced by the length of the motor and sensory blockade. It reveals that the duration of sensory blockade and motor blockade is longer in Group B than in Group A. The mean sensory block

Table 3: Comparison of Onsetand Duration of anaesthesia in both study groups

Group	Mean	Mean Difference	P-Value	95% CI (Lower)	95% CI (Upper)
The onset of Sensory Block					
Group A	9.51	5.27	< .00001	-5.51	-4.11
Group B	4.24				
The onset of Motor Block					
Group A	10.55	5.34	< .00001	-5.51	-4.12
Group B	5.21				
Duration of Sensory Block					
Group A	7.84	-3.4	< .00001	-3.7108	-3.0546
Group B	11.23				
Duration of Motor Block					
Group A	7.04	-2.47	< .00001	-2.7416	-2.213
Group B	9.51				

In Group B, the onset of sensory blockade and motor blockade is slightly smaller. With increased time in group-B, sensory blockade and motor blockade durations were statistically important.

Table 4: Comparison of time taken for full recovery in both study groups

Group	Mean	Mean Differ-ence	P-Value	95% CI (Lower)	95% CI (Upper)
Time is taken for full sensory recovery					
Group A	9.58	-4.14	< 0.00001	-4.5662	-3.7224
Group B	13.72				
Time is taken for full Motor recovery					
Group A	8.26	-2.43	< 0.00001	-2.7599	-2.1127
Group B	10.69				

The time is taken for maximum sensory recovery (mean difference -4.14, p<0.00001) and total motor recovery (mean difference -2.43 hours, p<0.00001) was longer compared with A in category B.

Table 5: Comparison of the effectiveness of Analgesia in both study groups

Group	Mean	Mean Difference	P-Value	95% CI (Lower)	95% CI (Upper)
Duration of complete Analgesia (VAS at 0)					
Group A	7.84	-3.39	< 0.00001	-3.7108	-3.0546
Group B	11.23				
Duration of effective Analgesia (VAS at 4)					
Group A	9.65	-4.19	< 0.00001	-4.6143	-3.7669
Group B	13.84				

The period of full VAS analgesia at 0 and 4 is slightly elevated in group-B relative to group-A.

duration was 7.84 minutes in Group A (plain Bupivacaine and Lignocaine), while 11.23 minutes in Bupivacaine and Lignocaine with Dexmedetomidine. The mean motor block time for plain Bupivacaine and Lignocaine was 7.04 minutes, while it was 9.51 minutes for Bupivacaine and Lignocaine with Dexmedetomidine. Sensory blockade onset (mean difference -5.27, p-value <0.00001) and motor blockade onset (mean difference -5.34 hours, p-value < 0.00001) were statistically significant, and all were statistically significant. It shows that the initiation of sensory blockade and motor blockade is faster in Group B than in Group A. The mean onset time of the sensory block was 9.23 minutes in Group A (plain Bupivacaine and Lignocaine), versus 4.41 minutes in Bupivacaine and Lignocaine with Dexmedetomidine. The mean motor block

onset time for plain Bupivacaine and Lignocaine was 10.22 minutes, while it was 5.41 minutes for Bupivacaine and Lignocaine with Dexmedetomidine.

Amany S. et al.[8] compared the ultrasound-guided infraclavicular brachial plexus block was contrasted with Bupivacaine alone and Bupivacaine with Dexmedetomidine In the Dexmeditomidine population. In the population of Dexmedetomidine, shortened start time, improved motor and sensory block length, as well as time for first analgesic use were registered. Sarita et al,[5] Kenan et al,[6] and Aliye Esmaoglu et al.[9] have all reported similar impacts in terms of sensory and motor block length prolongation.

During our sample time, the length of full analgesia was 7.84 minutes in Group A (plain Bupivacaine and Lignocaine), while 11.23 minutes in Bupivacaine and Lignocaine with Dexmedetomidine. The time for good analgesia with simple Bupivacaine and Lignocaine was 9.65 minutes, while in the Dexmedetomidine group of Bupivacaine and Lignocaine it was 13.84 minutes. It suggests that the time of total and successful analgesia was extended in group B relative to group A. Our results in our analysis found that in both classes, hemodynamic parameters such as heart rate and blood pressure and SpO2 were in the ideal range. In all the research classes, the respiratory parameters were approximately identical. In the Dexmedetomidine group, bradycardia and hypotension (transient) were found in 3 patients.

In our sample, the frequency of bradycardia was lower (only 3 cases), presumably due to the lower dose of Dexmedetomidine that we used. We used 0.75 μg/kg of Dexmedetomidine in our study, with a maximum of 50 μg. In their patient group, Esmaoglu et al.[10] reported bradycardia, in which 100 μg of Dexmedetomidine was used with Levobupivacaine.

In the intra-operative phase and up to 48 hours postoperatively, all patients were monitored for complications. In the proforma enclosed, the findings and descriptions of each patient were registered. In all research groups, there were no risks or major adverse effects found.[11]

Conclusion

Based on our results, we infer that the mixture of Bupivacaine, Lignocaine and Dexmedetomidine induces the statistically significant faster onset of sensory and motor blockade, substantially improved length of sensory and motor block relative to group A for elbow, forearm and hand surgery in the ultrasound-guided supraclavicular block. The hemodynamic parameters of both groups were inside the optimal range. Statistically, the duration of postoperative analgesia is greatly increased in the Dexmedetomidine population.

By minimizing sensory and motor block onset, prolonging sensory and motor block length, and quicker onset with hemodynamic stability and no side effects, USG supraclavicular block increases the block effect using dexmedetomidine with bupivacaine.

References

1. Brown DL, Cahill DR, Bridenbaugh LD. Supraclavicular nerve block: anatomic analysis of a method to prevent pneumothorax. Anesth Analg. 1993;76(3):530–534. Available from: https://doi.org/10.1213/00000539-199303000-00013.
2. Franco CD, Vieira ZE. 1,001 subclavian perivascular brachial plexus blocks: success with a nerve stimulator. Reg Anesth Pain Med. 2000;25(1):41–47. Available from: https://doi.org/10.1016/s1098-7339(00)80009-7.
3. Ootaki C. Ultrasound-guided infraclavicular brachial plexus block: An alternative technique to anatomical landmark-guided approaches. Reg Anesth Pain Med. 2000;25(6):600–604. Available from: https://dx.doi.org/10.1053/rapm.2000.18184.
4. Huang R, Hertz L. Receptor subtype and dose dependence of dexmedetomidine-induced accumulation of [14C]glutamine in astrocytes suggests glial involvement in its hypnotic-sedative and anesthetic-sparing effects. Brain Research. 2000;873(2):297–301. Available from: https://dx.doi.org/10.1016/s0006-8993(00)02525-7.
5. Swami SS, Keniya VM, Ladi SD, Rao R. 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 J Anaesth. 2012;56(3):243–249. Available from: https://doi.org/10.4103/0019-5049.98767.
6. Kaygusuz K, Ozdemirkol I, Duger C, Gursoy S, Ozturk H, Kayacan U. Effects of Adding Dexmedetomidine to Levobupivacaine in Axillary Brachial Plexus Block. Curr Ther Res Clin Exp. 2012;73(3):103–111. Available from: https://dx.doi.org/10.1016/j.curtheres.2012.03.001.
7. Rao PKG, Kumar M. Chaurasiya and Aparna Shukla Comparison of clonidine and dexmeditomidine in supraclavicular block: An Open Access. Online International Journal Available at;4(1):226–229.
8. Mahmoud K, Ammar A. Ultrasound-guided single injection infraclavicular brachial plexus block using bupivacaine alone or combined with dexmedetomidine for pain control in upper limb surgery: A prospective randomized controlled trial. Saudi J Anaesth. 2012;6(2):109. Available from: https://dx.doi.org/10.4103/1658-354x.97021.
9. Esmaoglu A, Yegenoglu F, Akin A, Turk CY. Dexmedetomidine Added to Levobupivacaine Prolongs Axillary Brachial Plexus Block. Anesth Analg. 2010;111(6):1548–1551. Available from: https://dx.doi.org/10.1213/ane.0b013e3181fa3095.
10. Esmaoglu A, Yegenoglu F, Akin A, Turk CY. Dexmedetomidine Added to Levobupivacaine Prolongs Axillary Brachial Plexus Block. Anesth Analg. 2010;111(6):1548–1551. Available from: https://dx.doi.org/10.1213/ane.0b013e3181fa3095.
11. Williams SR, Chovinard P, Arcand G, Harris P, Ruel M, Boudreault D. Ultrasound guidance speeds execution and improves the quality of supraclavicular block. Anesth Analg. 2003;97(5):1518–1523. Available from: https://doi.org/10.1213/01.ane.0000086730.09173.ca.

Copyright: © the author(s), 2020. It is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits authors to retain ownership of the copyright for their content, and allow anyone to download, reuse, reprint, modify, distribute and/or copy the content as long as the original authors and source are cited.

How to cite this article: Rajeswar P, Girish MN. A Comparative Study on Effects of Bupivacaine- Lignocaine and Bupivacaine-Lignocaine with Dexmedetomidine Combination in Ultrasound Guided Supraclavicular Brachial Plexus Block. Acad. Anesthesiol. Int. 2020;5(2):125-130.

DOI: dx.doi.org/10.21276/aan.2020.5.2.26

Source of Support: Nil, **Conflict of Interest:** None declared.