Section: Anaesthesia

Original Research Article

EFFICACY OF DEXMEDETOMIDINE VERSUS FENTANYL AS ADJUVANTS IN BRACHIAL PLEXUS BLOCK AT, SUPRACLAVICULAR LEVEL ALONG WITH LEVOBUPIVACAINE

N. Sankar Ganesh[1], A.Gokulkannan[1], S.U.Sham Kumar[1]

[1]Assistant Professor, Govt Stanley Medical College and Hospital, Chennai, Tamilnadu India

Received : 02/03/2024
Received in revised form : 12/05/2024
Accepted : 28/05/2024

Keywords:
Brachial Plexus Block, Levobupivacaine, Dexmedetomidine Hemodynamics, Upper Extremity.

Corresponding Author:
Dr. N. Sankar Ganesh,
Email: drsankarnatarajan@gmail.com

DOI: 10.47009/jamp.2024.6.3.154

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

Int J Acad Med Pharm
2024; 6 (3); 749-752

Abstract

Background: Brachial plexus blocks alleviate need for general anaesthesia in many patients posted for upper limb surgeries. Presence of ultrasound increases the safety margin of the block. Many different adjuvants including opioids additive, catheter insertion were tried to prolong the block to provide postoperative analgesia and still the search is on. In this study we compared the efficacy of dexmedetomidine versus fentanyl as adjuvants in brachial plexus block at supraclavicular level along with levobupivacaine. **Materials and Methods:** Prospective randomized double-blind controlled study. Study population was done in patients admitted for elective upper limb surgery. Group A: received Levobupivacaine with dexmedetomidine. Group B: received Levobupivacaine with fentanyl. Onset, duration and recovery of motor and sensory blockade, time to request first rescue analgesia, hemodynamics and any complications were monitored. **Result:** Dexemedtomidine group had significantly early onset(4.67± 1.322 & 9.10 ±1.845 minutes) with increased duration of motor(11.4033±0.994 &9.6730±9.6730 minutes) and sensory block and delay in request for first rescue analgesis when compared to fentanyl group. There is no significant difference in complications. **Conclusion:** We conclude that dexmedetomidine is better additive to levobupivacaine than fentanyl when added to levobupivacaine in supraclavicular brachial plexus block in view of early onset and increased duration of blockade.

INTRODUCTION

Blocking the brachial plexus is considered to be one of the effective methods to achieve anesthesia of the upper limb from the level of shoulder to the level of fingertips.[1] Using ultrasound probes help to visualize the pleura and to locate the position of the needle thereby it reduces the occurrence of pneumothorax and hence using ultrasound probe for achieving brachial plexus block is gaining popularity nowadays. The major advantage of using ultrasound- guided procedure is that it produces dense analgesia and anaesthesia, onset of achieving anaesthesia and analgesia is also rapid and at the same time avoid injury to vascular structures.[2] Available literatures have shown that the rate of occurrence of phrenic nerve palsy was 30% at the maximum with supraclavicular block.[3] Many drugs have been advised for brachial plexus block in our study we are comparing dexmedetomidine and fentanyl as additive to levobupivacaine in brachial plexus block.

The main aim of the study to compare the analgesic efficacy of dexmedetomidine and fentanyl as adjuvants to levobupivacaine in ultrasound guided supraclavicular brachial plexus block by comparing the onset, duration of sensory and motor block, quality of block and the time taken for recovery between the drugs.

MATERIALS AND METHODS

Design of the study: Prospective randomized double-blind controlled study. Study population: Patients admitted for the purpose of elective upper limb surgery.

GROUP A: Patients receiving Levobupivacaine with dexmedetomidine.

GROUP B: Patients receiving Levobupivacaine with fentanyl.

Methods of Study

The patients were placed in the supine position with their heads turned in the direction opposite the neutral position, along the body. Subsequently, the probe linear type (12MHZ) of the ultrasound equipment wrapped within a sterile rubber glove was placed on supraclavicular fossa to locate the subclavian artery and brachial plexus cluster. After

ISSN (O): 2687-5365; ISSN (P): 2753-6556

local anesthetic infiltration, a 50 mm 22 G insulated short beveled stimulation needle (Stimuplex A, B. Braun Melsungen AG, Germany) was inserted toward the brachial plexus cluster from lateral to medial in the long axis of the ultrasound beam after locating the subclavian artery and brachial plexus cluster. Once the needle tip reached the brachial plexus cluster on the ultrasound image, 30ml of drug was injected as appropriate for the group of study. Completion of injection was considered as time 0. Sensory and motor blockade evaluation was done every 1 min, till the onset of the successful sensory and motor block, and then hourly till the complete regression of the block. The sensory block was evaluated in the distribution of four nerves – musculocutaneous, median, radial, and ulnar with the pinprick method using a 3- point scale: 0 = normal sensation; 1 = loss of sensation of pinprick (analgesia); and 2 = loss of sensation of touch (anesthesia).Motor block was evaluated for four nerves (elbow flexion, thumb opposition, thumb abduction, and thumb adduction).Motor blockade was graded on 3-point scale: 0 = no block (normal motor functions with full flexion and extension of the elbow, wrist, and fingers); 1 = decreased motor strength with the ability to move fingers only; and 2 = complete motor blockade with the inability to move finger Quality of block was assessed on a 3-point scale by anesthesiologist who was blinded to study drugs as: 0 = complete failure; 1 = inadequate block; and 2 = successful block. The heart rate, respiratory rate, oxygen saturation, and blood pressure (systolic, diastolic, and mean arterial) were noted, hence every 5 min till 30 min and then every 30 min till the end of the surgery. On arrival in the postanasthesia care unit, pain scoring was assessed using visual analogue score on movement of operated arm: 0=no pain; 1-3=mid pain; and 5=moderate pain;10=most severe pain. VAS on movement was assessed hourly following surgery till the request of first analgesic. Any patient showing VAS >3 was given 1 g paracetamol infusion intravenously. A total number of rescue injections given during first 24 hours of post-operative period, was recorded Statistical analysis: The collected data was entered in Microsoft Excel and transferred to SPSS software for analysis. Statistical difference between two proportions was analyzed using chi-square test. To analyze the difference in mean between 2 groups, independent t test was done. For all tests of statistical significance, p value of <0.05 was taken as significant.

RESULTS

Both the groups were similar with respect to Age, Gender, Body Mass Index and ASA Status.

Mean duration of onset of sensory block among participants in dexmedetomidine group was 4.67 minutes whereas the same was 9.33 minutes in fentanyl group and Mean duration of onset of motor block among participants in dexmedetomidine group was 9.10 minutes whereas the same was 14.7 minutes in fentanyl group. The difference was statistically significant. The mean duration of sensory block among participants in dexmedetomidine group was 11.4 hrs whereas the same was 7.8 hrs in fentanyl group. The difference was statistically significant. The mean duration of motor block among participants in dexmedetomidine group was 9.6 hrs. whereas the same was 7 hrs in fentanyl group. The difference was statistically significant. The mean duration of time required for complete sensory recovery in postoperative period was high in dexmedetomidine group which was 13.9 hrs whereas the time needed for complete recovery in fentanyl group was only 9.5 hrs. Similarly the mean duration of time required for complete motor recovery in postoperative period was high in dexmedetomidine group which was 13.9 hrs whereas the time needed for complete recovery in fentanyl group was only 9.5 hrs. The mean duration of complete analgesia was 11.4 hrs in dexmedetomidine group compared to 7.8 hrs in fentanyl group and this difference was statistically significant. The mean duration of effective analgesia was 14 hrs in dexmedetomidine group compared to 9.6 hrs in fentanyl group and this difference was statistically significant. Time for requirement of first medication in dexmedetomidine group was 14.2 hrs and the same was 9.8 hrs in fentanyl group and this difference was statistically significant. There was no statistically significant difference in the occurrence of bradycardia in both the groups. None of the patients in both the groups had hypotension.

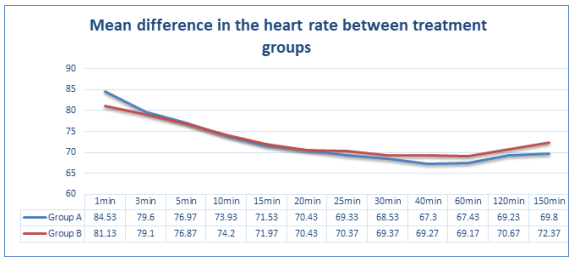

Figure 1: Comparison of heart rate

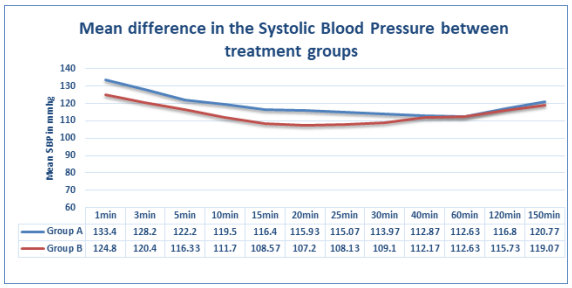

Figure 2: Comparison of systolic blood pressure

ISSN (O): 2687-5365; ISSN (P): 2753-6556

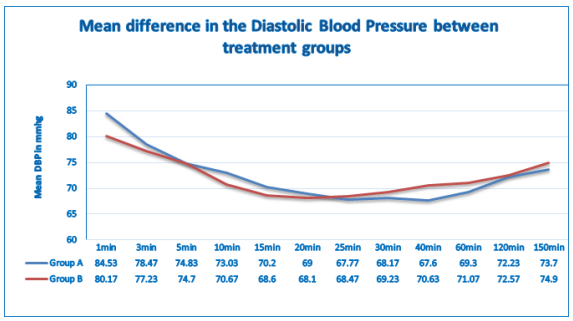

Figure 3: Comparison of Diastolic blood pressure

Table 1: comparison of onset of sensory and motor block

Mean duration of Onset of sensory block					
Group A	30	4.67	1.322	-7.6	<0.0001
Group B	30	9.33	3.055		
Mean duration of Onset of motor block					
Group A	30	9.10	1.845	-7.4	<0.0001
Group B	30	14.70	3.669		
Mean duration of sensory block					
Group A	30	11.4033	.99456	18.3	<0.0001
Group B	30	7.8037	.41393		
Mean Duration of motor block					
Group A	30	9.6730	.77269	17.06	<0.0001
Group B	30	7.0220	.35632		

DISCUSSION

The current study was done among 60 patients those who were admitted in a tertiary care hospital for the purpose of upper limb surgery with the objectives of studying and comparing the efficacy of dexmedetomidine versus fentanyl as adjuvants in brachial plexus block at supraclavicular level along with levobupivacaine. Mean age of the study participants in the present study was 37.2±12.7 years with majority in age group of 31 to 50 years. Among the total study participants, 15 were females and 45 were males contributing to 25% and 75% respectively.

In the current study mean duration of onset of sensory block among participants in dexmedetomidine group was 4.67 minutes whereas the same was 9.33 minutes in fentanyl group. The difference was statistically significant. In a study conducted by Kaur M et al,[4] they have reported the time of onset for sensory block as 6.9 minutes with dexmedetomidine and 8.5 minutes among patients those who were given fentanyl. As per the research article published by Hashim M et al,[5] onset of sensory block was 11.5 minutes in dexmedetomidine group and 15 minutes in fentanyl group. In their study, Dharmarao PS et al has reported a non-significant less duration of onset of sensory block among patients administered with dexmedetomidine than in fentanyl group.[6]

In my study the mean duration of onset of motor block among participants in dexmedetomidine group was 9.10 minutes whereas the same was 14.7 minutes in fentanyl group. The difference was statistically significant. In their study, Kaur M et al,[4] has stated that mean time of onset of motor block as 8 minutes in dexmedetomidine group and 9.7 minutes in fentanyl group. As per the research article published by Hashim M et al,[5] onset of motor block was 15.8 minutes in dexmedetomidine group and 16.3 minutes in fentanyl group.

In the current study, the mean duration of sensory block among participants in dexmedetomidine group was 11.4 hrs whereas the same was 7.8 hrs in fentanyl group. The mean duration of motor block among participants in dexmedetomidine group was 9.6 hrs whereas the same was 7 hrs in fentanyl group. The difference was statistically significant for both motor and sensory block. Hashim et al,[5] in their study has reported that participants in whom dexmedetomidine with bupivacaine group was administered they had significantly higher duration of sensory and motor block compared with fentanyl group. Similar to this report, Dharmarao et al6 also reported that duration of sensory block and also motor block was high in dexmedetomidine than in fentanyl group. Again another study by Ping Y et al,[7] also stated that dexmedetomidine had prolonged the duration of sensory block and also motor block.

In the present study, the mean duration of complete analgesia was 11.4 hrs in dexmedetomidine group compared to 7.8 hrs in fentanyl group and this difference was statistically significant. Similar to this report, Hashim et al also reported that dexmedetomidine was found to have higher analgesia than the fentanyl.[5] Another study by Ping Y et al also stated that adding dexmedetomidine was effective enough in providing analgesia.[7]

In this study, time for requirement of first medication was lower in dexmedetomidine group compared to fentanyl group. Similar to this finding, Hashim et al,[5] also reported that dexmedetomidine

ISSN (O): 2687-5365; ISSN (P): 2753-6556

provided better postoperative analgesia which was superior to fentanyl.

In a study by Hashim RM,[5] they have reported that occurrence of hypotension was present among 30% of the study participants in dexmedetomidine group and 20% patients in fentanyl group. Bradycardia was present among 40% of the study participants in dexmedetomidine group where as it was present among 30% patients in fentanyl group. Similarly Ping Y et al also reported that perineural dexmedetomidine was found to cause bradycardia, hypotension.[7] However, there was no such report of hypotension or bradycardia in the present study similar to cai et al.[9] In contrary the meta analysis done by Hussain et al showed that patients receiving dexmedetomidine should be continuously monitored for the potentially harmful but reversible adverse effect of intraoperative bradycardia.[8,10,11]

CONCLUSION

Dexmedetomidine when added to levo bupivacaine in Ultrasound guided supraclavicular plexus block had faster onset of both sensory and motor and the same time prolonged the duration of both sensory and motor blockade when compared to fentanyl.

REFERENCES

1. Al- Haddad MF, Coventry DM. Brachial plexus blockade. BJA CEPD Reviews. 2002 Apr 1;2(2):33-6.
2. Raju PK, Coventry DM. Ultrasound-guided brachial plexus blocks. Continuing Education in Anaesthesia, Critical Care & Pain. 2014 Aug 1;14(4):185-91.
3. Costa F. Fentanyl: What It's For, Dosing, How to Take & Side Effects.
4. Kaur M, Kaur R, Kaur S, Baghla N, Bansal A, Kalia A, Kumar S, Lall A. A study to compare the analgesic efficacy of dexmedetomidine and fentanyl as adjuvants to levobupivacaine in ultrasound-guided supraclavicular brachial plexus block. Anesthesia Essays and Researches. 2018 Jul 1;12(3):669-73.
5. Hashim RM, Hassan RM. The efficacy of adjuvants to bupivacaine in ultrasound-guided supraclavicular block: a comparative study between dexmedetomidine, ketamine, and fentanyl. Ain-Shams Journal of Anesthesiology. 2019 Jul 16;11(1).
6. Dharmarao PS, Holyachi R. Comparative study of the efficacy of dexmedetomidine and fentanyl as adjuvants to ropivacaine in ultrasound-guided supraclavicular brachial plexus block. Turkish Journal of Anaesthesiology and Reanimation. 2018 Jun;46(3):208.
7. Ping Y, Ye Q, Wang W, Ye P, You Z. Dexmedetomidine as an adjuvant to local anesthetics in brachial plexus blocks: a meta-analysis of randomized controlled trials. Medicine. 2017 Jan 1;96(4):e5846.
8. Hussain N, Grzywacz VP, Ferreri CA, Atrey A, Banfield L, Shaparin N, Vydyanathan A. Investigating the efficacy of dexmedetomidine as an adjuvant to local anesthesia in brachial plexus block: a systematic review and meta-analysis of 18 randomized controlled trials. Regional Anesthesia & Pain Medicine. 2017 Mar 1;42(2):184-96.
9. Cai H, Fan X, Feng P, Wang X, Xie Y. Optimal dose of perineural dexmedetomidine to prolong analgesia after brachial plexus blockade: a systematic review and Meta-analysis of 57 randomized clinical trials. BMC anesthesiology. 2021 Dec;21:1-20.
10. Vorobeichik L, Brull R, Abdallah FW. Evidence basis for using perineural dexmedetomidine to enhance the quality of brachial plexus nerve blocks: a systematic review and meta-analysis of randomized controlled trials. BJA: British Journal of Anaesthesia. 2017 Feb 1;118(2):167-81.
11. Dai W, Tang M, He K. The effect and safety of dexmedetomidine added to ropivacaine in brachial plexus block: A meta-analysis of randomized controlled trials. Medicine. 2018 Oct 1;97(41):e12573.

ISSN (O): 2687-5365; ISSN (P): 2753-6556